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April 2010

Online at <https://mpra.ub.uni-muenchen.de/27351/>
MPRA Paper No. 27351, posted 09 Dec 2010 20:18 UTC

An appraisal of the wealth effect in the US: evidence from pseudo-panel data

This draft: December 2010

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Abstract. How does household wealth influence consumption? The empirical evidence brought so far by the literature is unclear, mostly because of the low quality of the data more readily available: aggregate data, cross sections and panel datasets lacking important variables all present major shortcomings for a proper analysis of the wealth effect. The aim of our paper is to contribute to the appraisal of the wealth effect performing a pseudo-panel analysis for the USA (1989-2007), combining information from the Consumer Expenditure Survey and the Survey of Consumer Finances. We distinguish between total and non durables consumption, and we also investigate the roles of the different components of household wealth, both gross and net. Our estimates indicate that there is a significant tangible wealth effect (between 2 and 4 cents per dollar), with an overwhelming importance of the value of the house of residence. On the contrary, financial wealth seems to positively affect consumption of the older households only. In general, it seems that older households experience higher wealth effects, i.e., extract more liquidity from their assets, than younger ones, which rely more on income effects.

Keywords: consumption; household wealth; wealth effect; pseudo-panel.

JEL: D12, E21

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1. Introduction

Aggregate savings rates in the USA have declined considerably during the Nineties and the beginning of the new Millennium (Hüfner and Koske 2010). Due to the contemporary growth of stock prices up to 2000, and of housing prices afterwards, many economists (Bernanke 2005; Paiella 2007a) have seen a direct relationship between the two phenomena thanks to the so called ‘wealth effect’ channel. F.i. Greenspan (2003) credited housing wealth, realized capital gains, and home equity borrowing with shoring up the economy in the aftermath of the stock market collapse of 2000 and the 2001 recession, primarily through their effects on consumer spending. Accordingly, Juster et al. (2005) claim that the decline in the personal saving rate is due to the significant capital gains in corporate equities experienced over this period. On the other hand, others conclude that there is at best a weak evidence of a stock market wealth effect, and underline the importance of housing wealth in determining the households’ decisions on consumption and savings (Case et al. 2005).

However, the mechanism through which wealth affects consumption is not yet clearly understood: while the arguments supporting a direct wealth effect are clear (changes in wealth directly cause changes in consumption through their effect on households' contemporaneous budget sets), the empirical evidence brought so far by a large literature that investigates the role of wealth shocks on consumption is unclear. Moreover, wealth can affect consumption through the indirect channel of providing collateral for obtaining access to credit (Cynamon and Fazzari 2008). In light of that, the aim of our article is to explore deeply the influence of wealth on household consumption and savings.

In our article we overcome the well known problem of inappropriate and incomplete data (which is partly responsible for the mixed results produced by the previous empirical literature) using a pseudo-panel dataset that combines information from two different surveys, the Consumer Expenditure Survey (CES) and the Survey of Consumer Finances (SCF). First, we impute the SCF wealth variables to the CES households for which we have detailed consumption data (that is, we use the SCF as a donor to enrich the variables set of the CES).¹ Then, we construct panel data from the resulting time series of cross sections employing a methodology introduced in Browning et al. (1985) and Deaton (1985). These pseudo-panel data can be used as a substitute for the unavailable true panel data to answer long-term individual behavioural questions such as the one addressed in this paper. After having defined cohorts based on time-invariant parameters (i.e. year of birth), the mean values for each variable of interest become the observations in the pseudo-panel data. In addition to filling gaps in the availability of true panel data, Deaton (1985) identifies three additional advantages of pseudo-panel data. Data from different sources can be combined into a

single set of pseudo-panel data if comparable cohorts can be defined in each source. Attrition problems often found in true panel data are minimized. The problem of the individuals' response errors is smoothed by the use of cohort means and can be explicitly controlled by using errors-in-variables method.

Our analysis exploits all these features using the pseudo-panel dataset to estimate a consumption equation with wealth, in various decompositions, as one of the main explanatory variables, for the period 1989-2007. In our analysis we differentiate between financial and tangible wealth, the latter further disaggregated into the value of the house of residence and the other tangible assets (mainly, other real estate properties). In addition, we investigate the role of debt on consumption decisions by studying both gross and net wealth. We also devote particular attention to the consumption behaviour of the older households, since both theory and previous empirical evidence suggest that they behave differently from younger households (f.i. see Miniaci et al. 2010).

The main result of our study is that tangible wealth is the main type of household wealth to positively affect consumption. In particular, the house of residence is the component of tangible wealth responsible for the highest direct wealth effect. The estimated elasticity of consumption spending with respect to the value of the house of residence is between two and four cents per dollar, which is not far from previous estimates. We view these estimates as a lower bound for the actual effects, since we study the effects of three year changes in wealth on one year consumption only (due to the triennial nature of the SCF). Among the additional results, older households experience a higher wealth effect (i.e. they extract more liquidity from their assets, as predicted by theory). This is particularly evident for net financial wealth, while it is measured with lower precision for the rest of the household wealth.

It would be tempting to use our results to comment on the economic and financial crisis that originated from the subprime mortgage market in 2007. However, we believe it to be impossible to extend our results to the interpretation of the consumption and saving dynamics from the beginning of the crisis onwards, not only because we employ data up to 2007 only, but also because it would be implausible to assume that wealth effects of the same magnitude are at work both during booms and during recessions. Indeed, some studies investigated the asymmetry of consumption responses to increases and decreases in wealth (f.i. Shirvani and Wilbratte 2000; Bertaut 2002; Disney et al. 2003). The rationale behind the unequal wealth effects relates to the assumption of diminishing marginal utility of wealth, where preferences are represented by convex utility functions (reflecting risk aversion) such that consumers would value increases in wealth less highly than equivalent decreases. In addition, whereas consumers can readily reduce consumption in response to a wealth

reduction, some consumers may find it difficult to borrow to increase consumption. Thus, our analysis is unable to shed light on the mechanisms at work during the recent financial crisis.

The rest of this paper is organized as follows. Section 2 provides a brief review of the previous literature. Section 3 describes the data used and how they were combined. Also, the econometric models are presented. Section 4 illustrates the results. Section 5 concludes briefly.

2. The wealth effect in the literature

There is a large literature devoted to the study of the wealth effect. Most of it is based on the life-cycle model originally proposed by Ando and Modigliani (1963). According to this theory, an increase in wealth leads the individuals to gradually increase consumption. Also, the propensity to consume out of wealth, whatever its form, should be the same small number (Paiella 2007b). In practice, this is likely to be violated, “if assets are not fungible and households develop ‘mental accounts’ that dictate that certain assets are more appropriate to use for current expenditure and others for long-term saving” (Paiella 2007b, 191). Thus, the appraisal of the wealth effect is an empirical matter, and a fair number of articles have dealt with it. Consequently, a wide range of estimates have been produced. For the US economy, they usually lie between 2 and 7 cents of additional consumption per year per 1 dollar increase in household wealth. This is consistent with the magnitude of the effect estimated by the research staff of the Board of Governors of the Federal Reserve System, that maintains the longest and most regularly updated wealth effect estimates for the USA. However, there are significant differences in the results depending on the methods utilized.

