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Abstract

Existing evidence from the U.S. middle class shows that their MPCs out of tax rebates greatly exceed the PIH's prediction and are weakly related to household liquid assets. In contrast, precautionary savings models predict that MPCs decrease with wealth. We bridge this gap with term saving – households' savings for large foreseen expenditures – which we document to be empirically widespread. Once incorporated into a calibrated precautionary savings model, term saving generates realistic MPCs: The approaching expenditure simultaneously motivates asset accumulation and raises MPCs by shortening the effective planning horizon. We conclude that liquidity constraints substantially influence middle-class consumption choices.

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1 Introduction

Liquidity constraints of middle-class households are of key importance for a host of macroeconomic policy questions, such as the size of the fiscal multiplier from tax cuts and the nature of monetary policy propagation. However, it might seem implausible that middle class households face liquidity constraints; because they typically hold liquid assets. By definition, these can be converted immediately into consumption. Evidence from consumption responses to tax changes in the U.S. casts doubt on this view. For example, Sahm, Shapiro, and Slemrod (2010) found that households that own publicly-traded stocks reported spending no less and probably more out the one-time 2008 Economic Stimulus Payments than did poorer and more plausibly liquidity-constrained households. That is, there is evidence that middle-class households with liquid wealth can act as if 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 one-time 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 foreseen 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 household-level 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.

Term saving does not overturn the basic notion that high MPCs reflect liquidity constraints. However, it does bring into question the common view that only individuals with little liquid wealth can be liquidity constrained. With term saving, an expectation that liquid wealth will be low in the *future* can induce households with currently substantial liquid assets to display high MPCs today. Such expectations arise naturally when households foresee an approaching large expenditure.

For our empirical analysis, we assign households to the middle class if they are not in the top five percentiles of the wealth distribution, had after-tax labor income above the poverty line, and did not receive aid from the Supplemental Nutrition Assistance Program (food stamps) 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 embeds these features within the standard infinitely-lived household. We begin by developing intuition in a deterministic environment. The household has utility from ordinary consumption and from a special good. Ordinary consumption always increases utility, but the household has a taste for the special good only at equally-spaced points in time. The taste for the special good motivates 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 its consumption starkly capture this requirement.

In this deterministic model, the household eventually settles into a cycle. At its beginning, much 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 again. 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, an expectation of future liquidity constraints effectively shortens the horizon over which a currently unconstrained household optimizes and thereby generates 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 currently saving.

The quantitative assessment of term savings requires us to add earnings risk to the analysis not only for the sake of realism but also 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 greatly exceeds that predicted by the PIH and 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 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. Other 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 responds negatively to lagged disposable income. Because the analogous estimated responses for households with high wealth are weaker and sometimes statistically insignificant, Zeldes interpreted his results as evidence that low-wealth households are liquidity constrained. 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. Because the motivations for term saving we highlight (the purchase of a first home and the payment of college tuition) are plausibly more intense in the U.S. than abroad, we concentrate in this paper on evidence from the U.S. only.

Hayashi (1987) noted that these studies have only limited implications for the MPCs from temporary income 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, even households with considerable liquid wealth.

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 or retirement accounts, and a low-return liquid asset. They emphasized that if the difference between the two assets' returns is large enough, then those

[1] See that article's penultimate sentence for the full context of this quote.

who have converted all of their liquid assets into illiquid assets will have high MPCs in spite of having substantial illiquid wealth. Our model of term saving shows that households currently saving for a foreseen expenditure will also have high MPCs even though they have substantial *liquid* wealth.

As in this paper, Chetty and Szeidl (2007) examined the interplay between two consumption goods, one of which is subject to dynamic constraints. In their model, households continuously consume the special good but adjust its purchases infrequently to avoid paying fixed adjustment costs. Their special good generates non-concavities in the utility for wealth. Their household displays risk aversion towards small gambles because only ordinary consumption can adjust in response to them. However, the marginal utility of wealth jumps when adjustment of the special good occurs, so their households could benefit from large gambles, such as state lottery tickets. In contrast, households in our model *purchase* the special good infrequently. While we account for risk aversion in our quantitative analysis, the infrequently-purchased special good has no novel impact on the household's risk preferences. Instead, we focus on the implications of infrequent, large, and forecastable special-good purchases for the sensitivity of consumption to tax-induced changes to disposable income.

