Disentangling the Importance of the Precautionary Saving Motive[1]

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Abstract

We evaluate the importance of the precautionary saving motive by relying on a direct question about precautionary wealth from the 1995 and 1998 waves of the Survey of Consumer Finances. In this survey, a new question has been designed to elicit the amount of desired precautionary wealth. This allows us to assess the amount of precautionary accumulation and to overcome many of the problems of previous works on this topic. We find that a precautionary saving motive exists and affects virtually every type of household. However, precautionary savings account for only 8 percent of total wealth holdings. Even though this motive does not give rise to large amounts of wealth, particularly for young and middle-age households, it is particularly important for two groups: older households and business owners. Overall, we provide strong evidence that we need to take the precautionary saving motive into account when modeling saving behavior.

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1. Introduction

One of the major innovations in the literature on consumers' behavior has been the theory of precautionary saving. This theory predicts that risk depresses consumption and increases the accumulation of wealth as a type of self-insurance. In some theoretical specifications, the precautionary saving motive is the main reason to hold wealth. But does this hold empirically? As discussed in this paper, the existing evidence provides a very broad range of estimates, driven in large part by a variety of conceptual and empirical issues.

In our work, we adopt a new approach to study the importance of precautionary savings. We rely on a question from the 1995 and 1998 waves of the Survey of Consumer Finances (SCF95 and SCF98 hereafter), where respondents are asked to report directly their desired amount of precautionary wealth. This subjective measure of precautionary accumulation allows us to assess directly the size of the precautionary saving motive and to overcome many of the problems of previous work on this topic.

We find that a precautionary saving motive exists and affects virtually every household. Thus, models that rely on quadratic preferences or certainty equivalence are not a good characterization of consumers' behavior. But we also find that this motive does not give rise to high amounts of wealth at the aggregate level. Desired precautionary wealth represents approximately 8 percent of total net worth and 20 percent of total financial wealth in the economy. However, we can identify two groups in the population for which the precautionary saving motive is particularly important: older households/cohorts and business owners. These two groups alone account for the majority (65 percent) of total desired precautionary wealth. Close examination of both groups suggests that not just income risk but also other risks should be taken into account when modeling saving behavior. Because these groups play such a pivotal

role, analyses that include or exclude households close to or after retirement and/or business owners are bound to deliver very different estimates of the precautionary saving motive. In the last section of the paper, we discuss how our work can help explain the estimates currently available in the empirical literature on precautionary savings.

Another key finding in our work is the great heterogeneity in precautionary accumulation across households of similar types, much more than has been reported in previous work. This finding argues for the enrichment of theoretical models to account for such differences. We also argue that liquid or financial net worth are too restrictive as measures of precautionary accumulation. Finally, our findings help explain both the behavior of families at the bottom of the wealth distribution, where risk interacts with the presence of welfare programs, and the behavior of families at the top of the wealth distribution, where business owners are very prominent.

This paper is organized as follows: In Section 2, we review a key selection of the previous literature on precautionary saving and discuss in detail the problems associated with measuring risk and precautionary wealth. In Section 3, we describe our alternative approach based on a subjective measure of precautionary wealth and provide our estimates. In Sections 4 and 5, we discuss our findings and provide concluding remarks.

2. Review of the Previous Literature

Theoretical intertemporal models of consumption/saving with income uncertainty predict that precautionary wealth can explain a large share of total wealth accumulation.[1] For example,

[1] In our analysis, we concentrate mainly on wealth accumulation and we do not study the effect of the precautionary saving motive on consumption, labor supply, or other aspects of economic behavior.

Skinner (1988) calculates that about half of household wealth can be explained by precautionary savings due to income risk. Caballero (1991), Gourinchas and Parker (2002), and Cagetti (2003) report similar results. However, the empirical evidence based on micro data yields decidedly mixed results. We identify three sets of papers. The first set, which finds estimates in the lowest range, includes Skinner (1988) and Dynan (1993). Looking across occupation groups to assess the effect of occupation-specific risks, Skinner (1988) finds no evidence that households in riskier occupations save more. Similarly, Dynan (1993) argues the empirical estimates of the coefficient of relative prudence are too small to generate precautionary saving. The second set of papers, including Guiso, Jappelli and Terlizzese (1992), Lusardi (1997, 1998), and Arrondel (2002), uses subjective measures of income risk and finds modest values for precautionary wealth–2 to 8 percent of total household wealth. The final set of papers, including Dardanoni (1991), Hubbard, Skinner and Zeldes (1995), Carroll and Samwick (1997, 1998), Kazarosian (1997), and Engen and Gruber (2001, finds that precautionary savings can explain a sizable share of wealth. For example, according to Carroll and Samwick (1998), up to 50 percent of the wealth of the median household consists of precautionary savings.

All of these papers are distinguished by their rigorous approach and careful execution. But this disturbingly large range of estimates suggests there may be important latent conceptual and empirical factors that confound the analysis of the precautionary saving motive in micro data.

Most of the micro-empirical work on precautionary savings has focused on the estimation of the following equation:

$$g(W_h) = f\,(risk_h,\ Y_h^p,\ X_h)$$

where W_h indicates wealth of household h; $risk_h$ is a measure of the risk faced by household h; Y_h^p is permanent income; X_h is a set of controls for wealth including age, demographics, and other household characteristics; and g and f indicate the functions to measure wealth and the relationship between wealth and the right-hand-side variables respectively. The extent to which wealth increases with risk determines the importance of the precautionary saving motive. Several factors may cause estimates using this specification to be too high or too low. We address eight such issues, many of which are interrelated, and discuss how they are likely to affect the estimates of the importance of the precautionary saving motive (see the summary in Table 1).

1: *The measurement of wealth and risk*

There are many candidates for an appropriate wealth measure for the model. As noted by Browning and Lusardi (1996), the most straightforward measure, total net worth, turns out to be inappropriate except in the case of certainty equivalence; because of the differing risk and liquidity characteristics of the underlying assets and liabilities, they cannot, in general, be aggregated in this model. Some authors, such as Hrung (2000), Engen and Gruber (2001), and Alan (2004) have simply considered a measure of liquid wealth (which includes mostly savings and checking accounts, bonds, stocks and short-term debt) when estimating precautionary wealth. But this approach may be overly restrictive. The large majority of US households hold other assets in their portfolios and very often financial assets are a relatively small part of total wealth (Kennickell, Starr-McCluer, and Sundén (1997)). Typically, the largest asset is housing equity and instruments such as home equity lines of credit have served to make that wealth more liquid. Another large component of wealth, particularly for middle-aged and older workers, is designated retirement accounts, such as IRAs and Keogh plans and pension accounts like 401(k)s, but such assets are not freely accessible without incurring an early-withdrawal penalty

until age 59½ (Poterba, (2003)), but sometimes it is possible to borrow against such accounts. Another complication is business equity, which forms a large part of the portfolios of many wealthy households; such wealth is hard to measure and may be hard to liquidate or leverage. Even the treatment of debt is not necessarily straightforward (Engen and Gruber (2001)). Most households only need to service their debt. Thus, it may be that only the required loan payments over some period need to be netted from assets, rather than subtracting all the short and long term debt. In addition to all of these issues, the relevant measure may also differ across households if people differ in their preferences toward risk and liquidity or if institutional factors constrain how they manage their portfolios.

Much of the empirical work on precautionary savings has concentrated on one risk factor: income risk. For example, in the third set of papers mentioned above, researchers have modeled a household-specific stochastic process for income, estimated it using panel data, and then used the variance of earnings or non-capital income as a proxy for risk. But it may often be difficult to distinguish empirically between transitory income and measurement error, and because workers may know more than the econometrician, the estimated variability may be already insured against (Caballero (1991) and Browning and Lusardi (1996)). In principle, subjective measures of income risk obviate many of the problems with estimated income processes, but they often result in what may seem implausibly low estimates of income risk (Guiso, Jappelli and Terlizzese (1992) and Lusardi (1997, 1998)).

Other risk factors besides income may also be important. Two that have been investigated are longevity risk and health risk (Davies (1981), Leung (1994), Starr-McCluer (1996), Hubbard, Skinner, and Zeldes (1995), and Palumbo (1999), among others). Perhaps because such risks are hard to specify and hard to measure directly, we do not yet have reliable

subjective measures. Households may also face interest rate or investment risk, consumption risk (for example, the risk that durable good break down and should be replaced quickly), and other risks that have not yet been measured or used in the empirical work.

2: Preferences

Precautionary accumulation depends not just on risk, but also on preferences regarding risk. For example, a key factor in precautionary saving models is the coefficient of risk aversion (Caballero (1990, 1991) and Cagetti (2003)), and available information suggests there may be substantial variation in this measure across households (Barsky, Kimball, Juster, and Shapiro (1997)).

Differences in preferences can have other important implications. For example, workers who are risk-averse may self-select into occupations (or specific employers within industries) that offer job security. If risk aversion is positively correlated with prudence, these workers may also save more, resulting in a downward bias in the estimates of the precautionary saving motive (Lusardi (1997, 2000) and Fuchs-Schündeln and Schündeln (2005)).[2]

3: Liquidity constraints

Precautionary accumulation is strongly affected by the presence of liquidity constraints. To the extent that households can borrow, they may not need as much wealth to shield themselves against shocks. If households face differences in borrowing opportunities, they may want to hold different levels of precautionary savings. But individual borrowing opportunities are largely unobservable in most data sets.

4: *Other forms of insurance*

[2] See Kimball (1990), for an explanation of the role of prudence in models of precautionary saving.

Models of precautionary saving rely on the assumption that insurance markets are imperfect. But individuals can insure against risk through a network of family and friends or other informal channels, reducing their need for precautionary savings (Lusardi (1998)). Similarly, social insurance (unemployment benefits, health and disability insurance, etc) adds complications. When such programs are means-tested, they create a strong disincentive to hold wealth, (Hubbard, Skinner and Zeldes (1995)). Thus, even households facing high risk, particularly those with low permanent income, may find it optimal to hold very little wealth.

5: *Functional forms*

The functional form chosen in many studies involves the logarithm of wealth, a transformation which of necessity excludes a substantial fraction of the population (9 percent of households had net worth of zero or below in SCF98).[3] That these excluded households hold no wealth or are in debt may reflect features of the welfare system, individual preferences, or a substantial prior negative shock. Some of these excluded households are among those that face high risks, implying a selectivity bias in estimates of precautionary savings.

6: Macro-level shocks and other shocks

The importance of macro shocks has been largely ignored in the estimation of precautionary savings. However, such shocks make it very unlikely that a model like that above could be estimated reliably with only a single cross-section of wealth data. The problem may be best understood with an example. During a recession, households facing high unemployment risk are also those more likely to be hit by shocks that deplete their resources. In addition to macro-level shocks, households may face idiosyncratic shocks that cause their wealth to be either

[3] See Carroll, Dynan and Krane (2003) for an alternative functional form that does not exclude the zero-wealth observations.

temporarily high or low. Thus, it is important to account for past shocks if current wealth is to be used to make inferences about the level of precautionary savings (Carroll, Dynan and Krane (2003), Hurst, Lusardi, Kennickell and Torralba (2005)).

7: Precautionary saving and portfolio choice

Unless income risk is perfectly insurable, consumption and portfolio decisions are not separable (Drèze and Modigliani (1972)). To date, however, most of the saving and portfolio choice models have been estimated separately. A series of empirical papers have found that agents who face high earnings risks (Guiso, Jappelli and Terlizzese (1996), Haliassos and Bertaut (1995), and Hochguertel (2003)) or who own businesses (Heaton and Lucas (2000)) are less likely to invest in stocks. Given the extraordinary returns of the stock market in the 1990s, wealth is likely to be relatively high for households that have invested in stocks. But these households are those that face lower income risk. Thus, regressions of wealth on income risk are likely to confound these effects.

