

Liquidity Constraints of the Middle Class*

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Abstract

Among U.S. middle-class households, the marginal propensity to consume is either invariant to household wealth or a U-shaped function thereof. In contrast, precautionary savings models predict that wealth reduces the marginal propensity to consume. We bridge this gap between theory and data with *term saving*, households' savings for large forecastable expenditures. Household data indicate that term saving is widespread. Once incorporated into a calibrated precautionary savings model, it generates marginal propensities to consume like those from the data. This is because the approaching expenditure simultaneously motivates saving and raises the marginal propensity to consume by shortening the effective planning horizon.

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1 Introduction

Liquidity constraints of U.S. middle-class households are of key importance for resolving a host of macroeconomic questions, such as the size of the fiscal multiplier from tax cuts. However, it may seem implausible that middle class households face liquidity constraints because they typically hold liquid assets. By definition, these can be converted immediately into consumption. Nevertheless, evidence from consumption responses to tax changes casts doubt on this view. For example, [Shapiro and Slemrod \(2003\)](#) found that households that own publicly-traded stocks spent no less and probably more out of one-time tax rebates arising from the Bush tax cuts than did poorer and more plausibly liquidity-constrained households. That is, middle-class households with liquid wealth act like they face substantial liquidity constraints.

[Carroll and Kimball \(1996\)](#) proved that the consumption function from a precautionary savings model is concave in cash on hand (the sum of current earnings and past savings). Therefore, that model's consumption responses to tax rebates *decline* with household wealth. To bridge this gap between theory and data, we consider the possibility that a household's assets are accumulated to pay for a forecastable extraordinary expense. In that case, high assets signal a *shortage of liquidity* relative to the approaching expense rather than an abundance of liquidity arising from past good luck. For a household expecting such an expense, the time remaining until it arrives is a key state variable. Hence, we call the accumulated assets *term savings*. We provide evidence from the Survey of Consumer Finances (SCF) that term savings motivations (particularly the purchase of a house or the payment of a child's college tuition) are at least as prevalent among the middle class as are standard precautionary savings motivations like earnings risks.

For our empirical analysis, we assign households to the middle class if they are not in the top five percentiles of the wealth distribution and did not receive food stamps or Temporary Assistance to Needy Families in the previous year. This definition allows for the possibility that middle-class households occasionally spend all available financial assets. Our matching theoretical definition of a middle-class household combines impatience (relative to the market rate of interest), a borrowing constraint, and a recurring major expenditure. Impatience prevents middle class households from accumulating wealth and joining the rich, while the borrowing constraint keeps them from permanent immiseration in debt. With these two features alone, middle class households would become hand-to-mouth consumers like the "spenders" in [Mankiw \(2000\)](#). The foreseen expenditure provides a motivation to save.

Our term savings model embodies this theoretical definition within the standard infinitely-

lived household. We begin by developing intuition in a deterministic environment. The household enjoys ordinary consumption and a special good. Ordinary consumption always increases utility, but the household has a taste for the special good only at occasional and predetermined moments. The taste for the special good induces term savings. For it to induce substantially different behavior than does earnings risk in a precautionary savings model, the hazard rate for its arrival should *increase* with the time since its last occurrence. The predetermined times for the special good’s consumption starkly capture this requirement.

In this model of “pure” term savings, the household eventually settles into a cycle. At its beginning, a long time remains until the special good’s consumption. Although impatience might initially dominate the household’s decisions and drive wealth to zero, consumption smoothing eventually motivates the household to save. When the taste for the special good arrives, the household spends all cash on hand and the borrowing constraint binds. This cycle exemplifies [Zeldes’s \(1984\)](#) distinction between a currently-binding liquidity constraint and one that could possibly bind in the future. As he noted, expectations of future liquidity constraints effectively shorten the horizon over which a currently unconstrained household optimizes and thereby generate a large marginal propensity to consume (MPC) out of transitory income. Here, assets accumulate as the foreseen expenditure approaches, and so the current model predicts that the observed MPC *rises* with wealth for households that are not currently liquidity constrained.

The quantitative assessment of term savings requires us to add earnings risk to the analysis, because precautionary saving works against term saving in shaping the empirical relationship between household wealth and the MPC. We calibrate income risk to match observations of earnings from the PSID in [Meghir and Pistaferri \(2004\)](#) and we choose the household’s discount factor and the special good’s expenditure share to match percentiles of wealth relative to labor income from middle-class households in recent waves of the SCF. With this calibration, the average MPC from a one-time transfer is a relatively flat function of wealth. For two households at either extreme of the wealth distribution, with no wealth and wealth exceeding current annual earnings, the MPCs equal 53 percent and 72 percent. If we remove the special good from the model and recalibrate the discount factor, the MPC strongly decreases with wealth. That of households with no wealth is virtually unchanged while that for households with wealth exceeding current annual earnings falls 57 percentage points to 15 percent.

The pervasiveness of liquidity constraints has received a great deal of attention in the consumption literature. Using the 1983 SCF, [Jappelli \(1990\)](#) found that about 20 percent of U.S. households were either rejected for credit or rationally anticipated being rejected if they

applied. Much more work has focused on documenting liquidity constraints as violations of Hall’s (1978) random walk hypothesis for the marginal utility of consumption. Using food consumption data from the PSID, Hall and Mishkin (1982) found that about 20 percent of consumption is a simple function of current income, as if those households are consuming “hand-to-mouth.” Estimating a similar model with aggregate data, Campbell and Mankiw (1989) concluded that “Half of households follow the ‘rule-of-thumb’ of consuming their current income.” Also using the PSID, Zeldes (1989) observed that consumption growth of households with low wealth respond strongly to lagged disposable income. Because the analogous estimated responses for households with high wealth are smaller and sometimes statistically insignificant, Zeldes interpreted his results as evidence in favor of liquidity constraints. With this interpretation, different definitions of “low wealth” imply that between 30 to 66 percent of households are liquidity constrained. Jappelli and Pistaferri (2010) reviewed the considerable literature that has refined this approach and applied it to other countries and data sets. Hayashi (1987) noted that these studies have only limited implications for the average MPC from temporary income in part because “the horizon of those who satisfy the Euler equation is unknown ...”.¹ The importance of term saving we document with the SCF leads us to conclude that Hayashi’s “horizon” is typically much less than a decade, so that most of the middle class acts as if they are liquidity constrained. Our model’s recurring large expenditure tractably embodies this conclusion and allows us to measure its influence on middle-class household’s MPCs.

Kaplan and Violante (2014) provided an explanation for large MPCs of middle-class households that complements ours. In their model of “wealthy hand-to-mouth” consumers, households save for retirement in a high-return asset with large fixed transaction costs, which they interpreted as housing, and a low-return liquid asset. They emphasized that those who have recently converted all of their liquid assets into housing will have high MPCs in spite of having substantial illiquid wealth. Our model of term saving shows that households currently saving for a house will also have high MPCs even though they have substantial *liquid* wealth. On the other hand, Kaplan and Violante place this mechanism into a life-cycle model of saving. As noted above, we use an infinite-horizon dynastic framework to avoid the mechanical connection between a high MPC and high wealth near the end of life.

The remainder of this paper proceeds as follows. In the next section, we review previous observations of the marginal propensity to consume out of tax rebates and document the prevalence of precautionary and term saving with the SCF. Section 3 develops the pure

¹See that article’s penultimate sentence for the full context of this quote.

term savings model, and Section 4 adds earnings uncertainty and considers the quantitative implications of a calibrated version of the model for the evidence reviewed in Section 2. Section 5 offers concluding remarks.

2 Consumption and Saving

This section reviews the evidence on consumption and savings that motivates our exploration of middle-class liquidity constraints. We begin with a review of previous empirical analysis of households' MPCs from tax-induced changes to disposable income. We then document the pervasiveness of precautionary and term saving with data from recent waves of the SCF.

