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PRECAUTIONARY SAVINGS—A PANEL STUDY

Mark Kazarosian*

Abstract—Theoretical literature shows that income uncertainty boosts saving, yet empirical work is incomplete. I test for the precautionary motive for saving using panel data. Knowing this motive's size is important for gauging the responsiveness of saving to government programs that reduce uncertainty, and for comparison to other motives, such as bequests. Most empirical studies of precautionary saving use either aggregate time-series or cross-sectional data, which cannot capture the effects of individual income uncertainty. I derive measures of total, permanent, and transitory income uncertainty from panel data—the National Longitudinal Survey—and find a strong precautionary motive. A doubling of uncertainty increases the ratio of wealth to permanent income by 29%.

I. Introduction

IF A stockbroker's saving rate is higher than a tenured professor's, one motivation may be precautionary: the stockbroker is worried his or her income may drop dramatically next year. Theoretically, income uncertainty boosts saving. Yet empirical work on precautionary saving is in its early stages and has produced conflicting results because most research uses aggregate or cross-sectional data. These types of data cannot capture the effects of individual income uncertainty and permanent income. I find strong support for a precautionary motive, using panel data and appropriate proxies for total, permanent, and transitory income uncertainty, and for permanent income.

Empirical investigation of precautionary saving has both theoretical and policy implications. Knowing the extent of the precautionary motive aids in gauging the responsiveness of saving to government programs such as Aid to Families with Dependent Children which curb income risk (Danziger et al., 1981). It is also important to determine the strength of the precautionary motive relative to other motives, such as bequests or saving for retirement (Modigliani (1988) and Kotlikoff (1988)), because saving prompted by these motives may respond differently to tax and transfer policies. The precautionary motive for saving could also explain why retirees deplete wealth more slowly than the life cycle model predicts (Danziger et al., 1982–83). Finally, empirical evidence of precautionary savings would support the possibility that tastes are represented by a utility function with a positive third derivative (convex marginal utility), a necessary condition for precautionary saving (Leland (1968)).

Aggregate time-series investigations of saving contain proxies for uncertainty, such as the level and variability of inflation and unemployment (e.g., Boskin (1978) and Gylfason (1981)).[1] These proxies do not necessarily measure individual income uncertainty, and the results from these studies are mixed, suggesting positive, negative, and zero effects of uncertainty on saving.

Using cross-sectional data would seem a positive step for testing the precautionary motive, since the theory models individual behavior. But the cross-sectional literature is plagued by unsatisfactory uncertainty and permanent income proxies and has produced conflicting results. Contrary to prediction, Skinner (1988) finds no evidence for the precautionary motive using the 1972–1973 Consumer Expenditure Survey (CEX). He proxies income uncertainty by occupation; but as he notes, there may be self-selection of less risk-averse people into risky occupations, making it difficult to isolate the precautionary motive.[2] Guiso et al. (1992) sidestep the self-selection problem and proxy earnings uncertainty using the households' subjective assessment of uncertainty and find a small but significant precautionary motive, accounting for 2% of households' net worth. Yet they assume that one-year-ahead uncertainty represents long-run uncertainty. Also, their permanent income is prone to measurement error since they use cross-sectional income for estimation. Finally, one-third of their sample reported no uncertainty in nominal earnings, while 95% reported a standard deviation of less than 5% of current earnings which is in contrast to panel estimates, showing more variation (e.g., MaCurdy (1982)). Dynan (1993) uses the 1985 CEX and argues that with greater income uncertainty (measured by quarterly consumption growth variance), consumption growth should be higher, indicating precautionary saving. She finds a precautionary motive that is too small and inconsistent with plausible risk-aversion parameters. The size of the precautionary effect cannot be explained by either liquidity-constrained households or self-selection of households into risky environments. Her four-quarter panel may be too short to capture the true consumption response to unexpected income changes.

Carroll (1993) combines cross-sectional and panel data from the 1960 CEX and the Panel Study of Income Dynamics (PSID) for measures of future income and uncertainty. Carroll uses Kimball's (1990a) equivalent precautionary premium as an uncertainty proxy to estimate consumption, and his results support the precautionary saving hypothesis.

Jianakoplos et al. (1986) use a panel—the National Longitudinal Survey (NLS)—to investigate the relationship

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[1] Wachtel (1980) provides a survey of the effect of inflation on saving.