8: Other motives to save

Other motives to save may be difficult to disentangle from precautionary motives. For example, entrepreneurs are likely to face very high risk, and thus, would be expected to save more. Such households hold relatively large amounts of wealth, but mostly in their business(es) (Gentry and Hubbard (2004)). However, these households may also save more to leave a bequest (perhaps the family business) or to secure a comfortable retirement (business owners are less likely to hold private pensions (Hurst and Lusardi (2004)). Similarly, households that have a bequest motive may retain their wealth until the end of life in case shocks hit (Skinner (1996)) or possibly as an instrument to ensure the attention of the heirs. While many theoretical models of precautionary savings abstract from these and other motives to save, such motives can play an

important role empirically. Unfortunately, the data needed to control for such factors are often not available.

3. An Alternative Approach: A Direct Measure of Desired Precautionary Savings

Given the complications reported in the previous section, it is less puzzling that there is so much variation in existing estimates of the extent of precautionary accumulation. In this section we follow a different approach. We rely on a direct question about the level of desired precautionary savings. Our theoretical framework of reference is the 'buffer-stock' model, which we summarize below.

3.1 The "Buffer-Stock" Model of Saving

The theoretical model that has guided our empirical work is the "buffer-stock" model of saving, as derived by Carroll (1996, 1997) and Deaton (1991) from an intertemporal model of consumption behavior under uncertainty. In their specifications, consumers have a *target* wealth-to-income ratio which determines the "buffer-stock" of wealth they hold to insure against risk; when wealth goes below the target, saving will increase, and when wealth is above the target, saving will decrease. As Carroll (1997) notes, this feature aligns well with the predictions of many financial planners, who traditionally advise people to hold a certain ratio of wealth to long-run income as precaution against shocks. Furthermore, Deaton (1992, pages 202-203) shows that, even though the formal maximization problem may be quite difficult to solve, simple rules can closely approximate the optimal behavior. Thus, it is not unrealistic to expect households to be able to report the approximate size of the "buffer-stock" they wish to hold.

The model delivers testable predictions. First, the size of the "buffer-stock" households

want to hold should be a positive function of risk. In addition, preference parameters, such as the degree of impatience, play a pivotal role. According to the simulations of Carroll (1997), Carroll and Samwick (1998) and Deaton (1991), when households are impatient, precautionary savings can be relatively small, particularly for younger consumers and up to the age of 50. Another key prediction is that if there is no floor to income, the target level of wealth chosen by consumers is strictly positive to prevent consumption from going to zero.[4]

3.2 A Direct Measure of Precautionary Savings

The SCF95 introduced a new question intended to elicit the size of the "buffer-stock" that households would like to hold.[5] The exact wording of the question is as follows:

> "*About how much do you think you and your family need to have in savings for unanticipated emergencies and other unexpected things that may come up?*"

This question directly elicits the amount of desired "buffer-stock" savings and provides an alternative way to assess the extent of precautionary accumulation. Much work was devoted to pre-testing the question, assessing whether the question was understood, and identifying difficulties in answering.[6] Three aspects of the wording of the question merit particular

[4] This no-borrowing behavior has much to do with the assumption about preferences and the fact that the utility function is of the CRRA form. If preferences were of the CARA form, consumers would be willing to let assets be zero or negative.

[5] This question has now been added to the 2003 Italian Survey of Household Income and Wealth and the 2005 Dutch CentER Panel.

[6] This question is placed after a sequence of questions about saving and planning, and this context was selected specifically to create the correct cognitive framework for respondents to focus on the intent of the question. From the given responses, it appears that respondents did not have much difficulty with the question. In SCF95, only

consideration. First, households are asked what they "need to have in savings," rather what they have for that purpose, because their wealth may be out of equilibrium due to negative or positive shocks. Second, the phrase "unanticipated emergencies and other unexpected things that may come up" mirrors what households most commonly report in open-ended SCF questions concerning current motives to save. In SCF95, over 36 percent of participants gave such a response, as reported in the appendix Table A1. In other surveys that collect similar information on saving motives, such a "precautionary motive" is consistently the most frequently reported saving motive.[7] It is critically important to use a wording that respondents understand. Third, this measure does not restrict attention to income risk only.

The key advantage of this approach is that it circumvents the problems (discussed earlier) that must be surmounted in teasing out an indirect measurement of precautionary savings. Several specific points are worth noting in this regard. First, the survey response, in principle, already includes appropriate adjustments for unobservable preferences, borrowing possibilities, and informal or formal insurance schemes (issues 2, 3, and 4 discussed in Section 2). Second, the method allows households to be concerned with risks beyond income risk (issue 1). Third, because it measures the amount of "desired" (or equilibrium) precautionary savings, it is

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about three percent of the respondents answered "don't know" and were subsequently unable to provide even a range of values upon probing by the interviewer.

[7] See Kennickell (1995). Alessie, Lusardi and Aldershof (1997) examine the motives to save in the Dutch Socio-Economic Panel and report that the most frequently indicated motive to save is for "unforeseen events." The proportion of respondents choosing this motive remains high and constant over the life cycle. Similar findings are reported when using the Dutch CentERdata panel. In this case, households are asked to report on a scale from 1 to 7 the importance of several motives to save. Of the listed 13 motives, the one that received the highest score was "save as a reserve to cover unforeseen expenses." Similarly, in the new German SAVE survey, households have to rate the importance of 9 saving motives using a scale from 1 to 10. The motive that was considered most important by nearly all families is "saving as a precaution for unexpected events" (see Börsch-Supan and Essig (2003) for detail). Looking at data for Japan, Horioka, Yokot and Miyaji (1994) find that of the listed 12 motives to save, respondents have chosen most often the precautionary saving motive which is indicated as: "for illness, disasters, and other unforeseen expenditures."

unaffected by the cumulative effect of shocks to the "actual" amount of savings (issue 6). Finally, we avoid the problem of defining what measure of wealth is the appropriate one for gauging the variation in precautionary savings across households (issue 1).

There are also potential disadvantages in working with such subjective questions. For example, the question may turn out to be difficult for survey participants to understand and may be answered imprecisely. In addition, respondents may consider only their preferences and not think of budget constraints. They may also be led to think of current or small risks; alternatively, they may consider every possible risk over their remaining life but fail to discount the future. Such problems are not unique to our work; they also surface in the literature using subjective measures of income risk. In what follows, we provide a detailed evaluation of this question.

3.3 Some Descriptive Findings about Desired Precautionary Savings

Figure 1 reports the density of desired precautionary savings in the total sample using data from SCF95.[8] We first note that the reported amounts are concentrated in the range of $5,000 to $10,000. However, a small proportion of households also reports very high amounts of precautionary wealth. Thus, the precautionary saving motive can potentially rationalize high amounts of wealth holdings as well. Figure 1 also shows there is much heterogeneity in saving behavior, even when focusing on the precautionary saving motive alone.

In Figure 2, we overlap the densities of desired precautionary savings from the surveys in 1995 and in 1998 (in 1995 dollars). As the figure shows, the distributions of answers are remarkably similar. This is what we would expect empirically. This time was a period in which

[8] For a description of the SCF, see the data appendix.

unemployment risk was rather stable, and there were no major changes, at least at the aggregate level, in health, longevity, or other risks. At the same time, household wealth increased dramatically due to the very high returns in the stock market and housing market, a factor that would complicate an indirect estimate of precautionary savings over this period. Given the close similarity of the two distributions, we pool the data from SCF95 and SCF98 in the remainder of this paper (all dollar figures are reported in 1995 dollars).

To bring further credibility to our measure and to explain some of the heterogeneity in the whole sample, we examine the distribution of desired precautionary savings across age for three education groups: less than 12 years of education, 12-15 years of education, 16 years of education and higher.[9] The distribution of desired precautionary savings generally mirrors the distribution of wealth across education groups (Figures 3a-c). As reported by many authors (particularly Bernheim and Scholz (1993) and Hubbard, Skinner and Zeldes (1995)), the shape of the wealth distribution varies greatly by education; wealth is particularly low for those with low education. Figure 3a confirms this fact. The distribution of desired precautionary savings is low for the group with less than high school education, and the values remain low across age groups. However, values increase overall as we move to groups with higher education (Figures 3b-c). These values are much higher for households headed by people older than 50.

To address further the heterogeneity exhibited in these plots and to isolate the effects of different types of risk, we split the population into three subgroups. A large fraction of households at the top of the wealth distribution are business owners (Kennickell (2000), Gentry and Hubbard (2004), Hurst and Lusardi (2004)). The risks such people face may often be quite

[9] In a simple cross-section, we cannot distinguish between age and cohort effects. Thus, when we consider age we do not mean to characterize "age" versus "cohort" effects. To avoid confusion, we use both terms or simply use the term "older sample" to characterize this group in the population.

different from those faced by other households. To allow for more detailed investigation of these risks, we consider a sample of business owners only, while we divide the remaining sample between those in working years and those who are retired or close to retirement. The precise definition of the groups is as follows: households that do not own a business and have an employed head aged 25 to 61 (hereafter, "main sample"), households that do not own a business and have a head aged 62 or older (hereafter, "older sample"), and households that own a business in which they have an active management interest (hereafter, "business sample").[10] Note that these three groups face not only substantially different risks, but also different types of constraints. For example, business owners may be less averse to risk than respondents in other groups and may have self-selected into jobs with high risks, while older households may be less likely to face liquidity constraints than young households or business owners.

As the densities in Figure 4 indicate, desired precautionary savings is much larger and values are more dispersed for older sample and the business sample than for the main sample. Particularly for the business sample, the distribution has a long fat right tail. While the median household in the main sample desires to hold $5,000 (mean of $11,000) in terms of precautionary savings, the median household in the older sample wants much more— $7,600 (mean of $29,000). The median desired precautionary holding of business owners is the largest at $10,000 (mean of $33,000).

To further underscore the differences in the three subsamples, we note that while the main sample accounts for 50 percent of the population, it accounts for only 29 percent of total

[10] Three groups are omitted. First, we exclude households without business holdings and with a head under the age of 62 who was not working at the time of the interview, and households with a head aged less than 25. These groups were too small and heterogeneous to model with the available data. The number of observations in the main sample is 4,105, in the older sample it is 1,634, and in the business sample it is 2,236.

desired precautionary savings. The older sample accounts for 24 percent of the population, but 41 percent of total desired precautionary savings; the business sample accounts for only 11 percent of the population, but 24 percent of total desired precautionary savings. Together, these two latter groups account for as much as 65 percent of total precautionary savings. Overall, these figures indicate that the treatment of older households and business owners is likely to play a pivotal role in estimating the importance of the precautionary saving motive. We return to this point in Section 4.

3.4 Evaluating the Importance of Precautionary Savings

The comparison of desired precautionary savings and actual wealth is complicated by the factors discussed in Section 2. To understand better this relationship and to characterize the potential importance of precautionary accumulation, we compare desired precautionary savings with total net worth and financial net worth, two measures of wealth considered in the majority of the empirical studies on precautionary savings.

The amount of desired precautionary savings is frequently larger than financial assets (defined as the sum of net savings and checking deposits, savings bonds, stocks net of margin loans, bonds, mutual funds, and the net cash value of life insurance). We find that financial wealth is less than desired precautionary savings in 48 percent of cases in the main sample, 39 percent of cases in the older sample, and 36 percent in the business sample. When considering total net worth (defined as financial assets with the addition of IRAs, other retirement accounts, housing equity, other real estate, business equity and vehicles minus associated debts, and the net value of miscellaneous assets and debts), the figures change considerably. Net worth is below desired precautionary savings in only 17 percent of cases in the main sample, 14 percent in the

sample of the older, and 5 percent of the business owners.

Given the problems noted earlier in measuring wealth, as a sensitivity test we have also defined an alternative measure of accumulation ("liquidable wealth" hereafter) to serve as a crude intermediate concept between net worth and financial assets that accounts for the different degrees of liquidity and accessibility of various portfolio items. This measure sums financial wealth; home equity, other real estate, business equity, vehicles, and other miscellaneous assets weighted at 0.5; and IRAs and other retirement assets with at weight of 0.3. From that are subtracted 6 months of payments on loans other than credit balances, and 0.2 of outstanding credit card balances. Desired liquidable wealth is less than precautionary savings for 17 percent of observations in both the main sample and among the older sample and 7 percent among the business sample. Thus, the data suggest that most households are not in a deficit with their actual precautionary savings, but a substantial minority may be so.