2.1 MPC Estimates

Changes in tax law provide rich opportunities for the empirical investigation of consumption choices in the context of economically significant and plausibly exogenous changes to household income. The Reagan tax cuts, which were implemented in three stages, are particularly useful for this because the last two stages were known to the public well before their implementation. Whereas the permanent-income model predicts that the associated anticipated changes in take-home pay should have zero impact on consumption, Souleles (2002) estimated MPCs between 80 and 90 percent for nondurable consumption using Consumer Expenditure Survey data.² When he split the sample by liquid wealth relative to earnings, the MPCs of households in the bottom quartile were within 15 cents of their counterparts in the top three quartiles. Furthermore, these differences were statistically insignificant.³ It seems that the majority of households acted as if they were hand-to-mouth “spenders,” even those who had wealth when the tax cuts were implemented.

Shapiro and Slemrod (2003, 2009), and Sahm, Shapiro, and Slemrod (2010) provide more recent evidence on households' MPCs from survey data. The Economic Growth and Tax Relief Act of 2001 lowered tax rates retrospectively to the start of 2001, and the Treasury mailed tax rebates to most taxpayers from July to October. Shapiro and Slemrod attached questions to the University of Michigan's monthly Survey of Consumer Attitudes and Behavior that solicited respondents' anticipated uses of these rebated funds as well as their expectations about future government spending and taxes. They found that 22 percent of respondents anticipated spending most of the rebate, while the rest planned either to reduce

²See the row labelled “ $d(\textit{withholding})_{t+1}$ ” in his Table 2.

³See the first two rows of his Table 4.

their debts or increase their savings. Using plausible distributions of the marginal propensities to consume across those who would “mostly spend” and “mostly save”, [Shapiro and Slemrod](#) calculated an average marginal propensity to consume of about one third.

Famously, political disagreement made the persistence of the Bush tax cuts uncertain at the time of their passage. The original legislation sunset in 2011, but Congress could have either made them permanent or revoked them entirely before then. In theory, the persistence of a tax cut determines the resulting the consumption response, but [Shapiro and Slemrod](#) found no connection between a respondent’s views on future taxes and her propensity to mostly spend the rebate.⁴ One might also expect that tax cuts represent real wealth to a household only if accompanied by a reduction in government spending. Again, the data reveal no such Ricardian link between expectations of government spending and the propensity to spend.⁵

A theoretical justification for large MPCs out of windfall gains is that households cannot borrow against higher expected future income to smooth consumption. Such traditional liquidity constraints should be most prevalent among households with low income and low wealth. [Shapiro and Slemrod](#) find no difference in the propensity to mostly spend the tax rebates by income.⁶ They also tabulated the propensities to mostly spend across different households based on their ownership of stocks, either in retirement accounts, mutual funds, or brokerage accounts. They do find statistically significant differences across households, but they are not consistent with the model of traditional liquidity constraints: the spending fraction *increases* with stock ownership, with exceptions for the highest bracket and that with zero-assets.^{7,8}

⁴See the lines below “Size of future tax cuts” in their Table 5.

⁵See the lines below “Impact of tax cut on government spending” in their Table 5.

⁶See the rows under “Income (\$)” in their Table 2.

⁷See the lines under “Stock” in their Table 2. [Shapiro and Slemrod](#) report in their article’s original working paper that this pattern also arises in regressions with dummy variables for the different stock ownership brackets, while age and other control variables are included. However, the relationship is statistically indistinguishable from a flat line. See Tables 10 through 13 of NBER Working Paper 8672.

⁸One might be legitimately concerned that the failure to find that the propensity to mostly spend the tax rebate declines with stock wealth arises from the presence of illiquid retirement savings in that wealth. To address this possibility, we have obtained the original data from the August 2001 and October 2001 Surveys of Consumer Attitudes and Behavior used by [Shapiro and Slemrod](#). (ICPSR Studies 35286 and 35288) The ICPSR has not yet released the analogous data from September 2001, which [Shapiro and Slemrod](#) also used. These data contain a variable indicating whether anyone in the household has stocks invested within an IRA, Keogh, or 401K retirement account. About 1/4 of stockholders have no stocks in retirement accounts. Using this variable, *we removed households with such investments from the sample* and then regressed the indicator

Shapiro and Slemrod (2009) use the same survey instrument and methodology to measure households' propensities to spend the obviously temporary Economic Stimulus Payments (ESP's) of 2008. Surprisingly, the fraction of respondents who mostly spend their ESP's is nearly identical to that from the 2001 rebate checks, 20 percent. Just as with the earlier tax rebates, Shapiro and Slemrod find "there is no discernable difference in spending propensity by income."⁹ Furthermore, Sahm, Shapiro, and Slemrod (2010) replicate Shapiro and Slemrod's (2003) finding that households' expectations of their personal financial conditions have no impact on their spending out of the ESP's.¹⁰ Finally, Sahm, Shapiro, and Slemrod (2010) find a dependence of the Mostly-Spend rate on the household's wealth in stocks similar to that from the 2001 tax rebates.¹¹ Table 1 presents the Mostly-Spend percentages by stock ownership level from both Shapiro and Slemrod (2003) and Sahm, Shapiro, and Slemrod (2010). It clearly shows that the survey evidence does not support the traditional liquidity constraint model for either the 2001 tax rebates or the 2008 ESP's.¹²

for spending most of the rebate on indicators for the survey respondent's age group, educational attainment, household income quartile, region of residence, and indicators for whether the household's reported stock wealth is between \$1 and \$15,000 or exceeds \$15,000. The estimated regression uses 414 observations and has an R^2 of 0.05. The estimated linear-in-probabilities regression equation is

$$\text{spend}_i = \underset{(0.079)}{0.005} I\{S_i \in [1, 15000]\} + \underset{(0.054)}{0.083} I\{S_i \in (15000, \infty)\} + \text{Other regressors} + u_i.$$

where spend_i is the indicator of intending to spend most of the rebate for household i , S_i is household i 's stock wealth, and u_i is the regression error. The parentheses below each estimated coefficient contain heteroskedasticity-consistent standard errors. The two coefficients on the stock-ownership dummies are jointly insignificant. The analogous regression that includes all households, regardless of whether or not they hold stocks in retirement accounts, has 806 observations and an R^2 of 0.03. The equation is

$$\text{spend}_i = \underset{(0.053)}{0.007} I\{S_i \in [1, 15000]\} + \underset{(0.034)}{0.066} I\{S_i \in (15000, \infty)\} + \text{Other regressors} + u_i$$

The second coefficient is significant at the 5 percent level, but the two coefficients remain jointly insignificant. These results indicate that Shapiro and Slemrod's (2003) failure to find a negative relationship between stock wealth and the propensity to spend most of the 2001 tax rebate did not arise purely from a failure to separate stocks held in retirement accounts from total stock wealth.

⁹See their Table 3. This quote is from the discussion below it.

¹⁰See their Table 10.

¹¹Sahm, Shapiro, and Slemrod also examine the dependence of the Mostly-Spend rate on income and wealth in a multivariate setting. They find "Given the substantial positive correlation of income and wealth, it is hard to statistically identify separate effects of these two factors." (Sahm, Shapiro, and Slemrod, 2010, page 86).

¹²Shapiro and Slemrod (2003, page 385) offer the following explanation for the positive effect of stock

Stock Ownership Class	2001 Tax Rebates		2008 Economic Stimulus Payments	
	Percentage of Sample	Percentage Spending Most of Rebate	Percentage of Sample	Percentage Spending Most of Rebate
None	42.8	19.5	33	20
\$1 – \$15,000	9.1	13.1	13	19
\$15,001 – \$50,000	9.9	18.1	14	19
\$50,001 – \$100,000	6.8	26.7	10	14
\$100,001 – \$250,000	6.2	33.6	11	25
More than \$250,000	5.1	22.9	9	39
Refused/Don’t Know	20.1	25.3	11	25

Table 1: Rebate Spending Percentages

Source: Table 2 of [Shapiro and Slemrod \(2003\)](#) and Table 8 of [Sahm et al. \(2010\)](#)