Aggregate data analysis typically find positive effects of wealth increases on private consumption (Davis and Palumbo 2001; Mehra 2001). Also, the real estate wealth effect seems to be higher than the stock market wealth effect. This arises from studies that concentrate either on the former (Girouard and Blondal 2001; Belski and Prakken 2004; Catte et al. 2004), the latter (Ludvigson and Steindel 1999; Poterba 2000; Edison and Sløk 2002; Sousa 2003; Liu and Shu 2004; Case and Quigley 2008), or both (Ludwig & Sløk 2002; Benjamin et al. 2004; Case et al. 2005). As it is common in the empirical literature, some authors find opposite results on the relative importance of the two types of wealth effects (f.i. Dvornak and Kohler 2007). There is no widespread agreement on the econometric techniques to adopt, either. In particular, some studies try to disentangle the short run effects of wealth changes from the long run ones, due to the concern that wealth shocks must be perceived as permanent in order to affect consumption. While most of them adopt cointegration methods to disentangle between the short run and the long run (Tuttle and Gauger

2003; Lettau and Ludvigson 2004), some authors choose alternative ways (f.i. Carroll et al. 2006; Morris 2006).

However, the use of aggregate data has been criticized because of its inability to solve the well-known problem of endogeneity, which is present due to the fact that wealth is the result of both past savings/consumption decisions and movements of asset prices. Attanasio and Banks (2001) advise not to use aggregate data also because of aggregation issues and difficulties in decomposing age, cohort and time effects. Also, household-level data may permit to distinguish between durables and non-durables consumption (f.i., see Fernandez-Villaverde and Krueger 2007), and, on the wealth side, among different components of both tangible and intangible wealth (f.i. see Juster et al. 2005). Accordingly, a whole strand of literature uses household-level data to investigate the magnitude of the wealth effect. While there are few studies on economies outside the US (Campbell and Cocco 2007 on the UK; Paiella 2007b on Italy), most of them concentrate on the US economy (Engelhardt 1996; Skinner 1996; Parker 1999; Dynan and Maki 2001; Lehnert 2004; Juster et al. 2005). This is due to the availability of many US survey and panel data, such as the Consumer Expenditure Survey (CES), the Panel Study of Income Dynamics (PSID), or the Survey of Consumer Finances (SCF). However, each one of them, taken singularly, has some drawbacks for this type of analysis. The PSID contains data on food consumption only, and data on household wealth have been collected since 1984 every five year only. The CES has highly detailed consumption data, but the quality of its wealth data is low due to limitations both in scope and precision. On the other hand, the SCF does not contain detailed consumption variables, while information on wealth is collected very accurately. Some authors (f.i Maki and Palumbo 2001) tried to overcome these problems by using cohort-level analysis based on the original ideas by Browning et al. (1985) and Deaton (1985) by combining aggregate and household level data. An interesting alternative is the one by Bostic et al. (2009), where a sample combination technique has been used to obtain a dataset suitable for an analysis of the wealth effect.

Generally, household-level data studies tend to confirm the results of the studies that use aggregate data (Levin 1998, is a notable conflicting example, since he concludes that wealth does not affect consumption), but have a higher ability to distinguish between different channels through which wealth changes affect consumption. Also, depending on the data used, some of them have been able to shed light on the role of liquidity constraints and precautionary savings (f.i. Engelhardt 1996, and Campbell and Cocco 2007, respectively).

The strategy followed in our paper is to build a new pseudo-panel dataset combining information from existing US sources. A sample combination procedure is used to enrich the CES data with wealth variables from SCF households. Then, we use this time series of cross-sections to perform a

pseudo-panel analysis. The procedure generates a dataset which contains a large amount of information, which helps dealing with the problem of omitted variables, and therefore moderates the issue of endogeneity. Methods of integrating different sources of information similar to the one that we utilized here have been recently used by some national institutes of statistics as a convenient way to obtain detailed datasets without having to bear the costs of producing brand new surveys (f.i., see Rosati 1998; Del Boca et al. 2005). We follow closely the guidelines established in the literature (D’Orazio et al. 2006; Ridder and Moffitt 2007), then we use the resulting dataset to build a pseudo-panel, following the idea originally proposed by Browning et al. (1985) and Deaton (1985). Finally, we provide data and codes that we used to perform whole analysis in order to ensure its repeatability (see the Web Appendix).

3. Data: sample combination and pseudo-panel characteristics

3.1 CES and SCF data

In our analysis we use the wealth data from the SCF to enrich the information contained on the CES, that contains detailed consumption data, for the period 1989-2007.² The dataset arising from the combination of these two surveys contains data on both consumption and wealth, making it the appropriate source for the analysis of wealth effect. Also, there is a rich set of additional socio-economic variables that helps attenuating the problem of endogeneity related to omitted variables. The CES is collected by the Bureau of Labor Statistics (BLS) to compute the Consumer Price Index, and contains data on a high percentage of total household expenditures (see Garner et al., 2006). It is a rotating panel in which each household is interviewed four consecutive times over a one year period. Each quarter 25% of the sample is replaced by new households. The survey contains quarterly data, thus we had to extrapolate data on yearly consumption to perform the combination with the SCF. Also, the interviews are conducted monthly about the expenditures of the previous three months: for example, a unit interviewed in January will appear in the same quarter of a unit interviewed in February or March, even if the reported information will cover a slightly different period of time. This overlapping structure of the sample complicates the operation of estimating annual consumption in many dimensions. First, the year over which we have information for each household is different depending on the month in which the household completes its cycle of interviews. Second, and even more important, not all households complete the cycle of four interviews, thus they don't report all the expenditures made in one year. What follows is a detailed explanation of the procedure that we followed to obtain annual data from the CES, so to be able to combine it with the SCF.

In order not to waste a vast amount of information, we have chosen to use the data of the households present for the whole year of reference, as well as the data of the households that were interviewed three periods or less. First, we harmonized the expenditure variables using the Consumer Price Index (CPI), differentiated for food, energy and other goods, in order to have all expenditures expressed with the prices of June of the reference year. Second, we seasonally adjusted the quarterly measures of consumption using the ratio to moving average method. Finally, we used a simple technique to extend these corrected quarterly expenditures to the whole year of interest: we multiplied by four the expenditure of the households present for one quarter only, by two the expenditure of two quarters and by four thirds the expenditure of the households interviewed for three quarters. For the households that were present for four quarters in a row, we just computed the sum across quarters. We believe that this procedure does not produce distorted measures according to the number of quarters for which there are data in the CES, due both to the CPI harmonization and, even more important, the seasonal adjustment. We also checked whether this operation led to a dataset differing from the original (quarterly) one in terms of distributions of the variables that we used in our analysis, finding no significant differences. For each household, in addition to the consumption variables, both for total and non-durables expenditure, we kept socio-demographic variables and annual income.³

The household wealth data that we imputed to the CES households come from the SCF, which is triennial and is produced by the Federal Reserve Board. This survey contains socio-demographic information that proved valuable for the statistical matching procedure. In particular, we used data on marital status, race, age, education and occupation of the household head, home ownership status and family size. The period covered by the analysis starts in 1989, mainly because the SCF question frame was different in earlier periods, and ends in 2007, with 7 periods in total. In addition, we used the information contained in all the five implications of the SCF (five different versions of the dataset that derive from the multiple imputation procedure used to approximate the distribution of missing data, as explained by Kennickell 1998), by performing the sample combination with the CES separately for each implication.

3.2 The sample combination procedure

The aim of the procedure is to look for similar households across the two surveys and then to attach the wealth variables observed for the SCF households to the most similar ones in the CES, so to get an “augmented” CES that contains detailed information on wealth in addition to the consumption and socio-demographic variables originally collected by the BLS. In constructing and applying the matching procedure we followed the principles and suggestions given by Ridder and Moffitt (2007)

so to make sure to produce a high quality new dataset. The details of the procedure are the following.⁴

We first partitioned both samples into cells based on six categorical variables in order to avoid matching individuals that differ in important characteristics. For the year 2007, and similarly for the other years, more than 700 cells were created using:

- * Race - white, black or other;
- * Marital status - married or not;
- * Education - twelfth grade or less, high school, some college or more;
- * Tenure - home owner or not;
- * Occupation - not working, managers and professionals, technicians, services, operators, other;
- * Family size - one, two, three or four or more people in the household.

