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Precautionary Savings and the Importance of Business Owners*

Erik Hurst[1], Arthur Kennickell[2], Annamaria Lusardi[3], and Francisco Torralba[4]

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Abstract:
In this paper, we show the pivotal role business owners play in estimating the importance of the precautionary saving motive. The fact that business owners hold higher-than-average wealth while facing higher income risk than other households leads to a correlation between wealth and labor income risk regardless of whether or not a precautionary motive is important. Using data from the Panel Study of Income Dynamics in the 1980s and the 1990s, we show that within separate samples of both business owners and non-business owners the size of precautionary savings with respect to labor income risk is modest and accounts for less than ten percent of total household wealth. However, pooling together these two groups leads to an artificially high estimate of the importance of precautionary savings. Data from the Survey of Consumer Finances further confirms that precautionary savings account for less than ten percent of total wealth for both business owners and non-business owners. Thus, while a precautionary saving motive exists and affects all households, it does not give rise to high amounts of wealth in the economy, particularly among those households who face the most volatile labor earnings.

JEL Classification: G21, G22, M41

Keywords: Mark-to-market, Historical Cost, Incomplete Markets

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1. Introduction

Precautionary saving is considered one of the most important motives to save, particularly among the young population. While a variety of empirical estimates exist, several studies show that precautionary savings may contribute to as much as fifty percent of aggregate wealth for individuals under the age of fifty.[1] The general approach taken in these studies is to relate measures of labor income risk faced by households to the amount of wealth households accumulate. As a result of these large empirical estimates, most models in macroeconomics now incorporate a precautionary saving motive. Moreover, the importance of precautionary savings has implications for public policy; the effects of welfare and taxation policies very much rely on the strength of this motive**.**

In this paper, we show that the large positive estimates of precautionary savings documented so far in the literature are, in fact, an artifact of pooling together two different sub-group in the population: business owners and other households.[2] Such mixing has the potential to confound the analysis of precautionary savings. Business owners face, on average, higher expected income risk and accumulate larger amounts of wealth than other households but for reasons *unrelated to precautionary savings*. The fact that business owners hold higher-than-average wealth while facing higher income risk than other households leads to a correlation between wealth and labor income risk regardless of whether or not a precautionary motive is important.

To test this hypothesis, we separately analyze precautionary saving motives within a group of non-business owners and within a group of business owners using data from the Panel Study of Income Dynamics (PSID). Within each group, we find that precautionary savings explain only up to ten percent of total household wealth. Yet, when we pool these samples

[1] For a review of early work on precautionary savings, see Deaton (1992) and Browning and Lusardi (1996). For more recent results, see Carroll and Samwick (1997, 1998).

[2] As in Quadrini (1999) and Hurst and Lusardi (2004), we define business owners as households who report owning one or more businesses and we use the terms entrepreneurs and business owners interchangeably. In our robustness specifications, we also define business owners as households who report being self employed.

together, we find that as much as fifty percent of total wealth is explained by precautionary savings.

In the final part of the paper, we use another approach to estimate the importance of precautionary savings. Starting in 1995, the Survey of Consumer Finances (SCF) asked respondents about the amount of their desired savings earmarked for unplanned emergencies. We show that in the aggregate, reported precautionary savings from such survey question comprises less than ten percent of total wealth.

The work in this paper is the first to bridge the gap between the work of Carroll and Samwick (1997, 1998) and Kazarosian (1997), which show sizeable effects of precautionary savings, and the literature that finds small effects (Skinner (1988), Guiso, Jappelli, and Terlizzese (1992), Engen and Gruber (2001) and Lusardi (1998)). In the final portion of the paper, we discuss how the studies which find small estimates of precautionary savings have implicitly controlled for differences between non-business owners and business owners either by excluding business owners from their samples or by excluding business wealth from their measure of household savings. Overall, we conclude that, when analyzing the importance of precautionary savings using micro data sets, researchers have to properly account for differences in saving motives between business owners and non-business owners. When differences cannot be accounted for, business owners should be excluded from the sample.

2. Estimating the Importance of Precautionary Savings

Intertemporal models of consumption/saving behavior under uncertainty predict that agents accumulate wealth to insure themselves against risk (Deaton (1991), Carroll (1992, 1997)). For the most part, the precautionary saving literature has focused its attention on the relationship between labor income risk and wealth accumulation.[3] All else equal, households who face more

[3] Labor income risk is only one of the many risks faced by households. Other risks include, for example, health and longevity. As with the bulk of empirical work on precautionary savings, the focus in this paper is on examining the relationship between non-capital income risk and household wealth accumulation. Given that our attention will be on

labor income risk should accumulate more wealth to insure themselves against unexpected income realizations.

Using calibrated theoretical models, several researchers have calculated that precautionary savings can explain as much as fifty percent of total wealth in the US economy (Skinner (1988), Caballero (1990, 1991), Carroll (1992), and Gourinchas and Parker (2002)). Existing empirical estimates using micro data have yielded mixed results, but studies such as Carroll and Samwick (1997, 1998) have confirmed that precautionary saving is the leading motive to accumulate wealth and can explain roughly half of the total wealth of US households.

The empirical strategy of estimating the importance of precautionary savings using micro data is based on the following specification:[4]

$$\ln(W_{it}) = \alpha_0 + \alpha_1 \sigma_{it}^{permy} + \alpha_2 \sigma_{it}^{transy} + \alpha_3 \ln(y_{it}) + Z_{it}\beta + u_{it} \qquad (1)$$

where $\ln(W_{it})$ is the log of a measure of household i's wealth in period t, $\ln(y_{it})$ is the log of i's permanent income in t, σ_{it}^{permy} and σ_{it}^{transy} are, respectively, measures of the variance of permanent shocks and transitory shocks to i's income. The Z vector includes demographic characteristics of i in period t. The controls are included to capture potential differences in preferences across households and the hump-shaped profile of wealth over the life-cycle.