Despite the question of appropriate measures of wealth raised earlier, it is still an important question from a macro point of view to ask how much of observed wealth can be attributed to precautionary savings. For the time period considered here, the ratio of total desired precautionary savings of all households to total wealth is 8 percent. The ratio increases to nearly 20 percent when the denominator is only financial assets. Relative to liquidable wealth, the ratio is 12 percent. Thus, although some individual values of desired precautionary savings are quite large, the precautionary saving motive does not appear overall to account for a very large fraction of observed household wealth.

Since the comparisons with wealth face several limitations, we next examine the target that households wish to hold as compared with a measure of permanent income recorded in the

SCF.[11] In Figure 5, we consider the distribution of the ratio of desired precautionary savings over permanent income in the full sample and across the sub-groups. The relative size of the buffer-stock is generally fairly small for the full sample, but similarly to the measure of savings in levels, the distribution of the ratio has a long fat right tail. The mean value indicates that households desire to hold 64 percent of their normal income as a "buffer-stock," but the median value is 14 percent. However, values vary widely when we examine subgroups. In the main sample, the median desired "buffer-stock" is 10 percent of normal income. Households in the older sample desire to hold much more–a median of 35 percent of normal income. Households in the business sample also want to hold more than those in the main sample–a median of 16 percent of normal income.

The evidence is also consistent with another prediction of the "buffer-stock" model. With only very few exceptions, households desire to hold a positive stock of precautionary wealth to insure against shocks. The fact that this stock is typically not very large–between 15 to 60 percent of permanent income for a large share of the population in working years that do not own a business–is in line with the simulations of Caballero (1991). What our data further show is that precautionary savings becomes sizable and important for two specific groups: business owners and those older than 62. Other studies had emphasized the large wealth holdings of these groups, but without providing a link to the importance of the precautionary saving motive.

3.4.1 A Multivariate Analysis of Desired Precautionary Savings

[11] Permanent income is taken to be a measure of "normal" income reported by SCF respondents. This question follows a sequence of questions on actual income. Each respondent was asked whether the total of all components of their income for the preceding year, as summed by the interviewer's computer, was unusually high or low compared to normal. In this case, the respondent was asked for the figure that would be more usual. See Kennickell (1995) for more details.

The objectives of our empirical analysis are four-fold. First, we aim to explain in more detail the amount of precautionary savings reported by SCF respondents. Second, we examine whether the desired amount of precautionary savings correlates with risk, which is the most important prediction of the theory. Third, we aim to understand which types of risk people care about. Fourth, we want to evaluate the findings in the context of the previous literature.[12]

Our dependent variable is the log of desired precautionary savings. Since we have very few zero (and no negative) values, our sample does not suffer from meaningful selection problems. Rather than subtracting the log of permanent income (to express the ratio of desired precautionary wealth to permanent income), we include this variable on the right hand side to allow for the possibility that preferences might be non-homothetic. In order to explain desired precautionary savings, we use a rich set of variables, as described below.

Income risk and other controls

In the SCF, we do not have the information necessary to make a direct estimate the variance of income for individual households. In any case, such a measure may be misleading if risk-averse workers can self-select into jobs with low income variance. We follow the work of other researchers and use the state level rate of unemployment as proxy for risk (Lusardi (1997) and Engen and Gruber (2001).[13] Additionally, to capture income variation which is more individual-specific, we use a dummy for whether the respondent has a good idea of the household income for the next year. We also control for macro shocks (issue 6) including in the regression a year

[12] For those readers interested on the size of precautionary savings and who are already convinced of the reliability of the precautionary saving question in the SCF, this section can be skipped as we have already reported the figures about precautionary wealth in the previous section.

[13] These are the variables used by in their instrumental variables estimation. These instruments are valid insofar workers do not locate to states according to their degree of risk aversion.

dummy and the absolute deviation of predicted wages from actual wages divided by predicted wages.[14] We also use dummies for whether the income for the past year was above or below a level the survey respondent considered "normal."

Health risk and other controls

We cannot use information on whether households have health insurance, since that variable is clearly endogenous and because it proxies for common preferences toward risk (Starr-McCluer(1996)). Studies such as Chandra and Skinner (2002) show there is very high geographical variation in health costs, possibly reflecting differences in utilization and quality of health care. Since even those who have health insurance have to pay some out-of-pocket costs, we proxy for this risk by using the state-specific level of out-of-pocket health costs. Those who live in higher-quality higher-cost states face a higher risk of paying for some of their health expenses. To use a measure which is more individual-specific, we also use information on whether respondents foresee expenses for health care in the next 5-10 years. These expenses are relatively far in the future; thus, they are likely to be perceptible but still uncertain risks. Since these variables could potentially capture the expected costs, we also include current health status among our controls.

Longevity risk and other controls

We proxy for this risk using the coefficient of variation of longevity. This variable is calculated as the ratio of the standard deviation of life expectancy divided by the difference between average life expectancy and the current age.[15] The distribution of life expectancy is simulated for

[14] The predicted wage is estimated using data in the Current Population Survey at the level of three-digit occupation codes and conditioning on age, education, self-employment, sex, and race. Values were predicted for the SCF observations using the estimated parameters.

[15] For a couple, we use the maximum value over the two people.

each case using mortality probabilities conditioned on current age, race, and gender. In the regressions, we also include the reported value of expected longevity and current age.

Business risk and other controls

The measure of business risk (for the business sample only) we use is the failure rate of businesses of the same general type and age matched by state. Because the problem of self-selection can be particularly important for this group, the variance of income would not be an appropriate variable to use. We also consider whether the head and spouse work in the actively managed business(es) owned by the family as a proxy for lack of risk-sharing within the family. Finally, we add to the regressions the number of businesses managed by the family, as business risk may be reduced by spanning different types of sectors and activities.

Preferences

To highlight the importance of preferences and account for the vast heterogeneity in precautionary accumulation, we use a large set of controls. We control for several demographic characteristics, such as age, education, race, marital status, number of children, family size, and wealth dummies. We use wealth dummies (dummies for quintiles of wealth) to account for tastes for saving. Since wealth can be endogenous, we also present results without the wealth dummies. Implicitly, the results with and without wealth dummies also help to show that the desired precautionary savings is not simply a noisy measure of actual wealth. Because it is important to account for behavior toward risk, we use information on respondents' willingness to undertake financial risk as a proxy for risk aversion. In addition, we use data on smoking behavior to proxy for impatience (Lusardi (2003)). Data on whether the household has a regular plan for saving plan and the degree to which they shop for returns on saving and investments are used to proxy for attitudes toward saving (Lusardi (2003)). To capture intertemporal substitution and prices,

we also consider expectations about interest rates in the next 5 years. Finally, we account for the intention of leaving bequests.

Liquidity constraints

Liquidity constraints are proxied by several variables expressing the possibility of borrowing. We follow the approach of Maki (2000) and Kennickell, Starr-McCluer and Surette (2000) and use the variables reported in their work: a dummy for whether households own bank-type credit cards, the ratio of annualized payments on all types of loans to total normal income, the ratio of the credit limit on all credit cards to normal income, the ratio of credit card debt outstanding over the total credit limit on the family's cards, and the interactions of these two latter variables with an indicator for whether families have low income (income lower than $25,000).[16] To consider as well the supply of credit, we include the percentage of the local banking market (at the MSA level) held by the four largest depository institutions.

Future expenses and other relevant variables

We use dummies for other foreseeable future expenses (mainly education and home expenses) in the next 5-10 years to allow for variation in forward-looking behavior and future commitments which can also be uncertain. Additionally, we include a dummy for whether pension benefits are considered to be adequate for retirement, since pensions can also insure against risk, particularly longevity risk. We include a dummy for whether at least one parent is alive as a possible signal of the possibility of receiving inheritances in the future, thus decreasing the need to save (Lusardi (2003)).

We control for such an extensive set of variables for several reasons. First, our objective

[16] The SCF reports information on whether households have been denied credit in the past or are discouraged borrowers. We do not use these variables in our empirical work since we are interested in future rather than current or past liquidity constraints.

is to describe and explain the data as much as we can, and we do so by exploiting the richness of information offered in the SCF. Second, we aim to show that the proxies we use for risk are not necessarily capturing something other than risk. Third and most importantly, we aim to demonstrate that the data behave according to the predictions of the theory.

Our empirical results are consistent with the findings of other works on savings. Most importantly, we find that the reported measure of desired precautionary savings correlates with risk(s), even after accounting for a large set of controls. It is also correlated with other determinants of wealth in the expected way. These results are robust and do not depend narrowly on the chosen empirical specification. We report the empirical estimates for risk in Table 2; the complete set of estimates is reported in appendix Tables A2-A4. We summarize below the empirical findings for each subsample.[17]

Main sample

For the main sample, we find that all measures of risk–income, longevity, and health–are significant and correlate positively with desired precautionary savings (Table 2, second column). For example, those respondents who live in states with higher unemployment rates desire more precautionary savings, and those who have a good idea of next year income desire to have less. However, insofar as there is self-selection of workers into low-risk jobs that is not completely addressed by our proxies for income uncertainty, the estimates are still biased downward (Lusardi (1997, 2000) and Fuchs-Schündeln and Schündeln (2005)). Those who face higher health and longevity risk also hold higher amounts of precautionary savings.

[17] Estimation was performed using robust regressions. All standard errors were corrected for the multiple imputation of the SCF data (see Kennickell (1998)).

Other variables have the expected sign and significance, confirming that our variable has economic meaning (Table A2). As expected, the amount of desired precautionary savings increases with permanent income. Evaluated at the 1995 population mean for this sample, for an additional $1,000 of permanent income, households want to hold about an additional $221 in precautionary wealth. Moreover, precautionary accumulation increases sharply with education, even after accounting for wealth dummies. Thus, differences in precautionary wealth across education groups documented in Figures 3a-c and in other empirical studies (Hubbard, Skinner and Zeldes (1995), Lusardi (1998, 2000)) are still large even after accounting for many determinants of wealth.

Moreover, we find that if pensions are adequate, desired precautionary accumulation is substantially lower (about 4 to 5 percent lower). Planning is also important. Respondents who have a saving plan report higher precautionary savings and so do those that search for the best conditions on investment; work by Lusardi (2003) and Ameriks, Caplin and Leahy (2003) shows that planning is a major determinant of wealth accumulation. In addition to preferences, the economic environment matters for precautionary savings. Respondents who are more likely to face constraints (they report high loan payments or live in areas with a low concentration of large banks) accumulate higher precautionary savings.

While most of the variables used in the empirical work move in the expected way, there is still much unexplained variation. This result reinforces the claim that it should be difficult to find consistent evidence about precautionary savings in micro data by estimating the function reported in Section 2.1.

Older sample

It is important to focus attention on this group which accounts for such a disproportionate share of desired precautionary savings. Not many studies have examined this group in isolation and we know relatively little about the importance of precautionary savings among older people. However, this group is often included in the samples used to estimate the precautionary saving motive.

It is reassuring to note that, for this group, unemployment risk and income risk in general are not significant (Table 2, third column). Many of these households are retired or on the verge of retirement and, generally, labor income risk should not play an important role in explaining their desired precautionary accumulation. But as expected, two other risks are relevant: health and longevity risk, both of which are statistically significant.

As is the case for the main sample, desired precautionary savings for older households increases with permanent income and education (Table A3). As before, differences are sizable across education groups, and desired precautionary savings is high particularly among those with a college degree or more education. Most other variables show the expected results. For example, the liquidity constraint variables are overall not statistically significant. Older people/cohorts who have a bequest motive accumulate more precautionary savings; that is, the data suggest that people who desire to leave a bequest actually want to accumulate larger precautionary balances to increase the likelihood that there will be a bequest.

However, there is more variation in desired precautionary savings among older households/cohorts than we account for with our simple proxies. While the two risks mentioned above play a role, there are potentially more sources of risk that at least some older families would like to insure against. Modeling the saving behavior of this group is, therefore, likely to be quite complex and require more detailed information on the nature of the key risk factors facing

older families as well as on their risk preferences.