A pair of complementary articles, [Johnson, Parker, and Souleles \(2006\)](#) and [Parker, Souleles, Johnson, and McClelland \(2013\)](#), estimate the consumption responses from these two tax experiments using questions appended to the Consumer Expenditure Survey (CEX) that measured when the household received the disbursed funds. The Treasury randomized this timing based on the second-to-last digit in the recipient’s Social Security number, so the effect of *receiving* the funds on current consumption can be estimated without substantial endogeneity concerns. [Johnson, Parker, and Souleles](#) measure a one-quarter effect on non-durable consumption of 0.462 with a standard error of 0.173.¹³ [Kaplan and Violante \(2014\)](#) note that this cannot be interpreted as an *MPC*, because the control group’s response to the policy change is generally not zero. Nevertheless, it is somewhat larger than [Shapiro and Slemrod’s \(2003\)](#) *MPC* estimate of 1/3 for all consumption from the same experiment.

ownership on the Mostly-Spend rate: “Those stockholders with low wealth are trying to build wealth and therefore have a powerful saving motive; those with higher wealth may already have adequate assets and therefore are spenders on the margin.” [Sahm, Shapiro, and Slemrod \(2010, page 84\)](#) apply the same explanation to their findings. However, the most natural extant model of such “target savings”, the buffer stock model of [Deaton \(1991\)](#), does *not* deliver this result. That model does have a stationary long-run distribution of wealth, and households with initial wealth above its mean tend to dissave while those below it tend to save. Nevertheless, the MPC out of wealth *declines* with wealth. This is evident in [Deaton’s \(1991\) Figure 1](#), which shows consumption as a function of wealth to be *concave*. As noted in the introduction, [Carroll and Kimball \(1996\)](#) formally prove this concavity.

¹³See the first row and final column of their Table 3.

Johnson, Parker, and Souleles sort their sample into three groups by income. Households in their low-income group spent much more than those in the middle-income group, but those with the highest income also spent more than those in the middle. The same pattern arose when they split the sample by liquid assets.¹⁴ Since the differences between the middle income/asset and high income/asset groups are not statistically significant, Johnson, Parker, and Souleles conclude that “In sum, we find that households with low income or low liquid wealth consumed more of their rebates than typical, which is consistent with the presence of liquidity constraints.” (Johnson et al., 2006, page 1604). However, the standard errors on the high income/asset groups’ responses for nondurable goods are large enough so that an estimate of 1 would be statistically insignificant.¹⁵ For the 2008 ESPs, Parker, Souleles, Johnson, and McClelland measure responses for nondurable goods and all consumption of 0.128 and 0.523. Only the latter is statistically significant.¹⁶ When they sort their sample by income and liquid assets, the resulting responses are statistically indistinguishable from each other.¹⁷ We conclude that the CEX-based estimates are consistent with the irrelevance of a household’s income and assets for its consumption response to tax rebates and stimulus payments – as documented by Shapiro and Slemrod (2003) and Sahm, Shapiro, and Slemrod (2010), but they also have little power to reject this null hypothesis.

In summary, the existing evidence on the marginal propensity to consume from tax-induced income changes indicates that many households act as if they are liquidity constrained even though they have high income and/or available liquid assets for consumption smoothing. One potential explanation for this is that households imperfectly incorporate available information into current decisions or base their consumption and saving decisions on “rules of thumb”. Parker (1999) and Hsieh (2003) argue that households fail to optimize the intertemporal allocation of relatively small seasonal fluctuations in income. In particular, Hsieh (2003) shows that Alaskan households in the CEX raise their consumption following forecastable tax rebates, as originally documented for the whole United States by Souleles (1999), but they smooth their much larger annual dividend payments from the Alaska Permanent Fund over the year.

In the absence of further information, fiscal interventions of macroeconomic interest could plausibly fall into either the “small-enough-to-ignore” or “large-enough-to-respond” categories. However, Shapiro and Slemrod (2003) provide evidence that such rules of thumb

¹⁴See their Table 5

¹⁵See the final row of their Table 5.

¹⁶See the third row of their Table 2.

¹⁷See their Table 6.

cannot explain their observations from the 2001 Bush tax cut by sorting respondents by whether or not they have a budget and if they do, whether it targets spending, saving, or debt repayment. (Multiple responses to this last question were allowed.) They report

These findings are different than what one might have expected from an economic model of targeting, in which a household that spends a routine amount would save residual income and vice versa. The survey evidence is the opposite: target spenders tend to spend on the margin and target debt payers tend to save on the margin. There is no substantial difference in spending rates for target savers. (Shapiro and Slemrod, 2003, page 387)

While we do not wish to rule out the possibility that rules of thumb or other predictions of behavioral economics can illuminate households' responses to substantial fiscal policy shocks, this evidence leads us to believe that an explanation based on rational expectations and fully-optimizing behavior can be at least equally enlightening.

2.2 Term Saving and Precautionary Saving

The explanation for high MPCs among middle-class households that we put forward relies on saving to finance foreseen large expenditures. Before proceeding with its theoretical development, we present here evidence on the importance of such expenditures in the savings decisions of middle-class households. The principle expenses we have in mind are purchases of new homes and the college education of children.

2.2.1 The Sample

For our sample, we draw on five cross-sectional waves of the SCF; 1995, 1998, 2001, 2004, and 2007. The SCF sample weights give the number of U.S. households that each household in the sample represents. The first row of Table 2 uses these weights to list the number of households represented in each of the five waves. This ranges from 99 million in 1995 to 116.1 million in 2007. We wish to focus the analysis on working-age middle class households. To be included in our sample, a household must have answered all of the questions regarding savings motives that we use below. Table 2's second line gives the number of represented households after dropping those that fail this screen. The total number of households lost varies between 2 and 3 million. Next, the household head must be between 25 and 64 years old at the survey date. This requirement removes approximately 25 percent of the households.

The next two criteria remove the poor from our sample. The first requires the household to have not received Temporary Assistance to Needy Families (formerly known as Food Stamps) in the previous year, and the second requires the household’s after-tax labor income to exceed the official poverty line for a household of that demographic composition.¹⁸ To measure after-tax labor income for the previous year; we multiply the pre-tax labor income of the household head and his or her spouse by an average tax rate calculated with the household’s Adjusted Gross Income, the household’s federal tax filing status, and the federal income tax and social-insurance (FICA and Medicare) tax tables. The resulting tax is subtracted from pre-tax labor income. The SCF includes no information on state of residence, so we make no attempt to estimate state income taxes. However, we do assume that each worker with an IRA account that is eligible to contribute to it makes the maximum possible contribution. We treat these retirement savings as taxes for this calculation. (Footnote 21 below justifies this choice in light of our forthcoming theoretical analysis.) Table 2’s fourth and fifth rows list the number of households that these two poverty criteria retain. Together, they remove between 20 and 25 percent of the remaining represented households from our sample.

To exclude the wealthy from our sample, we first measure each household’s financial assets: stocks, bonds, and balances in checking, saving, money market, and mutual fund accounts. For consistency with our treatment of tax-advantaged retirement saving in the measurement of after-tax labor income, we exclude balances in IRA accounts from financial assets. We then define the wealthy to be those households in the top five percent of all households represented in that wave of the SCF. Our final sample-selection criterion removes households in which either the household head or spouse reports being self-employed. This ensures that savings for business purposes do not substantially influence our results, and it removes between 10 and 15 percent of the remaining households. Our final sample represents 43.1 million households in 1995 and 53.1 million households in 2007.

To present the financial wealth distribution in our sample, Table 3 reports summary statistics of financial wealth scaled by after-tax labor income for each SCF cross section. In each panel, the leftmost column gives the income-weighted average of this ratio, and the remaining columns give this income-weighted average for each decile of the ratio itself. For the top panel, we used all financial assets in the numerator. In 1995, the overall average equals 30.8 percent. This climbs quickly to 47.6 percent in 1998 and 50.4 percent in 2001. For 2004 and 2008, the overall averages are substantially lower, 43.7 percent and 46.1 percent. Since

¹⁸We use after tax labor income to determine the sample households in poverty because the official poverty line gives the household *expenditures* necessary to remain out of poverty.