According to the precautionary savings model, wealth is a function not only of permanent income, but also of uninsurable income risk faced by the household. Almost all empirical studies designed to estimate the importance of precautionary savings using micro data proxy uninsurable risk with either the variance of income (Carroll and Samwick (1997, 1998)), the variance of consumption (Dynan (1993)), or they exploit actual job loss or expectations of future job loss (Lusardi (1998) and Carroll, Dynan and Krane (2003)). In this paper, we follow Carroll and

heads of households aged 26-50, labor accounts for most of non-capital income, and labor income risk is likely to be the most important risk these households face.

[4] This specification is the one used by Carroll and Samwick (1997, 1998) and is similar to specifications used by Kazarosian (1997), Lusardi (1998) and Carroll, Dynan, and Krane (2003).

Samwick (1997, 1998) by using panel data to distinguish between the variance of permanent and transitory shocks to income.[5]

3. Data and Pooled Estimates

We perform the empirical work using data from the PSID. As in Carroll and Samwick (1997, 1998), we use wealth data from the 1984 PSID wave. Also, like Carroll and Samwick, we use income data from the 1981 through 1987 waves to construct measures of the permanent and transitory variance of income. To broaden our analysis, we also use data from the 1994 PSID wealth supplement. In doing so, we construct permanent income and the variances of income using income data from 1991-97. Lastly, like Carroll and Samwick, we restrict our sample to households whose head is between the ages of 26 and 50 in the year in which the wealth is measured.[6] A detailed description of other restrictions in constructing our final sample is reported in the data appendix. Appendix Table A1 includes descriptive statistics of the main variables we use in our empirical work. Our final sample includes 2,144 households.

The controls we use in our empirical work include the following demographics: age, age squared, race, gender, marital status, and education attainment. In addition, we exploit the panel dimension of the PSID to control for past income and wealth shocks experienced by households. Specifically, we include a year dummy and two dummies for whether the household head was unemployed during the year when the wealth data were collected and whether they were unemployed any time during the prior four years (1980-1983 or 1990-1993). Households who are more likely to face high income risk are also more likely to have been hit by past negative income shocks, and this may weaken the estimated relationship between wealth and risk. We

[5] See the data appendix for the computation of the income variances. The results presented in this paper are not sensitive to the measurement of the variance of income. For example, instead of separating out the permanent and transitory components, we simply used the variance of income as a regressor. Additionally, we experimented with other specifications for the variance of income. In every case we considered, the coefficient estimate of the variance of income is large when we pool business owners and non-business owners together. However, the estimate decreases sharply when we perform the same analysis within the sub-samples of non-business owners and business owners only.

[6] As a robustness test, we redid our entire analysis including non-retired households aged 26-57. This change did not affect the main results.

also include dummies for past positive shocks, such as having received inheritances or other lump sum payments. We construct permanent income by taking the average of non-capital income over the relevant sample period (1981 through 1987 or 1991 through 1997). See the data appendix for details on how non-capital income is defined. All dollar amounts are in 1997 dollars.

We use panel data from the PSID to compute the variances of permanent and transitory shocks to income. Since both permanent income and the variances of permanent and transitory income are measured with error, we instrument for these variables using a large set of variables. As suggested by Carroll and Samwick (1997, 1998), we use occupation dummies and these dummies interacted with age and age squared, as well as industry dummies. In addition, we use the unemployment rate in the county of residence during the prior year, the variance in the county unemployment rate over the sample period, and a dummy for whether the head belongs to a union (Lusardi (1997, 1998) and Engen and Gruber (2001)).

Table A2 in the Appendix shows our estimates of the variances of permanent and transitory income by one digit occupational categories. There are sizeable differences in income variances across occupations. For example, self employed managers are more likely to experience a shock to both their permanent and transitory components of income than managers employed in firms. The estimates reported in Table A2 match closely the estimates reported by Carroll and Samwick (1997).

The measure of wealth we use is total net worth, which is defined as the sum of checking and savings accounts, bonds, stocks and mutual funds (including IRAs), home equity, other real estates, business equity, cars and other vehicles, and other assets, minus the value of all debts. Since we use logs, we exclude households who have negative or zero net worth in our sample, which amount to a little more than five percent of our sample.

Empirical estimates of equation (1) are reported in Table 1. For brevity, only the coefficient estimates of the variances are reported. Both estimates of the income variances are

statistically significant and show that, as predicted by the theory, higher income risk leads to higher wealth holdings. Most relevant for our work is that, according to these estimates, the precautionary saving motive is very important. We perform two experiments to provide context to the magnitude of the coefficient estimates. First, we assume that households move from an occupation with low income risk (professionals, with an estimated variance of permanent income shocks of 0.013 and an estimated variance of transitory shocks of 0.040) to an occupation with high income risk (operatives and laborers, with an estimated variance of permanent shocks of 0.0199 and an estimated variance of transitory shocks of 0.059). The movement across those occupational categories increases household wealth by thirty-four percent (all else equal). If we move a manager who is employed by a firm (estimated permanent and transitory variances equaling 0.017 and 0.030, respectively) to being a self employed manager (estimated permanent and transitory variances equaling 0.027 and 0.0866), we predict that household's wealth would increase by fifty-three percent.