[2] Fisher (1956) and Friedman (1957) also use cross-sectional data and methods similar to Skinner's to explore this issue. They find some evidence supporting the precautionary motive.

between precautionary savings and government income maintenance programs, and find a strong precautionary motive. But since they do not account for an expected income trend, their uncertainty measure—the coefficient of variation of income—captures both income growth and uncertainty.

This paper aims to determine whether precautionary savings exists, using panel data from the NLS. I expand the analysis of Jianakoplos et al. by using panel econometric techniques to create improved measures for income uncertainty and permanent income. I then estimate cross-sectional wealth, using these measures as regressors. The results support the precautionary savings hypothesis.

With random effects estimation of King and Dicks-Mireaux's (1982) permanent income (KDM henceforth), I isolate the permanent component of current income and proxy individual-specific income uncertainty—the standard deviation of the residual of each individual's estimated age versus log-income profile. This measure controls for the individual's income growth rate so that income uncertainty is measured, rather than both predictable changes in human capital and uncertainty. I decompose the permanent and transitory components of individual-specific income uncertainty, following Carroll (1991).

After a summary of the theoretical literature (see section II), section III presents the empirical implementation, with special attention to the two key variables: permanent income and income uncertainty. Section IV describes the data, section V the results and implications, and section VI offers concluding remarks. An appendix describing alternate specifications is available from the author.

II. Brief Review of the Theoretical Literature

Leland (1968) was the first to analyze theoretically precautionary saving. Sandmo (1970) and Dreze and Modigliani (1972) expanded Leland's two-period approach, whereas Miller (1974, 1976) and Sibley (1975) pioneered the research in a multiperiod context.[3] The main finding of this work is that convex marginal utility is necessary for precautionary saving.

Recently Kimball (1990b, 1991) and Kimball and Weil (1992) investigated the strength of the precautionary motive relative to both risk aversion and intertemporal substitution. Kimball (1990a) calls the precautionary saving motive "prudence" and concludes that the theory of absolute and relative prudence is similar in form to the Pratt (1964) theory of risk aversion. Kimball (1990b) clarifies Dreze and Modigliani's finding that with decreasing absolute risk aversion the precautionary motive is stronger than risk aversion.

Skinner (1988), Blanchard and Mankiw (1988), and Kimball and Mankiw (1989) emphasize that only the permanent income shocks should matter for the precautionary response. With perfect capital markets the permanent income hypothesis implies only small precautionary saving in response to transitory shocks. Yet if households are liquidity constrained, transitory shocks will induce precautionary saving. Zeldes (1989a) and Caballero (1990) made considerable headway in explaining many nagging consumption puzzles, including excess sensitivity to transitory income, and Zeldes suggests that future research examine households' wealth relationship to uncertainty.

Caballero (1991), using an overlapping-generations model, and Carroll and Samwick (1992a, b), a buffer-stock framework, show that income uncertainty causes wealth to increase. The simulations of Skinner and Caballero and estimates of Carroll and Samwick suggest that precautionary wealth accounts for as much as 60% of total wealth. I test the wealth–income uncertainty relationship, using panel data, and find that both permanent and transitory uncertainty contribute to asset accumulation.

III. Empirical Implementation

In light of the previous section's results an empirical analysis of asset accumulation should incorporate income uncertainty. I perform the estimation in two stages. The first exploits the panel nature of the data to create measures of permanent income and income uncertainty for each individual. The second is a cross-sectional regression of assets as a proportion of permanent income on these measures, and a vector of personal characteristics.

A. *Assets*

Modifying KDM by adding income uncertainty,

$$W_i/Y_i^P = f(Y_i^P, U_i, \mathbf{X}_i) + e_i. \tag{1}$$

W_i is the total net assets in 1966 for person i, Y_i^P is the permanent income, U_i is the income uncertainty, and X_i is a vector of personal characteristics that is assumed to influence wealth, including a quadratic in age to test for the predicted humped shape of the W_i/Y_i^P versus age profile. The error term $e_i \sim N(0, \sigma_e^2)$.