The remainder of this paper proceeds as follows. In the next section, we review existing evidence about the marginal propensity to consume out of tax rebates in the U.S. and document the prevalence of precautionary and term savings with the SCF. Section 3 develops the deterministic 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 Evidence

This section reviews the evidence on consumption and savings that motivates our exploration of middle-class liquidity constraints. We begin with a review of existing empirical analyses 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 Evidence on MPCs

Changes in tax law provide rich opportunities for the empirical investigation of consumption choices in the context of economically significant, policy relevant, and plausibly exogenous changes to household income.

Shapiro and Slemrod (2003, 2009), and Sahm, Shapiro, and Slemrod (2010) provided evidence on households' consumption responses 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' uses of these rebated funds as well as their expectations about future government spending and taxes. They found that 22 percent of respondents reported spending most of the rebate, while the rest said they would either reduce their debts or increase their savings. We follow Shapiro and Slemrod by thinking of the time horizon for this adjustment as one year.[2]

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 consumption response; but Shapiro and Slemrod found no connection between a respondent's views on future taxes and her reported propensity to mostly spend the rebate.[3] 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 reported propensity to spend.[4]

One theoretical justification for large MPCs out of tax rebates 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 wealth. Shapiro and Slemrod tabulated the reported propensities to mostly spend across different households based on their ownership of stocks, either in retirement accounts, mutual funds, or brokerage accounts. They found that the spending fraction *increases* with stock ownership, with exceptions for the highest bracket and that with zero-assets.[5]

Shapiro and Slemrod (2009) used the same survey instrument and methodology to mea-

[2] Shapiro and Slemrod (2003, page 383). Given that the main question includes "Thinking about your financial situation this year, will the tax rebate lead you mostly to...", the time frame may be thought of as one year.

[3] See the lines below "Size of future tax cuts" in their Table 5.

[4] See the lines below "Impact of tax cut on government spending" in their Table 5.

[5] See the lines under "Stock" in their Table 2. Shapiro and Slemrod report in their 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.

sure households' propensities to spend the obviously temporary Economic Stimulus Payments (ESP's) of 2008. It turned out that the fraction of respondents who report mostly spending their ESP's is nearly identical to that from the 2001 rebate checks, 20 percent. Sahm, Shapiro, and Slemrod (2010) found a dependence of the Mostly-Spend rate on the household's wealth in stocks similar to that from the 2001 tax rebates. 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 substantial fractions of both low-wealth and high-wealth households reported mostly spending their 2001 tax rebates and 2008 ESP's.

The data for all these studies come from the Michigan Survey of Consumers. Parker and Souleles (2017) performed similar surveys with supplementary questions attached to the Consumer Expenditure Survey (CEX) and the Nielson Consumer Panel (NCP), and found similar results for the 2008 ESPs. They divided the CEX respondents by liquid assets using a threshold of $2000, and found that 29 percent of those with low liquid assets reported mostly spending their ESPs, while for those with high liquid assets the corresponding percentage is 37. For the NCP, the liquid assets threshold was two months of income, and the percentages of those reporting spending most of the rebate were 17 for those below the threshold and 21 for those above.

Parker and Souleles (2017) label the consumption responses to survey questions *reported preference* estimates. In their taxonomy, more traditional econometric estimates which use plausibly exogenous variation in tax rebates to identify consumption responses from expenditure data are *revealed preference* estimates.

Revealed preference estimates measure households' responses to the *receipt* of tax rebates, so Kaplan and Violante (2014) labeled such estimates *rebate coefficients*. The MPC equals the rebate coefficient summed with any consumption response between the *announcement* and the tax cut itself. In our theoretical analysis, we address the MPC as a whole, i.e., we deal with case of the announcement and the actual receipt occurring during the same time period—which we define as a year.