As a second way to gauge the magnitudes of the coefficients in Table 1, we compute the total amount of aggregate wealth explained by precautionary savings by eliminating all income risk, i.e., setting both variances to zero. After doing so, we can calculate how much wealth households would accumulate when facing no income risk and compare that amount to the estimates when income risk exists.[7] As reported in Table 1, we find that almost half of total net worth is accounted for by precautionary savings. Ninety-five percent bootstrapped confidence bands around our estimate suggest that the share of total wealth explained by precautionary savings ranges from about forty-one to sixty percent. Thus, our estimates are consistent with the existing literature (Carroll and Samwick (1997, 1998)).[8]

[7] To do this, we use the estimates from (1) to predict log wealth for each household. We then predict log wealth for each household setting the variances of permanent and transitory incomes to zero. To get the estimated percent of wealth explained by precautionary savings, we take the difference between the predicted log wealth with and without the variances set to zero for each household and then average over all households. We also repeat this procedure setting the value of the variances to the minimum mean value across occupations rather than setting the value to zero.

[8] However, zero income risk represents a rather extreme case. Therefore, we also redo the experiment setting the variances to the minimum mean value across occupations as found in Table A2 (i.e., setting the permanent variance to

The results shown in Table 1 are robust to a variety of alternate specifications. For example, we used an instrument set that excluded occupation and industry dummies given that workers may self-select into jobs according to their risk preferences (Lusardi (1997) and Fuchs-Schündeln and Schündeln (2005)). Additionally, we replaced our measures of the permanent and transitory variance of income with the variance of income over the sample period (1981-87 or 1991-97). We also replaced log wealth as the dependent variable with the ratio of wealth to permanent income to avoid excluding households with negative or zero values of wealth. In every specification, the share of wealth accounted for by precautionary motives is large (mostly close to fifty percent) when we use the pooled sample of business owners and non-business owners.[9]

4. Business Owners and the Importance of Precautionary Savings

One of the problems in estimating the types of regressions described above is that the sample pools together two distinct sub-groups within the population. Mixing together households that own a business with other households can be problematic to the extent that business owners as a group face higher risks and also accumulate larger amounts of wealth for reasons unrelated to precautionary saving. The large positive estimates of precautionary savings documented in the previous section may simply be an artifact of pooling together business owners and non-business owners.

Business owners have nearly three times as much wealth (Table A1) and experience nearly twice as much labor income risk (Table A3) as non-business owners. This result holds even after conditioning on permanent income. There are several reasons why business owners hold more non-pension wealth than non-business owners holding permanent income constant. For example, business owners have lower incidence of employer-provided pensions (Gustman et al (1999)), display stronger bequest motives (Hurst and Lusardi (2004)), and face higher risk in

0.0079 and the transitory variance to 0.0305). Under this experiment, the amount of total wealth accounted for precautionary saving is twenty-five percent. Ninety-five percent confidence bands around this estimate suggest that the share of total wealth explained by precautionary savings ranges from about seventeen to thirty-four percent.

[9] For brevity, estimates are not reported but are available from the authors upon request.

their portfolio than non-business owners, and as a result, earn higher returns.[10] However, these reasons are not accounted for in most of the empirical work on precautionary savings.

4.1 Estimating Precautionary Savings among Non-Business Owners

Our hypothesis is that the empirical estimates of precautionary savings from Section 3 (and from much of the existing literature on precautionary savings) are large because they pool together business owners and non-business owners. To test this hypothesis, we begin by estimating (1) on a sample which only includes households who do not own a business in year *t* (sample size = 1,729). Otherwise, the sample and specification are exactly the same as the one used for the estimates presented in Table 1. The results are reported in column I of Table 2.

The first thing to note is that, among non-business owners, the estimates on both income variance measures fall dramatically in magnitude and are no longer statistically different from zero. To gauge the overall importance of precautionary savings within this sample, we repeat the experiments in Section 3. First, we suppose that households move from an occupation with low income risk (professionals) to an occupation with high income risk (operatives and laborers). Under this experiment, household wealth would barely change at all. Second, we assume households face zero or very low risk and examine how much of the total wealth held by non-business owners is explained by precautionary savings (as in the procedure described in Section 3). The estimation implies that precautionary savings explain -4.1 percent of total wealth holdings when setting the variances to zero and -1.4 percent when setting the variances to the lowest mean value. Note that these estimates are not statistically different from zero. The bootstrapped 95 percent confidence bands for the first estimate (zero variances) are minus forty percent to twelve percent and for the second estimate (lowest mean value) are minus nine to seven percent. In other words, the confidence bands from these estimates imply that *at most* twelve percent of total

[10] Note that the dependent variable in most micro data estimations of the importance of precautionary savings is household wealth excluding pension wealth. The reason for this is that panel date sets such as the PSID do not measure pension wealth.

wealth held by households under the age of fifty is explained by precautionary savings. The result of this specification is striking. It says that among non-business owners (about eighty-five percent of the population), there is, at best, only a small systematic relationship between labor income risk and household wealth holdings.

Another set of variations serves to emphasize just how critically the importance of the precautionary saving motive hinges on the inclusion of business owners in the sample used for the estimation. One might argue that because business owners are, on average, wealthier than other households, the estimates may simply capture different behavior among the wealthy. To assess whether we are simply measuring wealthy or successful households when considering business owners, we cut the data in two additional ways. First, we remove from our sample those households in the top twenty percent of the income distribution (leaving us with 1,716 observations). Second, we exclude from the sample households who own stocks (for a sample of 1,238 observations). In both cases, we find that precautionary savings continue to explain a large (and statistically significant) portion of total household wealth. Specifically, for the sample of households in the bottom eighty percent of the income distribution, forty percent of wealth appears to be explained by precautionary reasons. In the sample of non-stock owners, thirty-five percent of wealth appears to be explained by precautionary reasons. Thus, in both cases substantial fractions of wealth can be explained by the precautionary motive, arguably because each sample includes a substantial fraction of business owners; eighteen percent of households in the bottom eighty percent of the income distribution and seventeen percent of non-stock owners report owning a business.

