# Who Are the Hand-to-Mouth?*

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October 23, 2020

**Abstract**

Many households hold little wealth, especially liquid wealth. In standard precautionary savings models these households should display not only higher marginal propensities to consume (MPCs), but also lower average propensities to consume (APCs) and higher future consumption growth. We see from the PSID that such "hand-to-mouth" households actually display higher APCs and no faster spending growth. They also adjust spending to a greater extent through the number of categories consumed. Consistent with a role for preference heterogeneity, the panel data show that it is the propensity to be hand-to-mouth, not current assets, that predicts high APC, low consumption growth, and other spending differences for the hand-to-mouth. To identify the extent of preference heterogeneity, we consider the model of Kaplan and Violante (2014) with both liquid and illiquid assets, but allow heterogeneity in preferences. To match the data, many poor hand-to-mouth must be impatient *and* have a high inter-temporal elasticity of substitution (IES). The model shows that preferences play a prominent role in differences in MPCs across consumers.

# 1 Introduction

This paper explores why some households hold low levels of wealth relative to income. The question is of interest in its own right, as the answer deepens our understanding of consumer behavior. It also sheds light on an important component in the design of macro-policy. These ostensibly "hand-to-mouth" households are often thought to have a relatively large

*We thank Nataliya Gimpelson, Stephan Gordeev, and Federico Kochen for excellent research assistance on this project. We also thank Martin Blomhoff Holm, Matthew Knowles, Gianluca Violante, and Ivan Werning for their helpful comments.

response to transfers and a muted direct response to changes in interest rates, and thus feature prominently in discussions of tax and transfer schemes to boost aggregate output as well as the efficacy of monetary policy.[1] To the extent that macro-policy analysis relies on "getting the micro foundations right," it is crucial to understand why so many consumers find themselves with limited net worth or liquidity relative to income.

We document five new facts on the behavior of hand-to-mouth (or $H2M$ for short) households using the Panel Study of Income Dynamics (PSID). These facts contradict predictions of the standard savings model unless households differ importantly in their long-run targeted assets-to-income. They also point to a role of preference heterogeneity, rather than differences in income processes, to explain that heterogeneity in savings targets. Exploiting the panel dimension of the PSID, our empirical work uses household fixed effects as well as each household's frequency in $H2M$ status as additional controls for long-run heterogeneity. Adding these controls bridges the gap between the standard model and the data. Motivated by our empirical findings, we then use a structural model to calibrate the extent of preference heterogeneity in the data and its role in the average and cross-sectional dispersion of marginal propensities to consume (MPCs).

The first two facts are that $H2M$ households actually display higher average propensities to consume (APCs), where APC is current consumption over total current income, and no faster spending growth than households with more assets. That is, $H2M$ households show no tendency to begin rebuilding assets or to be consuming below their permanent incomes. These statements apply to households that are hand-to-mouth based on their low net worth or based only on their lack of liquid assets (the wealthier hand-to-mouth). We follow households' income, assets, and spending for a period of up seventeen years. That allows us to relate a household's behavior to the frequency it appears hand-to-mouth in other surveys as well as its current $H2M$ status. We find it is those households that typically hold few assets that have higher APCs and lower spending growth. The third fact is that it is households who are typically hand-to-mouth, not necessarily currently so, that exhibit a greater spending response to an income change. Each of these first three facts suggest that $H2M$ households exhibit lower targeted savings.

Our fourth and fifth facts suggest a role for preference heterogeneity in these differential targets. We find that households frequently hand-to-mouth exhibit more volatile income

[1] Many papers have modeled low-asset households as responding more to fiscal policies. Recent examples include Kaplan and Violante (2014), Jappelli and Pistaferri (2014), Farhi and Werning (2017), McKay and Reis (2016), Carroll, Slacalek, Tokuoka and White (2017), Kaplan, Moll and Violante (2018), and Auclert (2019). Many of these authors also make clear that the hand-to-mouth will display less direct inter-temporal substitution response to interest rates, though they may respond more via indirect channels, such as the income and wealth effects, resulting from interest rate changes (e.g., Auclert (2019), Kaplan et al. (2018)).

and spending. So, absent preference heterogeneity, they should display a greater demand for precautionary savings; but instead they display less. Finally those frequently hand-to-mouth spend differently than others household. In particular, they adjust spending to a greater extent through the extensive margin of adding and dropping categories of spending on nondurables. That spending behavior cannot reflect income-related differences from other households or a different rate of time discounting. More active spending adjustment at the extensive margin is consistent, as we illustrate, with a greater elasticity of inter-temporal substitution in spending (higher IES).