Souleles (1999) estimated rebate coefficients using individual income tax refunds using CEX data. The author split the sample into low and high wealth households based on the ratio of liquid wealth to earnings. He found that both food purchases and Lusardi's (1996) strictly nondurable consumption respond substantially to tax rebates only for households with low wealth to earnings ratios. However, the measured response of total consumption is

	2001 Tax Rebates		2008 Economic Stimulus Payments	
Stock Ownership Class	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, Shapiro, and Slemrod (2010)

only economically and statistically significant for households with high wealth to earnings.[6] Those results imply a substantial response of high-wealth households' purchases of durable goods to their tax rebates.[7] Reflecting on these results, he wrote

> Insofar as a relatively large response in nondurables by those with little wealth is indicative of liquidity constraints, these results constitute evidence that such constraints are important. On the other hand, the response in durables by those with substantial liquid assets requires a different explanation. While spending on durables is in part a form of saving, the timing of the spending remains puzzling: liquid households need not tie their durables purchases to the arrival of a refund

[6]See his Table 4.

[7]In a related paper, Parker (1999) examined consumption responses to predictable changes in Social Security tax withholding using CEX data—which are in principle similar to rebate coefficients. His identification combined variation across households hitting the Social Security tax cap at different times with variation across time from statutory tax rate changes. He used financial asset data in the CEX to divide his sample into "Low asset ratio" and "High asset ratio" groups. Those in the former have less than one month of earnings in financial assets. The estimated elasticity for high asset ratio households equals 0.83, with a standard error of 0.35. The estimate from the low asset ratio group equals 0.51 with a standard error of 0.64. These large standard errors do not arise from working with a small sample. There are 33,795 observations from low asset ratio households and 29,460 observations from high asset ratio households. The author concludes that "There is little evidence that the Euler equation failure is concentrated among households with the fewest assets." (Page 968).

check. (Pages 953-954)

Souleles (2002) provided a perspective on rebate coefficients from persistent tax changes with evidence from the Reagan tax cuts of the early 1980s. These were implemented in three stages, the last two of which were well after their announcement. He estimated responses of nondurable consumption to the tax cuts of 80 to 90 cents per dollar using CEX data.[8] When he split the sample by liquid wealth relative to earnings, the consumption responses of households in the bottom quartile were within 15 cents of their counterparts in the top three quartiles. Furthermore, these differences were statistically insignificant.[9]

In a pair of articles, Johnson, Parker, and Souleles (2006) and Parker, Souleles, Johnson, and McClelland (2013) estimated monthly rebate coefficients from the 2001 and 2008 tax experiments using questions appended to the CEX that asked when the household received the disbursed funds. The Treasury randomized this timing based on the last two digits of the recipient's Social Security number, so the effect of *receiving* the funds on current consumption can be estimated without substantial endogeneity concerns.

Studying the 2001 tax cut, Johnson, Parker, and Souleles aggregated their monthly estimates into a one-quarter rebate coefficient for nondurable consumption of 0.462 with a standard error of 0.173.[10] They sorted their sample into three groups by liquid assets. Households in their low-assets group spent much more than those in the middle-assets group, but those with the highest level of assets also spent more than those in the middle.[11] For the 2008 ESPs, Parker, Souleles, Johnson, and McClelland measured quarterly rebate coefficients for nondurable goods and all consumption of 0.128 and 0.523. Only the latter is statistically significant.[12] When they sorted their sample by liquid assets, the resulting rebate coefficients were statistically indistinguishable from each other.[13] We conclude that the CEX-based estimates of rebate coefficients greatly exceed the predictions of the PIH for MPCs and are weakly related to households' liquid assets.

In a complementary analysis, Broda and Parker (2014) estimated rebate coefficients for the 2008 ESPs using weekly household expenditure data from the NCP augmented with survey data on the timing of the ESP's receipt and available household liquidity. NCP participants use barcode scanners and purchase receipts to report their spending on consumer

[8]See the row labelled "$d(withholding)_{t+1}$" in his Table 2.

[9]See the first two rows of his Table 4.

[10]See the first row and final column of their Table 3.

[11]See their Table 5.

[12]See the third row of their Table 2.