	SCF Survey Year				
	1995	1998	2001	2004	2007
Households Represented in Original Sample,	99.0	102.5	106.5	112.1	116.1
& without imputed Age or Saving Survey responses,	97.0	100.3	103.5	109.9	114.5
& with heads between 25 and 64 years old,	71.3	74.4	76.3	80.4	84.9
& that received no TANF,	63.9	68.8	71.7	74.3	76.5
& that had labor income above the poverty line,	54.2	59.2	61.5	62.5	64.3
& are among least wealthy 95% of remaining households	49.9	54.3	57.0	57.9	60.2
& are not self-employed.	43.1	46.9	48.8	49.1	53.1

Table 2: Number of Households (in millions) Represented in the Surveys of Consumer Finances

the rise and fall of this ratio coincides with the growth and decline of the internet stock boom, we calculated the same ratios excluding directly held stocks and mutual funds from financial wealth. The bottom table reports these. By construction, these ratios are less than those in the top panel. The average ratio still increases by 7 percentage points from 1995 to 1998, but excluding equities makes its evolution thereafter much smoother: hovering at around 30 percent. Even though the sample focuses on middle-class households, the distribution of the ratio is quite skewed. The average ratio for households in the fifth decile is between 9.2 and 13.1 percent. The analogous averages for households in the tenth decile range from 171.6 percent to 263.8 percent. One might think that this skewness reflects past realizations of idiosyncratic returns to investment. However, the skewness remains even after excluding equities from financial wealth.

If one defines being liquidity constrained as violating the Euler equation for intertemporal substitution between the current and next periods, then wealth statistics like these are sufficient for measuring the extent of liquidity constraints. For example, [Zeldes \(1989\)](#) divides his PSID sample into “constrained” and “unconstrained” groups based on wealth in several ways, one of which is easily mimicked here: Classify a household as constrained if and only if its financial wealth is less than two months of its annual earnings. For the observations in Table 3, the dividing line between constrained and unconstrained according to this criterion is a ratio of 16.6 percent. In 1995, 2004, and 2007; this falls between the means of the sixth and seventh deciles. Therefore, this rule would classify between sixty and seventy percent of those years’ middle-class households as constrained. In the internet stock boom years of 1998 and 2001, 16.6 percent falls between the means of the fifth and sixth deciles. Remarkably, [Zeldes \(1989\)](#) reports that this measure classifies 67 percent of his PSID sample as constrained.

2.2.2 Reasons for Saving

We begin the empirical case for term saving by examining households’ answers to the following question:

Question 1 *Now I’d like to ask you a few questions about your family’s savings. 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?*

Each respondent could give up to six answers (five in 1995) from a detailed list, which we broke into three categories, Retirement and Estate, Precaution, and Anticipated Expenditure.

Year	Full	Deciles									
	Sample	1	2	3	4	5	6	7	8	9	10
Including All Financial Assets											
1995	30.8	0.1	1.5	3.6	6.2	9.2	13.4	22.4	37.1	71.1	171.6
1998	47.6	0.3	2.1	4.6	8.0	13.1	20.4	32.3	54.7	100.5	247.7
2001	50.4	0.4	2.3	4.9	8.1	13.0	21.0	32.2	54.3	100.6	263.8
2004	43.7	0.1	1.5	3.6	6.2	10.3	16.0	25.4	42.4	85.5	214.9
2007	46.1	0.3	1.7	3.7	6.5	10.3	16.4	26.0	44.2	84.2	220.8
Excluding Equities											
1995	22.9	0.1	1.3	3.1	5.2	7.8	10.9	16.2	27.1	49.2	134.3
1998	29.8	0.3	2.0	4.0	6.6	10.1	15.0	22.7	35.5	62.9	162.9
2001	31.7	0.4	2.2	4.2	6.5	9.7	14.2	22.7	35.1	62.7	174.6
2004	29.4	0.1	1.3	3.0	5.3	8.3	12.4	18.6	29.8	51.4	150.9
2007	32.1	0.2	1.5	3.2	5.6	8.4	12.8	19.6	31.5	56.6	158.0

Table 3: Ratios of Financial Assets to Annual After-Tax Labor Income ($\times 100$)

Note: Each cell reports a weighted average of nonretirement financial assets to labor income net of federal income taxes, Social Security taxes, and contributions to tax-advantaged retirement accounts. The weights are proportional to this after-tax income measure. The leftmost column uses the entire sample, while the remaining columns use observations grouped by deciles of this ratio. The top panel measures financial wealth with the sum of checking accounts, savings accounts, money-market deposit accounts, money-market mutual fund accounts, certificates of deposit, non-money-market mutual fund accounts, savings bonds, brokerage call accounts, directly-held bonds, and directly-held stocks. The bottom panel excludes directly-held stocks and stock-based mutual funds from this calculation.

Both Retirement and Estate had distinct entries on the list of answers, although the Estate answer included inter vivos transfers. Following Kennickell and Lusardi (2005), we assigned an answer to Precaution if it was

- Reserves in case of unemployment,
- In case of illness; medical/dental expenses,
- Emergencies; “rainy days”; other unexpected needs; For “security” and independence, or
- Liquidity; to have cash available/on hand.

The answers we used to infer an Anticipated Expenditure motive were:

- Children’s education; education of grandchildren,
- Own education; spouse’s education; education – NA for whom,
- Wedding, Bar Mitzvah, and other ceremonies,
- Buying own house,
- Purchase of cottage or second home for own use,
- Buy a car, boat or other vehicle,
- To travel; take vacations; take other time off, or
- Burial/funeral expenses.

Table 4 reports the frequencies for each of these three classes. Because a given household can give multiple answers, these frequencies sum to more than 100 percent. In every year but 1995, Retirement and Estate is the most common of these three motivations with frequencies at about 60 percent. Again with the exception of 1995, between 30.9 and 33.8 percent of households reported Precautionary motives, while between 39.2 and 43.7 percent of them reported motivation from an Anticipated Expenditure. In 1995, the Precautionary motive is much more frequent and the Retirement and Estate motive is much less frequent. Overall, the data indicate that saving for an anticipated expenditure is widespread and at least as salient for middle-class households as precautionary saving.

	1995	1998	2001	2004	2007
Retirement & Estate	44.6	60.1	55.4	57.9	64.2
Precaution	45.1	30.9	31.9	31.3	33.8
Anticipated Expenditure	43.6	43.7	41.9	42.6	39.2

Table 4: Percentage Frequencies of Stated Reasons for Saving from the SCF

2.2.3 A Closer Look at Term Saving

Fortunately, the SCF has an additional question on savings motives particularly relevant for term saving:

Question 2 *In the next five to ten years, are there any foreseeable major expenses that you and your family expect to have to pay for yourselves, such as educational expenses, purchase of a new home, health care costs, support for other family members, or anything else?*

Note that this question explicitly references health care costs, which we counted above as a motive for precautionary savings. Fortunately, we can separate term saving for health care from other term saving using a follow-up question. If the respondent answered Question 2 affirmatively, then the interviewer asked

Question 3 *What kinds of obligations are these?*

The interviewer then showed the respondent a list of possible expenditures. Another follow-up question asked whether or not the household was currently saving for the expense. A household that is not currently saving might either have not begun saving or have already completed saving. In 2007, the SCF questionnaire addressed this ambiguity by asking respondents if their saving was completed.

Table 5 reports the frequencies with which respondents reported a foreseen expense, saving now for that expense, and (for 2007) whether or not the saving was complete. In all of the waves, about 60 percent of households report an anticipated expense, and about 35 percent report that they are saving now for it. This is not far below the approximately 40 percent of households that claim an Anticipated Expenditure as one of possibly several savings motivations when answering Question 1.¹⁹ Only a very small fraction of households report that their saving for anticipated expenditures is complete.

¹⁹One might wonder why many more households report an anticipated expense when responding to Question 2 than report an anticipated expense as a motive for saving in their answers to Question 1. One simple

	1995	1998	2001	2004	2007
Foresees Expense	63.1	58.8	60.5	59.0	57.5
Saving Now	38.1	37.1	36.8	35.8	33.9
Saving Complete					1.6

Table 5: Percentage Frequencies of Saving for Anticipated Expenditure

As might be expected, the major expenses listed in Question 2 – education, purchase of a new home, and health care costs – are concentrated at specific stages of the life cycle. Table 6 reports the frequencies with which households responded to Question 3 with that particular category, both overall and by age of the household’s head. (The denominators for these frequencies include *all* households, not just those that answered Question 2 affirmatively.) Between 13.3 and 17.7 percent of households anticipate a home purchase in the next five to ten years. As expected, these are concentrated among younger households. Anticipated educational expenses are somewhat more frequent, and these are concentrated among the middle aged. The overall frequency of anticipated medical expenses never exceeds 10 percent. In the 2001, 2004, and 2007 surveys this frequency is highest among those late in their working life, but one can hardly say that a typical older household is saving for medical care. This result validates our original decision to label saving in anticipation of medical expenses as precautionary. Overall though, Table 6 indicates that households tie anticipated expenditures to their life cycles.

