Liquidity Constraints of the Middle Class*

Jeffrey R. Campbell†‡ and Zvi Hercowitz§

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Abstract

Among U.S. middle-class households, the propensity to spend income changes is either invariant to household wealth or a U-shaped function thereof. This contrasts with the established view that the MPC should decline with wealth. We explain this puzzling observation with term saving, households’ savings for large forecastable expenditures. The Survey of Consumer Finances indicates that term saving is widespread. Once incorporated into a calibrated precautionary savings model, term saving generates MPCs that replicate the data well. This is because assets accumulated for anticipated expenses signal an impending shortage of liquidity that shortens the household’s effective planning horizon.

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†Federal Reserve Bank of Chicago, U.S.A.
‡CentER, Tilburg University, The Netherlands
§Tel Aviv University, Israel

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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. It may seem implausible that middle class households face liquidity constraints because they typically hold liquid assets, which can be converted immediately into consumption by definition. Nevertheless, puzzling evidence from consumption responses to tax changes casts doubt on this view. Souleles (2002) found substantial excess sensitivity of nondurable consumption to the implementation of the Reagan tax cuts for households regardless of their liquid assets. Similarly, Shapiro and Slemrod (2003) found that households with liquid financial assets 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.

Our first step towards understanding this evidence is to consider the possibility that a household’s assets are accumulated to pay for an impending need. Hence, high assets signal a shortage of liquidity relative to the approaching expense rather than an abundance of liquidity arising from past good luck. Because the time remaining until the impending need is the key state variable in our model, we call such assets term saving. We provide evidence from the Survey of Consumer Finances that saving towards the purchase of a house, a child’s education, or anticipated medical needs is at least as prevalent among the middle class as is precautionary saving.

Our empirical analysis assigns 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), an occasionally-binding 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 the motivation to save that allows us to replicate the observed wealth of the middle class. Our presumption is that poor households – i.e. those that always have little wealth – either lack a taste for the goods associated with term saving (home ownership, education, and health care) or that they are too impatient to save even given utility from their consumption.

We develop our model of middle class households using a standard infinitely-lived house-
hold representation of a dynastic life-cycle model, so we do not rely on the mechanical connection between a high marginal propensity to consume and high wealth at the end of life. The foreseen expenditure has exogenous timing and endogenous size. Its periodic nature generates an easily interpretable deterministic cycle. For term saving to substantially influence household decisions, these expenditures should be large and have a hazard rate that increases with the time since their last occurrence. Periodicity starkly captures this second requirement.

Although earnings risk is also an important fact of middle-class life, we begin by illustrating term saving in a deterministic environment. In the conflict between impatience and consumption smoothing, impatience wins when the foreseen expenditure is far ahead– so the borrowing constraint binds then. However, consumption smoothing eventually motivates the household to start saving ahead of the expenditure so that the borrowing constraint becomes slack. At the time of the expenditure, the household dissaves and the cycle repeats itself. When our model household is saving, it expects the borrowing constraint to bind in the future. This situation exemplifies the distinction between a currently-binding liquidity constraint and a liquidity constraint that could possibly bind in the future made by Zeldes (1984). As he noted, such expectations effectively shorten the horizon over which a currently unconstrained household optimizes. Thereby they generate a large $MPC$ out of transitory income. Of course, households with currently binding borrowing constraints have their $MPC$s equal to one. Since assets accumulate as the foreseen expenditure approaches, the model predicts that the observed $MPC$ rises with wealth for households that are not currently liquidity constrained.

The illustrative model raises the possibility that term saving could underly the observed relative insensitivity of the $MPC$ to household wealth, but a quantitative assessment requires us to add earnings risk and the associated precautionary savings to the analysis. This is because precautionary saving works against term saving in shaping the empirical relationship between household wealth and the $MPC$. As Carroll and Kimball (1996) proved, the consumption function from a precautionary savings model is a concave function of total wealth, so the associated marginal propensity to consume declines with wealth. In our quantitative analysis, we calibrate wage risk to match observations of household earnings from the PSID in Meghir and Pistaferri (2004) and we choose the size of the recurring expenditure to match average middle-class wealth measured from the SCF. With this calibration, the average $MPC$ from a one-off grant to a middle-class household is a relatively flat function of wealth.

The pervasiveness of liquidity constraints has received a great deal of attention in the consumption literature. Using the 1983 Survey of Consumer Finances (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) find 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) find that “Half of households follow the ‘rule-of-thumb’ of consuming their current income.” Also using the PSID, Zeldes (1989) found that the consumption growth of households with low wealth responded strongly to lagged disposable income. Because the analogous estimated responses for households with high wealth was smaller and sometimes statistically insignificant, Zeldes interprets 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) review the considerable literature that has refined this approach and applied it to other countries and data sets. Hayashi (1987) notes 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 and the insensitivity of $MPC$’s to wealth documented by Souleles (2000) and Shapiro and Slemrod (2003) lead us to conclude that the average “horizon” Hayashi mentions is 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 significance for the average $MPC$.