[13]See their Table 6.

package goods at a daily frequency. As the authors note, the data cover only a small portion of personal consumption expenditures, mostly those goods which retailers track using UPC codes. The NCP data's limited expenditure coverage on consumer package goods means that these estimates do not embody expenditures on infrequently purchased items. Nevertheless, the data reveal a statistically-significant response of these expenditures to ESP receipt. The estimated MPC for spending during the four weeks following ESP receipt is between 3 and 4 percent. Using three distinct methodologies to extrapolate from spending on consumer packaged goods to all personal consumption expenditures, the authors estimate MPCs from 0.40 to 0.65.[14]

The paper's penultimate section estimates MPCs separately for "low" and "sufficient" liquid wealth households, based on households' responses to the survey question used by Parker and Souleles (2017) mentioned above. Broda and Parker found that both low-wealth and sufficient-wealth households display statistically significant responses in the month of receipt. However, the response of low-wealth households is nearly four times as large as that of sufficient-wealth households. Since the samples are independent, we can calculate a t-statistic for the difference. This equals $(8.56 - 2.24)/\sqrt{1.34^2 + 1.00^2} = 3.78$.[15] Thus, the immediate responses of package goods consumption to the ESPs are disproportionately concentrated within low-wealth households. However, even households with sufficient wealth respond statistically significantly (t-statistic $= 2.24$) to the ESP receipt.[16]

Overall, both high-wealth and low-wealth households have large rebate coefficients. Since high-wealth households do not *need* to borrow in order to smooth consumption between a tax rebate's announcement and its implementation, we interpret these estimates as consistent with some inattention to fiscal policy announcements. Hsieh (2003) provides evidence that this inattention decreases as the tax rebate increases. He used data from Alaskan households to estimate rebate coefficients for foreseen tax refunds and for much larger annual dividend payments from the Alaska Permanent Fund (received in the fourth quarter of the year). He found that the rebate coefficient from the tax refunds is positive and comparable to that estimated for the whole United States by Souleles (1999), but the rebate coefficient from the Permanent Fund payment was close to zero. He concluded that

[14]See the first lines of their Table 5's Panels A and B.

[15]This calculation is based upon Panel A of Table 8. If we instead use that table's Panel B, the analogous t-statistic equals 2.84.

[16]Although the measured response of 2.24 cents per dollar received might appear to be small, this measures only expenditures on consumer packaged goods. These account for approximately ten percent of total consumption expenditures.

> This evidence suggests that households will take anticipated income changes into account in their consumption decisions when the income changes are large, regular, and easy to predict, but will not do so when they are small and irregular. (Hsieh, 2003, page 397)

This evidence leads us to believe that household inattention to policy announcements underlies the substantial estimated rebate coefficients for households with financial wealth. That is, the relevant timing of the policy change, from the household's perspective, is the moment of the tax rebate's receipt; and the measured rebate coefficient *equals* the relevant MPC.

In summary, the evidence surveyed above indicates that both high-wealth and low-wealth households' total consumption spending, either as tabulated by the CEX or as implied by survey questionnaires, react strongly to tax rebates. By definition, households who live hand-to-mouth have few assets and display high MPCs. Similarly, a temporarily asset-poor household facing a borrowing constraint will consume all of a marginal increase in current cash-on-hand. Households *with* liquid wealth can insulate consumption from such a temporary income fluctuation by saving or dissaving, so the size of their reported MPCs and revealed rebate coefficients presents a puzzle vis a vis the permanent income hypothesis.

One potential explanation for high MPCs among middle-class households with liquid wealth is that they base their consumption and saving decisions on "rules of thumb." Shapiro and Slemrod (2003) investigated this possibility by sorting their 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 write

> 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 Hsieh's (2003) evidence suggests that predictions of behavioral economics can illuminate households' responses to fiscal policy shocks, Shapiro and Slemrod's (2003) results do not support one of the simplest such behavioral models. Although behavioral economics clearly can contribute to understanding households' MPCs, we believe that a baseline explanation for the relationship between MPCs and liquid wealth based on optimizing behavior can be equally enlightening.

2.2 Term Saving and Precautionary Saving

We put forward an explanation for high MPCs among wealthy middle-class households that relies on saving to finance foreseen large expenditures. Before proceeding with its theoretical development, we present here evidence on the importance of such expenditures for 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. Unfortunately, the more recent 2010, 2013 and 2016 SCF waves omit a key variable, the household's Adjusted Gross Income, that we use to measure its federal income tax paid.

The SCFs' 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 Supplemental Nutrition Assistance Program payments 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. 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.