3 The Model

Inspired by the above evidence, our quantitative model of middle-class consumption and savings decisions adds precautionary and term savings motivations to the impatient, borrowing-constrained household in [Campbell and Hercowitz \(2009\)](#). The precautionary motive arises from wage uncertainty, and the term-saving motive comes from a periodic expenditure with predetermined timing but endogenous size. The household lives forever and is impatient relative to the market rate of interest. In spite of impatience, the household saves in anticipation of the periodic expenditure.

reason is that the latter explicitly includes foreseen health costs. However, the results reported below in Table 6 imply that this cannot account for the entire discrepancy. We believe that the specific reference to “the next five to ten years” induces respondents to consider savings goals over a longer horizon.

Table 6: Frequency of Saving for a Specific Major Forecastable Expenditure by Age Group

Age Category	Home Purchase					Education					Medical Care				
	1995	1998	2001	2004	2007	1995	1998	2001	2004	2007	1995	1998	2001	2004	2007
All	15.5	17.7	17.1	15.5	13.3	18.6	19.9	17.8	19.2	17.1	7.6	5.8	5.4	5.9	6.8
25-29	28.3	33.5	24.0	29.5	35.1	11.8	18.5	11.1	16.3	13.7	5.7	5.3	2.5	5.1	4.3
30-34	25.2	28.1	29.0	21.2	14.4	14.7	16.9	16.9	14.9	13.3	9.5	7.1	6.5	2.6	5.2
35-39	16.9	19.0	22.6	16.1	16.4	27.0	26.8	20.5	22.1	23.4	6.3	7.9	4.7	5.6	4.8
40-44	8.3	15.3	14.8	11.8	11.5	24.5	29.4	26.6	27.3	21.6	7.7	6.1	6.0	3.3	4.0
45-49	9.4	15.4	11.2	12.7	8.5	26.9	19.1	23.1	26.4	25.3	7.5	5.8	3.4	5.7	7.5
50-54	8.9	5.3	12.6	10.4	11.0	13.4	19.2	15.7	15.5	15.5	8.4	3.8	7.0	6.0	8.1
55-59	11.9	6.1	6.4	11.3	5.0	7.1	6.4	7.7	11.8	9.3	7.9	2.0	6.4	11.3	11.8
60-64	5.9	3.4	6.1	7.3	3.0	4.9	2.2	2.6	6.2	6.7	9.5	6.0	10.1	14.3	10.2

This table reports the frequency of the three major forecastable expenses listed among households with some forecastable major expense for the Surveys of Consumer Finance in 1995, 1998, 2001, 2004, and 2007. The first row reports the frequencies for all households, and the remaining rows report the frequencies for households in the indicated 5-year age bins.

3.1 Primitives and Optimization

The model proceeds in discrete time, and we denote a point in time as a “year.” A single infinitely lived household values two goods, standard consumption and the special good. We denote the quantities of these consumed in year t with C_t and M_t . The utility function is

$$\sum_{t=0}^{\infty} \beta^t \left\{ \frac{C_t^{1-\sigma}}{1-\sigma} + \left((1 + \mu_t)^{1/\sigma} - 1 \right)^\sigma \frac{M_t^{1-\sigma}}{1-\sigma} \right\}, \quad (1)$$

with $0 < \beta < 1$ and $\sigma > 0$. Here, $\mu_t = \mu > 0$ every τ years and $\mu_t = 0$ at other times. This specification generates a periodic expenditure with exogenous timing and endogenous size.²⁰

The household is endowed with one unit of labor which it supplies inelastically at the wage rate W_t . Denote lump-sum taxes with T_t and net financial assets at the end of the previous year with A_t . The household’s budget constraint is

$$C_t + M_t = W_t - T_t + RA_t - A_{t+1}, \quad (2)$$

where R is the gross interest rate, assumed to be constant. We assume that $\beta R < 1$, so the household is impatient. In [Campbell and Hercowitz \(2009\)](#), we provide a general equilibrium environment in which such a low interest rate arises endogenously from trade with a more patient household.²¹

The household’s choices of all goods must satisfy nonnegativity constraints. Furthermore, the household faces the standard borrowing constraint

$$A_{t+1} \geq 0. \quad (3)$$

Given A_0 , the household chooses sequences of C_t , M_t and A_{t+1} to maximize its utility subject to the sequence of nonnegativity and budget constraints.

²⁰One of the two major anticipated expenses that we document above is the purchase of a home. In this case, we interpret the utility from consuming M_t as the discounted expected utility from the consumption flow. Adding other realistic aspects of home purchases into the model, like the good’s durability and mortgage credit, would add state variables to an already complicated problem; so we leave those extensions for future research.

²¹Our model omits one of the most prevalently cited savings motivations, retirement and estate. In the U.S., saving limited amounts towards retirement has tax advantages if the saver is willing to suffer penalties for withdrawal before a statutory retirement age. It is relatively straightforward to build such tax-advantaged retirement savings into the model if we abstract from earnings risk and assume that all households hit the statutory upper-bounds on retirement savings. That version of the model suggests that we measure income *net* of retirement savings contributions, as we did above. Including such savings vehicles in our model with earnings risk is much more challenging and lies beyond the scope of this paper.

Denote the Lagrange multipliers on the year t budget and borrowing constraints with Ψ_t and Γ_t . The first-order conditions for optimization are

$$\Psi_t = C_t^{-\sigma}, \quad (4)$$

$$\Gamma_t = \Psi_t - \beta R \Psi_{t+1}, \quad (5)$$

$$\Psi_t M_t^\sigma = \left((1 + \mu_t)^{1/\sigma} - 1 \right)^\sigma. \quad (6)$$

Without borrowing constraints, Ψ_t equals the marginal utility of lifetime resources. Here, it represents the marginal value of current resources. The multiplier Γ_t equals the marginal value of relaxing the borrowing constraint, which is the deviation from the standard Euler equation; Γ_t is zero when the borrowing constraint is slack. Because Ψ_t is always positive, the periodic expenditure M_t is positive when $\mu_t > 0$ and zero otherwise.²²

3.2 The Ergodic Distribution of Wealth and the MPC

Because of the periodic changes in preferences, the appropriate analogue of a steady state in this model is a non stochastic cycle: W_t and T_t are constant by assumption, and all of the household's choices follow a pattern that repeats itself every τ years. If we assume that households are uniformly distributed across points in such a cycle at any point in time, then we can calculate the cross sectional distribution of financial wealth and the MPC. The remainder of this section characterizes this ergodic distribution of wealth and the MPC analytically. These results verify the intuition given above that term saving makes wealth an indicator of anticipated liquidity constraints, so MPCs increase with wealth amongst households with positive wealth. They also serve as a foundation for understanding the next section's quantitative model which incorporates both term saving and precautionary saving.

Denote ordinary consumption and assets κ years after the most recent purchase of the special good in a non stochastic cycle with C^κ and A^κ .²³ From (4) and (5), the necessary

²²We can manipulate (4), (6), and the constraint that $C_t + M_t$ equals total consumption expenditures in year t to get $\Psi_t = (1 + \mu_t) (C_t + M_t)^{-\sigma}$. That is, μ_t has the interpretation of an increment in marginal utility for any given total consumption expenditure.