Kaplan and Violante (2013) provide an explanation for large $MPC$s 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 interpret as housing, and a low-return liquid asset. They emphasize that households that have recently converted all of their liquid assets into housing will have high $MPC$s in spite of having substantial illiquid wealth. Our model of term saving shows that households currently saving for a house will also have high $MPC$s even though they have substantial liquid wealth. On the other hand, Kaplan and Violante place this mechanism into a richer life-cycle model of saving. As noted above, we use an infinite-horizon dynastic framework to avoid the mechanical correlation between a high $MPC$s and a short horizon at the end of life.

The remainder of this paper proceeds as follows. In the next section, we review evidence

\(^1\)See that article’s penultimate sentence for the full context of this quote.
on consumption and saving behavior. This includes previous observations of the marginal propensity to consume out of tax rebates as well as new data on the prevalence of precautionary and term saving from the Survey of Consumer Finances. We find that term saving is at least as widespread among U.S. middle class households as is precautionary saving, and we present new evidence from the 2007-2009 Panel SCF that both motives substantially influence wealth growth. Section 3 incorporates term saving into a deterministic model of saving and consumption to develop intuition without undue complications, and Section 4 adds earnings uncertainty (a precautionary motive for saving) 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 extant empirical analysis of households’ marginal propensities to consume from tax-induced changes to disposable income. We then document the pervasiveness of precautionary and term saving with data from several waves of the SCF. We finish this section with an analysis of how these savings motives influence housing purchase decisions and the growth of financial wealth.

2.1 MPC Estimates

Changes in tax law provide rich opportunities for the empirical investigation of the permanent-income hypothesis/life-cycle model 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 MPC’s between 80 and 90 percent for nondurable consumption using Consumer Expenditure Survey data. When he split the sample by liquid wealth relative to earnings, the MPC’s of households in the bottom quartile were within 15 cents of their counterparts in the top three quartiles. Furthermore, these differences were statistically insignificant. It seems that the majority of households acted as if they were

\[ d(t+1) \]

\[ \text{Table 2.} \]

\[ \text{Table 4.} \]
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 Consumers 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 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.\(^5\)

One common theoretical justification for finding 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.\(^6\) One might argue that to be liquidity constrained one must also expect higher future income. Again, Shapiro and Slemrod find that households’ expectations of improvements in their personal financial conditions over the next year have no impact on the rebate spending propensities. Shapiro and Slemrod 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

\(^4\)See the lines below “Size of future tax cuts” in their Table 5.
\(^5\)See the lines below “Impact of tax cut on government spending” in their Table 5.
\(^6\)See the rows under “Income ($)” in their Table 2.
traditional liquidity constraints: the spending fraction *increases* with stock ownership, with exceptions for the highest bracket and that with zero-assets.\(^7\)

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.”\(^8\) 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.\(^9\) Finally, Sahm, Shapiro, and Slemrod (2010) find an a similar dependence of the Mostly-Spend rate on the household’s wealth in stocks as that from the 2001 tax rebates.\(^10\) 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.\(^11\)

A pair of complementary articles, Johnson, Parker, and Souleles (2006) and Parker, Souleles, Johnson, and McClelland (2012), estimate the consumption responses from these two tax experiments using questions appended to the Consumer Expenditure Survey that measured

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\(^7\)See 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.

\(^8\)See their Table 3. This quote is from the discussion below it.

\(^9\)See their Table 10.

\(^10\)Sahm, 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).

\(^11\)Shapiro and Slemrod (2003, page 385) offer the following explanation for the positive effect of stock 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 model of “target savings” we know of, 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.
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 nondurable consumption of 0.462 with a standard error of 0.173.\footnote{See the first row and final column of their Table 3.} Kaplan and Violante (2013) 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. 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.\footnote{See their Table 5} 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

Source: Table 2 of Shapiro and Slemrod (2003) and Table 8 of Sahm et al. (2010)
1 would be statistically insignificant.\textsuperscript{14} 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.\textsuperscript{15} When they sort their sample by income and liquid assets, the resulting responses are statistically indistinguishable from each other.\textsuperscript{16} They report that a quarter of their sample is lost due to missing income data and note that “While the point estimates suggest little spending by low-asset households, the associated confidence intervals are quite large, and none of the spending differences or even levels throughout the panel are statistically significant. The loss of precision when using the asset variable might reflect the smaller sample sizes due to missing asset values and measurement error in the available asset values. Roughly half of the data on liquid assets is missing.” (Parker et al., 2012, page 18).

We conclude that while the CEX-based point 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) – the CEX has too little power to distinguish this irrelevance from the hypothesis of traditional liquidity constraints.

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), Hsieh (2003), and Browning and Collado (2001) all 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. Browning and Collado (2001) support the view that there is a threshold size above which households smooth seasonal income by showing that Spanish households receiving large predetermined “bonuses” in July and December (which are not tied to performance on the job) have no different seasonal consumption patterns than their counterparts paid with equally-sized paychecks throughout the year.\textsuperscript{17} In the absence of further information, fiscal interventions of macroeconomic in-

\textsuperscript{14}See the final row of their Table 5.  
\textsuperscript{15}See the third row of their Table 2.  
\textsuperscript{16}See their Table 6.  
\textsuperscript{17}Just as with the responses to large one-time tax-induced changes in income, the failure of households
terest could plausibly fall either the “small-enough-to-ignore” or “large-enough-to-respond” categories. However, Shapiro and Slemrod (2003) provide evidence that such rules of thumb 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 buying a new house, college education of children, and old-age medical costs. These all are

1. large in relation to a typical middle-class household’s annual income,

2. likely to occur sequentially over the life-cycle. Buying a new house typically comes first, then college expenses, and later on in life old-age medical costs, and

3. forecastable well in advance of their occurrence.