In column II of Table 2, we redo the analysis this time restricting the sample to include only households who report not being self employed. Around eighty percent of business owners report themselves as self employed and only two thirds of the self employed report owning a business. The results are nearly identical to those shown in column I of Table 2. In conclusion, there is no evidence of precautionary savings driving large amounts of wealth accumulation in the

sample of non-business owners (or non-self employed). Moreover, the 95th percentiles of the confidence bands around the estimates are much closer to zero than they are to fifty percent.

4.2 Estimating Precautionary Savings among Business Owners

In the above subsection, we documented that the estimated importance of precautionary savings is severely mitigated if we exclude the business owners (or the self employed) from our sample. However, this does not imply that precautionary savings are not important. It may be that business owners respond strongly to labor income risk. Their response to such risk, in turn, may give rise to large amounts of wealth in the economy, a point previously noted in the work by Carroll and Samwick (1997, 1998).[11] In fact, a key contribution of this paper is to show that, even among the sub-sample of business owners, the relationship between wealth and income risk proxies for something other than precautionary motives.

To probe the precautionary motives of business owners further, we re-estimate (1) for this group alone. The results of this estimation are shown in column I of Table 3. The coefficients on both variance measures are positive and statistically different from zero. Using the same procedure as above and setting the variances to zero, we find that thirty-three percent of wealth among business owners can be explained by precautionary motives. When setting the variances to the lowest mean value, we find that precautionary savings account for twenty-three percent of wealth. These effects are also statistically different from the non-business owners sample.

In column II, we show the results for the self employed, which are directly analogous to the discussion put forth in Carroll and Samwick (1998). Notice, that within the self employed, the fraction of wealth explained by precautionary motives is only eight percent, only slightly higher than the estimates for either the non-business owner or the non-self employed samples.

[11] Carroll and Samwick (1998) note that when they exclude farmers and the self employed from their sample their estimates suggest that precautionary motives explain essentially zero percent of aggregate wealth holdings. They state that: "Our preferred interpretation of these findings is of course that the farmers and the self employed provide exactly the same kind of variation in the independent variable that is very valuable to identify the coefficient on uncertainty, and hence, these groups should remain in the sample" (page 415). In fact our paper shows that business owners have high wealth (compared to non-business owners) for other reasons than precautionary motives.

The upper ninety five percent confidence bands on the estimates of the self employed show that the share of wealth explained by precautionary motives for the self employed is no greater than sixteen percent.

On the surface, the estimate for the business owners sample seems large. But, as with pooling different types of households in the full sample, the numbers reported in column I of Table 3 could result from other reasons than the desire to insure against risk. Specifically, those business owners who take more risks should, on average, be compensated with higher returns. The relationship between wealth and income risk could simply capture the *risk-return trade-off* rather than the strength of the precautionary saving motive among business owners.[12]

To address this issue, we consider several alternative specifications. One simple change to the estimation is to exclude business wealth from our measure of total net worth. If equity in private businesses is illiquid, the returns to business ownership may show up in higher business wealth.[13] Moreover, it seems implausible that business owners would hold their precautionary wealth in their businesses; income streams from the business and the value of the business are clearly positively correlated. For savings to provide insurance, we expect business owners to hold at least a portion of their precautionary reserves outside of their businesses.

In column III of Table 3, we report the estimates of (1) for business owners where the dependent variable is now the log of non-business wealth. Under this specification, the estimated impact of the precautionary saving motive falls by more than half (from thirty-three percent to fifteen percent when setting the variances to zero and from twenty-three to ten percent when setting the variances to the lowest mean value). The degree to which non-business wealth responds to risk is now fairly small among business owners.

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[12] Note that since we consider those households who are business owners in the years when the wealth data was collected (1984 or 1994), we are implicitly considering only those business owners who either started in that year or that started earlier and survived. The survival bias further strengthens the relationship between wealth and labor income risk in the sub-sample of business owners.

[13] We are aware that business owners could effectively liquidate the returns to their business by holding lower non-business wealth. The exclusion of business wealth from our measure of net worth is meant to explore the robustness of our estimates to plausible alternative specifications.

Another important point concerns the estimation of permanent income. As mentioned before, permanent income is measured by averaging non-capital income for a given household over the sample period. While non-capital income is likely to be a sufficient measure of compensation for non-business owners, it is likely to be a poor measure for business owners.[14] This mis-measurement is problematic for this sort of analysis, particularly given that the return to the investment of business owners (i.e., their total compensation) is likely correlated with the underlying risk of the project.

As a potentially better proxy for lifetime resources, we use consumption in lieu of non-capital income in the estimation of (1).[15] According to standard specifications of the Permanent Income Hypothesis, consumption in year t is a sufficient statistic for the household's period t expectation of lifetime resources. The PSID provides information on food consumption at home (including food stamps) and food outside the home. Although the sum of these two measures is only a limited proxy for total nondurable consumption, many studies have used food consumption to test the predictions of the theory and have found that food consumption often displays characteristics similar to non-durable consumption (Lusardi (1996), Hurst (2004)). We take the average of the sum of food at home, food away from home, and food stamps over the sample period as a proxy for permanent income to test the sensitivity of the model to our original definition of permanent income. We instrument for the variances of income and average food consumption using the same set of variables as before.