B. *Permanent Income*

To distinguish permanent income from current income I adopt KDM's cross-sectional model of permanent income and estimate it using panel data,

$$Y_i^P = \mathbf{Z}_i\beta + \delta_i \tag{2}$$

where $\mathbf{Z}_i$ is a vector of observable characteristics, with the parameter vector β. δ_i is the time constant individual-

[3] Sandmo (1970) distinguishes between the effects of two different types of uncertainty—noncapital income risk and a risky yield on capital investment. While noncapital income risk induces precautionary saving, capital risk can increase consumption so that there is less to lose. My findings are consistent with Sandmo's prediction—the precautionary motive using only noncapital income is stronger (see the appendix, available from the author) than the motive using total income (specification 1 in table 2).

specific error. $\delta_i \sim N(0, \sigma_\delta^2)$. Permanent income Y_i^P is annual income with no transitory component, evaluated at the same age for everyone.

Current income in terms of Y_i^P is

$$E_{it} = \mathbf{Z}_i\beta + g(A_{it}) + \mu_{it} + \delta_i \tag{3}$$

where E_{it} is the income in year t for individual i, $g(A_{it})$ is the age–income profile, and μ_{it} is the observation-specific error. I assume μ_{it} has an arbitrary covariance structure that is constant across individuals and is uncorrelated with δ_i. Equation (3) shows the components of current income and its associated errors.

This permanent income model distinguishes between individuals by the individual-specific component δ_i of the total error $\delta_i + \mu_{it}$. μ_{it} and δ_i must be separated in estimation to isolate the individual-specific component $\hat{\delta}_i$ of each intercept $\overline{\beta} + \hat{\delta}_i$. The estimating equation is

$$\ln E_{it} = \sum_{k=1}^{10} \overline{\beta}_1 J_k + \sum_{k=1}^{10} \beta_{2k} J_k g(A_{it}) + \mu_{it} + \delta_i \tag{4}$$

where $\ln E_{it}$ is the log of current income for person i in year t, J_k are occupation dummies, and $g(A_{it})$ is a cubic in age.

Random effects estimation of equation (4) yields individual-specific age–income profiles. Each profile has a unique random intercept $\hat{\beta}_{1i} = \overline{\beta}_1 J_k + \hat{\delta}_i$, with mean $\overline{\beta}_1$ and variance $\hat{\sigma}_\delta^2$, while the slope $\hat{\beta}_{2k}$ is occupation-specific. This amounts to a separate random effects regression for each occupation. I account for possible serial correlation in μ_{it} by imposing no restrictions on its process and by treating the random effects regression as a seemingly unrelated regression system (SUR)—one equation for each time period—following Chamberlain (1982). If the μ_{it} are correlated, SUR will yield efficient estimates.

Estimated permanent income is the annual average of the present discounted value of expected (predicted) income, from equation (4), within a standardized age bracket (55–60).[4]

Using a panel, rather than a cross section, to locate the individual's income profile and estimate permanent income reduces error in measuring the direction and size of the individual-specific effect δ_i, and the slopes of the profiles.

In a cross section, someone whose income is below the profile is assigned a negative δ_i to locate the individual profile. If the person's unobserved income (from other years) is above the cross-section profile, we should instead assign a positive δ_i. This problem is less likely in a panel because many income observations generate the individual-specific profiles that determine the Y_i^P differences.

Even if the direction of the individual-specific effect δ_i in a cross-sectional estimate is correct, its size is suspect. The δ_i value is taken from outside panel studies, and could misrepresent the true δ_i specific to the cross section being analyzed.

Finally, the slope of the income profile in a cross section is biased downward because an elder's income is a downward biased estimate of the future income of the younger person. This vintage effect is reduced in a panel since each individual has many income observations.

C. *Uncertainty*

Income is assumed to be more uncertain the more erratic its variation around an expected trend. I use two related methods to proxy income uncertainty. Each is generated from the residuals of the individual's profile ($\hat{\mu}_{it}$—5.6 per person on average) and is therefore less likely to confound the effects of predictable income growth and uncertainty. The residuals $\hat{\mu}_{it}$ contain both permanent and transitory shocks because the profile's slope is not updated over time.

The first uncertainty proxy, which includes both shocks, is the standard deviation of each individual's profile residual $\sigma_{\hat{\mu}_{it}}$. The second uncertainty proxy follows Carroll (1991) in isolating the transitory and permanent components that compose total uncertainty. Carroll's income shock decomposition complements my method of measuring individual-specific profiles in creating a unique value for both permanent and transitory uncertainty for each individual, measured directly from time-series residuals of each individual's profile.