Souleles (1999) finds a higher MPC for total consumption for households with high wealth to earnings ratios. (See his Table 4). Similarly, Parker (1999) finds a higher MPC for nondurable consumption for households with high wealth to consumption ratios. (See his Table 5.)
The last two features imply that the hazard for incurring such a large expense increases with the time elapsed time since the last expense. For example, a couple with a 35 year old head that just purchased a home and has a single eight-year-old child faces a hazard of incurring college expenses that is close to zero for the next ten years. Thereafter, the hazard jumps sharply. This increasing hazard is the most important technical distinction between our model of term saving and the more familiar theory of precautionary saving. The remainder of this section examines data on saving motives and behavior from the Survey of Consumer Finances (SCF) to place the importance of term saving for middle-class households into the perspective of previous evidence on precautionary saving.

2.2.1 The Sample

For our sample, we draw on five cross-sectional waves of the SCF; 1995, 1998, 2001, 2004, and 2007; and the 2007-2009 panel SCF. We wish to focus the analysis on working-age middle class households. 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 cross-sectional waves. This ranges from 99 million in 1995 to 116.1 million in 2007. 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 between 20 and 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 (TANF) 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. To measure after-tax income for the previous year; we use the pre-tax labor income of the household head and his or her spouse, 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 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. Because our model treats retirement savings and dissavings as taxes and transfers, we include these contributions in the taxes used for this calculation. 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 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
Table 2: Number of Households (in millions) Represented in the Surveys of Consumer Finances

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<td>Households Represented in Original Sample, &amp; without imputed Age or Saving Survey responses,</td>
<td>99.0</td>
<td>102.5</td>
<td>106.5</td>
<td>112.1</td>
<td>116.1</td>
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<td>&amp; with heads between 25 and 64 years old,</td>
<td>97.0</td>
<td>100.3</td>
<td>103.5</td>
<td>109.9</td>
<td>114.5</td>
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<td>&amp; that received no TANF,</td>
<td>71.3</td>
<td>74.4</td>
<td>76.3</td>
<td>80.4</td>
<td>84.9</td>
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<td>&amp; that had labor income above the poverty line,</td>
<td>63.9</td>
<td>68.8</td>
<td>71.7</td>
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<td>&amp; are among least wealthy 95% of remaining households</td>
<td>54.2</td>
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<td>&amp; are not self-employed.</td>
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<td>57.0</td>
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<td>43.1</td>
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financial wealth is less than two months of its annual earnings. For these SCF observations, the dividing line between constrained and unconstrained 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 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. Both Retirement and Estate had distinct entries on the list of answers, although the Estate answer included intervivos 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.

In spite of our conjecture that medical expenses in old age motivate term saving, we include the answer of medical/dental expenses in precautionary saving because the given answer encompasses both term saving when approaching old age and precautionary saving against unanticipated illness when young. The answers we used to infer an Anticipated Expenditure motive were:

- Children’s education; education of grandchildren,
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<th>Year</th>
<th>Sample</th>
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<td><strong>Including All Financial Assets</strong></td>
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<tr>
<td>1995</td>
<td>30.8</td>
<td>0.1</td>
<td>1.5</td>
<td>3.6</td>
<td>6.2</td>
<td>9.2</td>
<td>13.4</td>
<td>22.4</td>
<td>37.1</td>
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<td>171.6</td>
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<td>1998</td>
<td>47.6</td>
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<td>2.1</td>
<td>4.6</td>
<td>8.0</td>
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<td>54.3</td>
<td>100.6</td>
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<tr>
<td>2004</td>
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<td>0.1</td>
<td>1.5</td>
<td>3.6</td>
<td>6.2</td>
<td>10.3</td>
<td>16.0</td>
<td>25.4</td>
<td>42.4</td>
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<td>46.1</td>
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<td>1.7</td>
<td>3.7</td>
<td>6.5</td>
<td>10.3</td>
<td>16.4</td>
<td>26.0</td>
<td>44.2</td>
<td>84.2</td>
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<tr>
<td><strong>Excluding Equities</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>1995</td>
<td>22.9</td>
<td>0.1</td>
<td>1.3</td>
<td>3.1</td>
<td>5.2</td>
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<td>16.2</td>
<td>27.1</td>
<td>49.2</td>
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<td>35.5</td>
<td>62.9</td>
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<td>62.7</td>
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<td>3.2</td>
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<td>8.4</td>
<td>12.8</td>
<td>19.6</td>
<td>31.5</td>
<td>56.6</td>
<td>158.0</td>
</tr>
</tbody>
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Table 3: Ratios of Financial Assets to Annual After-Tax Labor Income (×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.
<table>
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<tr>
<th>Year</th>
<th>Retirement &amp; Estate</th>
<th>Precaution</th>
<th>Anticipated Expenditure</th>
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<tr>
<td>1995</td>
<td>44.6</td>
<td>45.1</td>
<td>43.6</td>
</tr>
<tr>
<td>1998</td>
<td>60.1</td>
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<td>43.7</td>
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<tr>
<td>2001</td>
<td>55.4</td>
<td>31.9</td>
<td>41.9</td>
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<tr>
<td>2004</td>
<td>57.9</td>
<td>31.3</td>
<td>42.6</td>
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<tr>
<td>2007</td>
<td>64.2</td>
<td>33.8</td>
<td>39.2</td>
</tr>
</tbody>
</table>

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 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.