Thanks to this detailed partition that makes use of many different variables, we were able to avoid the risk of matching pairs of households differing in fundamental characteristics. Almost every cell contained individuals from both surveys, and the imputation of the wealth variables to the CES households has been done only using SCF households pertaining to the same cell. Thus, within every cell, we looked for the most similar households across the two surveys according to the values of income and age, building a unique distance function able to measure the differences in these two variables.⁵ The wealth values of the SCF households were assigned to the most similar CES households within the cell. We also refined the matching by dropping the individuals for which the distance function displayed too high value, that is, the matched individuals had non-deniable differences in age and/or income to be paired together.⁶ The matching process yielded a dataset with more than 12,000 observations in 2007.

We checked the result of the matching procedure in two different ways. We verified the similarity among the correlations between income (which is observed in both surveys) and the wealth variables both in the SCF and in our augmented CES (after-matching). Table 1 shows that the similarity is very high, suggesting that the procedure did not alter the distribution of the imputed variables, a signal of good quality of the overall sample combination. Furthermore, we produced the graphs of the probability density functions of the matched variables obtained with a kernel density estimation, finding comfortingly similar curves.

insert Table 1 about here

insert Figures 1-7 about here

Figures 1-7 report the graphs for household net wealth: we have chosen this variable because it comprehends both assets and debt, therefore it summarizes more than other variables the results of the matching procedure. Although the two distributions do not completely overlap because not all

the SCF individuals are used as donors in the matching procedure, the curves do show very similar patterns, again making sure that the matching procedure maintained the distributional properties of the variables of interest.

We used these precautions because sample combination methods must be applied with care, as there are some conditions that have to be met in order not to commit errors. First, the two different surveys must be two samples drawn from the same population. Second, there must be a set of common variables on which to condition the matching procedure, as it is clear from the above description of the procedure. As for the first condition, both the CES and the SCF are samples representing the US population. Their sample designs are different, since the SCF oversamples households that are likely to be wealthier, while the CES does not. However, we decided to proceed with the sample combination procedure without correcting for this difference, since any correction (that is, dropping a certain percentage of the wealthier SCF households) would have involved a high degree of subjectivity. Despite this fact, the resulting dataset is robust to the alternative *modus operandi* where the wealthiest SCF households are dropped before the sample combination.⁷ About the second condition, there are many socio-demographic variables that are collected in both surveys, and for some of them a recoding proved to be necessary to express them in the same way. This has been carried out making a large use of the documentation that accompanies the public releases of the two surveys. Most recoding operations turned out to be straightforward. The most interesting exception has been the recoding of the occupational sector variable for the 1989 and 1992 waves of the CES, where there is an additional category, "self-employed", that in the SCF is not taken into account. In this case we performed a multinomial logit estimation to impute the occupational sector to the CES individuals labeled as "self-employed" in order to proceed with the matching with the SCF. The estimation results were in line with the distributions of the occupational variable both in the SCF and in the subsequent editions of the CES.

3.3 Pseudo-panel: construction and characteristics

Following Browning et al. (1985) and Deaton (1985), we constructed panel data from the time series of cross sections resulting from the sample combination procedure. This method allows us to overcome the major limitation of repeated cross-sectional data, i.e. the fact that the same individuals are not followed over time. Pseudo-panel data present the additional advantage of dealing with the attrition problem more flexibly with respect to genuine panel data.

In this section we define cohorts based on the year of birth of the household head. Each cohort consists of households whose head was born within four-year period: the oldest cohort is for individuals born between 1898 and 1901, and the youngest for individuals born between 1986 and

1989. The resulting dataset is composed by 23 cohorts and 7 years of data (see Table 2 for more details).

Insert Table 2 about here

Figure 8 plots the evolution of the ratio of net wealth over income over the life cycle. Each line corresponds to a different cohort. It is interesting to notice that the ratio rises somewhat constantly starting from the beginning of the age of majority, until it experiences a decline between 70 and 80 years old.⁸

Insert Figures 8-9 about here

Figure 9 is built in a similar way, and shows the ratio of non durables consumption on income over the life cycle. The profiles are hump-shaped over the life cycle, reflecting the evolution of the income profiles. At the beginning of the age of majority income is typically low, leading to values of the ratio larger than one. Then, as income rises, this kind of expenditure represents a declining share of it (reaching a minimum of approximately .5), until the age of retirement, when income decreases due to retirement.

4. Model and results

4.1 The model

Following the literature on life cycle consumption, the basic specification of our model would be the following, if household-level panel data were available:

$$\log(C_{it}) = \alpha_1 \log(\text{income}_{it}) + \alpha_2 \log(\text{wealth}_{it}) + \beta' Z_{it} + k_i + \varepsilon_{it} \quad (1)$$

where C_{it} is consumption (either total or non durables consumption); income_{it} is current income; wealth_{it} is household wealth; k_i is a fixed (time-invariant) individual effect; Z_{it} is a vector of additional controls; ε_{it} is a time-varying and individual-specific error term.

However, we estimate a similar model based on a pseudo-panel, thus equation (1) has to be aggregated over all individuals within a specific cohort. We obtain the following model that refers to cohorts rather than individuals (indexed by c , instead of i):

$$\log(\bar{C}_{ct}) = \alpha_1 \log(\overline{\text{income}_{ct}}) + \alpha_2 \log(\overline{\text{wealth}_{ct}}) + \beta' \bar{Z}_{ct} + \bar{k}_{ct} + \bar{\varepsilon}_{ct} \quad (2)$$

where the variables are the cohort means. Note that, differently from the individual fixed effect in equation (1), the mean of the cohort effect is no longer necessarily constant over time, since the pseudo-panel is composed by independent cross sections, so that the same individuals are not present in more than one of them. It can be expected that the cohort effect will be correlated with the explanatory variables, leading to inconsistent estimates. Deaton (1985) solves this problem by considering the model in terms of unobserved population cohort means and the actual cohort data as

error-ridden measurements of these means, thus suggesting an error-in-variables estimator. We therefore estimate a fixed effects model, correcting for the measurement errors in observed cohort means.

In our analysis we use three different specifications of the model in equation (2), in order to investigate the role of the different components of household wealth. Specification 1 divides wealth between the value of the house of residence (*house*), the value of the rest of tangible assets (mostly other real estate properties, *ore*) and gross financial wealth (*fin*); the other two specifications investigate the role of household debt. Specification 2 includes financial wealth net of debt (*netfin*), while specification 3 includes gross financial wealth together with the total value of tangible assets diminished by debt (*netting*). The additional explanatory variables of the model are the following: annual income (*income*), age (*age* and *agesq*), educational level (*educ*), two dummies for the race (*race-black* for African Americans, *race-other* for other non-White), a dummy for the occupational status (*not working*). We also include a few interaction variables in order to better grasp the wealth and consumption dynamics of the old people. In particular, a dummy that takes the value of 1 if the household head is over 65 years old is multiplied by income and by the relevant (according to the various model specifications, see below) income and wealth variables.

Notice that in principle, when trying to explain the observed variance of the variables, we would like to be able to differentiate between cohort effects, age effects and period effects. However, as noted by Russell and Fraas (2005), these three effects “cannot be simultaneously identified because only one time dimension and one individual or cohort dimension exists. More specifically, the functional relationship between all three effects causes perfect collinearity when all three effects are fully specified (Fienberg & Mason, 1985; Ryder, 1965)” (Russell and Fraas 2005, 3). We address the age, period and cohort identification problem by using a linear restriction that all period effects are equal, therefore we do not include year dummies among the controls. This assumption allows a set of mean age dummies, and the fixed effects estimation takes into account the cohort effects.