The core paradigm of both the micro and macro literatures, and the starting point of our analysis, is the precautionary saving model in which consumers self-insure against idiosyncratic income risk by saving in a non-contingent asset subject to a borrowing constraint.[2] This model has some key empirical predictions: (i) the consumption policy function is strictly concave in wealth, and hence the MPC is strictly decreasing; (ii) the APC is increasing in wealth, as low-wealth agents are actively saving away from the constraint; and (iii) expected consumption growth is decreasing in wealth, as low-wealth agents are either constrained or in the process of building up their buffer stock of savings.

Guided by these predictions, we explore the consumption behavior of households in the PSID. Following Zeldes (1989), we treat low-net worth households as empirical analogues to the model's low-wealth agents that are potentially "hand-to-mouth." An alternative group of interest are higher net worth households with negligible liquid assets, those Kaplan, Violante and Weidner (2014) refer to as the "wealthy hand-to-mouth." On average, we label about 40 percent of households as hand-to-mouth based on either low net worth or low liquid wealth, with a little over half of these classified as low net-worth.

The five facts we document for $H2M$ households run counter to the predictions of the standard model in which agents are ex ante identical and H2M-status is solely due to bad luck. They also invalidate differences in income processes as an explanation for low wealth holdings. The facts suggest differences across households in their targeted assets-to-income are driven, at least in part, by preference heterogeneity. Because households having either a low time discount factor or a high IES will target lower assets, we explore a quantitative model that allows households to differ in these two key parameters. We examine how that preference heterogeneity influences behavior key to macro policies: the distribution of MPCs across households and responsiveness of $H2M$ households to interest rates or other inter-temporal prices. To distinguish heterogeneity in discount factors from that in IES, we exploit portfolio choices in the two-asset model of Kaplan and Violante (2014) calibrated to allow

[2]Just a few of the many papers in this vein are Schechtman and Escudero (1977), Imrohoroglu (1989), Deaton (1991), Carroll (1992), Huggett (1993), Aiyagari (1994) and Krueger, Mitman and Perri (2016).

preference heterogeneity. The model helps identify high-IES consumers because, being less averse to consumption varying over time, they are more willing to save in illiquid assets. We calibrate the model to match the shares of $H2M$ households in the PSID, due to low net worth or lack of liquid assets, as well as the average net worth of households by $H2M$ status.

We find that adding modest preference heterogeneity – 84% of households have standard "macro" preferences, being fairly patient and inter-temporally inelastic – plays a major role in dispersion in MPCs. Differences in preferences, independent of shocks, capture a full half of the variance across agents' MPCs in the model. Our empirical and model results both suggest that empirical work on MPCs should consider stratifying households by their tendency to be hand-to-mouth, not just current $H2M$ status. Finally, we find that the effective IES for the poor hand-to-mouth is as high as for others. While they are disproportionately at a borrowing constraint, muting their inter-temporal response, those not literally constrained are especially responsive given they tend to exhibit high-IES preferences.

Our paper is related to the literature studying the spending behavior of low wealth households either empirically or quantitatively. Empirically, this literature focuses on how these households respond to income shocks and, more recently, interest rate shocks. Havranek and Sokolova (2019) reference many of the studies in the former group as they perform a meta analysis of 144 of them. Cloyne, Ferreira and Surico (2019) and Holm, Paul and Tischbirek (2020) are examples of the latter. Quantitatively, starting with Kaplan and Violante (2014) and Kaplan et al. (2018), the literature has focused on assessing the ensuing implications for fiscal and monetary policy. We contribute to this line of work by pointing to a broader set of predictions of standard consumption theory regarding the behavior of low wealth households, including spending growth, spending volatility, and spending allocation. Testing these predictions using panel data allows us to uncover that the key predictor for a household's spending is not its current assets, but rather the longer-run positioning of its assets, pointing to a role for permanent differences between households as joint determinants of their wealth holding and spending behavior.