### 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?*
If the answer is positive, the first follow-up question is:

**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.\(^{18}\) Interestingly, only a very small fraction of households report that their saving for anticipated expenditures is complete.\(^{19}\)

We conjecture that 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 verifies this conjecture by reporting 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

---

\(^{18}\)One 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 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.

\(^{19}\)We discuss this finding in the context of our model of impatient households below in Section 3.
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. Surprisingly to us, 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. Overall though, Table 6 indicates that households tie anticipated expenditures to their life cycles.

2.3 Wealth Accumulation

The cross sectional evidence from survey questions clearly indicates that households believe that large anticipated expenditures are relevant to their saving decisions, but it is silent about how those beliefs impact their actual decisions. To measure this, we turn to the 2007-2009 SCF panel. Of course, the Federal Reserve’s Board of Governors only initiated this panel’s collection to measure the impact of the 2007-2008 financial crisis, so one can hardly say that this time period is “typical.” Nevertheless, these are the only repeated observations provided by the SCF project since the early 1980s. To measure the association between self-reported saving for a particular anticipated expenditure and wealth dynamics, we regressed two measures of savings behavior – an indicator for a home purchase between 2007 and 2009 and the growth rate of liquid assets – on indicator variables for an anticipated home purchase, for an anticipated non-housing expense, and for saving now for either (or both) expenses. Below, we refer to these three variables together as measuring the households’ “term-saving intentions.”

In addition to the measures of Term Saving behavior, the regressions include age (to control for life-cycle effects) and a control for wealth dynamics arising from precautionary motives, the Precautionary Wealth Gap. To construct this, we follow Kennickell and Lusardi (2005) who identify Desired Precautionary Wealth with the answer to

**Question 4** About how much do you think you (and your family) need to have in savings for emergencies and other unexpected things that may come up?

With this, we measure the Precautionary Wealth Gap with

\[
2 \times \frac{\text{Actual Financial Wealth} - \text{Desired Precautionary Wealth}}{\text{Actual Financial Wealth} + \text{Desired Precautionary Wealth}}
\]

By construction, this lies in \([-2, 2]\). In the few observations with zero Actual Wealth and Desired Wealth, we set the Precautionary Wealth Gap to zero. In the basic precautionary
### Table 6: Frequency of Saving for a Specific Major Forecastable Expenditure by Age Group

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Purchase</td>
<td>15.5</td>
<td>17.1</td>
<td>17.6</td>
<td>19.2</td>
<td>21.1</td>
</tr>
<tr>
<td>Education</td>
<td>18.6</td>
<td>19.9</td>
<td>21.8</td>
<td>23.7</td>
<td>25.6</td>
</tr>
<tr>
<td>Medical Care</td>
<td>7.6</td>
<td>5.8</td>
<td>6.2</td>
<td>6.4</td>
<td>8.3</td>
</tr>
</tbody>
</table>

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.
wealth model, financial wealth is cointegrated with the household’s permanent income from labor. If the households’ answers to Question 4 are at all related to that household’s average wealth (across time) given permanent income, then we expect that increasing a household’s Precautionary Wealth Gap reduces is subsequent wealth accumulation.

The regressions include two other variables that control for some of the effects of the financial crisis on households’ savings decisions, the growth rates of the household’s pre-tax labor income (from 2006 to 2008) and the household’s Desired Precautionary Wealth (from 2007 to 2009). Both regressions use observations from 1413 middle-class households. Because of non-response in the 2009 wave, the measures of Term Saving behavior have slightly different averages in this sample than those reported above. The regressions are calculated without sampling weights. In practice, the means, standard deviations, and mutual correlations of the regressions’ variables (unreported) change very little when calculated with weights.