We estimate these three specifications using two alternative dependent variables: the logarithms of total consumption and of non-durable goods expenditure. We disregard the expenditure on durable goods because its timing does not match the flow of services coming from the goods. In particular, the relationship between consumption, income and wealth applies to the flow of consumption, but durable goods expenditure “represents replacements and additions to a stock, rather than the service flow from the existing stock” (Paiella 2007b, 198). This is why we concentrate on the results for total and, above all, non durable goods consumption.⁹

4.2 Results

All the fixed effects estimations take into account the multiple imputation used in the SCF using the RII (see Montalto and Sung 1996; Rubin 1987). Very briefly, every year the SCF consists of five complete data sets because missing data are multiply imputed, producing implications 1 to 5. For each survey year, we performed the sample matching with the CES separately for every implication, thus obtaining five different datasets for each year of interest (1989, 1992... and 2007). Then, in order to get the whole time series of cross-sections, we aggregated all the implications 1, then all the implications 2, and so on until the implications number 5, obtaining 5 different implications of the same dataset, from which obtaining our pseudo-panel.¹⁰ Thanks to the RII, we use information from all these five data sets in order to make valid inferences, taking into account the extra variability in the data due to the imputed missing values. Also, standard errors are clustered, as it is advisable using pseudo-panel data (Petersen 2009).

Insert Tables 3-5 about here

The results of the estimation of equation (2) (131 non empty cohorts, obtained from more than 73,000 observations for each implication) are reported in Tables 3-5, because of the three specifications based on the different decompositions of household wealth. In each table, results are reported separately for models with the two different dependent variables. Results show that current income positively and significantly affected consumption in the period 1989-2007. The estimated elasticity ranges between 0.47 and 0.62, indicating that current income plays a very important role in determining current consumption. Turning to the household wealth coefficients, it seems that its various components differently affect consumption. In particular, gross financial wealth did not positively affect consumption during the period of interest (the *fin* coefficients are always very small and negative). On the contrary, tangible wealth positively affected consumption, with an estimated elasticity reaching at most 4 cents per dollar (see the *house* coefficient in Table 3 when non durables expenditure is the dependent variable). In particular, the estimated coefficients associated to the house of residence are always highly significant, while the ones of the other tangible assets, although always positive, are not statistically different from zero at standard significance levels.

Once debt is introduced in the analysis, with the estimation of the second and third specifications, results show that considering tangible wealth net of debt lowers the estimated elasticity (1 and 2 cents per dollar with total consumption and non durables expenditure as dependent variables, respectively - see Table 4), but remains significantly different from zero when the dependent variable is non durables expenditure.

The behaviour of the older households is investigated thanks to the income and wealth interaction terms with the *old* dummy. The coefficients of the interaction terms related to financial wealth and

housing wealth are always positive, suggesting that older households extract more liquidity out of their properties. However, these estimates suffer from a low precision, as only the coefficient of the interacted net financial wealth (Table 4, total consumption as the dependent variable) is statistically significant at standard levels (showing an elasticity of 2 cents per dollar). Finally, the *old*income* interaction term shows that older households rely less on income when deciding their consumption levels, since the estimated coefficients are always negative.

The rest of the explanatory variables present the following results. The non trivial relationship between age and consumption is confirmed by the high statistical significance of the coefficients of age and age squared (the first positive, the second smaller and negative). Higher education is associated with higher consumption, while of the two ethnic-minorities dummies, only the one indicating a non-White and non-Black household head is always negative and statistically significant (the reference ethnic group is White).

We investigated the robustness of our findings in several ways. The results hold when we get rid of the 1% of household that are at the top and at the bottom both of the income and of the consumption distributions. As said previously, the results are also robust to variations of the sample combining procedure. This robustness is not surprising, since our sample is very large, and it is unlikely that our results are driven by outliers or by small subsamples of households.

To conclude, wealth surely plays a role in determining consumption and savings patterns of American households during the period 1989-2007. However, the phenomenon is multi-faceted, since various kinds of wealth affect consumption in different ways. In particular, financial wealth does not seem to exert positive effects on it, while tangible wealth does, particularly through the value of the house of residence. Additionally, the direct wealth effect phenomenon is more important for older households, while the younger ones rely more on current income when deciding their expenditure levels.

5. Conclusions

This paper analyses the strength of the wealth effect on consumption in the USA with a pseudo-panel dataset specifically built for this scope. We combine data from the CES and the SCF for the years 1989-2007. In particular, the SCF was used as the “donor” survey: its wealth data were given to CES households in order to enrich the data collected in this latter survey and to perform an analysis capable to link consumption and wealth using household-level data. This sample combination produced a large time series of cross sections with more than 70,000 observations. The resulting dataset was then used to build a pseudo-panel dataset aggregating individual observations in cohorts based on the year of birth of the head of the households. Each cohort consists of

households whose head was born within four-year period: the oldest cohort is for individuals born between 1898 and 1901, and the youngest for individuals born between 1986 and 1989. The resulting dataset is composed by 23 cohorts and 7 years of data. The effects of wealth were investigated using two different dependent variables: total and non durables consumption. Our dataset permits a high disaggregation of tangible wealth, as well as a differentiation between net and gross financial wealth. We differentiate between financial and tangible wealth, the latter further disaggregated into the value of the house of residence and the other real estate properties; in addition, we investigate the role of debt on consumption decisions by studying both gross and net wealth.

The main result of our study is that tangible wealth is the main type of household wealth to significantly and positively affect consumption during the period 1989-2007. The estimated elasticity of consumption spending with respect to tangible wealth is between 2 and 4 cents per dollar, which is not far from previous estimates. In particular, the house of residence is the part of tangible wealth which is responsible for the highest direct wealth effect. It seems that households tend to consume both out of their house of residence and out of their other real estate properties, even if the latter effect is estimated with lower precision. On the other hand, our results suggest that financial wealth exerts a positive direct effect on household consumption for the older households only. Among the additional results, older households experience a higher tangible wealth effect (that is, extract more liquidity from their assets, as predicted by theory), while they have a lower elasticity of consumption with respect to income.

It would be tempting to use our results to comment on the economic and financial crisis that originated from the subprime mortgage market in 2007. However, it would be implausible to assume that wealth effects of the same magnitude are at work both during booms and during recessions. As some studies pointed out (f.i. Hassan and Wilbratte 2000; Bertaut 2002; Disney et al. 2003), consumption responses to increases and decreases in wealth are unlikely to be symmetric. On the other hand, our results show that wealth seems to play an important role in determining the consumption dynamics of the households. In this respect, it would be interesting to investigate which other factors contributed to the impressive decline of saving rates observed in the USA from the Eighties to the beginning of the 2007 crisis. Policy makers should concentrate on these determinants if willing to manipulate the private (household in particular) consumption and savings patterns of the economy.