Our interpretation of these permanent differences as reflecting differences in preferences intersects with a large literature identifying preference heterogeneity. Recent examples include Parker (2017), Gelman (2019), Athreya, Mustre-del-Río and Sánchez (2019), and Calvet, Campbell, Gomes and Sodini (2019a). Our work is especially complementary to Calvet et al. (2019a), who also find support for heterogenity in both the IES and discount factors across a sample of Swedish households.[3]

The paper proceeds as follows. To guide our empirical work, we begin in Section 2 by

[3] They draw this conclusion from the heterogeneity in how households reduce savings as the need for precautionary savings declines.

reviewing predictions of the standard buffer-stock savings model of consumption smoothing. In Section 3 we describe the panel we employ from our primary data source, the PSID. We present our empirical results in Section 4. There we first describe how we identify $H2M$ households and our strategy to highlight persistent versus transitory factors in their spending. We then present our five facts for the hand-to-mouth, followed by a number of robustness results. In Section 5 we calibrate our version of the two-asset Kaplan and Violante (2014) model of precautionary savings that allows for preference heterogeneity. We explore its ability to generate the $H2M$ facts from the PSID, then show its implications for the level and cross-sectional dispersion of MPCs. We conclude in Section 6.

# 2 Hand-to-Mouth in the Canonical Consumption Model

To guide our empirical exploration of the hand-to-mouth, we review the canonical consumption-savings model in which agents use a non-contingent asset to smooth idiosyncratic income fluctuations. In Section 5, we extend the model to include both liquid and illiquid assets along the lines of Kaplan and Violante (2014); for the current motivational section, we present the standard single-asset environment.

Specifically, suppose agents are infinitely lived and receive a stochastic endowment $y_t$ that follows a first-order Markov chain on support $\{y_1, ..., y_N\}$, with $0 < y_1 < ... < y_N < \infty$. Preferences over consumption streams are given by:

$$\mathbb{E} \sum_{t=0}^{\infty} \beta^t u(c_t),$$

where $\beta \in (0, 1)$ and the expectation is conditional on some initial state. We assume $u$ takes the CRRA form:

$$u(c) = \begin{cases} \frac{c^{1-\gamma}}{1-\gamma} \text{ if } \gamma \neq 1 \\ \ln c \text{ if } \gamma = 1. \end{cases}$$

The parameter $\sigma \equiv 1/\gamma$ is the inter-temporal elasticity of substitution (IES).

The agent has access to a non-contingent savings vehicle that has gross return $R = 1+r < \beta^{-1}$. The environment is partial equilibrium and we take $R$ to be a primitive of the model. The level of assets is restricted to be above some threshold $\underline{a} \leq 0$. At the start of period $t$, the agent has resources ("cash on hand") $x_t \equiv Ra_t + y_t$ to allocate to consumption and next period's assets $a_{t+1}$. The agent's problem can be expressed in its recursive form:

$$V(x, y) = \max_{c, a' \geq \underline{a}} u(c) + \beta \mathbb{E}\left[V(Ra' + y', y') \mid y\right]$$

$$\text{subject to } a' + c \leq x.$$

Let $\mathcal{C}(x, y)$ denote the associated optimal consumption function. Letting $c_t = \mathcal{C}(x_t, y_t)$, consumption satisfies the usual Euler equation:

$$\mathbb{E}_t\left[\beta R \left(\frac{c_{t+1}}{c_t}\right)^{-\frac{1}{\sigma}}\right] \leq 1, \tag{1}$$

with equality when $a_{t+1} > \underline{a}$.

We define the *marginal propensity to consume* (MPC) as $\partial \mathcal{C}/\partial x$. As is well known (see Carroll and Kimball, 1996), in this environment $\mathcal{C}$ is a strictly increasing and concave function of $x$. Hence, the MPC is well-defined almost everywhere and decreasing in the level of assets.

A voluminous literature uses this fact to proxy MPC with some measure of wealth (or liquid wealth). A complication is that the consumption function is defined for a particular utility function, borrowing constraint, and process for income. It is not generally the case that the MPC is monotonic in assets when comparing across people with distinct preferences at a point in time, or, if the process for income changes, across time for the same person.

More generally, consider an individual with relatively low assets compared to the population average. Such a low asset position may be a consequence of a string of low income realizations. Alternatively, the individual may have preferences that imply a low target level of assets to long-run income.[4] A potentially useful concept to sort between these forces is the *average propensity to consume* (APC) out of income:

$$APC(x, y) \equiv \frac{\mathcal{C}(x, y)}{ra + y},$$

which is well defined whenever $ra + y > 0$.[5]

[4]Given $\beta R < 1$, a stationary process for $y_t$, and the specification of preferences, there exists a unique ergodic distribution for $(a_t, y_t)$, denoted $\lambda(a, y)$. Integrating the budget constraint over the distribution $\lambda$, we define the *target wealth* $a^*$ by:

$$a^* = \frac{1}{r}\left(\int \mathcal{C}(Ra + y, y) d\lambda - 1\right).$$

That is, $a^*$ is the mean of the ergodic distribution for assets, integrating the ergodic distribution over both assets and income.