Table 7 reports the two regressions’ estimates. Its first column corresponds to the regression for the home purchase indicator. We have multiplied this by 100 so that the estimates may be interpreted as change in probability points of the likelihood of purchasing a home.20 Reassuringly, all three of the measures of Term Saving behavior have the expected signs and are statistically significant. Those who report foreseeing a home purchase in 2007 are about 12 percentage points more likely to actually purchase a home in the next two years than those that do not, and reporting that you are saving for that (or another) expense increases the likelihood of purchase by about another five percentage points. On the other hand, households that foresaw a non-housing expense were about five percentage points less likely to purchase a home. These are large effects relative to the unconditional frequency of home purchase in this sample, about ten percent. Thus, it seems that these measures of term-saving intentions predict actual behavior and are not just cheap talk. Unsurprisingly, the growth of the household’s pre-tax labor income also influences home purchases strongly. Its standard deviation is about 0.55, so a one-standard deviation increase in income increases the propensity to purchase a home by about 3 percentage points. The remaining variables have small and statistically-insignificant coefficient estimates. In light of the well-known lifecycle component to home purchase decisions, the insignificance of the respondent’s age is surprising. This testifies to the power of the measures of term-saving intentions. If these are omitted from the regression, age acquires a negative and strongly significant coefficient. The statistical insignificance of the Precautionary Wealth Gap and the growth rate of de-

---

20 About five percent of this linear-in-probabilities model’s fitted values are less than zero, and none of them are greater than 100. The qualitative results are robust to replacing the linear model with a probit or logit specification.
sired precautionary balances suggests that precautionary considerations do not substantially influence home ownership decisions.\textsuperscript{21}

The second column of Table 7 reports the estimates for the growth rate of financial wealth. The effects of term-savings intentions on this variable cannot be signed ex ante: If the foreseen expenditure does not occur over the measured time interval, then wealth should increase. Otherwise, the expense itself can decrease wealth. In this sample, the indicator that the household is saving for a foreseen expense has a positive coefficient that is statistically significant at the five percent level, and the indicator for anticipating a home purchase has a negative coefficient that is statistically significant at the ten percent level. That is, term saving intentions did influence wealth growth in this sample.

The estimates also provide substantial evidence of precautionary motives at work. The coefficient multiplying the Precautionary Wealth Gap is highly statistically significant and has the expected negative sign. That variable’s standard deviation is about 1.2, so the estimated coefficient indicates that a one-standard deviation increase in this gap reduces financial wealth growth by about 36 percentage points. This is a very large effect and (to the best of our knowledge) is the first evidence documenting the mean reversion in wealth predicted by the precautionary savings model.\textsuperscript{22} Furthermore, the growth rate of the desired precautionary balance (which has a standard deviation of about 0.86) also has a large, positive and statistically-significant effect on the growth of financial wealth. The measured importance of precautionary motives in this regression is robust to omitting the measures of term-saving intentions, and it is robust to adding the ratio of financial wealth to aftertax labor income used to build Table 3 to the regression. (However, the importance of the term saving motives is not robust to omitting two precautionary variables.) Finally and less surprisingly, both the respondent’s age and the growth rate of pre-tax labor income positively influence financial wealth growth. Overall, these two regressions provide substantial evidence that both term saving intentions and precautionary motives influence the asset accumulation of middle-class

\textsuperscript{21}However, Carroll et al. (2003) find effects of unemployment risk on wealth only when it includes home-owners’ equity.

\textsuperscript{22}Precautionary saving has been extensively explored empirically. Guiso et al. (1992), Carroll and Samwick (1997), Engen and Gruber (2001), and Carroll et al. (2003) documented the positive influence of labor market risks on the level of household wealth that one would expect from the precautionary savings model. To the best of our knowledge, only Jappelli, Padula, and Pistaferri (2008) have empirically examined the precautionary savings model’s implications for wealth growth using panel data. They measure a similar difference between desired precautionary balances and actual wealth in the Italian Survey of Income and Wealth, but they find it has little explanatory power for subsequent wealth accumulation. Our opposite finding clearly calls for further exploration, but this lies outside of the present paper’s focus on term saving.
households.

3 The Model

Inspired by the above empirical results, 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 the impatience, the household saves in anticipation of the periodic expenditure. Since the economics of term saving are most easily appreciated in an environment with only the periodic expenditure, we hold the household’s earnings constant in this section.

3.1 The Basic Model

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 periodic consumption. We denote the quantities of these consumed in year $t$ with $C_t$ and $M_t$. The utility function is

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

with $0 < \beta < 1$ and $\sigma \geq 1$. Here, the indicator $\mu_t$ follows a cycle with $\mu_t = \mu > 0$ every $\tau$ years and $\mu_t = 0$ at other times. This specification generates a periodic expenditure with exogenous timing and endogenous size.

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

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

where $R$ is the gross interest rate, assumed to be constant. We assume that $\beta R < 1$, so the household is impatient.\textsuperscript{23}

\textsuperscript{23}See Campbell and Hercowitz (2009) for a general equilibrium environment in which such a low interest rate arises endogenously from trade with a more patient household.
<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Home Purchase Indicator (×100)</th>
<th>Growth of Financial Wealth (×100)</th>
</tr>
</thead>
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<td>Saving for Foreseen Expense (2007)</td>
<td>4.59**</td>
<td>15.22**</td>
</tr>
<tr>
<td></td>
<td>(2.11)</td>
<td>(7.31)</td>
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<td>Forsee Home Purchase (2007)</td>
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<td>-12.16*</td>
</tr>
<tr>
<td></td>
<td>(2.52)</td>
<td>(7.10)</td>
</tr>
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<td>Forsee Educational or Medical Expense (2007)</td>
<td>-4.31**</td>
<td>-6.72</td>
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<td>(1.83)</td>
<td>(6.15)</td>
</tr>
<tr>
<td>Precautionary Wealth Gap (2007)</td>
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<td>-32.20***</td>
</tr>
<tr>
<td></td>
<td>(0.71)</td>
<td>(2.51)</td>
</tr>
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<td>Growth of Precautionary Target Wealth (2007-2009)</td>
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<td></td>
<td>(0.97)</td>
<td>(3.46)</td>
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<td>Growth of Pre-Tax Labor Income (2006-2008)</td>
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<td>35.21***</td>
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<td>(1.32)</td>
<td>(5.37)</td>
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<td></td>
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<td>(0.27)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.07</td>
<td>0.15</td>
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</table>