The results of this regression are reported in column IV of Table 3. Using the log of non-business wealth as our dependent variable and replacing average food consumption as our proxy for permanent income, we now find that precautionary motives explain a little more than

[14] There are three important factors in this difference. First, tax evasion may drive some business owners to under-report their labor income (by far, the most important component of non-capital income). Second, tax avoidance drives some business owners to retain part of their compensation within the business. Lastly, tax evasion and tax avoidance aside, it is hard to specify and measure the actual labor return from business ownership; the part of business income attributed to capital and to labor is inevitably arbitrary in many cases. This is even more problematic given that the PSID imputes a large fraction of labor income for households who own a business.

[15] See, among others, Meyer and Sullivan (2003) who also use consumption as a proxy for permanent income.

eight percent of total wealth within the sample of business owners. The ninety-five percent confidence bands on these estimates range from roughly negative three percent to twelve percent.

Finally, we return to the pooled sample and re-estimate (1) using the log of non-business wealth as the dependent variable and using food consumption as the measure of permanent income (and keeping everything else the same). As before, we still instrument permanent income and the variance measures using the instrument sets described above. In this way, we can account for some of the differences between business owners and other households. We find results that are dramatically different from those reported in Table 1 (see column V of Table 3). Notably, the implied share of precautionary wealth explained by precautionary motives decreases from forty-seven percent to less than ten percent.

These results are striking. When pooling together non-business owners and business owners and using total wealth which includes business equity, we find that precautionary savings explains nearly half of total wealth accumulation. However, this is simply an artifact of pooling together different groups of households without accounting for their differences. When we explicitly control for the differences between business owners and non-business owners, we find that the estimates of the impact of precautionary savings in explaining aggregate are no larger than ten percent.

5. An Alternative Approach to Estimating Precautionary Savings

Given the results above, we argue there is reason to believe that, contrary to the estimates reported in the prevailing research, precautionary motives explain a small share of wealth holdings for households under the age of 50. To further check the validity of the results above, we propose an alternative strategy to evaluate the importance of precautionary savings, which relies on a direct question about desired precautionary wealth from the Survey of Consumer Finances (SCF). Starting from 1995, the following question has been asked to all SCF respondents:

"*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 was specifically designed to get respondents to elicit the amount of desired precautionary savings.[16] We acknowledge upfront that this question has shortcomings. However, this question may actually overstate the amount of precautionary savings a household holds since the question refers to all types of risk the household finds relevant.[17]

To look at the level of precautionary wealth held by households in the 1995 SCF, we create a sample of SCF households that are analogous to the sample of PSID households used above, as described in the data appendix. We next run regressions to estimate equation (1) using as dependent variable the log of desired precautionary savings reported in the SCF rather than the log of total net worth. We use our measure of income risk constructed in the PSID for the 1990s and impute it to the SCF. Estimates from this two-sample procedure show that the coefficients of both the permanent and transitory variance are positive and statistically significant.[18] Thus, desired precautionary savings increase with income risk.

In our most preferred analysis, we simply examine the amount of reported precautionary savings as a fraction of total wealth for SCF households. If the SCF question is measuring desired precautionary savings, as we have shown above, we can assess the overall importance of precautionary savings by directly examining the ratio of desired precautionary wealth to total gross wealth reported by SCF households. Panel A of Table 4 reports mean and median values of desired precautionary savings in the total sample, the sub-sample of non-business owners, the sub-sample of business owners, the sample of the self employed, and the sample of non-self

[16] The wording reflects the responses households give when asked open-ended questions about motives to save. Other data sets, such as the Dutch CentERdata and the German Save, have questions about precautionary savings that have the same wording. See Börsch-Supan and Essing (2003). A similar question has now been added to the 2003 Italian Survey of Household Income and Wealth and the 2005 Dutch CentERdata Panel.

[17] It should be noted that this question was rigorously pre-tested prior to being added to the SCF. Additionally, Kennickell and Lusardi (2004) show that responses to this question are correlated with various measures of risk, including income, longevity and health risk. In other words, this question from the SCF seems to vary in ways that are consistent with households having a precautionary motive. The question we seek to answer by looking at this question is how important this motive is.

[18] The estimates (and standard errors) for the variance of the permanent and transitory shocks to income are 3.05 (1.52) and 2.2.5 (0.62) respectively.

employed. These values highlight again the importance of business owners/self employed when assessing the importance of precautionary savings. Business owners (or the self employed) desire a higher amount of precautionary savings than non-business owners (non-self employed) and these values are often rather high.

Panel B of Table 4 reports the more relevant statistic, the ratio of desired precautionary savings to total assets.[19] Precautionary savings account for approximately six percent of total assets in the full sample of households under the age of 50 in the SCF. Among business owners, precautionary savings account for approximately three percent, while among non-business owners, precautionary savings account for seven percent of total assets. Similar ratios hold if we split the sample by self employment status.

This analysis is consistent with our regression analysis outlined in the first part of the paper. These values show that a precautionary saving motive does exist among young families in the U.S. Thus, models of consumption/saving behavior should incorporate income risk into their theoretical framework. However, this motive does not give rise to large amounts of wealth. The precautionary saving motive can at best explain less than ten percent of total net worth.