We compute after-tax labor income as pre-tax labor income less income and social insurance taxes as well as IRA contributions.[17] We elaborate on our treatment of IRA contribu-

[17] More specifically, to compute the household's after-tax labor income we calculated an average tax rate using 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 of the household's head and his or her spouse. The SCF includes no information on state of residence, so we make no attempt to estimate state income taxes. We assume that each worker with an IRA account that is eligible to contribute to it makes the maximum possible contribution.

tions below in Footnote 23.

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. The second 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. 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 2007, the overall averages are substantially lower, 43.7 percent and 46.1 percent.[18] 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.

2.2.2 Reasons for Saving

We begin exploring the quantitative importance of 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.

[18] Since 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 stock-based mutual funds from financial wealth. The results (unreported here) confirm that excluding equities smooths this ratio's evolution.

	SCF Survey Year				
	1995	1998	2001	2004	2007
Households	99.0	102.5	106.5	112.1	116.1
without imputed variables,	97.0	100.3	103.5	109.9	114.5
& with $25 \leq \text{age} \leq 64$,	71.3	74.4	76.3	80.4	84.9
& that received no SNAP,	63.9	68.8	71.7	74.3	76.5
& with income > poverty line,	54.2	59.2	61.5	62.5	64.3
& with wealth < 95%, and	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

Year	Full Sample	Deciles 1	2	3	4	5	6	7	8	9	10
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

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

Note: Each cell reports a weighted average of non retirement 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 second column uses the entire sample, while the remaining columns use observations grouped by deciles of this ratio. Financial wealth equals 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.

Both Retirement and Estate had distinct entries on the list of answers, although the Estate answer included inter vivos transfers. Following Kennickell and Lusardi (2004), 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,

	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

- 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 of 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. Overall, the data indicate that saving for an anticipated expenditure is widespread and at least as salient for middle-class SCF respondents as precautionary saving.

2.2.3 A Closer Look at Term Saving

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?*

	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

Note that this question explicitly references health care costs, which we counted above as a motive for precautionary savings. However, 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. We have also tabulated the answers to these two savings questions by the wealth deciles used in Table 3. The fraction of households reporting a foreseen expense is nearly constant across wealth deciles, while the fraction reporting that they are currently saving for the expense rises with wealth. Therefore, the data do not reject the possibility that term savings substantially influence the wealthiest middle-class households.

[19] One might wonder why many more households report anticipated expenditures when responding to Question 2 than report such expenses as a motive for saving in their answers to Question 1. One reason might be that Question 1 explicitly includes foreseen health costs. Another reason might be that the specific reference to "the next five to ten years" induces respondents to consider savings goals over a longer horizon.

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, 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 saving motivations to the impatient, borrowing-constrained household in Campbell and Hercowitz (2009). The precautionary motive arises from earnings uncertainty, and the term-saving motive comes from a periodic expenditure with predetermined timing but endogenous size. The household represents an infinitely-lived dynasty that is impatient relative to the market rate of interest. In spite of impatience, the household saves in anticipation of the periodic expenditure.

This is an analysis of a household's choices. Before proceeding, it is useful to view the model household within our vision of the economy as a whole. We conceive of the public as being composed of households, each with one of three rates of time preference, low, intermediate, and high. In the deterministic steady state, the interest rate equals the low rate of time preference. The other two groups endogenously become "impatient" since their rate of time preference is higher than the interest rate. Correspondingly, households with the low rate of time preference become the "patient" and the economy's wealthy. In this paper, we focus on households with the intermediate rate of time preference, which we describe as the middle class. Although they are impatient, they save for big and infrequent expenditures such as a house and college tuition. We do not include those with the high rate of time

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

	Home Purchase					Education					Medical Care				
Age Category	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	8.3	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	5.6	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	7.8	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	8.9	6.5	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	8.0	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	9.7	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 foreseen expenses listed among households with some foreseen 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.

preference in the model—which are thought to be too impatient to save even for such goods. These individuals become the poor.[20]

3.1 Primitives and Optimization

The model proceeds in discrete time, and we think of a point in time as a year. We assume that both the announcement and the actual rebate occur during the year, so we focus on the entire MPC. That is, we presume that any behavioral considerations which make the rebate coefficient differ from the MPC do not influence substantially consumption and savings decisions at an annual frequency.