Business sample

No one has studied this group in detail to assess the importance of the precautionary saving motive, but according to our descriptive results presented earlier in this paper, this group is very important for understanding both precautionary and overall wealth accumulation[18]. In an attempt to understand the precautionary behavior of business owners more effectively, we added several variables related to business risk to our model. As mentioned above, we account for whether both spouses work in the business and, thus, for lack of risk sharing within the household. We also include the number of businesses actively managed by the respondent or spouse (Table 2, fourth column). Furthermore, we include the business size and type of business(es), and a dummy for whether the head or spouse has a MBA (Tables A4).

Overall, it is very hard to decompose the variation in desired precautionary holdings for business owners with the available data; even basic demographic variables are not statistically significant. The risk measures, such as unemployment and income risk, are significant and so are some proxies for health risk, but, for example, the business failure risk variables are not significant (Table 2). A variable that is strongly significant is the number of businesses owned by the family and actively managed, but contrary to initial expectations, the higher the number of businesses, the higher the precautionary savings. This perhaps is due to the fact that there is little risk diversification in running more than one business; often owners of multiple businesses have businesses in closely related areas.

[18] See Hurst, Lusardi, Kennickell and Torralba (2005).

Liquidity constraints matter for business owners and, consistent with theoretical predictions, those that are more likely to face constraints hold higher amounts of precautionary savings. Like the main sample, business owners that have adequate pensions report lower precautionary savings.

The most salient result of the model for this group is how little the explanatory variables explain desired precautionary savings. Business owners account for both a large share of desired precautionary savings and actual net worth, but our model suggests that they may be an unusually heterogenous group. Business owners are typically thought to be risk takers, and many business owners face more complex risks than simple income variability. More work needs to be done to characterize and measure these risks and to understand how business owners perceive them.

3.4.2 Desired Precautionary Savings and Permanent and Transitory Shocks to Income.

The empirical work reported in section 2 is focused more narrowly on income risk than is our model above. To connect more directly with that literature, we use a procedure outlined in two of the most commonly cited papers on precautionary saving (Carroll and Samwick (1997, 1998)). Simply, we construct a measure of permanent and transitory shocks to income and show it is related to our measure of desired precautionary savings.

First, we use data from the 1995 SCF to construct a sample that mirrors as closely as possible the one of Carroll and Samwick (1997, 1998), which uses one wave of the Panel Study of Income Dynamics (PSID). Specifically, we exclude any household where the head is outside the age range 26-50, where the head is not working, or where the marital status of the head changed at any time during the last 5 years. The total number of observations in this subsample

is 1,497. Carroll and Samwick use panel data on non-capital income from 1980 through 1987 to construct a measure of the variances of permanent and transitory shocks to income. They then regress the log of wealth in 1984 on these measures of risk as instrumented by industry, occupation and occupation dummies.. Because the SCF waves we use do not have a panel dimension, we cannot make independent parallel estimates of risk. However, we can construct measure of income variance from the PSID and then impute these measures in the SCF.. Specifically, we estimate the variance of permanent and transitory shocks to income using PSID non-capital income data from 1990 to 1997.[19] We then regressed these variances on demographics (age, age squared, marital status, race, gender and number of children), dummies for industry, occupation and education alone and these dummies interacted with age and age squared. These variables are common to both the PSID and the SCF. Using these estimated coefficients, we calculate a measure of the variances of both permanent and transitory income shocks for households in the SCF in 1995.

Estimates from this two-sample procedure are reported in Table 3. In the first column, we report the estimates of the regressions using as dependent variables the log of desired precautionary savings. In the second column, we use the log of total net worth. The models also include the additional controls used by Carroll and Samwick (1997, 1998)–permanent income and demographics such as age, age squared, marital status, race, gender, and number of children–but, for brevity, their estimates are not reported in the table. As predicted by the theory, we find that desired precautionary saving is positively related to both variances.[20] Thus, when

[19] To construct these variances, we use the procedure described in Carroll and Samwick (1997). See also Hurst, Lusardi, Kennickell and Torralba (2005).

[20] Standard errors have been corrected using a boostrapping procedure with 1,000 repetitions to account for the fact that the income variances are generated regressors from the PSID.

income variances increase, household wish to hold higher amounts of precautionary saving. Estimates for net worth (column II) reveal a similar pattern, but the estimates are weaker. As found in Carroll, Dynan and Krane (2003), it is much harder to find evidence of precautionary savings in samples using data from the 1990s, probably because wealth was strongly affected by the increase in stock marker prices. Our data on desired precautionary savings overcome that potential problem. Most importantly, our estimates show that the measure of desired precautionary savings in a sample of relatively young households correlates with income risk in the way predicted by the theory.

3.5 Another Look at the Quantitative Importance of Precautionary Savings

As noted earlier, most earlier work has focused on income risks, and where other risks have been considered, generally the risks have not been clearly connected to precautionary savings. Having shown that our measure of desired precautionary savings is associated with risks and other factors in a sensible way, we can use that measure to tease out which risk is most important quantitatively. We exploit the information on the motives to save reported in the SCF (the list of responses is reported in appendix Table A1), which is the first of a sequence of attitudinal questions on saving. From the reported motives, we are able to isolate four categories of precautionary savings related to different types of risks:

- Emergencies, "rainy days," other unexpected needs, for "security" and independence;
- Reserves in case of unemployment;
- In case of illness, medical/dental expenses;
- To have cash available on hand/liquidity; wise/prudent things to do.

As a simple way of inferring the quantitive importance of different types of risk, we

simply regress the ratio of desired precautionary savings to permanent income on these four dummies using robust regressions (along with dummy variables to control for variations in wealth). What emerges from these simple regressions is that, relative to other risks, it is health risk that gives rise to the largest amounts of precautionary savings overall (Table 4). This finding is consistent with what was reported earlier, in particular for the older sample. On the other hand, earnings (unemployment) risk, which is the risk that has been considered in the majority of the papers on precautionary savings, does not account for high amounts of precautionary accumulation in the total sample, though as expected, it is more relevant for the main sample. Only a very small number of respondents in the older and the business owner samples reported this motive as either their first or second most important reason to save.[21] Our estimates are consistent with the recent work of Carroll, Dynan and Krane (2003), which also finds small amounts of precautionary wealth to insure against unemployment risk. Overall, what emerges again from these simple regressions is that we need to move beyond earnings risk when modeling precautionary accumulation, in particular when evaluating the quantitative importance of the precautionary saving motive in comprehensive surveys that include all types of households.

4. Discussion

According to our findings a precautionary saving motive exists and affects the behavior of all households. However, the precautionary saving motive does not give rise to high amounts of wealth, at least for the group of households who are in working years and do not own a

[21] However, it may be that some part of the health saving motive indirectly signals saving for lost wages during times of ill health.

business. Simply stated, our data show that precautionary savings may account for as much as 8 percent of total accumulation in the US. These estimates are similar to the upper range of values obtained in studies of precautionary savings using subjective measures of risk. Our findings further indicate that we need to move beyond earnings risk when modeling precautionary accumulation. Older households play a very important role in explaining precautionary savings and for them, it is very important to model health and longevity risks as well as other sources of risk (for example "consumption" risk and other such emergencies). Health risk may also lead to sizable amounts of precautionary accumulation. Thus, models that incorporate more than one source of risk are likely to be better suited to modeling the behavior of households, particularly in samples that do not concentrate on the young only.

There is also another group that deserves close attention: business owners. Our work shows that it is very hard to characterize their behavior well. There are several problems in measuring properly the risk that these households face. Most importantly, these households may self-select into self-employment because of their risk tolerance or their perceptions of risk. Moreover, these households are less likely to have pensions or to retire at age 62 or 65 (Hurst and Lusardi (2004)). Thus, they accumulate wealth for reasons other than to build a buffer to insure against shocks. Our estimates suggest that it will be fruitful to study them in isolation. Alternatively, models that include business owners should at least attempt to model more adequately their differences with respect to other households.

Our results provide insights into previous empirical findings using the regressions that were discussed in Section 2. For example, we can better understand the findings of Kazarosian (1999) and Lusardi (1998, 2000), which examine older workers. They find that a precautionary saving motive exists even for older households and, as this study also shows, older households

display a strong precautionary saving motive. We can also explain the finding of the well-cited paper by Carroll and Samwick (1998), which shows that precautionary savings tend to become more, rather than less, important with the addition of respondents older than 50.

Our findings can also explain another and rather important result of Carroll and Samwick (1998). When farmers and self-employed are excluded from their sample, not only do the coefficient estimates on income risk drop by 50 to 60 percent, but they are also no longer statistically significant. As reported above, precautionary wealth is relatively small in the main sample, but it becomes large for business owners. This group surely plays a pivotal role in the estimates of precautionary savings.

Hurst, Lusardi, Kennickell and Torralba (2005) push this point further and show that the high estimates of precautionary savings reported in many empirical works are the result of mixing together two different groups in the population: business owners and other households. Because business owners on average face higher income risks than other households and hold large amount of wealth for reasons unrelated to precautionary saving, they lead to a high correlation between wealth and income risk regardless of whether or not a precautionary motive is important. In their work, they can reproduce the high estimates of precautionary savings reported by Carroll and Samwick (1997, 1998). However, when they explicitly account for the difference between business owners and other households, they find that the share of wealth accounted for by precautionary savings decreases from 50 percent to 10 percent.

Our results also provide insights into another important and puzzling finding: the lack of annuitization among the older households. As many authors have shown, many retirees do not annuitize their wealth. Furthermore, when given the option, many retirees choose lump-sum payments rather than annuities for their retirement income (see Ameriks (2004) and the

references therein). If retirees face risks other than simply longevity, this behavior is reasonable. Our data provide evidence that respondents in the older sample care about many sources of risk. Similarly, it can explain why households do not use reverse mortgages (Venti and Wise (1991)). If older households face the risk of incurring high expenses, for example large health expenses, they may be reluctant to downsize or annuitize the value of their house. This result is consistent with the work of Skinner (1996), which also emphasizes the importance of the precautionary saving motive among older households.

Our findings are also in line with the work by Hubbard, Skinner and Zeldes (1995), which shows that low-income and low-education families have little precautionary savings. As the authors argue, this may be due to the existence of welfare programs. While households at the bottom of the wealth distribution may face high risk, this risk interacts with means-tested welfare programs in a nonlinear way. Finally, our findings are consistent with the evidence regarding motives to save. As reported in many data sets, the precautionary saving motive is consistently the most important motive indicated by respondents, and, as reported by Alessie, Lusardi and Aldershof (1997), Kennickell (1995) and Samwick (1998), it remains strong among older cohorts. However, as reported by Horioka, Yokota and Miyaji (1994), households indicating a precautionary saving motive do not hold large amounts of wealth.

Our findings also imply that models of savings relying certainty equivalence or preferences and economic environments that do not generate precautionary savings will not be able to characterize well the behavior of US households. But our work further suggests that the precautionary motive is very heterogenous across the population, much more so than what has been found in previous work. This difference may be because only a limited number of sources of risk have previously been considered in the empirical literature and/or because it is hard to

capture well empirically all the complexities of precautionary accumulation. Income risk, in particular, appears likely to give rise to relatively little precautionary accumulation in aggregate, but other risks, such as health and business risk, can lead to large amounts of precautionary accumulation.

For a large part of the younger population, our findings are consistent with studies using subjective measures of risk in that the precautionary saving motive does not give rise to a lot of wealth (Guiso, Jappelli and Terlizzese (1992), Lusardi (1998, 2000), Arrondel (2002)). Thus, we believe that some of the initial large estimates of precautionary savings coming out of simulations for the aggregate economy do not characterize well the behavior of the average or the median household in the economy. Similar findings are reported in the recent theoretical work and simulation results by Irvine and Wang (2001, page 234), which also states that "the overall wealth stock in the economy is less influenced by income uncertainty than the existing theoretical literature suggests." Similarly, Laitner (2004) finds that, for plausible calibrations, precautionary saving only adds 5-6% to aggregate wealth. In the work of Cagetti (2003) as well, households display high degrees of impatience and low risk aversion, and this combination leads to low amounts of precautionary accumulation, particularly for low educated and young households. Although consistent with those predictions, our findings further suggest that there is much more heterogeneity in the precautionary saving motive than usually generated by these stylized models.