Carroll shows that if the permanent shock n and the transitory shock τ are independently and identically distributed (i.i.d.) and uncorrelated, then

$$\mathrm{Var}(r(d)) = \mathrm{Var}(\ln E_{it+d} - \ln E_{it}) = d\sigma_n^2 + 2\sigma_\tau^2 \tag{5}$$

where d is the number of years between income observations.[5] First I identify predictable life-cycle income changes using equation (4) estimates, then apply equation (5) to decompose the remaining time-series change $\hat{\mu}_{it+d}$.[6]

Equation (5) shows that permanent shocks are cumulative whereas transitory shocks are not. Current income in any year E_{it+d} consists of permanent income in year t, all past permanent shocks, growth, and the current transitory shock. Two or more d values solve equation (5) for each individual, because if the mean of $r(d) = 0$, then $[r(d)]^2$ provides an unbiased estimate of equation (5). Although this sample's mean $\hat{\mu}_{it}$ is close to zero (<0.01), an F-test cannot reject individual-specific income growth rates.

[4] I use real returns on 1-, 2-, 3-, and 5-year constant maturity bonds at age 55.

[5] Carroll's permanent and current income (log) are $Y_{t+1}^P = g + Y_t^P + n_{t+1}$ and $E_t = Y_t^P + \tau_t$, where g is predictable life-cycle growth. These definitions and recursive methods yield $r(d) = dg + n_{t+1} + \ldots + n_{t+d} + \tau_{t+d} - \tau_t$.

[6] In year t if one expects $\hat{E}_{it+d}$, then after removing the predictable life-cycle element, $r(d) = \hat{\mu}_{it+d}$. If instead one expects E_{it} plus the predicted growth rate, then $r(d) = (\hat{\mu}_{it+d} - \hat{\mu}_{it})$. Table 2, specification 3, adopts the first interpretation. Specification 6A in the appendix (available from the author) adopts the second. Both generate the precautionary result.

Specifications 1 and 2 in table 2 use the first uncertainty proxy $\sigma_{\hat{\mu}_{it}}$, and specification 3 uses σ_τ (transitory uncertainty) and σ_n (permanent uncertainty) from equation (5), assuming τ is i.i.d.[7]

IV. Data

The Older Men cohort of the NLS is a panel of 5020 men and their families, with 11 interviews from 1966 to 1981. It follows a representative cross section aged 45 to 59 at the time of the first interview (1966).

Total family income E_{it} is measured before tax and is available for 10 years between 1965 and 1980, of which I use eight—1965, '66, '68, '70, '72, '74, '75, and '80. Family members are relatives living in the household. The data are unbalanced—the sequence of nonmissing observations varies across people. Taxes are not reported in the NLS.[8] I delete income observations in years that the male of the household is over 65. Finally, I use only those families that have three or more income observations over time.

Net wealth in 1966 includes housing, farm, and business assets, investment real estate, deposits in financial institutions, U.S. Savings Bonds, stocks, bonds and mutual funds, personal loans made to others, minus all debt. Expected pension income is not available. All income and wealth values are in 1976 dollars using the GNP deflator.

V. Results

A. Main Findings

I estimate the panel equation for individual income profiles (see equation (4)) to impute permanent income and income uncertainty for each individual. I then estimate the cross-sectional wealth to permanent income ratio (equation (1)), using the permanent income and uncertainty proxies as explanatory variables. Table 1 lists summary statistics of Y_i^P and W_i/Y_i^P, while table 2 contains results from three specifications of equation (1) and means for all variables.

The evidence indicates substantial precautionary savings. The impact of uncertainty on the wealth to permanent income ratio is highly significant, positive, and large (see table 2, specification 1). A doubling of uncertainty increases the ratio of wealth to permanent income by 29%. The significantly positive coefficients on transitory uncertainty

TABLE 1.—PANEL RESULTS—RANDOM EFFECTS INCOME REGRESSION SUMMARY STATISTICS

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Occupation	Sample Size	Permanent Income Y_i^P Mean	SD	Wealth/Permanent Income W_i/Y_i^P Mean	SD
Total sample	3072	13,034	7,451	2.75	5.77
Professional/technical	249	22,150	6,376	2.97	6.20
Managerial	363	19,348	10,794	5.22	8.84
Clerical	159	15,072	3,693	1.67	1.99
Sales	112	19,358	7,331	2.79	3.92
Craftsperson	668	13,798	5,632	1.89	2.87
Operative	648	10,430	3,467	1.58	3.98
Services	243	9,400	4,011	1.40	2.77
Farmers	215	7,853	4,195	10.28	10.67
Farm laborers	112	4,524	1,220	1.14	3.74
Laborers	303	8,189	3,667	0.92	1.53
Self-employed nonfarmers	310	14,130	8,523	5.57	8.77