The 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

$$\sum_{t=0}^{\infty} \beta^t \left(\ln C_t + \mu_t \ln M_t \right), \tag{1}$$

with $0 < \beta < 1$.[21] 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.[22] The endogenous size generates a positively-sloped Engel curve for the special expenditure. This seems realistic for our two main examples, housing and college. The fixed timing is the simplest possible example of a hazard for the special expenditure that increases since its last occurrence. To us, this seems to be a reasonable approximation for college education; but it is an admittedly stark representation of the link between household age and the purchase of a home. However, the model's simplicity allows us to stress saving for anticipated large expenditures over households' fine tuning these purchases timing.

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

[20] We carry out a general equilibrium analysis with two types of time preference (corresponding to the "low" and "intermediate" above) in Campbell and Hercowitz (2009).

[21] This is a special case of the more general utility function

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

with $\sigma > 0$. We chose the simpler logarithmic formulation ($\sigma = 1$) given that the alternative values $\sigma = 1/2$ and $\sigma = 2$ produced very similar results to those reported below in Section 4.

[22] We interpret the utility from consuming M_t as the discounted expected future benefits from this expenditure.

previous year with A_t. The household's budget constraint is

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

where R is the gross interest rate, assumed to be constant.[23] Consistently with our focus on middle-class households, who are impatient, we assume that $\beta R < 1$. The household's choices of all goods must satisfy nonnegativity constraints. Furthermore, the household faces the standard borrowing constraint

$$A_{t+1} \geq 0. \tag{3}$$

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

$$\Psi_t = 1/C_t, \tag{4}$$

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

$$\Psi_t M_t = \mu_t. \tag{6}$$

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.[24]

[23] Our 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 and wealth *net* of retirement savings contributions and the savings themselves, 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.

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

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 deterministic cycle: W_t and T_t are assumed to be constant, and all of the household's choices follow a pattern that repeats itself every τ years. If we assume that households are uniformly distributed over the 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 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 deterministic cycle with C^{κ} and A^{κ}.[25] From (4) and (5), the necessary conditions which a deterministic cycle must satisfy are

$$\frac{C^{\kappa+1}}{C^{\kappa}} \geq \beta R \text{ for } \kappa = 1, 2, \ldots, \tau - 1, \text{ and} \tag{7}$$

$$\frac{C^{1}}{C^{\tau}} \geq \beta R. \tag{8}$$

The corresponding budget constraints are

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

This final form of the budget constraint replaces the periodic expenditure with its optimal level derived from (4) and (6), μC^{τ}. With these conditions, we can characterize deterministic cycles with the following

Proposition 1 *There exists a unique deterministic cycle. In it*

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

Appendix B 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

[25] Our 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.

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.[26]

Zeldes (1984) noted that a binding borrowing constraint in the future works like a terminal condition which shortens the effective planning horizon. If the borrowing constraint binds in the year of a temporary increase in after-tax income, 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

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

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, $1-\beta$. This will be less than MPC^{κ} if and only if

$$1+\mu < \frac{1}{1-\beta}. \tag{9}$$

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

Figure 1 plots the model's deterministic cycle using the calibrated parameter values reported below in Section 4. 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 and the marginal propensity

[26]This household is occasionally constrained. Households that are *always* constrained satisfy our definition of the poor, and our theoretical analysis does not consider their behavior.