One of the novelties of our paper with respect to previous work is that we can identify two groups in the population for which precautionary savings is really important: older households and business owners. Consideration of business owners, a group that can account for a large share of aggregate wealth, suggests risks besides income risk should also be taken into account and their differences should be modeled more explicitly (Hurst, Lusardi, Kennickell and Torralba,

2005)). The same holds for older households. In addition, it is likely that differences in preferences and economic circumstances in these groups give rise to much of the observed heterogeneity. Further research on precautionary savings should give more attention to the behavior of these two groups in the population.

5. Concluding Remarks

The estimation of the precautionary saving motive is a very complex task. There exist many pitfalls and difficulties in assessing the empirical importance of this motive. One of the major problems is how to measure accurately the amount of reserves people use to shield themselves against risk. The commonly used measures of wealth have many problems and much more attention should be devoted to this important issue.

Our approach deviates from previous works and relies on a subjective measure of precautionary savings provided in the SCF. This survey, by oversampling the wealthy, provides a reasonably accurate account of the range of household wealth holdings. Beginning in 1995, the SCF also provides a measure of desired precautionary savings, further enriching the information currently available to study household behavior toward savings. We provide an extensive evaluation of this measure. The underlying question was subjected to careful pre-testing as well as post-survey evaluation. We show that the measure is consistent across time-periods; two independent cross-sections in 1995 and 1998 give very much the same results. The decomposition across groups shows that the features of the data accord with the theory. In particular, the shape of the distribution of desired precautionary savings mimics that of wealth, but at a much lower level than wealth. Finally, desired precautionary savings correlates with risk, permanent income, liquidity constraints, and household preferences in a sensible way.

Our findings shed new light on the importance of precautionary savings. The precautionary saving motive continues to be strong even among older households/cohorts. Thus, we need to move beyond earnings risk when studying the importance of precautionary accumulation. Moreover, the precautionary saving motive is very important for business owners, and for this group as well, we need a more careful modeling of sources of risk. Given that older households and business owners alone account for 65 percent of total precautionary accumulation by our measure, further research on this topic should focus on these two groups of the population. Because the heterogeneity seen in our data is large, it may be particularly important to enrich the description of the economic environment, including accounting for imperfections in the financial and insurance markets and the institutions that are already in place to insure against risk (e.g., welfare programs, sources of support from family and friends).

The measure of desired precautionary wealth available in the SCF can substantially enhance empirical work. For example, researchers interested in accounting for precautionary accumulation can use this information, rather than relying on traditional measures of wealth. Furthermore, these data can be used to account for household-specific behavior toward risk. There is little information in existing data sets on risk aversion, prudence, or the amount and type of risks that households face; in principle, the subjective measure of precautionary wealth in the SCF encompasses all such information. Thus, studies of portfolio choice, entrepreneurship, and the labor market can benefit much from the availability of this information. These data can also help yield better understanding of other questions concerning household saving behavior, such as whether and how fast older households should decumulate wealth after retirement and what are the most important motives for saving.

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Table 1: Empirical Issues in Estimating the Importance of Precautionary Savings

#	Issues	Empirical Implementation	Relevant papers that face or address issue	Problems	Direction of bias
1	Measurement of wealth	Use financial wealth	Hrung (2000) Engen et al (2001) Carroll et al (1998) Alan (2004)	Very limited measure of accumulation	↓
1	Measurement of risk	Use subjective measures of income variance	Guiso et al. (1992) Lusardi (1998) Arrondel (2002)	Income variance is very low	↓
2	Preferences: Risk Aversion	Use occupation dummies as proxy for risk	Skinner (1988) Lusardi (1997) Fuchs-Schundeln et al. (2005)	Risk-averse workers can self-select into low risk occupations	↓
3	Liquidity constraints	Use proxies for constraints	Guiso et al. (1996)	Mostly un-observable	Imprecise estimates
4	Other forms of insurance	Use data on sources of help and support	Hubbard et al. (1995) Lusardi (2000)	Mostly un-observable	Imprecise estimates
5	Functional form	Use logs	Carroll & Samwick (1997, 1998) Carroll et al (2003)	Heavily selected sample	↑
6	Macro and past shocks	Use proxies for past shocks	Lusardi (1998, 2000) Carroll, Dynan and Krane (2003)	Both wealth and income risk are sensitive to the business cycle	↓
7	Portfolio choice	Include stocks in the measure of wealth	Most papers	Those facing high income risk should invest less in stocks	↓
8	Other motives to save	Entrepreneurs and older households are included in the sample	Most papers	Interaction of enterprise & bequest with precautionary mot.	↑

Note: This table summarizes the empirical issues in estimating precautionary savings discussed in section 2 in the text.

Table 2: Summary of Key Regression Estimates, by Sample Group.

	Main sample	Older sample	Business Sample
Variables: risk and permanent income	Estimates (s.e.)	Estimates (s.e.)	Estimates (s.e.)
State unemployment rate	0.042** (0.020)	0.011 (0.042)	0.053** (0.029)
Respondent has good idea of next year's income	-0.124*** (0.044)	-0.024 (0.096)	-0.032 (0.065)
State out-of-pocket health costs	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Future health expenditure	0.230*** (0.057)	0.369*** (0.095)	0.203** (0.093)
Longevity risk	3.043*** (0.759)	5.409*** (1.660)	1.140 (1.856)
State failure rate of businesses of same type & age	_	_	0.011 (0.018)
Head works in actively managed firm owned by family	_	_	-0.035 (0.113)
Spouse works in actively managed firm owned by family	_	_	0.003 (0.073)
Family own 2 businesses they actively manage	_	_	-0.042 (0.082)
Family own more than 2 businesses they actively managed	_	_	0.304*** (0.099)
Log of permanent income	0.319*** (0.031)	0.137*** (0.050)	0.360*** (0.034)
Preferences, liquidity constraints, future expenses, and other controls	yes	yes	yes
Wealth dummies	yes	yes	yes
# of observations	4,105	1,634	2,236

Note: This table summarizes the estimates of the regressions of desired precautionary savings (in logs) on the variables measuring risk (income, health, and business risk) and permanent income. The full set of estimates is reported in Tables A2-A4**.** Column 2 reports the estimates in the main sample, while columns 3 and 4 report the estimates in the older sample and the business sample. "*", "**, "***" indicate significance at the 10% , 5% and 1% level, respectively.

Table 3: The Effects of Labor Income Risk on Desired Precautionary Savings and Total Net Worth

Variables	I Desired Precautionary Savings	II Total Net Worth
Variance of Permanent Income Shocks	3.05 (1.52)	2.31 (2.02)
Variance of Transitory Income Shocks	2.25 (0.62)	3.78 (0.97)
Other Demographics	yes	yes
# of observations	1,497	1,497

Note: This table reports the regressions of log of desired precautionary savings in the 1995 SCF on the variance of permanent income shocks, the variance of transitory shocks, and additional controls such as normal income, age, age squared, marital status, race, gender, and number of children (column I). In the second column, it reports the regression of total net worth on the same set of variables described above. The variance measures are predicted using PSID non-capital income data and fitting estimates back to the SCF**.** Standard errors have been corrected to account for the fact that the variance measures are generated regressors from the PSID.

Table 4: Precautionary Savings and Motives to Save

Variables	Full sample	Main sample	Older sample	Business sample
Constant	0.123*** (0.005)	0.097*** (0.003)	0.266*** (0.026)	0.159*** (0.022)
Emergencies	0.014*** (0.004)	0.010*** (0.004)	0.026 (0.026)	0.016* (0.011)
Unemployment	0.018* (0.014)	0.033*** (0.011)	-0.118 (0.120)	0.020 (0.038)
Health expenses	0.044** (0.010)	0.018** (0.009)	0.077** (0.033)	0.001 (0.023)
Liquidity, wise/prudent thing to do	0.019** (0.011)	0.013 (0.012)	0.000 (0.046)	0.027 (0.024)
Wealth dummies	yes	yes	yes	yes

Note: This table reports the estimates from a regression of the ratio of desired precautionary savings over permanent income on the dummies for the motives to save reported in the first column. All regressions include a set of wealth dummies to account for household preferences. "*", "**, "***" indicate significance at the 10% , 5% and 1% level, respectively.

Data Appendix

The data used in this paper derive from the 1995 and 1998 cross-sections of the Survey of Consumer Finances (SCF). The SCF is sponsored by the Board of Governors of the Federal Reserve System, and the data for the 1995 and 1998 surveys were collected by NORC, a national organization for social science and survey research at the University of Chicago. The field period ranged from approximately June through December of the survey years. All asset and liability variables used in this paper are valued as of the time of the interview. All dollar values from the 1998 SCF have been adjusted to 1995 dollars using the Consumer Price Index (CPI).

In each of the two years of the SCF we use, there are about 4,300 participants. The original sample comprises two random sub-samples. The first is an area-probability sample, which accounts for about two-thirds of the participants. This part of the sample provides broad national coverage of the population. The second part contains an over-sample of wealthy households. Non-response to the survey is a substantial problem which is addressed through the weighting design (Kennickell and Woodburn, 1999). For individual questions, non-response, or partial response in the form of range information, is also a problem. The survey deals with this type of non-response through multiple imputation (Kennickell, 1998), a technique that allows one to account for the variability associated with non-response in model estimation. The standard errors of all models presented in this paper are corrected for the imputation of the originally missing data. See Kennickell, Starr-McCluer, and Sundén (1997), and Kennickell, Starr-McCluer and Surette (2000) for more information on the SCF in 1995 and 1998.

Table A.1: Motives to Save in the 1995 SCF

Motives to save	Percentages in the total sample
Emergencies, "rainy days," other unexpected needs, for "security" and independence	36.2
In case of illness, medical/dental expenses	6.3
Reserves in case of unemployment	2.4
Liquidity, to have cash available/on hand, wise/prudent thing to do	2.5
Retirement/old age	32.4
"To get ahead", for the future, to advance standard of living	6.2
Children or grandchildren's education, own or spouse education	18.2
For the children/family, "to help the kids out"	5.4
Buying own house, cottage, second house, home improvements/repairs, to meet contractual commitments to pay off house	11.5
Buying a car, boat or other vehicle, buy durable household goods, to travel, take vacations	17.6
Buying (investing in) own business/farm, equipment for business/farm	1.8
No reason, money "left over"	0.6
Don't/can't save, "have no money"	6.8
Other motives	7.4

Note: This table reports the frequencies of the responses to the following question in the 1995 SCF: "People have different reasons for saving, even though they may not be saving all the time. What are your family's most important reasons for saving?" Percentages sum to more than 100 because some respondents provided more than one reason.