6. Conclusion

Some of the papers in the literature on precautionary savings suggest that precautionary motives explain about half of total wealth, while other papers suggest a much smaller fraction. The results of this paper indicate that the high estimates of the importance of precautionary savings are driven by mixing two very different groups of households: business owners and non-business owners. Relative to the latter group, the former holds large amounts of wealth for non-precautionary reasons and also faces high income risk. Although pooling these two groups leads

[19] We use gross assets to avoid the problem of zero or negative values in the denominator. However, we have also examined the ratios of precautionary savings to total net worth (as opposed to gross assets). In no case is the share of precautionary savings to net worth greater than eight percent.

to very large estimates of the share of precautionary wealth out of total net worth, we show that, within these two groups separately, the estimated amount of precautionary savings is low.

Our results can explain and reconcile the widely different estimates of precautionary savings that are found using different micro data sets. For example, Engen and Gruber (2001), Hrung (2000), Lusardi (1998), and Skinner (1988) all found rather modest estimates of the importance of precautionary savings. Upon examination, these findings are consistent with our results. For example, Engen and Gruber (2001) use data from the Survey of Income and Program Participation and consider a measure of gross financial assets that does not include business equity in their estimation of precautionary savings. Similarly, Hrung (2000) uses a measure of liquid financial wealth from the Continuous Work History Sample Panel of the U.S. Treasury that excludes business equity. Lusardi (1998) uses total net worth in her estimation, but her sample excludes the self employed. All of the previous papers which found low estimates of the importance of precautionary savings in explaining wealth holdings within the U.S. economy have either explicitly or implicitly controlled for differences between business owners and non-business owners.

Lastly, we want to stress that the results presented in this paper have implications for research well beyond precautionary savings. We show that, when examining household consumption or savings behavior, it is important to account for the difference between business owners and non-business owners. This is likely to be equally important in studies assessing the importance of bequest motives since business owners are more likely to leave bequests to their children. Similarly, business owners may play a critical role in assessing the offset of pension and private wealth; business owners are far less likely to have pensions than other households but may hold large amounts of wealth for reasons unrelated to pensions. We conclude that given the well documented differences between business and non-business owners, micro studies of household consumption and saving decisions should attempt to account for these differences. Alternatively, researchers should exclude business owners from their sample.

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Table 1: Instrumental Variables Estimates of the Effect of Labor Income Risk on Log of Net Worth: Pooled Sample

Variables	Coefficient (Standard Error)
Variance of Permanent Income Shocks (α_1)	15.91 (2.98)
Variance of Transitory Income Shocks (α_2)	7.52 (1.48)
Percent of Net Worth Explained By Precautionary Savings	47.5%
Sample Size	2,144

Notes: This table reports IV estimation of a regression of the log of net worth on the variance of permanent income shocks, the variance of transitory income shocks, and permanent income. The regression also includes controls for household demographics and past shocks to wealth. See text for full detail of additional variables included. Estimation was performed using PSID wealth data from 1984 and 1994. Sample was restricted to household between the age of 26 and 50. Permanent income is measured as average household non-capital income. The two variance measures as well as permanent income were instrumented using occupation dummies, industry dummies, interactions between occupation dummies with age and age squared, union status of household head, the county unemployment rate, and the variance of county unemployment rate. Sample pools together business owners and non-business owners. We compute the percent of net worth explained by precautionary savings by predicting net worth using the regression equation for each household. We then predict the household's net worth using the regression equation for each household but this time setting permanent and transitory variances to zero. We compute the percent of net worth explained by precautionary saving by comparing these two predicted values. See text for full details.

Table 2: Instrument Variables Estimates of the Effect of Labor Income Risk on Log of Net Worth: Non-Business Owners and Non-Self Employed Only

Variables	I. Non-Business Owners Sample	II. Non-Self Employed Sample
Variance of Permanent Income Shocks (α_1)	-0.63	1.48
	(3.65)	(4.02)
Variance of Transitory Income Shocks (α_2)	-0.70	-0.11
	(1.58)	(1.61)
Percent of Total Net Worth Explained By Precautionary Savings	-4.1%	1.5%
Sample Size	1,729	1,798

Notes: Estimations in this table is the same as the estimation reported in Table 1 except that the sample is restricted to non-business owners only (column I) and non-self employed only (column II). See notes to Table 1 for a full description of the specification and how we compute the share of total net worth explained by precautionary savings.

Table 3: Instrument Variables Estimates of the Effect of Labor Income Risk on Log of Net Worth: Business Owners and Self Employed Only

Variables	I	II	III	IV	V
Variance of Permanent Income Shocks (α_1)	6.79 (3.05)	1.47 (2.48)	3.38 (2.82)	2.85 (2.62)	3.95 (2.53)
Variance of Transitory Income Shocks (α_2)	2.82 (1.75)	0.47 (1.25)	1.00 (1.64)	0.07 (1.53)	0.63 (1.23)
Percent of Total Net Worth Explained By Precautionary Savings	33.2%	8.4%	15.9%	8.7%	9.4%
Sample	Business Owners	Self Employed	Business Owners	Business Owners	Pooled Sample
Dependent Variable	Log of Total Net Worth	Log of Total Net Worth	Log of Net Worth Less Business Equity	Log of Net Worth Less Business Equity	Log of Net Worth Less Business Equity
Measure of Permanent Income	Average Non-Capital Income	Average Non-Capital Income	Average Non-Capital Income	Average Food Expenditure	Average Food Expenditure
Sample Size	415	346	407	392	2,077

Notes: Estimations in column I of this table is exactly the same as the estimation reported in Table 1 except that the sample is restricted to business owners only. See notes to Table 1 for a full description of the specification and how we compute the percent of total net worth explained by precautionary savings. Column II differs from column I in that the sample is restricted to self employed rather than business owners. Column III differs from column I in that the dependent variable is the log of non-business wealth. Column IV differs from column III in that our measure of permanent income is average food expenditure rather than average non-capital income. Column V reports the estimates for the total sample using the log of non-business wealth as dependent variable and average food expenditure as our measure of permanent income.