Notes: Results are from the subset of 3072 families used in the wealth regressions (second stage of estimation). They are generated by the random effects regression (equation (4)) on 23,167 income observations (total family income before tax, in 1976 dollars) from a sample of 4140 families.

(see table 2, specification 3) suggest that a large portion of consumers may be liquidity constrained, as does Zeldes (1989b).

B. Additional Findings[9]

I interact self-employment and occupation with uncertainty to investigate two potential biases. First, it is possible that there is a self-selection of those less risk-averse into riskier situations (e.g., self-employed nonfarmers).[10] Since those less risk-averse may, in certain cases, be less responsive to an increase in uncertainty (i.e., less prudent (Kimball, 1990)), there is a potential downward bias in uncertainty effects. The significantly negative point estimate on the interactive self-employed variable (see specification 3) shows that the self-employed have a weaker response to a permanent shock than have wage earners. Yet specification 1 indicates greater prudence of the self-employed.[11]

Second, since farmers have high values for both W_i/Y_i^P and uncertainty, it is possible that the precautionary result in specification 1 is driven by a spurious farming effect. Specifications 2 and 3 show that this is not the case—precautionary behavior is statistically significant in most

[7] If the transitory shock is $MA(q)$ rather than i.i.d., it can still be decomposed if $d > q$. I also assume $MA(2)$ and it does not change the qualitative precautionary result. I also combine the two proxies by applying Carroll's proportions $(\sigma_n/(\sigma_n + \sigma_\tau)$ and $(\sigma_\tau/\sigma_n + \sigma_\tau))$ to my individual-specific uncertainty measure $\sigma_{\hat{\mu}_{it}}$ as an alternate method of decomposition. This alternative uses more information since it decomposes the actual time-series residual standard deviation $\sigma_{\hat{\mu}_{it}}$, which is calculated from at least three residuals per family. Again, the precautionary motive remains.

[8] I simulated post federal tax income using published tax rates from each year, distinguishing individuals by number of dependents, married or single, low-income allowance, and by whether a homeowner. The precautionary motive discussed in the results remains (see the appendix, available from the author).

[9] An appendix that addresses possible objections to the above specifications is available from the author. It illustrates that the main results are robust. I (a) substitute a fixed-effects for the random-effects model, (b) allow the profile's intercept and slope to be individual specific, (c) eliminate extreme values of the dependent variable in the wealth equation, (d) substitute estimated after-tax income, (e) use labor (noncapital) income rather than total income, and (f) decompose $r(d) = (\hat{\mu}_{it+d} - \hat{\mu}_{it})$ rather than $r(d) = \hat{\mu}_{it+d}$ to create the uncertainty components.

[10] Farmers are generally born into the profession rather than having chosen it. Since I want to select those who choose the riskier profession, I do not include farmers in this category.

[11] One possible explanation for the significantly positive coefficient on the noninteractive self-employed dummy (all specifications) is that the self-employed need more wealth to operate a business than a wage earner with the same permanent income.

TABLE 2.—LEAST-SQUARES REGRESSION RESULTS OF EQUATION (1)