²³Our model has a deterministic asset cycle in common with the models of [Baumol \(1952\)](#) and [Tobin \(1956\)](#). Those models differ in key respects from ours. There, the length of the cycle is the key endogenous variable, while here it is exogenous. We focus on the link between the asset cycle and liquidity constraints, while those models focused on the link between assets and money demand.

conditions which a non stochastic cycle must satisfy are

$$\frac{C^{\kappa+1}}{C^\kappa} \geq (\beta R)^{1/\sigma} \text{ for } \kappa = 1, 2, \dots, \tau - 1, \text{ and} \quad (7)$$

$$\frac{C^1}{C^\tau} \geq (\beta R)^{1/\sigma}. \quad (8)$$

The corresponding budget constraints are

$$\begin{aligned} C^\kappa + A^{\kappa+1} &= W - T + RA^\kappa \text{ for } \kappa = 1, 2, \dots, \tau - 1, \\ (1 + \mu)^{1/\sigma} C^\tau + A^1 &= W - T + RA^\tau. \end{aligned}$$

This final budget constraint replaces the periodic expenditure with its optimal level derived from (4) and (6), $((1 + \mu)^{1/\sigma} - 1)C^\tau$. With these conditions defining a non stochastic cycle, we can characterize them with the following

Proposition 1 *There exists a unique non stochastic cycle. In it*

1. $C^1/C^\tau > (\beta R)^{1/\sigma}$, and
2. if $C^{\kappa+1}/C^\kappa > (\beta R)^{1/\sigma}$ and $\kappa \geq 2$, then $C^\kappa/C^{\kappa-1} > (\beta R)^{1/\sigma}$.

The appendix contains this proposition's short proof. Its first enumerated result says that the borrowing constraint binds in the cycle's final year, when the household consumes the special good. This fact is the analogue of the familiar result that an impatient household faces a binding borrowing constraint in a steady state. The second enumerated result says that if the borrowing constraint binds in some period before the special good is consumed, then it must bind in the previous period as well. Taken together, these results state that the periodic cycle always ends with the borrowing constraint binding while the household consumes the special good. Immediately afterwards, it might be binding for one or more years. If it ceases to bind, then the household accumulates wealth until the next opportunity to consume the special good.

[Zeldes \(1984\)](#) noted that a binding borrowing constraint in the future works like a terminal condition which shortens the effective planning horizon. The household's response to an unanticipated one-time increase in $W_t - T_t$ on the non stochastic cycle illustrates this. If the borrowing constraint binds in the year of the increase, then the MPC equals one as expected. If instead the borrowing constraint is slack then, the household allocates the increase in current income across consumption between the present year in the cycle, $\kappa < \tau$, and the next time the borrowing constraint binds. The resulting marginal propensity to consume

(Which can be easily calculated from the corresponding finite-horizon utility-maximization problem) is

$$MPC^\kappa = \left(\frac{1 - (\beta R^{1-\sigma})^{\frac{\tau-\kappa}{\sigma}}}{1 - (\beta R^{1-\sigma})^{\frac{1}{\sigma}}} + (\beta R^{1-\sigma})^{\frac{\tau-\kappa}{\sigma}} (1 + \mu)^{\frac{1}{\sigma}} \right)^{-1}.$$

Whether or not this MPC is “large” relative to that we expect from the permanent income theory of consumption depends on the importance of the special good for consumption. Intuitively, MPC^κ can be quite small if μ is so large that the household effectively only consumes the special good. To make this more precise, consider the marginal propensity to consume from the infinite-horizon utility-maximization problem with neither the special good nor borrowing constraints, $1 - (\beta R^{1-\sigma})^{\frac{1}{\sigma}}$. This will be less than MPC^κ if and only if

$$(1 + \mu)^{\frac{1}{\sigma}} < \frac{1}{1 - (\beta R^{1-\sigma})^{\frac{1}{\sigma}}}. \quad (9)$$

Reasonable calibrations of the model in which ordinary consumption account for the majority of expenditures satisfy (9) comfortably, so we hereafter assume that it holds good.

We began this paper highlighting the empirical failure of MPC s to substantially decline with observed household wealth. The next proposition shows that term saving can indeed account for this qualitatively. To see our model’s implications for these observations, we differentiate MPC^κ above with respect to κ . The upper bound for μ in (9) signs the derivative positively. Therefore, we conclude:

Proposition 2 *Set $\kappa \in 1, \dots, \tau - 2$. If μ , β , R , and σ satisfy (9) and $C^{\kappa+1}/C^\kappa = C^{\kappa+2}/C^{\kappa+1} = (\beta R)^{\frac{1}{\sigma}}$, then $A^\kappa < A^{\kappa+1}$ and $MPC^\kappa < MPC^{\kappa+1}$.*

Proposition 2 implies that if we sampled households from some distribution across the deterministic cycle, we would find that MPC_t covaries positively with A_t among households with assets. Overall, the MPC is a U-shaped function of wealth, attaining its highest value of one when beginning-of-period wealth is either zero or its maximum observed value (RA^τ).

4 Quantitative Analysis

In this section, we investigate the quantitative contribution of term savings to middle-class households’ MPCs by enriching the model with ongoing wage risk, calibrating its parameters, and calculating the MPCs to transitory income changes and balanced-budget tax experiments. Our addition of wage risk follows Meghir and Pistaferri (2004). Using annual PSID

observations, they estimate a stochastic process of household heads' log earnings that sums a random walk with a first-order moving average. The resulting process for W_t is

$$\begin{aligned}\ln W_t &= \ln W_t^P + \ln W_t^T, \\ \Delta \ln W_t^P &\sim N(0, 0.177^2), \\ \ln W_t^T &= \varepsilon_t + 0.2566\varepsilon_{t-1} \\ \varepsilon_t &\sim N(0, 0.173^2)\end{aligned}$$

Although they estimate several processes with heteroskedasticity, we focus on this homoskedastic process for the sake of simplicity. We assume that the household faces a four percent real rate of interest, so $R = 1.04$. Motivated by the phrasing of Question 2, we set τ to 10. Our calibration uses logarithmic preferences ($\sigma = 1$), but we have also calibrated the model given $\sigma = 1/2$, $\sigma = 3/2$, and $\sigma = 2$. The MPCs we report below are all within one percentage point of the analogous MPCs from these alternative calibrations. That is, the assumed value for σ has no impact on our results worth reporting. The remaining parameters to be determined are β and μ , which jointly govern the household's desired intertemporal allocation of consumption. We set these so that the median and 75th percentile of the distribution of wealth to current labor income in the model's ergodic distribution equal 0.14 and 0.46. These are the averages (across years) of the analogous medians and 75th percentiles calculated from the 1995, 1998, 2001, 2004, and 2007 cross-sectional waves of the SCF. Given the model's other parameters, this procedure selects $\beta = 0.8967$ and $\mu = 1.5859$.²⁴ With these values, the special good accounts for about 61 percent of total consumption expenditures in one of every ten years.

Figure 1 illustrates the qualitative implications of Proposition 2 with plots of the model's non stochastic cycle at the calibrated parameter values (holding W_t constant). In the year of the expenditure and for four years thereafter, the household chooses zero wealth, so its marginal propensity to consume in those years equals 100 percent. In the fifth year after the expenditure, saving begins, wealth begins to accumulate, and consumption begins to fall. Although the marginal propensity to consume when saving is far below 100 percent, it also greatly exceeds the permanent-income benchmark of the interest rate. Furthermore, the MPC increases as the expenditure approaches. Since wealth simultaneously increases, those

²⁴To solve the model, we first create its stationary representation by dividing C_t , M_t , and A_t by W_t^P . Our solution of this stationary model uses standard discrete state space dynamic programming techniques. We constrain A_{t+1} to lie on $\{0, 0.0001, 0.0002, \dots, 1.3, 1.3001, 1.3002, \dots, 4\}$. We approximate $\ln W_t^T$ with a nine-point Markov chain constructed from a three-point Gauss-Hermite approximation to a standard normal random variable. We use the same three-point approximation to model $\Delta \ln W_t^P$.