Notes

1. To the best of our knowledge, a similar procedure has been exploited only once previously for similar purposes, by Bostic et al. (2009). However, following closely the guidelines on data matching laid out by Ridder and Moffitt (2007), we adopt a sample combination procedure which differs considerably from the one implemented by Bostic et al. (2009). First, we obtain a much larger dataset both in terms of observations and of number of variables. Second, we do not constrain the analysis to home owners only. Third, our analysis includes the years 2004 and 2007, while Bostic et al. (2009) have data up to 2001 only. Fourth, we provide all the codes that we used in order to perform the analysis (see the Web Appendix) in order to ensure its repeatability. Finally, we perform a pseudo-panel analysis, while they use cross-sections and pooled cross-sections only.
2. The CES contains both the Diary Survey and the quarterly Interview Survey. We used the latter, which constitutes the bulk of the survey, containing all kinds of expenditure, while the Diary Survey only serves as a supplement for different details.
3. We had to decide how to proceed with the households for which socio-demographic variables changed from one quarter to another. For example, when the educational status changed from one quarter to another, we used the educational status of the quarter closer to the central quarter of the year (details in the Web Appendix).
4. Again, they differ considerably from the ones described (and used) by Bostic et al. (2009). We ensure the repeatability of our results by making available the codes used (see the Web Appendix).
5. We did it performing a bivariate (income and age) propensity score matching based on Mahalanobis distance. In order to perform a very precise matching, we deliberately decided to treat age as a non-categorical variable (building 5 or 10 year groups, as it has been done in some previous works such as Bostic et al., 2009), something that would have left income as the only variable to be used in the within-cell matching. In particular, suppose we used 10 year age groups, dividing between individuals that are 21-30 years old, 31-40 years old and so on. In this case it would have been possible to match a 30 years old household with a 21 years old control, even if a 31 years old control (with equal income) would have been a better choice. By using age together with income for the propensity score matching, we avoid such possibility and we minimize the distance between potential controls of the SCF and “treated” individuals of the CES (treated in the sense that we imputed to them the wealth variables).
6. In particular, we dropped the households that fell into the top 15% of the distribution of the distance variable. We also had to build a different distance function for the groups with one or two individuals only from either one or the other survey, using the normalized logarithmic income and age, and we dropped the top 20% of households matched according to this second, and rougher, algorithm (because with few households in a cell, there was a higher probability to match pairs of households that differ significantly in their values of income and age).
7. We also performed the combination procedure after having got rid of the wealthiest households present in the SCF in order to get comparable income distributions between the two surveys (in particular, dropping a percentage between 20 and 30% of the sample households with the highest income depending on the survey year). The resulting dataset did not differ noticeably from the one that we used. This is not surprising, because the Mahalanobis procedure discards the SCF households that differ considerably from the CES households in terms of income (and age), so that most of the preliminarily dropped SCF individuals would have been discarded anyway by the matching algorithm.
8. Notice that Figure 8 does not control for changes in family composition or other demographic variables.
9. Additionally, the issue of endogeneity is likely to heavily affect the results in the case of durable goods expenditure, more than when non-durable goods expenditure is used as the dependent variable. Suppose a household buys a car in 2004: we will observe an increase both in tangible wealth and in durables consumption, a fact that will pose some

problems in the estimation of the wealth effect (spurious relationship). Using non-durables consumption as the dependent variable mitigates this problem.

10. This was only one of the 5^5 possible combinations of the various implications. We chose this particular one for the sake of simplicity, and due to the non-impressive differences among the various implications, we find it accurate enough to guarantee the goodness of the results.

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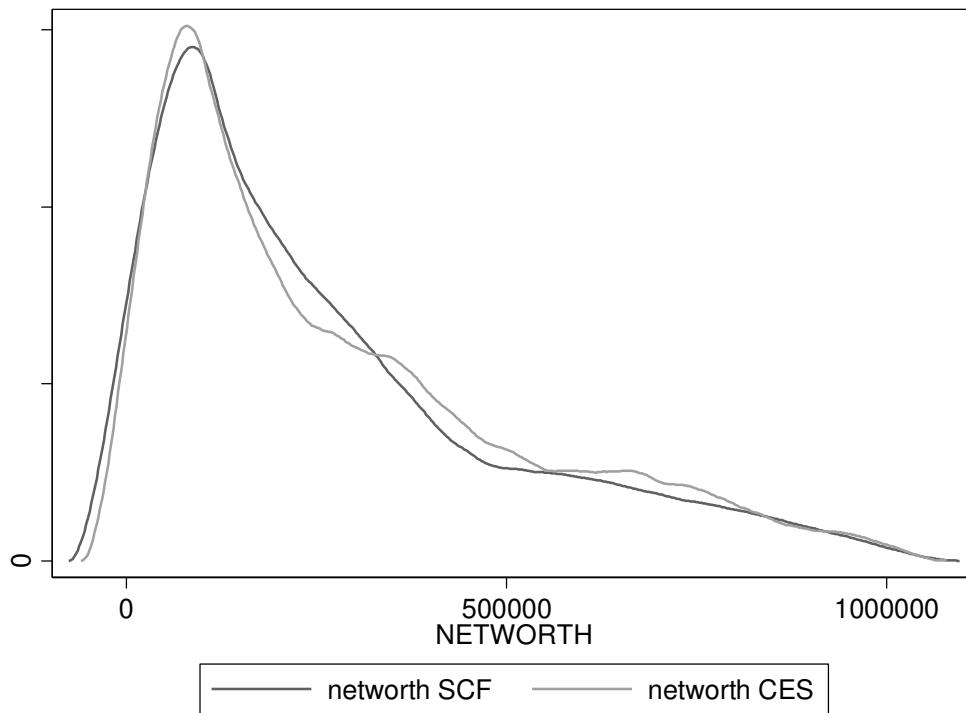
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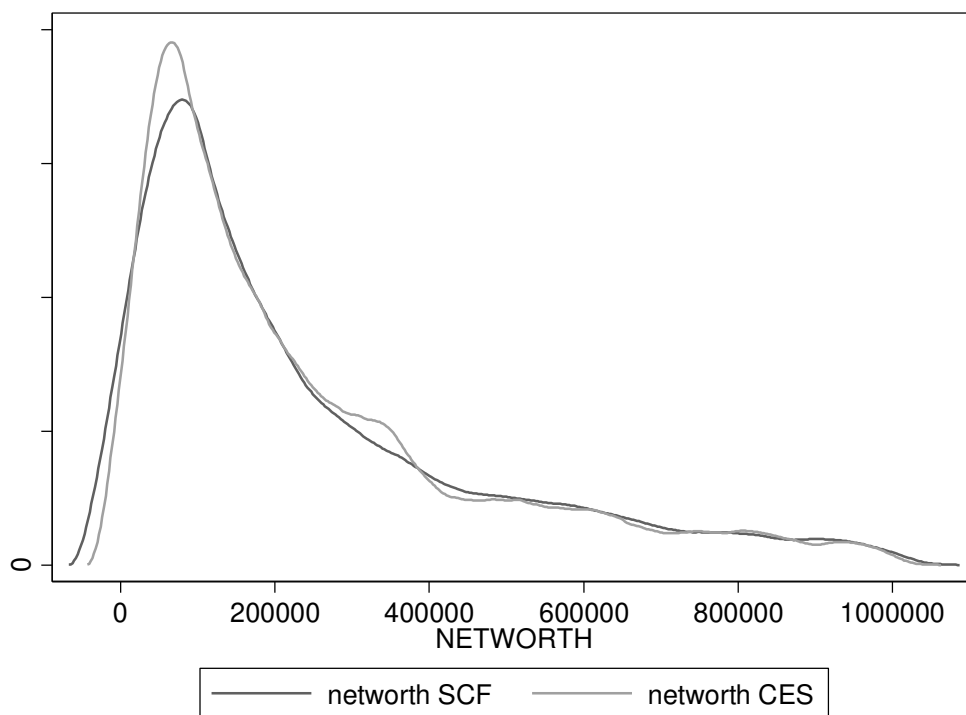
Figures