Table 7: Home Purchases and Wealth Accumulation in the 2007-2009 Panel SCF

Note: All regressions used 1413 observations. Standard errors robust to heteroskedasticity appear below each estimated coefficient in parentheses. All growth rates are taken from 2007 to 2009 and are calculated as the difference in the variable’s level divided by its average level. Similarly, the Precautionary Wealth Gap is calculated as the difference between actual liquid wealth and the household’s desired precautionary balance divided by their average value. The resulting gap and growth rates lie in $[-2, 2]$. If both measures equal zero, the corresponding gap or growth rate was set to zero. See the text for further details.
The household’s choices of all goods must satisfy nonnegativity constraints. Furthermore, the household faces the standard borrowing constraint

\[ A_{t+1} \geq 0. \] (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.

Denote the Lagrange multipliers on the year \( t \) budget and borrowing constraints with \( \Psi_t \) and \( \Gamma_t \). The first-order conditions for optimization are

\[
\Psi_t = C_t^{-\sigma},
\]

\[
\Gamma_t = \Psi_t - \beta R \Psi_{t+1},
\]

\[
\Psi_t M_t^\sigma = \left( (1 + \mu_t)^{1/\sigma} - 1 \right)^\sigma.
\]

Without borrowing constraints, \( \Psi_t \) equals the marginal current utility of lifetime resources. Here, it represents the marginal value of current resources. The multiplier \( \Gamma_t \) equals the marginal value of relaxing the borrowing constraint, which is the deviation from the standard Euler equation; \( \Gamma_t \) is zero when the borrowing constraint is slack. Because \( \Psi_t \) is always positive, the periodic expenditure \( M_t \) is positive when \( \mu_t > 0 \) and zero otherwise.\(^{24}\)

### 3.2 The Nonstochastic Cycle

Because of the periodic changes in preferences, the household’s problem has no steady state, even if wages and taxes remain unchanged. Nevertheless, there does exist a nonstochastic cycle when \( W_t \) and \( T_t \) are constant. This cycle is the analogue of a steady state in our model, so we begin with the cycle’s characterization, and focus in particular on term saving, i.e., the level of assets along the cycle. For this, we denote ordinary consumption and assets \( \kappa \) years after the most recent periodic expenditure in a nonstochastic cycle with \( C^\kappa \) and \( A^\kappa \).\(^{25}\)

\(^{24}\)We can manipulate (4),(5) and (6) to get \( \Psi_t = \left( 1 + \mu_t \right) (C_t + M_t)^{-\sigma} \). That is, \( \mu_t \) has the interpretation of an increment in marginal utility for any given total consumption expenditure.

\(^{25}\)Our model has a deterministic asset cycle in common with the models of Baumol (1952) and Tobin (1956). This and those models, however, differ in key respects. There, the length of the cycle is the key endogenous variable, while here it is exogenous. We focus is on the link between the asset cycle and liquidity constraints, while those models focused on the link between assets and money demand.
From (4) and (5), the necessary conditions which a nonstochastic cycle must satisfy are
\[
\frac{C_{\kappa+1}}{C_{\kappa}} \geq (\beta R)^{1/\sigma} \text{ for } \kappa = 1, 2, \ldots, \tau - 1, \text{ and }
\]
\[
\frac{C_1}{C_{\tau}} \geq (\beta R)^{1/\sigma}.
\]
(7)  
(8)

The corresponding budget constraints are
\[
C_{\kappa} + A_{\kappa+1} = W - T + R A_{\kappa} \text{ for } \kappa = 1, 2, \ldots, \tau - 1,
\]
\[
(1 + \mu)^{1/\sigma} C_{\tau} + A_1 = W - T + R A_{\tau}.
\]
We replaced here the periodic expenditure with its optimal level from (4), and (6), ((1 + \mu)^{1/\sigma} - 1)C_{\tau}.

To solve these conditions, it is helpful to begin with the case of \( \mu = 0 \), which corresponds to the standard optimization under impatience. The only path for \( A_{\kappa} \) and \( C_{\kappa} \) satisfying these conditions is the standard steady state for impatient agents in which the borrowing constraint always binds and the household consumes all labor earnings. That is, \( A_{\kappa} = 0 \) and \( C_{\kappa} = W - T \) in all periods, and hence (7) and (8) hold with strict inequalities.