Variable	Estimated Coefficient (t-Value) Specification 1[a]	Specification 2[b]	Specification 3[c]	Variable Mean
Constant	−29.025 (−2.00)	−29.232 (−2.07)	−31.774 (−2.30)	1.00
Total uncertainty $\sigma_{\rho_{it}}$	1.875 (9.99)	—	—	0.43
$\sigma_{\rho_{it}}$ × self-employed nonfarmers	2.270 (5.59)	0.282 (0.60)	—	0.57
$\sigma_{\rho_{it}}$ × professional/technical	—	2.168 (4.10)	—	0.37
$\sigma_{\rho_{it}}$ × manager	—	7.864 (15.01)	—	0.44
$\sigma_{\rho_{it}}$ × clerical	—	2.689 (3.04)	—	0.34
$\sigma_{\rho_{it}}$ × sales	—	3.459 (2.09)	—	0.35
$\sigma_{\rho_{it}}$ × craftsperson	—	2.218 (5.36)	—	0.38
$\sigma_{\rho_{it}}$ × operative	—	1.884 (5.02)	—	0.40
$\sigma_{\rho_{it}}$ × services	—	1.804 (3.07)	—	0.42
$\sigma_{\rho_{it}}$ × farmers	—	1.259 (2.99)	—	0.72
$\sigma_{\rho_{it}}$ × farm laborers	—	−0.183 (−0.26)	—	0.62
$\sigma_{\rho_{it}}$ × laborers	—	0.325 (0.73)	—	0.48
Transitory uncertainty σ_τ × self-employed nonfarmers	—	—	0.283 (0.41)	0.36
Permanent uncertainty σ_n × self-employed nonfarmers	—	—	−3.157 (−2.21)	0.09
σ_τ × professional/technical	—	—	2.832 (3.72)	0.24
σ_n × professional/technical	—	—	3.616 (2.35)	0.09
σ_τ × manager		—	12.409 (16.33)	0.25
σ_n × manager	—	—	7.377 (4.95)	0.09
σ_τ × clerical	—	—	4.087 (1.91)	0.15
σ_n × clerical	—	—	3.864 (2.29)	0.11
σ_τ × sales	—	—	2.478 (1.05)	0.19
σ_n × sales	—	—	7.889 (1.97)	0.09
σ_τ × craftsperson	—	—	2.373 (3.90)	0.18
σ_n × craftsperson	—	—	4.733 (4.40)	0.09
σ_τ × operative	—	—	2.828 (3.99)	0.20
σ_n × operative	—	—	4.111 (5.64)	0.11
σ_τ × services	—	—	1.923 (2.15)	0.23
σ_n × services	—	—	5.413 (3.23)	0.11
σ_τ × farmers	—	—	1.133 (2.32)	0.49
σ_n × farmers	—	—	2.902 (3.25)	0.14
σ_τ × farm laborers	—	—	0.320 (0.41)	0.47
σ_n × farm laborers	—	—	0.332 (0.20)	0.12
σ_τ × laborers	—	—	−0.025 (−0.03)	0.24
σ_n × laborers	—	—	1.088 (1.07)	0.11
Occupation dummies				
Self-employed nonfarmers	1.410 (3.61)	2.207 (5.60)	2.280 (5.75)	0.10
Manager	2.394 (5.14)	0.063 (0.12)	0.024 (0.05)	0.12
Clerical	0.758 (1.35)	0.826 (1.27)	0.771 (1.13)	0.05
Sales	0.818 (1.36)	0.460 (0.55)	0.660 (0.76)	0.04
Craftsperson	1.055 (2.29)	1.317 (2.60)	1.429 (2.77)	0.22
Operative	1.482 (3.10)	1.974 (3.77)	1.804 (3.36)	0.21
Services	1.416 (2.61)	1.931 (3.14)	1.756 (2.75)	0.08
Farmers	9.540 (17.03)	10.526 (16.18)	10.580 (16.25)	0.07
Farm laborers	1.769 (2.64)	3.631 (4.44)	3.422 (4.11)	0.04
Laborers	1.395 (2.60)	2.697 (4.53)	2.832 (4.64)	0.10
Others				
Age (1966)	1.030 (1.82)	1.028 (1.87)	1.127 (2.10)	51.22
Age squared	−0.009 (−1.61)	0.009 (−1.65)	−0.010 (−1.91)	2641.06
Permanent income	0.629 × 10^{-4} (3.37)	0.906 × 10^{-4} (4.93)	0.880 × 10^{-4} (4.93)	13,033.72
Bequest dummy (1 if intend to leave bequest)	0.164 (0.86)	0.128 (0.69)	0.132 (0.72)	0.67
Race dummy (1 if nonwhite)	−1.331 (−6.11)	−1.330 (−6.26)	−1.276 (−6.12)	0.31
Number of children	−0.129 (−3.43)	−0.132 (−3.59)	−0.133 (−3.70)	2.86
Married dummy (1 if married)	0.579 (1.94)	0.583 (2.00)	0.585 (2.05)	0.89
Health dummies				
Excellent health	1.158 (2.78)	0.935 (2.30)	1.175 (2.93)	0.35
Good health	1.071 (2.64)	0.856 (2.16)	1.054 (2.70)	0.42
Fair health	1.040 (2.42)	0.716 (1.7)	0.936 (2.26)	0.17
Education dummies				
Elementary education	−2.979 (−4.81)	−3.128 (−5.18)	−2.960 (−4.99)	0.47
Some high school education	−2.377 (−3.84)	−2.653 (−4.39)	−2.515 (−4.25)	0.19
High school education	−1.977 (−3.29)	−2.168 (−3.70)	−2.008 (−3.50)	0.21
Some college education	−1.689 (−2.68)	−1.870 (−3.04)	−1.720 (−2.85)	0.06
College education	−1.198 (−1.79)	−1.132 (−1.73)	−0.999 (−1.56)	0.04
Adjusted R^2	0.27	0.31	0.34	—
F-statistic	43.60	39.24	34.87	—
Observations	3072	3072	3072	—
Dependent variable mean	2.752	2.752	2.752	—