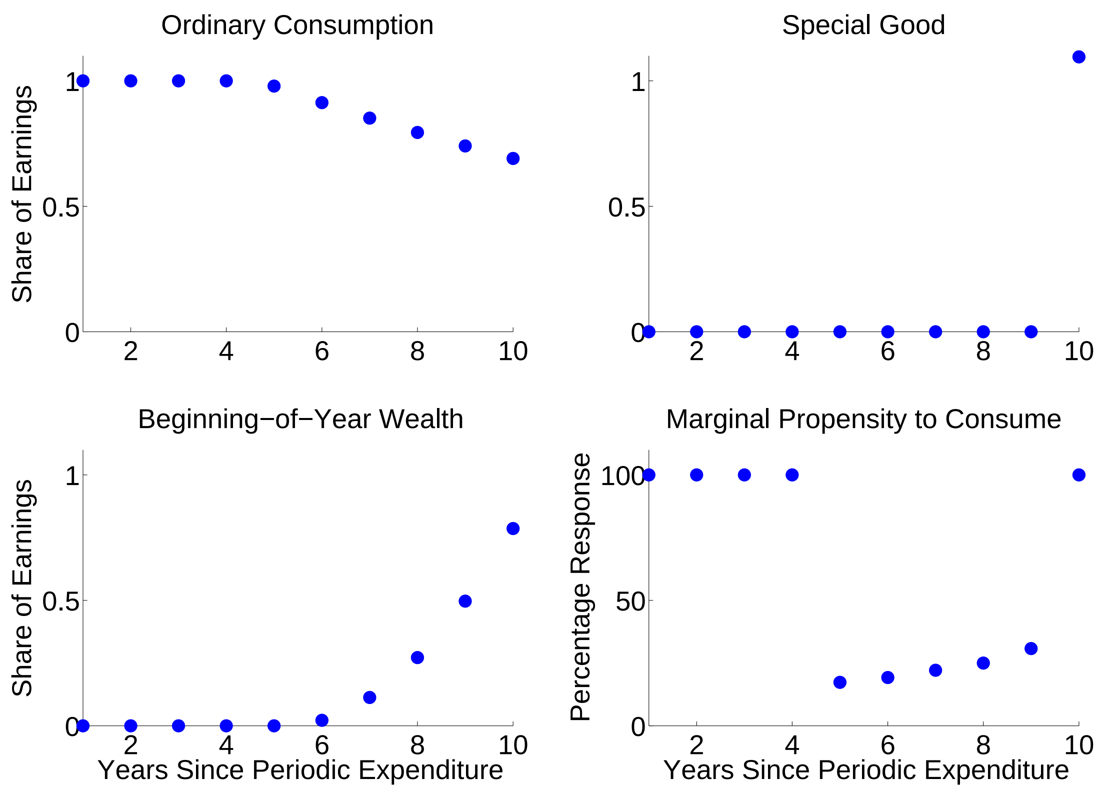

Figure 1: The Calibrated Model's Deterministic Cycle

to consume falls. The MPC and the beginning-of-year wealth increase together as the expenditure approaches. When the household consumes the special good, beginning-of-period wealth is at its maximum while the MPC equals 100 percent.[27]

The model's borrowing constraint contributes to our results in two ways. First, it prevents the households' impatience from leading them into debt immiseration. Second, it induces them to finance a forthcoming special expenditure with saving. It is worth considering how our results would change if households could borrow, but at a penalty rate $\bar{R} > \beta^{-1}$. Clearly, such a high rate is enough to keep households out of ever-increasing debt. The possibility of borrowing might lead households to finance some or all of the special expenditure with debt.

[27]Since much of the expenditure during this period is on the special good, a survey like the NCP which measures only expenditures on frequently-purchased goods will underestimate the total MPC for such a household. Therefore, they will be biased towards finding a negative link between liquid wealth and the MPC.

However, the requirement that it be paid back along a deterministic cycle would merely shift the vehicle for wealth accumulation from financial assets to debt repayment.

Before proceeding to our quantitative analysis, we wish to compare the deterministic model's predictions with Souleles's (2000) evidence on the nondurable consumption of households with children in college. He regresses consumption growth from the summer to the fall against college tuition. Since this expenditure is fully anticipated, the null hypothesis is that the coefficient multiplying tuition should be zero. A negative coefficient would indicate lack of planning in advance. His main results indicate small coefficients which are in some specifications positive. Souleles explains positive coefficients as possibly due to non-separability of college expenditures and nondurable consumption. Regardless of any such non-separability, it appears that households save in advance to finance the forthcoming college expenditures. These results are fully consistent with the term saving mechanism.

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 specification of wage risk follows Meghir and Pistaferri (2004). Using annual PSID observations, they estimated a stochastic process for household heads' log earnings that sums a random walk with a first-order moving average. The resulting process for W_t is

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

Although they estimated 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. 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 $\mu = 1.5859$.[28,29]

To 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 $\{0, 0.0001, 0.0002, \ldots, 1.3, 1.3001, 1.3002, \ldots, 4\}$. 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 $\Delta \ln W_t^P$.