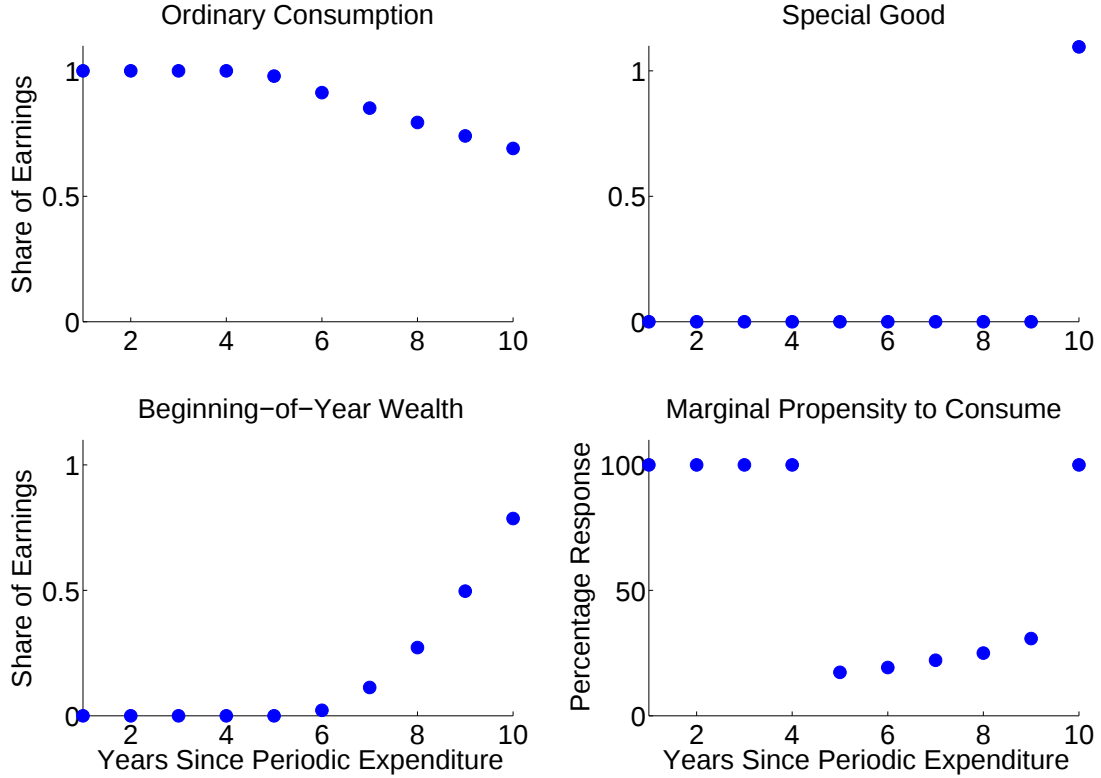


Figure 1: The Calibrated Model's Non Stochastic Cycle

saving households with the highest wealth also have the highest MPCs; just as predicted by Proposition 2.

Table 7 reports results from the full model with ongoing wage uncertainty. We begin with the model's ergodic distribution of households across wealth and earnings, both scaled by earnings' permanent component. For each point in the support, we calculate the household's responses to four changes in lump-sum transfers. In the first, each household receives a one-time transfer. This is *not* a balanced-budget experiment, but the next experiment balances the budget with a lump-sum tax in all subsequent years equal to the interest cost of perpetually servicing the government debt used to fund the initial transfer. The next two experiments extend the initial tax cut to three and five years and increase the following permanent tax increase accordingly. Each row reports the MPCs in each experiment's *first* year for the group of households with income to wealth ratios in 14 ranges. The first contains all households with exactly zero wealth (30 percent of the households), the second

		Marginal Propensities to Consume out of a			
$12A_t/W_t$	Frequency	One Year Transfer	One Year Tax Cut	Three Year Tax Cut	Five Year Tax Cut
0	30	53	51	82	93
(0,1]	15	35	32	64	86
(1,2]	8	26	24	59	81
(2,3]	8	25	22	59	79
(3,4]	6	24	22	59	78
(4,5]	5	26	24	61	75
(5,6]	4	31	29	64	75
(6,7]	4	37	36	67	75
(7,8]	3	46	44	71	77
(8,9]	3	51	50	74	79
(9,10]	3	58	57	78	81
(10,11]	2	63	62	80	83
(11,12]	2	66	65	82	84
13 or more	6	72	71	88	91
All Households	100	42	40	71	85

Table 7: Average MPCs from the Calibrated Model with Term Saving

contains households with positive wealth that is less than one month of its current earnings, households in the third group have wealth greater than or equal to one month's earnings but less than two month's earnings, etc. The table's column labeled "Frequency" shows that the distribution of the wealth to income ratio has a thick tail. The calibration ensures that its median value is 0.14, but its mean equals 0.28.

For the first experiment of a one-time transfer, the MPC of households with zero wealth equals 53 percent. Consistent with the intuition from a precautionary savings model, 43 percent of these households are actually accumulating wealth and so have MPCs below 100 percent. The MPC declines to 35 percent for households with between zero and one month of income in wealth, and then to 26 percent for households with wealth between one and two months' income. Thereafter, the MPC flattens out until it begins to rise for households with wealth between 5 and 6 months' earnings. For the 6 percent of households with wealth exceeding a full year of earnings, the MPC equals 72 percent.

		Marginal Propensities to Consume out of a			
12A/W	Frequency	One Year Transfer	One Year Tax Cut	Three Year Tax Cut	Five Year Tax Cut
0	16	52	49	85	93
(0,1]	23	40	37	72	87
(1,2]	15	38	35	67	84
(2,3]	12	28	24	58	78
(3,4]	10	24	20	53	74
(4,5]	7	23	19	51	72
(5,6]	5	22	18	48	69
(6,7]	3	21	17	45	67
(7,8]	2	19	16	43	64
(8,9]	2	18	15	41	62
(9,10]	1	18	14	39	60
(10,11]	1	17	13	37	58
(11,12]	1	17	13	36	56
13 or more	1	15	12	33	52
All Households	100	34	31	63	80

Table 8: Average MPCs from the Calibrated Model without Term Saving

The model without earnings risk suggested that how (and whether) a short-run windfall would be paid for with long-run tax increases are irrelevant for a household's present consumption response because of the effective shortening of the planning horizon. This more quantitatively relevant framework mimics this prediction: Permanently raising taxes to pay for the one-year tax cut reduces the MPCs very little. For those with no wealth, the MPC drops from 53 percent to 51 percent, and for those with wealth exceeding annual earnings it drops from 72 to 71 percent. Furthermore, the U-shaped relationship between the MPCs and household wealth remains unchanged. Extending the tax cuts to three and five years raises the MPCs and flattens them. For a five-year tax cut, the average MPC of households without wealth equals 93 percent. For those with wealth exceeding annual earnings, it equals 91 percent. Overall, these results suggest that the persistence of tax-induced increase in current income matters much more than how it is financed.

In our model, households face both precautionary motives and term motives for saving. To

illustrate the quantitative contributions of term saving to its results, we have also calibrated our model without term saving. For this, we set μ to zero and choose β so that the ergodic distribution’s median ratio of financial wealth to current income equals 0.14. The resulting value for β is 0.9303. The model’s other parameters all remain unchanged. Table 8 reports the ergodic distribution and MPCs from this alternative calibration. Unsurprisingly, removing term saving motives makes the wealth distribution’s right tail much thinner. Also as expected, the marginal propensities to consume *decline* with wealth. For the experiment with a one-year transfer, the MPC of households with no wealth is 52 percent, while the analogous MPC for household’s with wealth exceeding current annual earnings equals only 15 percent. The other experiments display a similarly dramatic decline of the MPC with wealth. Apparently, the model cannot come close to reproducing the invariance of the MPC to household wealth without term saving.

5 Concluding Remarks

In standard precautionary savings models, liquidity constraints disproportionately influence the consumption and savings decisions of households with low wealth. However, U.S. data indicate that marginal propensities to consume are high (relative to the permanent-income-hypothesis benchmark) and fail to decline with wealth. To bridge this gap between theory and data, we have incorporated saving towards a specific forecastable expense – term saving – into the standard precautionary savings model. In a deterministic model with only term saving, high wealth reflects an anticipated demand for liquidity rather than a liquidity surplus arising from past luck (as with precautionary saving). In our quantitative model with earnings risk, the resulting high MPCs for high-wealth households flatten what would otherwise be a declining relationship between wealth and the MPC and thereby bring the model into better alignment with the data.