Figure 1: Household net wealth kernel distribution, 2007



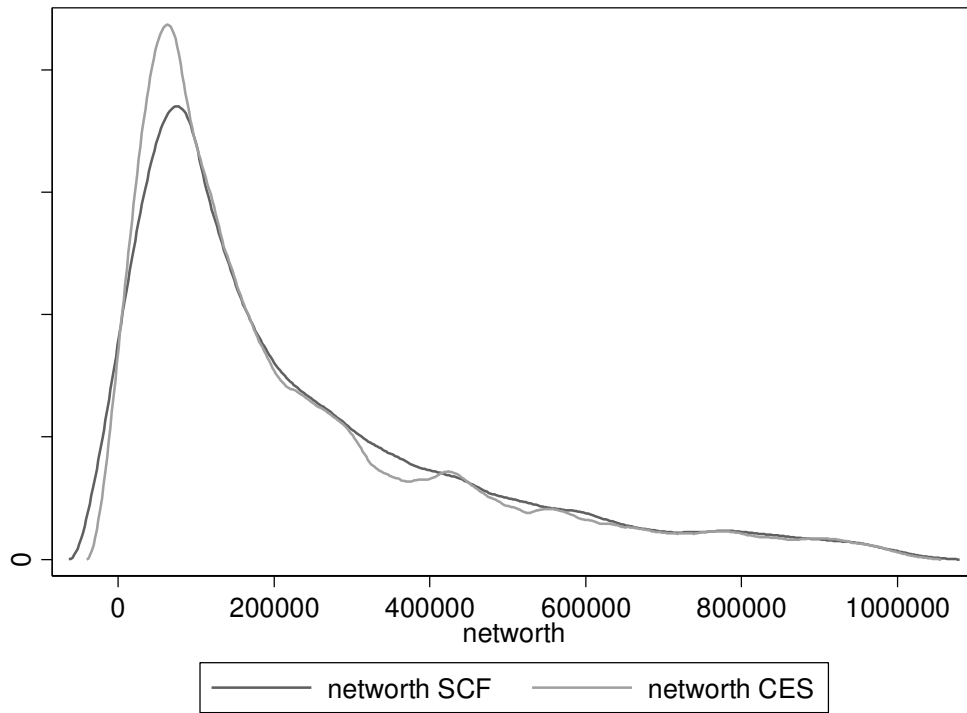
Source: SCF and CES 1989-2007, own computations.

Figure 2: Household net wealth kernel distribution, 2004



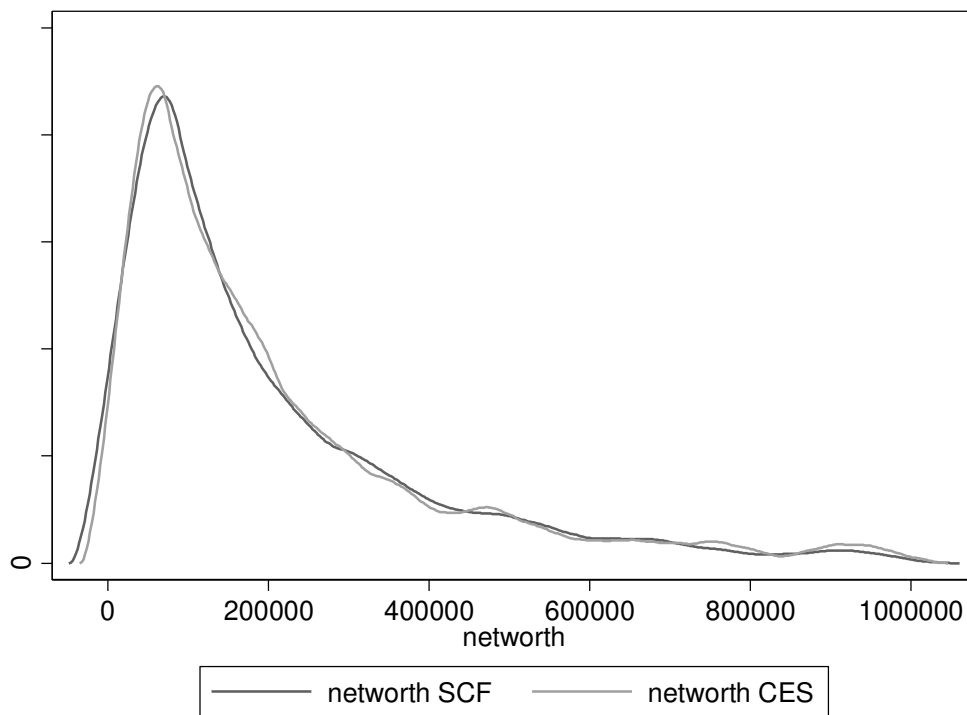
Source: SCF and CES 1989-2007, own computations.

Figure 3: Household net wealth kernel distribution, 2001



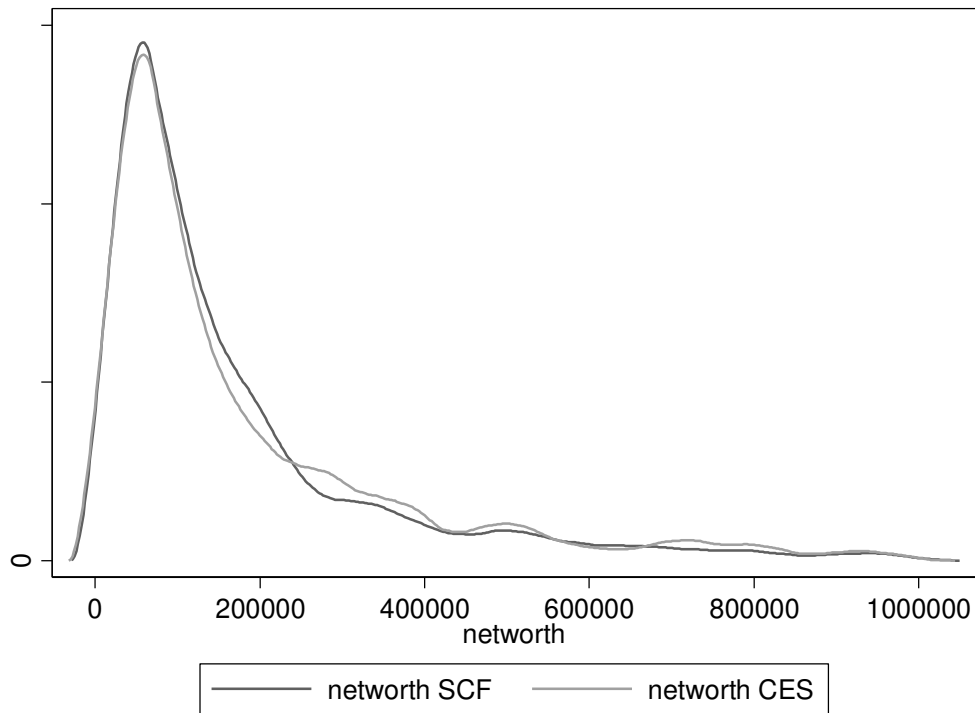
Source: SCF and CES 1989-2007, own computations.

Figure 4: Household net wealth kernel distribution, 1998



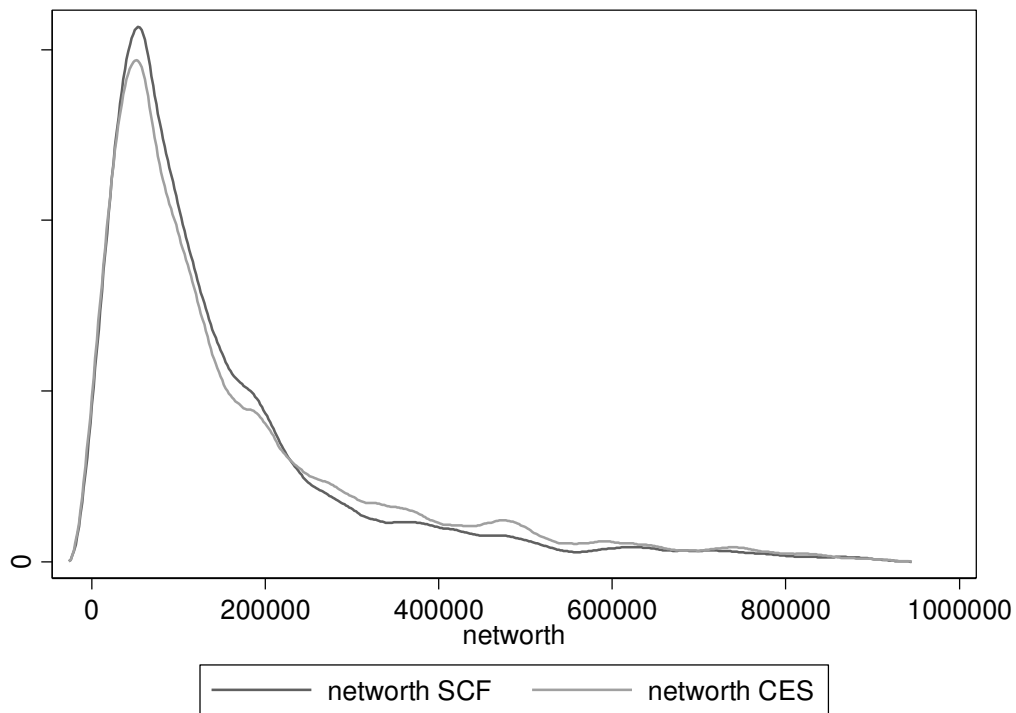
Source: SCF and CES 1989-2007, own computations.