Table A2: Explaining Desired Precautionary Savings: Main Sample

Variables	Estimates	Std. Err	Estimates	Std. Err
Risk and permanent income				
State unemployment rate	0.032*	(0.020)	0.042**	(0.020)
Respondent has good idea of next year's income	-0.120***	(0.045)	-0.124***	(0.044)
State out-of-pocket health costs	-0.000	(0.000)	-0.000	(0.000)
Future health expenditure	0.201***	(0.057)	0.230***	(0.057)
Longevity risk	2.903***	(0.762)	3.043***	(0.759)
Log of permanent income	0.486***	(0.028)	0.319***	(0.031)
Macro shocks				
Deviation from predicted wages	0.038***	(0.012)	0.024***	(0.012)
Income lower than normal	-0.044	(0.054)	-0.022	(0.053)
Income higher than normal	0.120**	(0.065)	0.081	(0.064)
Year dummy	0.094	(0.074)	0.074	(0.074)
Age and longevity				
Age	0.039**	(0.019)	0.038**	(0.019)
Age squared	-0.029	(0.023)	-0.039**	(0.023)
Expected years left to live (max of head or spouse)	-0.000	(0.002)	-0.001	(0.002)
Liquidity constraints				
Household has a bank-type credit card	0.160***	(0.057)	0.131**	(0.057)
Ratio of credit limit on all credit cards over permanent income	0.267***	(0.079)	0.247***	(0.076)
Credit limit/perm income * low income (Y < 25,000)	-0.177**	(0.082)	-0.182***	(0.078)
Ratio of debt on all credit cards over total credit limit	-0.208***	(0.054)	-0.129***	(0.054)
Total credit card debt/total limit * low income (Y<25,000)	0.206***	(0.058)	0.126**	(0.058)
Annualized payments on total loans over income	0.092***	(0.033)	0.066**	(0.034)
Percent of local banking mkt held by four largest banks	-0.003	(0.002)	-0.003**	(0.001)
Future expenses				
Household had education expenses in next 5-10 years	-0.044	(0.047)	-0.051	(0.047)
Household has home expenses in next 5-10 years	-0.063*	(0.044)	-0.023	(0.044)
Households has other expenses in next 5-10 years	0.126	(0.145)	0.107	(0.142)
Risk preferences				
Unwilling to take any financial risk	-0.075*	(0.050)	-0.053	(0.049)
Willing to take above average risk for above average return	0.014	(0.053)	-0.012	(0.053)
Willing to take large risk for large return	-0.019	(0.093)	-0.064	(0.093)
Other preferences and attitudes toward savings				
The head or spouse smoke	-0.022	(0.043)	-0.002	(0.043)
Household has plan for saving	0.123***	(0.042)	0.084**	(0.042)
Degree of shopping for returns on saving and investment	0.032**	(0.015)	0.022*	(0.015)
Expected interest rates in the next 5 years	0.011	(0.033)	0.031	(0.032)
Adequacy of pensions/Social Securiy	-0.044***	(0.017)	-0.050***	(0.016)
It is import to leave an inheritance	0.072**	(0.039)	0.047	(0.039)
At least one parent is alive	0.029	(0.070)	0.049	(0.068)

Variables	Estimates	Std. Err	Estimates	Std. Err
Demographics				
High school degree	0.041	(0.068)	0.064	(0.068)
Some college	0.129**	(0.074)	0.143**	(0.074)
College and more than college	0.307***	(0.079)	0.304***	(0.079)
Nonwhite or Hispanic	0.001	(0.068)	0.022	(0.068)
Married	0.007	(0.073)	0.012	(0.073)
Separated or divorced	0.135**	(0.069)	0.164***	(0.069)
Widowed	0.254	(0.133)	0.220**	(0.132)
Dummy if there are children younger than 18	-0.151***	(0.064)	-0.156***	(0.063)
Dummy if there are children between age 18-24	-0.057***	(0.018)	-0.048***	(0.018)
Dummy if there are children age 25 or older	-0.042*	(0.029)	-0.025	(0.029)
Household size	0.038*	(0.024)	0.036*	(0.024)
Other controls				
Excellent health	0.080**	(0.044)	0.066*	(0.043)
Fair or poor health	-0.090*	(0.057)	-0.075*	(0.057)
Constant	0.880**	(0.529)	2.408***	(0.541)
Wealth dummies	no		yes	

Note: This table reports estimates of the regressions of the log of desired precautionary saving on the variables listed in the first column for the main sample. The number of observations is 4,105. "*", "**, "***" indicate significance at the 10% , 5% and 1% level, respectively.

Table A3: Explaining Desired Precautionary Savings - Older Sample

Variables	Estimates	Std. Err.	Estimates	Std. Err.
Risk and permanent income				
State unemployment rate	0.017	(0.042)	0.011	(0.042)
Respondent has good idea of next year's income	-0.008	(0.098)	-0.024	(0.096)
State out-of-pocket health costs	0.000	(0.000)	0.000	(0.000)
Future health expenditure	0.365***	(0.099)	0.369***	(0.095)
Longevity risk	5.410***	(1.728)	5.409***	(1.660)
Permanent income	0.317***	(0.050)	0.137***	(0.050)
Macro shocks				
Deviation from predicted wages	-0.003	(0.027)	-0.001	(0.026)
Income lower than normal	-0.097	(0.149)	0.020	(0.148)
Income higher than normal	0.256**	(0.153)	0.194*	(0.150)
Year dummy	-0.127	(0.161)	-0.159	(0.161)
Age and longevity				
Age	0.070	(0.091)	0.040	(0.089)
Age squared	-0.068	(0.060)	-0.050	(0.059)
Expected years left to live (max of head or spouse)	0.000	(0.006)	0.004	(0.006)
Liquidity constraints				
Household has a bank-type credit card	0.223**	(0.114)	0.138	(0.115)
Ratio of credit limit on all credit cards over permanent income	0.009	(0.099)	-0.018	(0.101)
Credit limit/perm income * low income (Y < 25,000)	0.030	(0.099)	0.037	(0.101)
Ratio of debt on all credit cards over total credit limit	-0.297	(0.525)	0.040	(0.533)
Total credit card debt/total limit * low income (Y<25,000)	0.128	(0.522)	-0.148	(0.530)
Annualized payments on total loans over income	0.126	(0.211)	-0.028	(0.208)
Percent of local banking mkt held by four largest banks	0.002	(0.003)	0.003	(0.003)
Future expenses				
Household had education expenses in next 5-10 years	0.286*	(0.216)	0.235	(0.217)
Household has home expenses in next 5-10 years	0.191	(0.155)	0.210*	(0.149)
Households has other expenses in next 5-10 years	-0.140	(0.257)	-0.128	(0.248)
Risk preferences				
Unwilling to take any financial risk	-0.164**	(0.099)	-0.037	(0.102)
Willing to take above avg/larger risk for above avg/large return	-0.032	(0.132)	-0.040	(0.130)
Other preferences and attitudes toward savings				
The head or spouse smoke	-0.024	(0.109)	0.024	(0.106)
Household has plan for saving	0.073	(0.088)	0.040	(0.087)
Degree of shopping for returns on saving and investment	0.077***	(0.032)	0.062***	(0.031
Expected interest rates in the next 5 years	0.054	(0.067)	0.070	(0.065)
Adequacy of pensions/Social Securiy	-0.001	(0.031)	0.003	(0.030)
It is import to leave an inheritance	0.169**	(0.084)	0.117*	(0.081)
At least one parent is alive	-0.104	(0.117)	-0.111	(0.117)
Demographics				
High school degree	0.175*	(0.113)	0.047	(0.111)
Some college	0.385***	(0.135)	0.282**	(0.131

Variables	Estimates	Std. Err.	Estimates	Std. Err.
College and more than college	0.602***	(0.140)	0.431***	(0.135
Nonwhite or Hispanic	-0.662***	(0.168)	0.519***	(0.165
Married	0.007	(0.245)	-0.016	(0.240)
Separated or divorced	-0.027	(0.229)	0.140	(0.232)
Widowed	-0.157	(0.208)	-0.120	(0.206)
Dummy if there are children younger than 18	-0.201	(0.302)	-0.280	(0.295)
Dummy if there are children between age 18-24	-0.024	(0.021)	-0.017	(0.020)
Dummy if there are children age 25 or older	-0.058	(0.063)	-0.050	(0.064)
Household size	-0.057	(0.125)	-0.044	(0.123)
Other controls				
Excellent health	0.182*	(0.115)	0.189**	(0.112
Fair or poor health	-0.142*	(0.091)	0.055	(0.088)
Constant	0.446	(3.399)	2.594	(3.339)
Wealth dummies	no		yes	

Note: This table reports estimates of the regressions of the log of desired precautionary saving on the variables listed in the first column for the older sample. The number of observations is 1,634. "*", "**, "***" indicate significance at the 10% , 5% and 1% level, respectively.

Table A4: Explaining Desired Precautionary Savings - Business Sample

Variables	Estimates	Std. Err.	Estimates	Std. Err.
Risk and permanent income				
State unemployment rate	0.055**	(0.030)	0.053**	(0.029)
Respondent has good idea of next year's income	-0.032	(0.065)	-0.032	(0.065)
State failure rate of businesses of same type and age	0.010	(0.018)	0.011	(0.018)
Head works in the actively managed firm owned by family	-0.025	(0.114)	-0.035	(0.113)
Spouse works in the actively managed firm owned by family	0.004	(0.073)	0.003	(0.073)
Family own 2 businesses they actively manage	-0.008	(0.082)	-0.042	(0.082)
Family own more than 2 businesses they actively manage	0.419***	(0.096)	0.304***	(0.099)
State out-of-pocket health costs	0.000	(0.000)	-0.000	(0.000)
Future health expenditure	0.184**	(0.093)	0.203**	(0.093)
Longevity risk	1.471	(1.907)	1.140	(1.856)
Log of permanent income	0.449***	(0.031)	0.360***	(0.034)
Macro shocks				
Deviation from predicted wages	0.048***	(0.016)	0.043***	(0.015)
Income lower than normal	0.037	(0.094)	0.052	(0.091)
Income higher than normal	0.160**	(0.088)	0.123*	(0.090)
Year dummy	0.008	(0.125)	0.016	(0.126)
Age and longevity				
Age	0.069***	(0.019)	0.067***	(0.019)
Age squared	-0.048***	(0.019)	-0.049***	(0.019)
Expected years left to live (max of head or spouse)	0.005*	(0.003)	0.005	(0.003)
Liquidity constraints				
Household has a bank-type credit card	0.007	(0.129)	-0.002	(0.129)
Ratio of credit limit on credit cards over permanent income	0.518***	(0.118)	0.525***	(0.117)
Credit limit/perm income * low income (Y < 25,000)	-0.493***	(0.117)	-0.503***	(0.116)
Ratio of debt on all credit cards over total credit limit	-0.011	(0.010)	-0.012	(0.010)
Total credit card debt/total limit * low income (Y<25,000)	0.435	(0.401)	0.357	(0.395)
Annualized payments on total loans over income	0.002*	(0.001)	0.001	(0.001)
Percent of local banking mkt held by four largest banks	-0.004**	(0.003)	-0.004*	(0.003)
Future expenses				
Household had education expenses in next 5-10 years	0.067	(0.078)	0.053	(0.077)
Household has home expenses in next 5-10 years	0.004	(0.081)	0.021	(0.082)
Households has other expenses in next 5-10 years	-0.079	(0.176)	-0.164	(0.175)
Risk preferences				
Unwilling to take any financial risk	-0.067	(0.103)	-0.067	(0.102)
Willing to take above average risk for above average return	0.036	(0.068)	0.020	(0.068)
Willing to take large risk for large return	0.111	(0.111)	0.073	(0.110)
Other preferences and attitudes toward savings				
The head or spouse smoke	0.026	(0.076)	0.033	(0.076)
Household has plan for saving	0.026	(0.062)	0.014	(0.062)

Variables	Estimates	Std. Err.	Estimates	Std. Err.
Degree of shopping for returns on saving and investment	0.058***	(0.021)	0.047**	(0.021)
Expected interest rates in the next 5 years	0.015	(0.048)	0.005	(0.047)
Adequacy of pensions/Social Securiy	-0.048**	(0.021)	-0.049***	(0.021)
It is import to leave an inheritance	0.109**	(0.066)	0.071	(0.066)
At least one parent is alive	-0.146*	(0.105)	-0.131	(0.103)
Demographics				
High school degree	-0.108	(0.167)	-0.117	(0.167)
Some college	-0.171	(0.167)	-0.180	(0.166)
College and other non-professional degrees	-0.020	(0.166)	-0.066	(0.166)
Head or spouse has MBA	0.213*	(0.137)	0.172	(0.135)
Head or spouse has other professional degree (JD, MD, etc.)	0.129	(0.112)	0.133	(0.111)
Nonwhite or Hispanic	-0.017	(0.160)	0.037	(0.159)
Married	-0.161	(0.182)	-0.122	(0.180)
Separated or divorced	-0.077	(0.185)	0.184	(0.265)
Widowed	0.175	(0.270)	0.265	(0.274)
Dummy if there are children younger than 18	-0.022	(0.113)	-0.010	(0.112)
Dummy if there are children between age 18-24	-0.002	(0.024)	-0.000	(0.024)
Dummy if there are children age 25 or older	-0.060*	(0.040)	-0.046	(0.040)
Household size	0.001	(0.042)	0.004	(0.041)
Other controls				
Excellent health	0.087**	(0.066)**	0.074	(0.066)
Fair or poor health	0.034	(0.107)	0.028	(0.110)
Constant	1.238*	(0.807)*	2.359***	(0.817)
Wealth dummies	no		yes	
Controls for business size and type	yes		yes	

Note: This table reports estimates of the regressions of the log of desired precautionary saving on the variables listed in the first column for the business sample. The number of observations is 2,236. "*", "**, "***" indicate significance at the 10% , 5% and 1% level, respectively.