Table 7 reports results obtained from this calibrated model. To calculate these, we begin with the model's ergodic distribution for wealth and earnings (both scaled by earnings' permanent component). For each point in its discrete state space, we compute the households' 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 contains households with positive wealth that is less than one month of its current earnings, the third contains households with 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 the distribution of households' wealth to income ratios. The calibration ensures that the median value of assets to annual income is 0.14 and the 75th percentile is 0.46. As mentioned in Footnote 29, Its

[28] In the calibrated model, the special good accounts for about 61 percent of total consumption expenditures in one of every ten years.

[29] We checked whether the calibrated model displays *saving complementarity* as defined by Blundell, Etheridge, and Stoker (2014). They addressed complementarity between saving for two types of risk, but their idea can be applied in general to different motives for saving. In the present context, saving complementarity prevails if the average assets held in the model with the two motives simultaneously are smaller than the sum of the average assets held with each motive in isolation. In our complete model, the average assets-to-wage ratio is 0.28. With term saving only, as in Figure 1, the average assets-to-wage ratio is 0.17. With precautionary saving only—i.e., with $\mu = 0$ and the same $\beta = 0.8976$—the average ratio is 0.07. Hence, this model does not display saving complementarity but the opposite: In Blundell, Etheridge, and Stoker's terminology, one motive "amplifies" the other. Intuitively, it seems that term saving motives exacerbate consumption risk at and after the special expenditure.

$12A_t/W_t$	Frequency	Marginal Propensities to Consume out of a 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

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 zero to 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. This pattern qualitatively resembles the positive link between stock ownership and the fraction of households which report that they "mostly spend" their 2001 and 2008 tax rebates as shown in Table 1.

The deterministic version of the model suggested that the long-run tax increase to balance the current tax cut should have a small effect on the present consumption response – given

$12A_t/W_t$	Frequency	Marginal Propensities to Consume out of a 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 effective shortening of the planning horizon. The present, more quantitatively relevant, framework supports 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. Extending the tax cuts to three and five years raises the MPCs. 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.

To illustrate the quantitative contributions of term saving to the results, we have also calibrated our model without term saving. For this, we set μ to zero and chose β so that the ergodic distribution's median ratio of financial wealth to current income equals 0.14. In other words, we recalibrate the model so it fits the actual median ratio of financial wealth to income. The resulting β is 0.9303. The model's other parameters remain unchanged. Table 8 reports the ergodic distribution and MPCs from this alternative calibration. Note that removing term saving lowers the average MPC—in the last row of Tables 7 and 8—from 42 to 34. Hence, the MPC is also fairly high in a calibration based on precautionary savings alone. However, the MPCs of households with middle to high assets in Table 8 are much lower than their analogues in Table 7. The other experiments in Table 8 display a similarly dramatic decline of the MPC with wealth.

5 Concluding Remarks

Evidence from the responses to tax rebates in the U.S. indicates that marginal propensities to consume are high (relative to the PIH benchmark) even for households with high liquid wealth. To address this puzzling observation, we have incorporated saving towards a large foreseen expense – term saving – into a standard precautionary savings model. In a deterministic version of the model with term saving only, 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-liquid-wealth households bring the model into better alignment with the evidence.

The principal lesson we take away from these results regards the pervasiveness of liquidity-constrained behavior across the middle class. Identifying "liquidity constraints" with violations of the standard Euler equation leads one to conclude that only a minority of households could be liquidity constrained. The standard precautionary savings model reinforces this view, because it predicts that the MPC should sharply decline with wealth. However, the empirical pervasiveness of term saving motives, the relatively high MPCs of households with liquid assets, and the success of the term saving model at replicating the wealth-MPC relationship lead us to believe that liquidity constraints are salient for most middle class households' consumption and savings choices.

A Proofs for Section 3.2

Lemma 1 *The borrowing constraint must bind at least once in any deterministic cycle.*

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

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

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

Lemma 2 *Suppose that the borrowing constraint is slack in one year of a deterministic 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 in the first year 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 year κ from above with $(W - T)(\beta R)^j < (W - T)$. 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 in year $\kappa + 1$. Therefore, $\kappa = \tau - 1$. ■

Proof of Proposition 1. Lemmas 1 and 2 together imply that the borrowing constraint binds in the final year (τ) of a deterministic cycle. Therefore, a deterministic 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 deterministic cycle. With this established, applying Lemmas 1 and 2 again yield the proposition's first numbered conclusion, and the second numbered conclusion is a consequence of Lemma 2 alone. ■

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