Figure 5: Household net wealth kernel distribution, 1995



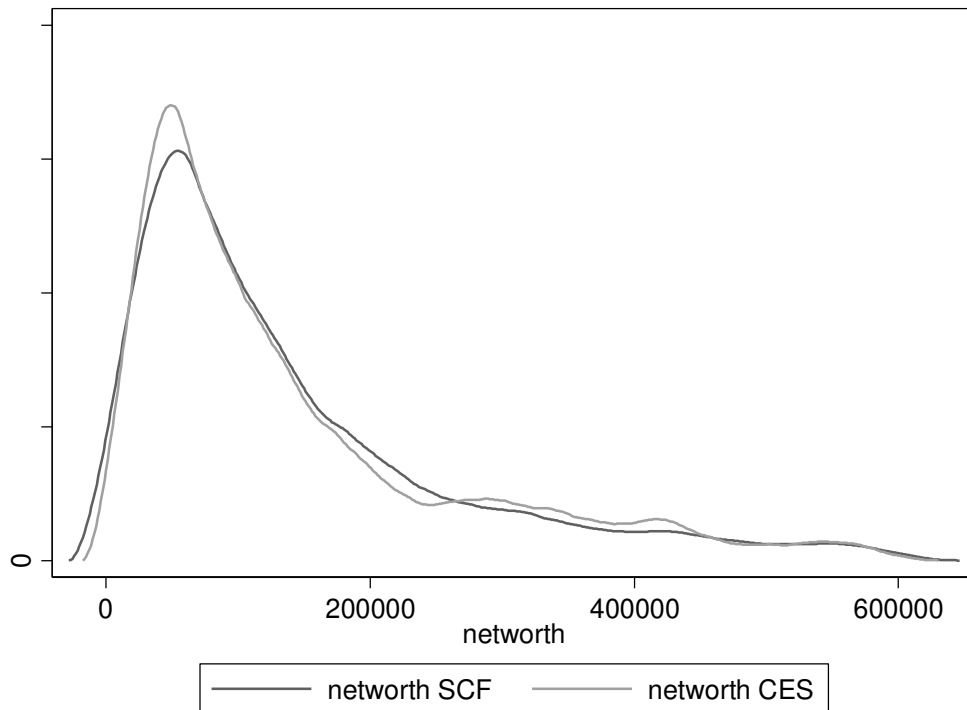
Source: SCF and CES 1989-2007, own computations.

Figure 6: Household net wealth kernel distribution, 1992



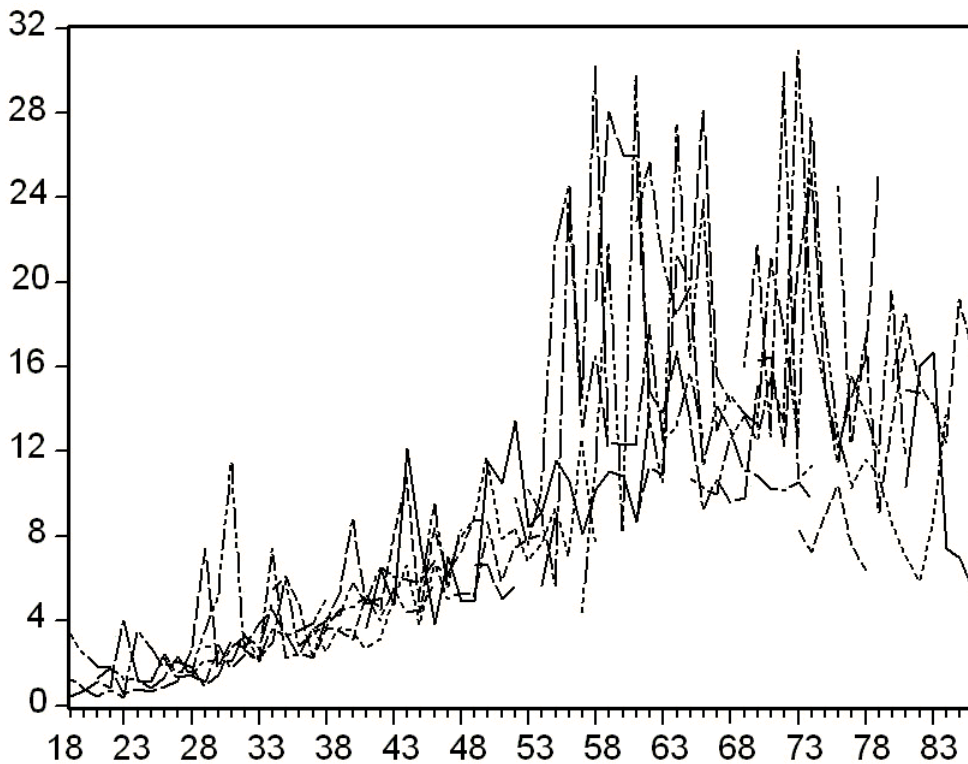
Source: SCF and CES 1989-2007, own computations.

Figure 7: Household net wealth kernel distribution, 1989



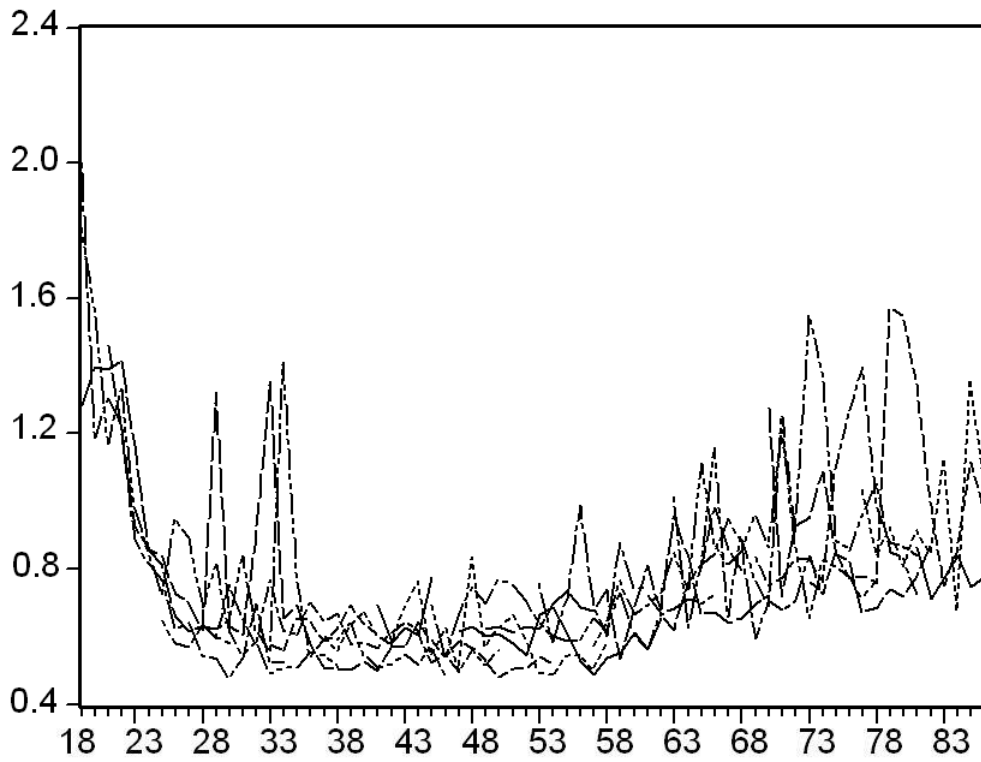
Source: SCF and CES 1989-2007, own computations.