Table 4: Level of Desired Precautionary Savings and Ratio of Desired Precautionary Savings to Total Assets in the 1995 SCF

Panel A: Level of Precautionary Savings		
Sample	Mean	Median
Business owners	$17,800	$7,000
Non-business Owners	$10,500	$5,000
Self employed	$17,900	$5,000
Non-self employed	$10,800	$5,000
Panel B: Ratio of Precautionary Savings to Total Assets		
Business owners	3.1%	2.9%
Non-business owners	6.9%	5%
Self employed	3%	3%
Non-self employed	6.4%	4.7%

Notes: Panel A reports the response to a survey question designed to measure how much savings a household desires to have due to uncertainty surrounding future income and consumption needs. See the text for the exact wording of the question. Panel B shows the ratio of desired precautionary savings to total assets for the same sub-samples of households. Data are from the 1995 Survey of Consumer Finances. The sample is restricted to households with heads aged between 26 and 50 and other restrictions listed in the text and data appendix. Sample size equals 1,433.

DATA APPENDIX

PANEL STUDY OF INCOME DYNAMICS (PSID)

A.1 Sample selection

We use data from the PSID in 1981-87 and 1991-97. To construct our final sample, we drop all households from the Survey of Economic Opportunity (SEO), which over-samples the poor, and we drop the Latino sub-sample. We also drop households with heads who were younger than 26 or older than 50 in 1981 (for the 1981-1987 panel) or 1991 (for the 1991-1997 panel). We drop households with invalid education, occupation or industry responses (including the unemployed and those who are not participating in the labor market) in those same years, as well as households where the marital status of the head changes at any time during the period considered. We also drop households from the sample if the head or the wife changes during the period considered. Finally, to avoid the estimation of the permanent and transitory variances to be driven by a few households with extremely volatile incomes, we drop those households whose income in any year falls below twenty percent of the average household income during the time period. We also exclude observations with missing county unemployment rate. When using log wealth over permanent income, we also exclude those observations with zero or negative net worth. In total, the amount of households dropped due to missing observations or excessively volatile income was small.

A.2. Definitions

Net worth

Net worth is defined as the sum of all assets owned by the household at the time of the interview. It includes money in checking or savings accounts and in IRAs; money market bonds; Treasury bills; bond funds; cash value in life insurance policies; valuable collections for investment purposes; rights in trusts or estates; shares of stock in publicly held corporations; mutual funds; investment trusts; stocks in IRAs; value of all vehicles, and value of all (partially or fully) owned farms and businesses. The value of all those assets is net of anything owed on them,

such as the value of mortgages and due payments of car loans. Other debts that have been subtracted include: mortgages on other owned real estate, credit card charges, student loans, medical or legal bills and loans from relatives.

Non-capital current income

We calculate non-capital income as labor income plus transfers of the head, spouse, and all other members of the household. Labor income includes wages and salaries, overtime compensation, bonuses, commissions and tips, and income from the practice of a profession or trade, as well as the labor share of income from farm income and business income. Total transfers include: (a) ADC/AFDC, Supplemental Security income and other welfare transfers; (b) Social Security transfers; (c) other retirement income, pensions and annuities; (d) unemployment compensation; (e) workmen's compensation; (f) child support transfers; (g) transfers from relatives and friends; and (i) food stamps, which are not included in any of the transfers above. All dollar values were deflated to 1997 dollars, using the CPI.

Permanent income

We consider two alternative definitions of permanent income. The first one is simply the time average of current income. For example, for a given household in the 1981-1987 panel, permanent income is average income over that period. We have also considered the time average of expenditures on food (the sum of food at home, food away from home and annual value of food stamps) over the same period as an alternative proxy for permanent income.

Business owner

A household is classified as business owner if answering 'yes' to the following question in the wealth supplement of the PSID: '*Do you (or anyone in your family living there) own part or all of a farm or business?'* Our alternative definition of business owner is the household whose head is self employed. The exact wording of that question is 'Do *you (head) work for someone else, yourself, or what?*' The possible answers to this question are: (1) someone else; (2) both

someone else and self; and (3) self only. A household is considered self employed if the answer is either (2) or (3).

A.3 Construction of the variance of permanent and transitory incomes

To calculate the variance of permanent and transitory income, we follow closely the method used by Carroll and Samwick (1997). We assume that the natural logarithm of current non-capital income, y_t, can be decomposed into three components:

$$y_t = g_t + y_t^p + \varepsilon_t \tag{A.1}$$

where g_t represents a predictable trend due to demographic and human capital factors, y_t^p is the permanent component of income, and ε_t is the transitory component.

The transitory component is a white noise with variance σ^2_ε, whereas the permanent component follows a random walk:

$$y_t^p = y_{t-1}^p + \eta_t \tag{A.2}$$

where η_t, another white noise with variance σ_η^2, is the shock to permanent income in period t; ε_t and η_t are assumed to be uncorrelated at all leads and lags.

The first step in the construction of the variances consists of removing the trend. To do that, we run a cross-sectional OLS regression of the natural logarithm of current income on age, age squared, a gender dummy, a marital status dummy, a white race dummy, education, occupation and industry dummies, and the interaction of the education and occupation dummies with age and age squared. The residual from that regression is our detrended income, $\hat{y}_t$.