Figure 1: Density estimate of desired precautionary saving; 1995 SCF; 1995 dollars.

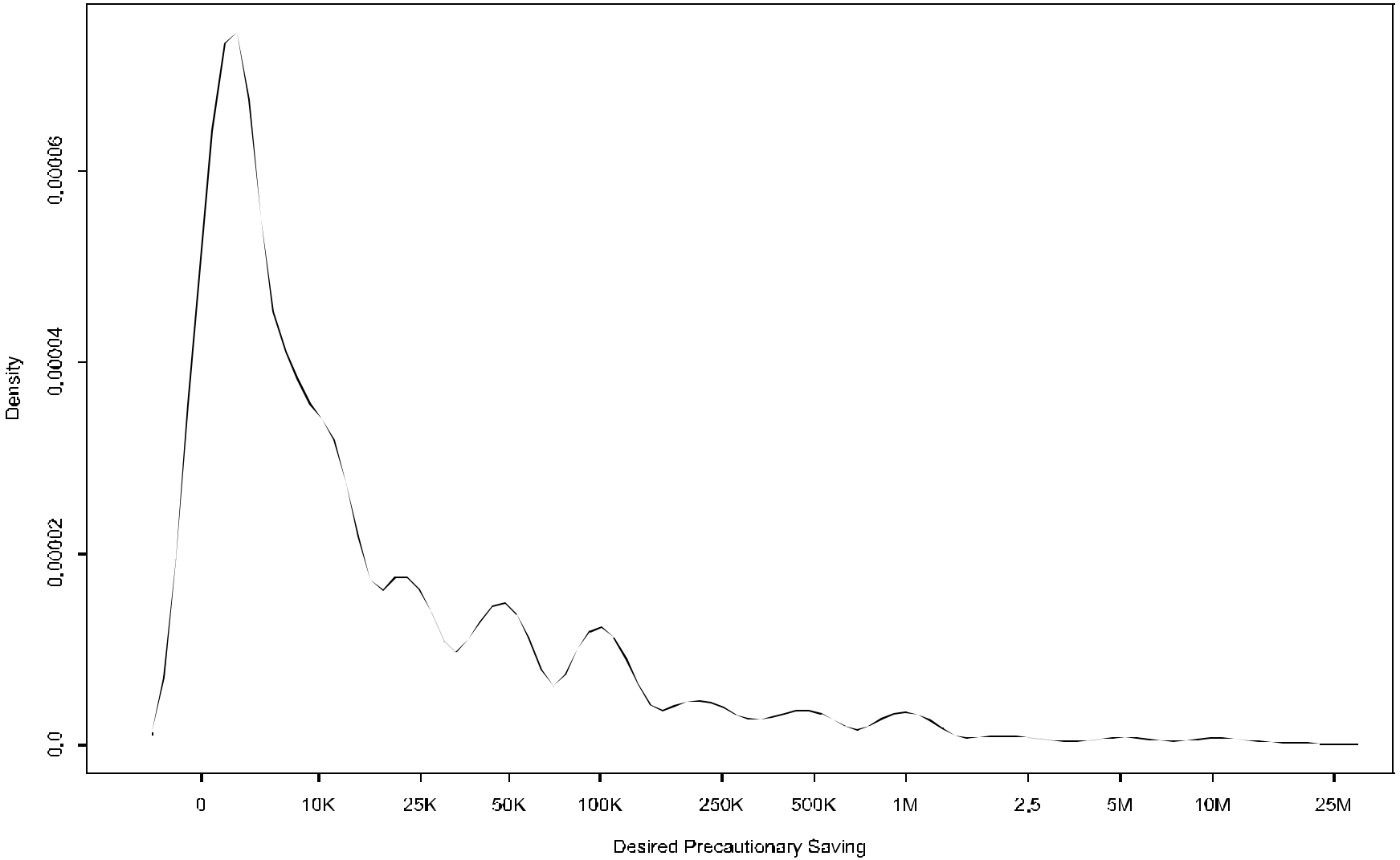

Figure 2: Density estimates of desired precautionary saving; 1995 and 1998 SCF; 1995 dollars.

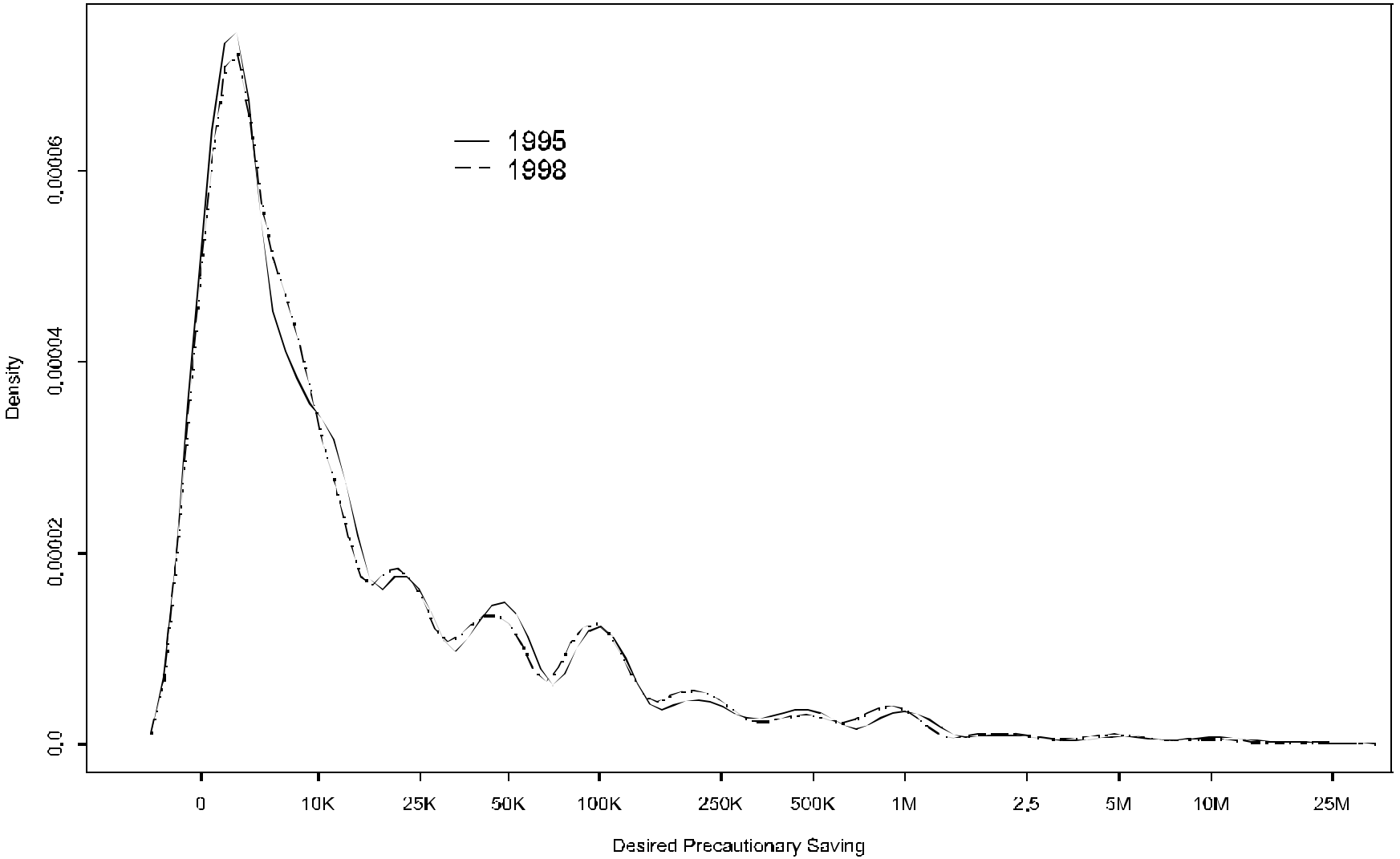

Figure 3a: Conditional distribution of desired precautionary saving, by age of the head of the household; 10th, 25th, 50th, 75th, and 90th percentiles of the distribution; sample with household heads having less than 12 years of formal education; 1995 and 1998 SCF; 1995 dollars.

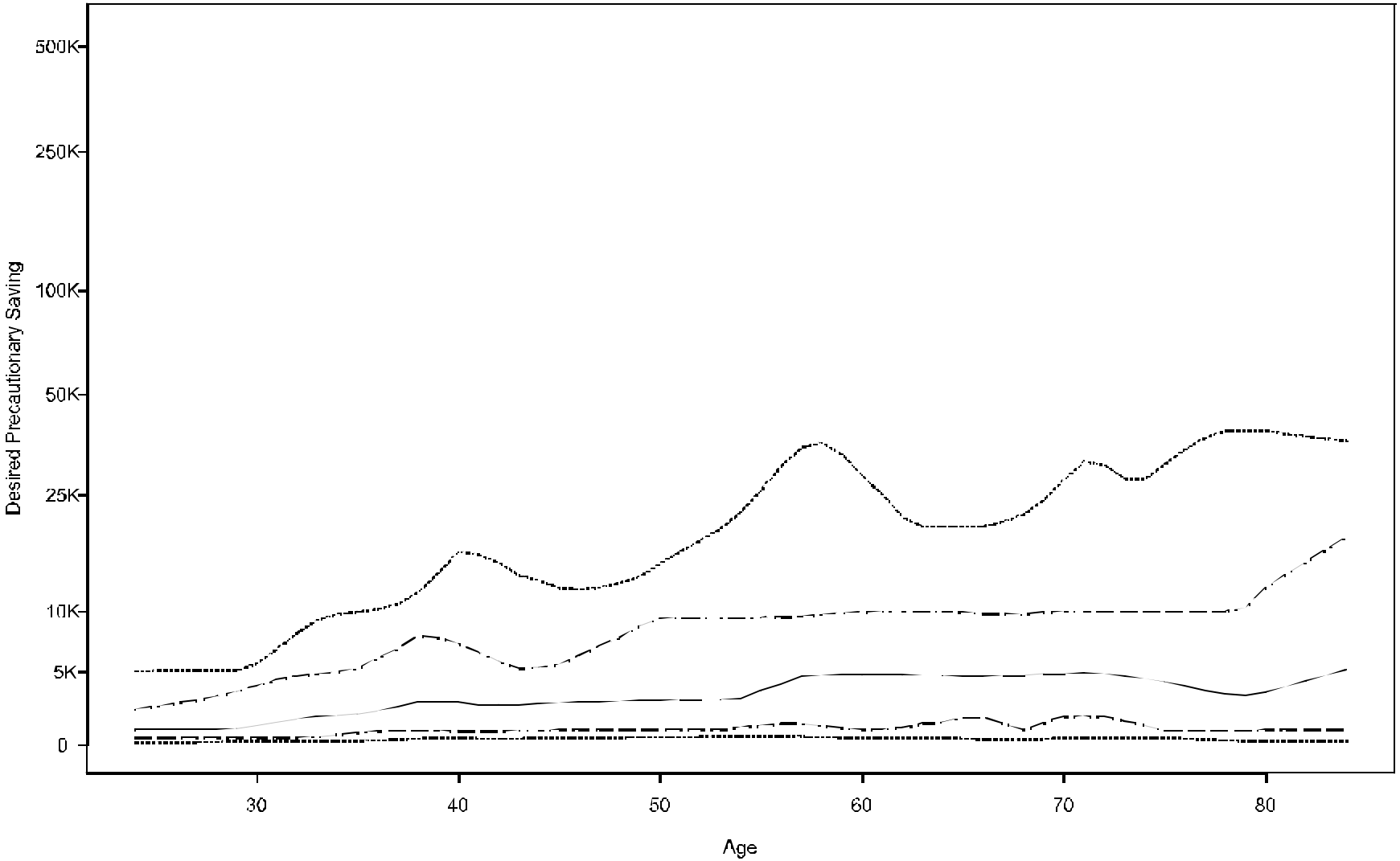

Figure 3b: Conditional distribution of desired precautionary saving, by age of the head of the household; 10th, 25th, 50th, 75th, and 90th percentiles of the distribution; sample with household heads having 12 to 15 years of formal education; 1995 and 1998 SCF; 1995 dollars.