Figure 8. Ratio of net wealth over income over the life cycle – cohort averages. Each line corresponds to a different cohort.



Source: SCF and CES 1989-2007, own computations.

Figure 9. Ratio of non durables consumption over income over the life cycle – cohort averages.
Each line corresponds to a different cohort.



Source: SCF and CES 1989-2007, own computations.

Tables

Table 1: correlations between logarithmic income and the wealth (SCF) variables

	2007		2004		2001		1998	
	SCF	CES	SCF	CES	SCF	CES	SCF	CES
fin	0.26***	0.16***	0.26***	0.18***	0.27***	0.14***	0.22***	0.11**
nfin	0.27***	0.30***	0.25***	0.26***	0.24***	0.18***	0.19***	0.17***
asset	0.32***	0.29***	0.30***	0.26***	0.31***	0.20***	0.25***	0.17***
debt	0.46***	0.43***	0.41***	0.40***	0.47***	0.42***	0.38***	0.29***
networth	0.30***	0.26***	0.28***	0.23***	0.29***	0.18***	0.23***	0.16***
kgtotal	0.21***	0.21***	0.18***	0.15***	0.18***	0.09**	0.13***	0.12**
	1995		1992		1989			
	SCF	CES	SCF	CES	SCF	CES		
fin	0.18***	0.12**	0.24***	0.19***	0.25***	0.08***		
nfin	0.20***	0.09**	0.16***	0.09***	0.21***	0.10***		
asset	0.24***	0.12***	0.21***	0.11***	0.27***	0.13***		
debt	0.32***	0.29***	0.28***	0.14***	0.39***	0.33***		
networth	0.22***	0.10***	0.19***	0.10***	0.25***	0.12***		
kgtotal	0.14***	0.04**	0.12***	0.07***	0.15***	0.06***		

** , *** significant at 5 and 1% respectively.

Table 2. Number of households in the dataset, by date of birth and year of survey

		Date of birth of household and cohorts											
Oldest: 19-	1898	02	06	10	14	18	22	26	30	34	38	42	
Youngest: 19-	01	05	09	13	17	21	25	29	33	37	41	45	
Cohort: ->	1	2	3	4	5	6	7	8	9	10	11	12	
1989	57	89	181	270	341	411	442	385	363	409	467	519	
1992	0	98	147	231	333	390	434	371	340	365	411	559	
1995	0	36	91	151	224	364	350	392	330	337	373	482	
1998	0	39	48	0	565	297	413	443	479	418	417	519	
2001	0	0	0	0	0	99	414	494	511	515	521	653	
2004	0	0	0	0	0	696	221	512	521	599	692	825	
2007	0	0	0	0	0	484	81	396	433	463	521	687	
Oldest: 19-	46	50	54	58	62	66	70	74	78	82	86		
Youngest: 19-	49	53	57	61	65	69	73	77	81	85	89		
Cohort: ->	13	14	15	16	17	18	19	20	21	22	23		
1989	736	732	774	809	688	405	138	0	0	0	0		
1992	651	775	828	780	744	577	439	21	0	0	0		
1995	626	697	696	794	725	584	468	248	0	0	0		
1998	724	816	842	863	843	788	739	550	268	0	0		
2001	866	942	983	1107	1079	966	905	723	662	165	0		
2004	990	1131	1227	1255	1226	1121	1020	890	770	628	81		
2007	827	893	1030	1094	1032	949	956	852	759	629	365		

Table 3: equation (2), specification 1 (gross wealth) - two different dependent variables

Expl. variables	Total consumption		Non durables consumption	
	Coeff.	Standard error	Coeff.	Standard error
income	0.552***	0.046	0.481***	0.044
fin	-0.031	0.019	-0.034*	0.018
house	0.022**	0.011	0.039***	0.010
ore	0.020	0.019	0.021	0.018
old*income	-0.011	0.044	-0.021	0.042
old*fin	0.051	0.033	0.021	0.032
old*house	0.007	0.033	0.025	0.031
old*ore	-0.045	0.029	-0.020	0.027
age	0.017**	0.009	0.017**	0.008
agesq	-0.000*	0.000	-0.000	0.000
educ	0.145**	0.059	0.044	0.054
not working	-0.031	0.097	-0.133	0.092
race-black	0.174	0.320	0.185	0.304
race-other	-1.910***	0.577	-1.974***	0.566

Note: All the fixed effects estimations were carried out using the Repeated Imputation Inference (RII) , using all the five implications resulting from the CES procedure of imputing missing income values. ***, **, * significant at 1, 5, 10% respectively; standard errors are clustered (Petersen 2009).

Table 4: equation (2), specification 2 (net financial wealth) - two different dependent variables

Expl. variables	Total consumption		Non durables consumption	
	Coeff.	Standard error	Coeff.	Standard error
income	0.546***	0.049	0.466***	0.046
netfin	-0.007	0.005	-0.008*	0.005
house	0.008	0.012	0.025**	0.011
ore	0.022	0.019	0.023	0.018
old*income	0.010	0.036	-0.018	0.035
old*netfin	0.023**	0.010	0.021	0.032
old*house	0.022	0.031	0.034	0.030
old*ore	-0.043	0.028	-0.019	0.027
age	0.019**	0.009	0.019**	0.008
agesq	-0.000**	0.000	-0.000	0.000
educ	0.090*	0.054	-0.007	0.051
not working	-0.009	0.098	-0.116	0.093
race-black	0.109	0.322	0.113	0.307
race-other	-2.024***	0.596	-2.078***	0.590

Note: All the fixed effects estimations were carried out using the Repeated Imputation Inference (RII) , using all the five implications resulting from the CES procedure of imputing missing income values. ***, **, * significant at 1, 5, 10% respectively; standard errors are clustered (Petersen 2009).

Table 5: equation (2), specification 3 (net tangible wealth) - two different dependent variables

Expl. variables	Total consumption		Non durables consumption	
	Coeff.	Standard error	Coeff.	Standard error
income	0.617***	0.034	0.555***	0.033
fin	-0.023	0.020	-0.020	0.019
nettng	0.010	0.006	0.018***	0.007
old*income	-0.060	0.042	-0.049	0.040
old*fin	0.054	0.033	0.031	0.033
old*nettng	0.012	0.026	0.023	0.025
age	0.019***	0.007	0.027***	0.007
agesq	-0.000***	0.000	-0.000***	0.000
educ	0.121**	0.059	0.012	0.055
not working	-0.045	0.094	-0.099	0.090
race-black	0.180	0.331	0.181	0.322
race-other	-1.718***	0.581	-1.739***	0.582

Note: All the fixed effects estimations were carried out using the Repeated Imputation Inference (RII) , using all the five implications resulting from the CES procedure of imputing missing income values. ***, **, * significant at 1, 5, 10% respectively; standard errors are clustered (Petersen 2009).