Raising \( \mu \) above zero generates a positive \( M \) every \( \tau \) years. However, if \( \mu \) is less than \( \hat{\mu}^{\tau-1} \equiv (\beta R)^{-1} - 1 \), then the borrowing constraint still binds at all times. That is, for \( \kappa = 1, \ldots, \tau - 1 \), \( C_{\kappa} = W - T \), and \( C_{\tau} = (W - T) / (1 + \mu)^{1/\sigma} \). Thus, conditions (7) and (8) still hold with strict inequalities. Mechanically, this follows from the fact that the reduction of \( C_{\tau} \) as \( \mu \) goes up is not enough to bring (7) to an equality while \( C_{\tau-1} \) still equals \( W - T \). Intuitively, the anticipated reduction in consumption is too small to induce the household to save in year \( \tau - 1 \) towards the expenditure in year \( \tau \), so the household finances the expenditure only by reducing ordinary consumption.

Now, suppose that \( \mu > \hat{\mu}^{\tau-1} \) (so that \( A_{\tau} > 0 \)) and define
\[
\hat{\mu}^{\tau-1} \equiv \frac{((\beta R)^{-1/\sigma}(R + 1) - R)^{\sigma} - 1}{\beta R} < \hat{\mu}^{\tau}.
\]
When \( \mu = \hat{\mu}^{\tau-1} \), then the saving for the periodic expenditure reduces \( C_{\tau-1} \) so that \( C_{\tau-1} / C_{\tau-2} = (\beta R)^{1/\sigma} \). That is, the borrowing constraint in cycle year \( \tau - 2 \) does not bind, but the household nevertheless saves nothing. If \( \mu \) is less than \( \hat{\mu}^{\tau-1} \), then the borrowing constraint in cycle year \( \tau - 2 \) binds; \( A_1 = A_2 = \cdots = A_{\tau-1} = 0 \), and \( A_{\tau} > 0 \). If instead \( \mu > \hat{\mu}^{\tau-1} \), then \( A_{\tau-1} > 0 \). Applying this reasoning to higher and higher values of \( \mu \) yields the following result.

**Proposition 1** There exist positive and finite threshold values of \( \mu \), \( \hat{\mu}^{2} > \hat{\mu}^{3} > \cdots > \hat{\mu}^{\kappa} \), such that \( A^{\kappa} > 0 \) if and only if \( \mu > \hat{\mu}^{\kappa} \).
Note that progressively higher values of $\mu$ generate positive assets for year $\tau - 1$ first, then for year $\tau - 2$, and so on backwards until year 1 of the cycle. The constraint always binds in the cycle’s final year, so that $A^1 = 0$. We conclude that the borrowing constraint “switches off” at most once during the cycle. It switches back on in the year of the special expenditure. We use this result to link the level of assets to the stage in the cycle.

**Proposition 2** Assume that the constraint switches off in year $\kappa$ of the deterministic cycle, where $1 \leq \kappa < \tau$. Then, because $W - T \geq C^\kappa > C^{\kappa+1} > \cdots > C^{\tau-1}$, we have that $A^{\kappa+1} < A^{\kappa+2} < \cdots < A^\tau$.

In words, the saving towards the next periodic expenditure monotonically increases the level of assets.

### 3.3 Shortening of the Planning Horizon and the MPC

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 temporary increase in $W_t - T_t$ on the nonstochastic cycle illustrates this. If the borrowing constraint binds in the year of the increase, then $MPC = 1$ 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, $\kappa$, and the next time the borrowing constraint binds. The resulting marginal propensity to consume is

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

This exceeds the marginal propensity to consume of an unconstrained household without a periodic expenditure facing the same interest rate if and only if

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

If (9) does not hold, then effect of saving for the periodic expenditure (which lowers the $MPC$) dominates the effect of shortening the household’s effective horizon (which raises it). Our calibrations of the model satisfy this condition comfortably, so we proceed under this assumption.

We began this paper highlighting the empirical puzzle of $MPC$s substantially larger than the rate of interest for households with wealth. To see our model’s implications for these
observations, we differentiate \( MPC^\kappa \) above with respect to \( \kappa \). The upper bound for \( \mu \) signs the derivative positively. Therefore, we conclude:

**Proposition 3** If \( \mu, \beta, R, \) and \( \sigma \) satisfy (9) and if the borrowing constraint becomes slack in year \( \kappa \) of the cycle, then \( MPC^\kappa < MPC^{\kappa+1} < \cdots < MPC^{\tau-1} \).

Propositions 2 and 3 together imply that if we sampled households uniformly distributed across the deterministic cycle, we would find that \( MPC_t \) covaries positively with \( A_t \) among households with assets. Furthermore, beliefs about the path of taxes beyond the next periodic expenditure would be irrelevant for a household’s \( MPC \).