Notes: The reference categories for dummy variables: Occupation—professional, health—poor, education—graduate school. The sum of the uncertainty components by occupation (specification 3) does not equal total uncertainty (specification 2) since the calculation methods differ (see text). Dependent variable—total net family wealth in 1966 divided by permanent income (W_i/Y_i^P).

[a] Specification 1—total sample response to total uncertainty

[b] Specification 2—response to total uncertainty by occupation

[c] Specification 3—response to permanent and transitory uncertainty by occupation

occupations. The differences by occupation are likely due to differences in risk preferences.

The relative permanent incomes across occupational categories are as expected: professionals, managers, and sales people have the highest incomes while farmers, laborers, and service people have the lowest (see table 1). Also, farmers and the self-employed have the highest total and transitory uncertainty in their income streams (see table 2).[12]

All estimates support the life-cycle prediction of the hump-shaped profile of asset accumulation and predict a peak in the ratio of wealth to permanent income at age 57. The age coefficients are jointly significant at the 0.01 level in all regressions. This result is contrary to many studies that do not support the life-cycle prediction (Kotlikoff (1988)).

The significant permanent income coefficient rejects Modigliani's (1954) homogeneity of utility assumption. Also, if education augments the information contained in the permanent income variable, homogeneity is further questioned in light of the positive education estimates.[13] Although the education coefficients may indicate that the more highly educated are better able to capitalize on financial opportunities, they could also reflect possible reverse causation. KDM find evidence that homogeneity cannot be rejected.

The insignificant coefficient on the bequest intent dummy raises doubts about the bequest motive for saving. A portion of bequests may prove accidental—the savings truly intended for precautionary purposes.

Families save significantly less as the number of children increases. Perhaps children are a form of security which reduces income uncertainty during retirement and therefore reduces saving. The coefficients on the health dummies indicate that those with poor health save the least, which contradicts the precautionary motive if they have more uncertain health expenses. The unhealthy may have depleted their assets for health care.

My wealth measure does not include expected pension income, which is not available and almost certainly negatively related to asset accumulation. If those with more uncertainty have less expected pension income, the coefficient on uncertainty will be biased upward, reflecting asset accumulation in response to the lower expected pension income, i.e., life-cycle saving.

Finally, the precautionary result may be clouded by endogeneity driven by self-selection of wealthier individuals (or those expecting large inheritances) into riskier occupations. Yet there is a strong precautionary finding within most occupations (specifications 2 and 3).

[12] The mean uncertainty for the self-employed *including* farmers ($n = 520$) is 0.63.

[13] A rise in education may also imply a lower rate of time preference, hence more saving.

VI. Conclusion

My estimates show a strong precautionary motive for saving. Income uncertainty has a positive effect on the wealth to permanent income ratio. This precautionary motive varies in size depending on occupation. The results suggest that risk preference is an important factor in the strength of the precautionary motive, as predicted. In all occupations, the self-employed, who are probably less risk averse, have a weaker response to permanent shocks than have their more risk-averse counterparts.

The findings are important because they indicate that government income maintenance programs that reduce income uncertainty may reduce personal saving. Wealth's significant response to transitory shocks emphasizes the importance of liquidity constraints on precautionary saving. The results are also relevant to the controversy about the size of the bequest motive. Bequests may partly be saving for that rainy day that never comes. Finally, my results suggest that the marginal utility of consumption is convex.

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