Next, we calculate the d-year difference of detrended income, r_d:

$$r_d \equiv \hat{y}_{t+d} - \hat{y}_t \tag{A.3}$$

Combining (A.3) with equations (A.1) and (A.2), and ignoring the trend g_t, since it has been previously removed,

$$r_d = \sum_{s=1}^{d} \eta_{t+s} + \varepsilon_{t+d} - \varepsilon_t \qquad \text{(A.4)}$$

r_d^2 is the estimate of the variance of r_d, and it is related to the variance of the permanent and transitory components of income, since, using (A.4) we find that

$$r_d^2 = Var(r_d) = d\sigma_\eta^2 + 2\sigma_\varepsilon^2 \qquad \text{(A.5)}$$

In principle, (A.5) alone would be enough to calculate the variances. However, we exploit all the information contained in the data set by running an OLS regression, household by household, of r_d^2 on d and a constant. The coefficient on d is our estimate of the permanent variance of income, whereas the constant (divided by two) is our estimate of the transitory variance of income.

For each of the two panels, 1981-1987 and 1991-1997, we considered all the possible differences between incomes at least three years apart.[20] For example, for the period 1981-1987, we took 1984-1981, 1985-1982, 1986-1983, 1987-1984, 1985-1981, 1986-1982, 1987-1983, 1986-1981 and 1987-1982. Therefore, a household's variance of permanent and transitory incomes is estimated with a regression on 9 observations. This is the same procedure as used by Carroll and Samwick (1997).

SURVEY OF CONSUMER FINANCES (SCF)

B.1 Sample selection

We use data from the 1995 SCF. To construct our final sample, we use as much as possible the same restrictions used to construct the PSID sample. To summarize the main restrictions, we drop households whose head is younger than 26 or older than 50. We also drop

[20] Our procedure is, thus, not affected if the stochastic process for transitory income is a moving average of order 1 or 2. See Carroll and Samwick (1997) for more detail.

households where the head of the household is not working and where the marital status of the head changed at any time during the last 5 years. When using log wealth, we exclude those observations with zero or negative wealth and zero desired precautionary savings.

B.2. Definitions

Net worth

Net worth is defined as the sum of net savings and checking deposits, savings bonds, stocks net of margin loans, bonds, mutual funds, IRAs, net value of other retirement accounts, equity interests in annuities and trusts, housing equity, other real estate equity, business equity, net value of vehicles, net cash value of life insurance and the net values of miscellaneous assets minus all remaining debts.[21]

Permanent income

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 was unusually high or low compared to normal. In this case, the respondent was asked for the figure that would be more usual.

Business owner

A household is classified as being a business owner when reporting owning one or more businesses in which the household has either an active management role or a passive investment role.

[21] See Kennickell (1998) and Kennickell and Woodburn (1999) for a detailed analysis of net worth in the SCF.

Table A1: Summary Statistics of PSID Sample:
Full Sample and Sub-Samples

Variables	*Total Sample*	*Business Owners*	*Non-Business Owners*	*Self Employed*	*Non-Self Employed*
Age of head	36.57	37.47	36.35	37.49	36.39
Number of children	1.38	1.41	1.37	1.60	1.34
Percentage of married households	85.35	93.73	83.34	93.93	83.70
Percentage of white households	92.91	97.11	91.90	96.53	92.21
Percentage of female household heads	8.82	1.69	10.53	2.31	10.07
Average household non-capital income	45,164	50,535	43,875	49,258	44,376
Mean wealth	132,645	291,594	94,493	287,582	102,829
Median wealth	58,216	146,708	46,907	140,116	49,803
25^{th} percentile of wealth distribution	22,995	71,285	18,041	57,622	19,408
75^{th} percentile of wealth distribution	125,741	302,001	98,112	302,001	104,966
Number of observations	2,144	415	1,729	346	1,798

Notes: Sample includes households in either the 1984 or the 1994 PSID between the ages of 26 and 50. See data appendix for additional sample restrictions. Average household non-capital income is the average of household non-capital income between 1981 and 1987 for households from the 1984 PSID and between 1991 and 1997 for households from the 1994 PSID. Non-capital income includes all income from wage and transfers received by the household. All dollar amounts are in 1997 dollars.

Table A2: Estimated Variances of Permanent and Transitory Income by Occupation Groups

Group	Permanent variance	Transitory variance	Percent of sample
Total sample	0.0162 (0.0023)	0.0513 (0.0040)	100
Professional and technical workers	0.0135 (0.0042)	0.0404 (0.0069)	23.74
Managers (not-self employed)	0.0171 (0.0048)	0.0305 (0.0083)	14.60
Managers (self employed)	0.0272 (0.0163)	0.0866 (0.0270)	5.27
Clerical and sales workers	0.0192 (0.0075)	0.0541 (0.0128)	13.25
Craftsmen	0.0129 (0.0043)	0.0524 (0.0079)	20.10
Operatives and laborers	0.0199 (0.0055)	0.0592 (0.0094)	15.35
Farmers and farm laborers	0.0079 (0.0209)	0.1414 (0.05)	2.01
Service workers	0.0126 (0.0096)	0.0547 (0.0184)	5.69

Note: Standard errors in parentheses.

Table A3: Estimated Variances of Permanent and Transitory Income by Household Groups

Group	Permanent variance	Transitory variance	Percent of sample
Business owners	0.0277 (0.0066)	0.0763 (0.0116)	19.36
Non-business owners	0.0134 (0.0023)	0.0453 (0.0041)	80.64
Self employed	0.0301 (0.008)	0.0923 (0.0142)	16.14
Non-self employed	0.0135 (0.0022)	0.0435 (0.0039)	83.86

Note: Standard errors in parentheses.

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