4 Quantitative Analysis

In this section, we enrich the model with the addition of ongoing wage risk, calibrate its remaining parameters, and calculate the \( MPC \)s 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

\[
\begin{align*}
\ln W_t & = \ln W^P_t + \ln W^T_t, \\
\Delta \ln W^P_t & \sim N(0, 0.177^2), \\
\ln W^T_t & = \varepsilon_t + 0.2566 \varepsilon_{t-1} \\
\varepsilon_t & \sim N(0, 0.173^2)
\end{align*}
\]

Although they estimate several processes with heteroskedasticity, we focus on this homoskedastic process for the sake of simplicity. For the other model parameters, we set \( R = 1.04 \) and \( \beta = 1/1.06 \). Motivated by the phrasing of Question 2, we set \( \tau \) to 10. The last remaining parameter to be determined is \( \mu \). We set this so that the average financial wealth to after-tax income ratio calculated from a large random sample of model households equals that from the 2001 SCF, 50.1 percent. Given the other parameters, this sets \( \mu \) to 1.0135.\(^{26}\)

\(^{26}\)To solve the model, we first create its stationary representation by dividing \( C_t, M_t, \) and \( A_t \) by \( W^P_t \). Our solution of this stationary model uses standard discrete state space dynamic programming techniques. We approximate constrain \( A_{t+1} \) to lie on \( \{0, 0.001, 0.002, \ldots, 3\} \). We approximate \( W^T_t \) with a nine-point Markov chain constructed from a three-point Gauss-Hermite approximation to a standard normal random variable. We use the same approximation to model \( W^P_t \).
Figure 1 plots the model’s deterministic cycle at the calibrated parameter values (holding $W_t$ constant). In the year of the expenditure and for the two years following, the household chooses zero wealth, so its marginal propensity to consume in those years equals 100 percent. In the third year after the expenditure, saving begins, wealth begins to accumulate, and consumption begins to fall. Although the marginal propensity to consume when saving is ongoing 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 saving households with the highest wealth also have the highest MPCs.

Table 8 reports MPCs from the full model with ongoing wage uncertainty. For these, we begin with the model’s steady-state 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 equal to one percent of its earnings. 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 (seven percent
of the households), the second 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 households are approximately uniformly distributed across
the first nine of these bins. Thereafter, the density falls.

For the first experiment of a one-time transfer, households with zero wealth unsurprisingly
have the highest MPC, 35 percent. Consistent with the intuition from a precautionary savings
model, the majority of these households are actually accumulating wealth and so have MPCs
below 100 percent. The MPC declines to 28 percent for households with between zero and

Table 8: Average Marginal Propensities to Consume from the Calibrated Model

<table>
<thead>
<tr>
<th>12A/W</th>
<th>Frequency</th>
<th>One Year Transfer</th>
<th>One Year Tax Cut</th>
<th>Three Year Tax Cut</th>
<th>Five Year Tax Cut</th>
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<tr>
<td>0</td>
<td>7</td>
<td>35</td>
<td>33</td>
<td>54</td>
<td>68</td>
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<td>16</td>
<td>43</td>
<td>61</td>
</tr>
</tbody>
</table>
one month of income in wealth, and then to 19 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. The MPC achieves a local peak of 29 percent for households with wealth between 8 and 9 months’ earnings, and thereafter falls. For the 15 percent of households with wealth exceeding a full year of earnings, the MPC equals 20 percent.

The simple model suggested that details of 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. 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 35 percent to 33 percent, and for those with more than a year of wealth it drops from 20 to 16 percent. Furthermore, the 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 68 percent. For those with wealth exceeding annual earnings, it equals 61 percent. Overall, these results suggest that the persistence of tax-induced increase in current income matters much more than how it is financed. This prediction is at odds both with Shapiro and Slemrod’s (2003) finding that households’ beliefs about future tax cuts have little predictive power for their spending propensities and with the results of Shapiro and Slemrod (2003) and Sahm et al. (2010) in Table 1 that the spending percentages from the persistent 2001 Bush tax cuts and the temporary 2008 Economic Stimulus payments are very similar. Kaplan and Violante (2014) compound this discrepancy with an effect our model omits. They find that larger 2008 payments should have smaller MPCs than the smaller 2001 tax rebates because they induce more middle-class households to adjust their portfolios. While we are pleased with the invariance of the predicted MPCs with respect to long-run tax rates, their dependence on the persistence of short-run and medium-run tax cuts remains a challenge.

5 Concluding Remarks

How liquidity constrained are middle-class households in the U.S.? To address this question, we developed a model where households hold financial assets, and measured liquidity constraints with the fraction spent out of a temporary tax rebate. In the model, a future binding borrowing constraint effectively shortens the planning horizon of households who
are infinite-horizon planners. These households value liquidity in spite of being currently unconstrained. This model has two main implications:

- The spending responses to a temporary transfer in the model are much higher than for a permanent-income consumer. The responses are invariant to the long-run tax changes that finance the short-run stimulus. This implies that the response of these households to a balanced-budget tax rebate differs greatly from the zero-response of a Ricardian permanent-income consumer.

- The volume of assets owned reflects a forthcoming demand for liquidity rather than a liquidity surplus arising from past luck. This feature combined with the negative relationship between the MPC and wealth predicted by the theory of precautionary saving together yield a relatively flat relationship between financial assets and the marginal propensity to consume out of temporary income.

The second implication provides a rationalization of the finding in Shapiro and Slemrod (2003), that among households with positive amounts of shares, the fraction of households who spent most of the 2001 rebate weakly increases with stock ownership. Our interpretation of these results is that middle-class households with financial assets face quantitatively significant liquidity constraints that arise from term saving.
References