The principal lesson we take away from this for future work regards the pervasiveness of liquidity-constrained behavior across the middle class. Identifying “liquidity constraints” with violations of the standard Euler equation lead one to conclude that only a minority of households are liquidity constrained. The standard precautionary savings model reinforces this view, because it predicts that the MPC should sharply decline with wealth. However, term-saving motives can create *anticipated* liquidity constraints, which induce high MPCs for households with high wealth. The empirical pervasiveness of term savings motives, the failure of measured MPCs to decline with wealth, and the success of the term savings model

at replicating the wealth-MPC relationship lead us to believe that liquidity constraints are very salient for most middle class households' consumption and savings choices even if they are not currently binding.

A Proofs for Section 3.2

Lemma 3 *The borrowing constraint must bind at least once in any non stochastic cycle.*

Proof. Suppose otherwise. then from (7) and (8), we can conclude that

$$\frac{C^2}{C^1} \frac{C^3}{C^2} \cdots \frac{C^\tau}{C^{\tau-1}} \frac{C^1}{C^\tau} = (\beta R)^{\frac{\tau}{\sigma}}.$$

But this is impossible, because the left-hand side equals one while the right hand side is strictly less than one. ■

Lemma 4 *Suppose that the borrowing constraint is slack in one year of a non stochastic cycle. Then either the borrowing constraint is slack in the cycle's next year or the cycle's next year is τ .*

Proof. Let κ denote a year in which the borrowing constraint is currently slack but which is followed by a year in which it binds. By construction, κ caps a spell of years over which the borrowing constraint has been slack. Denote the number of years in this spell with j . By definition, beginning-of-period wealth at the beginning of such a spell is zero. Therefore, consumption in that year cannot exceed $W - T$. Since the borrowing constraint is slack throughout the entire spell, this in turn bounds ordinary consumption in the year after κ from above with $(W - T)(\beta R)^{\frac{j}{\sigma}} < (W - T)$. However, *total* consumption expenditures in that year must weakly exceed $W - T$, because the borrowing constraint binds in that year (by assumption) and so consumption expenditures must equal total earnings summed with any accumulated wealth. If $\kappa \neq \tau - 1$, then this is impossible because total consumption expenditures equals ordinary consumption expenditures. Therefore, $\kappa = \tau - 1$. ■

Proof of Proposition 1. Lemmas 3 and 4 together imply that the borrowing constraint binds in the final year (τ) of a non stochastic cycle. Therefore, a non stochastic cycle corresponds to a solution of the finite-horizon utility maximization problem that starts in period 1 with zero assets and ends in period τ with the household consuming all available resources. Since this problem maximizes a strictly concave objective over a convex constraint set, it has a unique solution. This guarantees existence and uniqueness of a non stochastic cycle. With this established, applying Lemmas 3 and 4 again yield the proposition's first numbered conclusion, and the second numbered conclusion is a consequence of Lemma 4 alone. ■

Proof of Proposition 2. Establishing that $A^\kappa \leq A^{\kappa+1}$ proceeds inductively. First, suppose that $A^\kappa = 0$. That is, κ is the periodic cycle's first year in which the borrowing constraint is slack. The borrowing constraint alone then gives us that $A^{\kappa+1} \geq 0 = A^\kappa$. Next, suppose that $A^\kappa > 0$ and that $A^\kappa \geq A^{\kappa-1}$. Since the borrowing constraint is slack in year $\kappa - 1$, we know that $C^\kappa = (\beta R)^{\frac{1}{\sigma}} C^{\kappa-1} < C^{\kappa-1}$. Therefore, we have that

$$A^{\kappa+1} - A^\kappa = R(A^\kappa - A^{\kappa-1}) - (C^\kappa - C^{\kappa-1}) > 0.$$

To prove that $MPC^\kappa < MPC^{\kappa+1}$, differentiate the expression for MPC^κ in the text with respect to κ .

$$\frac{\partial MPC^\kappa}{\partial \kappa} = (MPC^\kappa)^2 \ln(\beta R^{1-\sigma}) \frac{1}{\sigma} \left((1 + \mu)^{\frac{1}{\sigma}} - \frac{1}{1 - (\beta R^{1-\sigma})^{\frac{1}{\sigma}}} \right)$$

This is positive if and only if (9) holds good. In this case, integrating from κ to $\kappa + 1$ gives us the result that $MPC^\kappa < MPC^{\kappa+1}$. ■

References

- Baumol, W. J. (1952). The Transactions Demand for Cash: An Inventory Theoretic Approach. *Quarterly Journal of Economics* 66(4), 545–556.
- Campbell, J. R. and Z. Hercowitz (2009). Welfare Implications of the Transition to High Household Debt. *Journal of Monetary Economics* 56(1), 1–16.
- Campbell, J. Y. and N. G. Mankiw (1989). Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence. In *NBER Macroeconomics Annual*, pp. 185–216.
- Carroll, C. D. and M. S. Kimball (1996). On the Concavity of the Consumption Function. *Econometrica* 64(4), 981–992.
- Deaton, A. S. (1991, September). Saving and Liquidity Constraints. *Econometrica* 59(5), 1221–1248.
- Hall, R. E. (1978, December). Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy* 86(6), 971–987.
- Hall, R. E. and F. S. Mishkin (1982, March). The sensitivity of consumption to transitory income: Estimates from panel data on households. *Econometrica* 50(2), 461–481.
- Hayashi, F. (1987). Tests for liquidity constraints: a critical survey and some new observations. In T. F. Bewley (Ed.), *Advances in Econometrics: Fifth World Congress*, pp. 91–120. Cambridge University Press.
- Hsieh, C.-T. (2003, March). Do Consumers React to Anticipated Income Changes? Evidence from the Alaska Permanent Fund. *American Economic Review* 93(1), 397–405.
- Jappelli, T. (1990, February). Who is Credit Constrained in the U.S. Economy? *Quarterly Journal of Economics* 105(1), 219–234.
- Jappelli, T. and L. Pistaferri (2010, September). The Consumption Response to Income Changes. *Annual Review of Economics* 2(1), 479–506.
- Johnson, D. S., J. A. Parker, and N. S. Souleles (2006, December). Household Expenditure and the Income Tax Rebates of 2001. *American Economic Review* 96(5), 1589–1610.
- Kaplan, G. and G. L. Violante (2014). A Model of the Consumption Response to Fiscal Stimulus Payments. *Econometrica* 82(4), 1199–1239.

- Kennickell, A. B. and A. Lusardi (2005, December). Disentangling the Importance of the Precautionary Saving Motive. Technical report.
- Mankiw, N. G. (2000, June). The Savers–Spenders Theory of Fiscal Policy. *American Economic Review* 90(2), 120–125.
- Meghir, C. and L. Pistaferri (2004, January). Income Variance Dynamics and Heterogeneity. *Econometrica* 72(1), 1–32.
- Parker, J. (1999, September). The Reaction of Household Consumption to Predictable Changes in Social Security Taxes. *American Economic Review* 89(4), 959–973.
- Parker, J., N. S. Souleles, D. S. Johnson, and R. McClelland (2013, October). Consumer Spending and the Economic Stimulus Payments of 2008. *American Economic Review* 103(6), 2530–2553.
- Sahm, C. R., M. D. Shapiro, and J. Slemrod (2010). Household Response to the 2008 Tax Rebate: Survey Evidence and Aggregate Implications. *Tax Policy and the Economy* 24, 69–110.
- Shapiro, M. D. and J. Slemrod (2003, March). Consumer Response to Tax Rebates. *American Economic Review* 93(1), 381–396.
- Shapiro, M. D. and J. Slemrod (2009, May). Did the 2008 Tax Rebates Stimulate Spending? *American Economic Review* 99(2), 374–379.
- Souleles, N. S. (1999, September). The Response of Household Consumption to Income Tax Refunds. *American Economic Review* 89(4), 947–958.
- Souleles, N. S. (2002, July). Consumer response to the Reagan tax cuts. *Journal of Public Economics* 85(1), 99–120.
- Tobin, J. (1956). The Interest-Elasticity of Transactions Demand for Cash. *Review of Economics and Statistics* 38(3), 241–247.
- Zeldes, S. P. (1984, July). *Optimal Consumption with Stochastic Income: Deviations from Certainty Equivalence*. Ph. D. thesis, MIT.
- Zeldes, S. P. (1989, April). Consumption and Liquidity Constraints: An Empirical Investigation. *Journal of Political Economy* 97(2), 205–346.