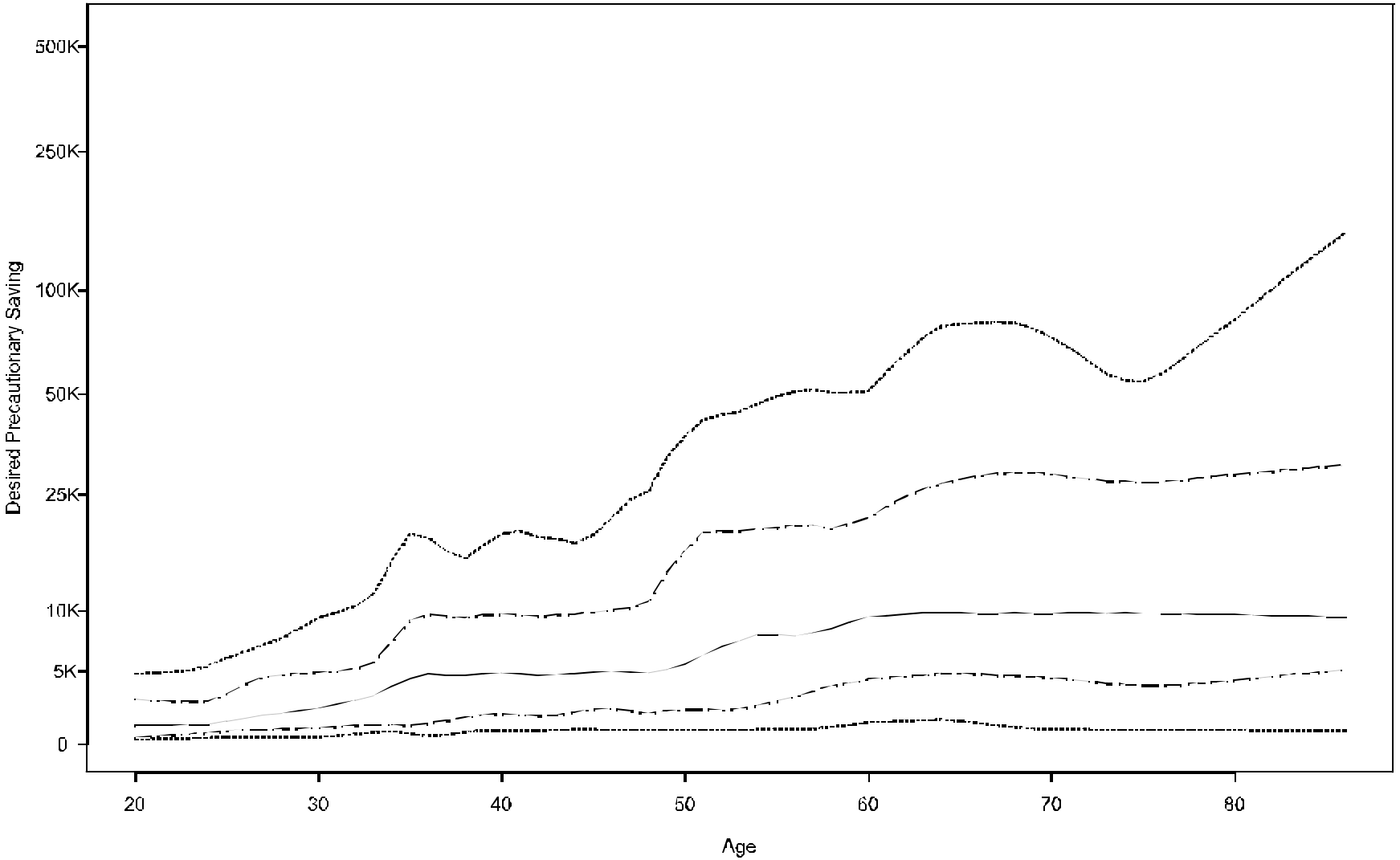

Figure 3c: Conditional distribution of desired precautionary saving, by age of the head of the household; 10th, 25th, 50th, 75th, and 90th percentiles of the distribution; sample with household heads having 16 or more years of formal education; 1995 and 1998 SCF; 1995 dollars.

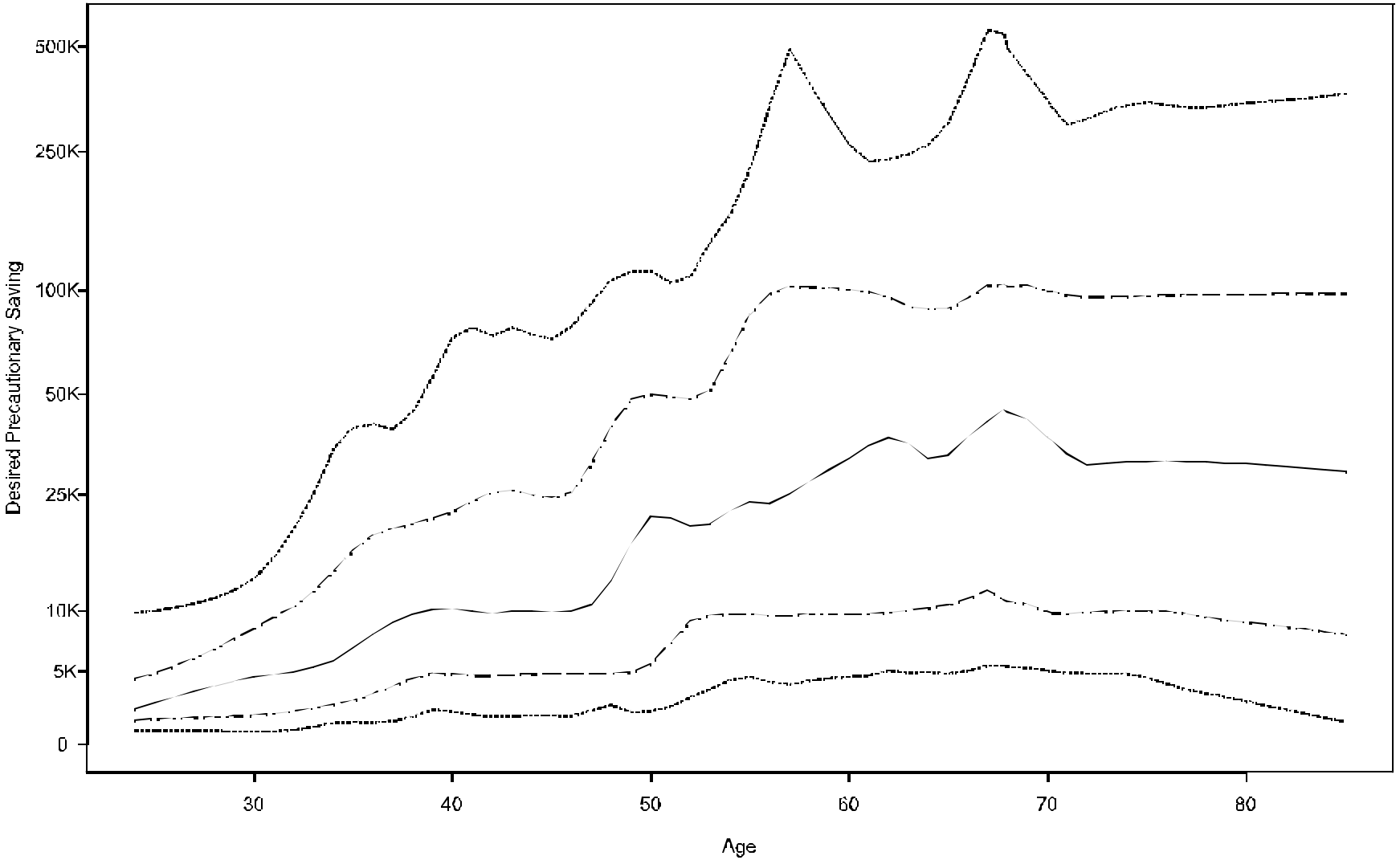

Figure 4: Density estimate of desired precautionary savings; full sample, main sample, older sample, and business sample; 1995 and 1998 SCF; 1995 dollars.

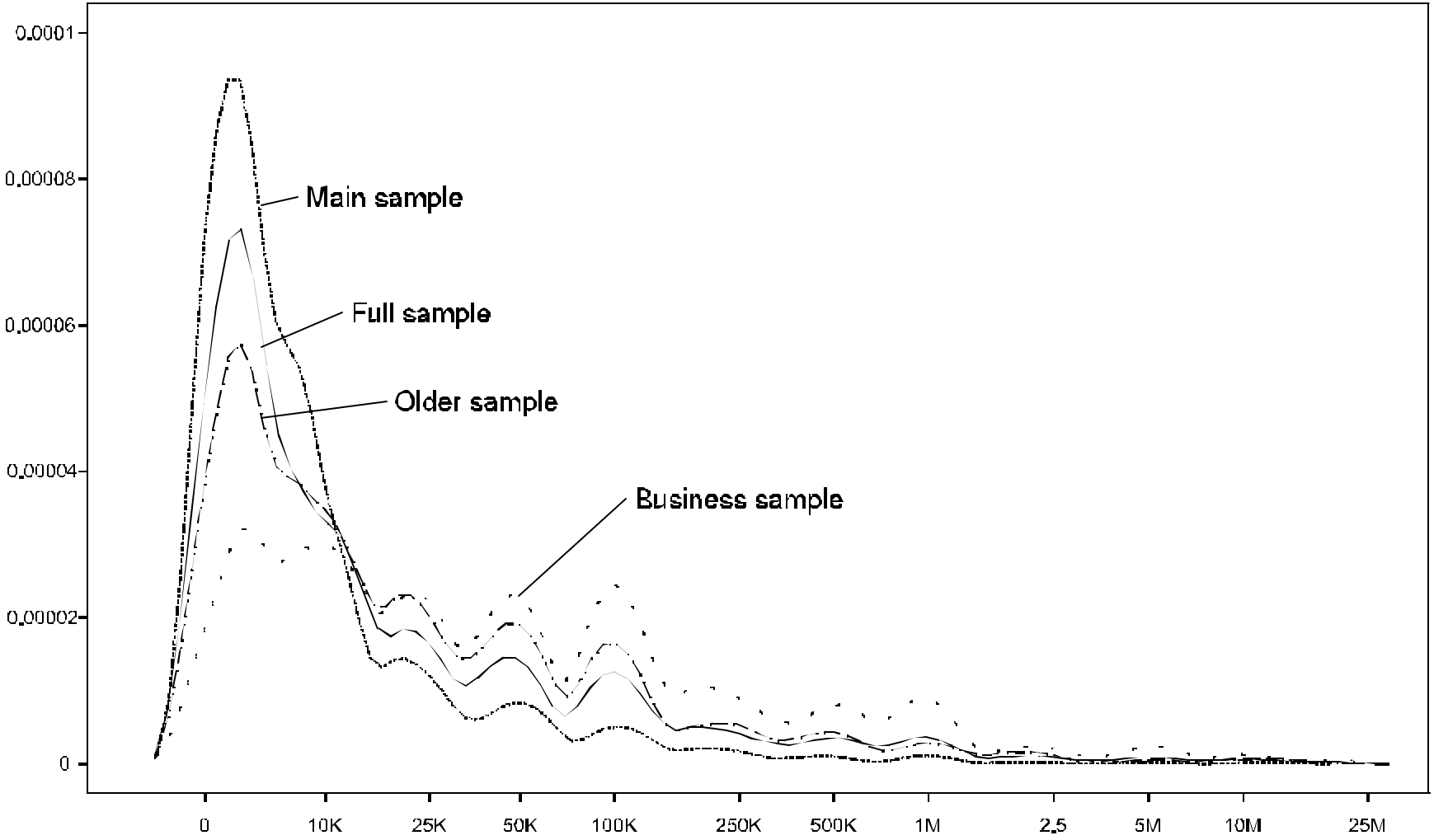

Figure 5: Density of the ratio of desired precautionary saving to normal income; full sample, main sample, older sample, and business sample; 1995 and 1998 SCF.