[5]In the data, we encounter a few households with negative denominators (none zero); but we exclude them from the sample.

To understand the mapping between APC and resources, we can rewrite the flow budget constraint as:

$$\frac{a' - a}{ra + y} = 1 - APC,$$

where $a$ is start-of-period assets and $a'$ is next period's asset position. Hence, assets are accumulating when $APC < 1$. That is, $APC \gtrless 1$ signals whether the agent's asset position is above or below their target. In the appendix we show that the ergodic mean of assets increases in $\beta$, decreases in the IES when $\beta R < 1$, and increases in the variance of income.

If asset dynamics are monotone (that is, $a' - a$ is decreasing in $a$ given $y$) and $r \approx 0$, then APC is increasing in $a$ for a given level of income. That is, APC is monotonically related to $x$ conditional on income, and hence to MPC. In many datasets that include consumption expenditures, we have arguably more reliable measures of income than wealth; so APC, being normalized by flow income, is a useful empirical proxy for $x$ and MPC.

We can use the Euler equation (1) to develop intuition and guide our empirical analysis. If consumption growth is approximately log-normally distributed, we can log-linearize the Euler equation (1) as:

$$\mathbb{E}_t \Delta \ln c_{t+1} \geq \sigma \ln(\beta R) + \frac{1}{2\sigma} Var_t(\Delta \ln c_{t+1}). \tag{2}$$

This suggests that a consumer will have relatively large expected consumption growth if (i) they are constrained; (ii) they are relatively patient (high $\beta R$); (iii) they have a relatively low IES (low $\sigma$, assuming $\beta R < 1$); and/or (iv) they have a relatively large demand for precautionary savings (a large conditional variance of consumption growth scaled by risk aversion $1/\sigma$).

In Appendix A1, we solve the model numerically and show how the MPC, APC, and consumption growth vary with assets under alternative income and preference specifications. The intuition gleaned from the Euler equation carries over to the global solution of the model. Specifically, given an income process and a set of preferences, low-wealth households exhibit higher MPCs, higher expected rates of consumption growth, and lower APCs. However, these predictions are sensitive to preference heterogeneity and the income process. All else equal (including wealth), MPCs and APCs are decreasing in the discount factor $\beta$ and increasing in the IES, while expected consumption growth is increasing in the discount factor and decreasing in the IES. The MPC and expected consumption growth are increasing in the volatility of the income process, while the APC decreases in income risk.

The usual approach in the literature is to assume ex ante identical individuals. In that environment, low wealth is due to the idiosyncratic history of income realizations. However, the analysis in this section suggests (at least) three other possibilities for why an individual has low levels of assets. One, also familiar from the literature, is that the agent is relatively impatient. The second, which is perhaps less familiar, is that the agent has a high elasticity of inter-temporal substitution (assuming that $\beta R < 1$). The third possibility is differences in the income process, particularly a high anticipated growth rate or low volatility, which reduces the demand for precautionary savings. All these three motives generate low wealth positions due to low target wealth, as opposed to "bad luck" in the standard model. Identifying the strength of these forces in the data will be the focus of the empirical work.

# 3 Data

Our empirical work is primarily conducted on the PSID, employing its biennial surveys from 1999 to 2015. 1999 was the onset of the PSID measuring wealth in each survey. It also initiated the PSID including spending more broadly than on food and housing. Appendix A2 discusses our variable constructions and sample restrictions in detail. Here we highlight the key variables for our analysis of earnings, income, wealth, and expenditures.

In the next section we identify households as hand-to-mouth, following Zeldes (1989) and Kaplan et al. (2014), by assets relative to a measure of earnings. Our earnings measure equals labor income, net of payroll taxes, plus government transfers received. We also consider a broader measure of after-tax income, for instance for calculating a household's APC. After-tax income is the sum of earnings and transfer income, net profits from business or farm, and net income from assets, minus the family's federal and state income tax liabilities calculated by TAXSIM. For homeowners we include 6 percent of the home value as implicit rent, while subtracting associated property taxes, mortgage interest, and home insurance.

Our division of assets by liquidity largely follows Kaplan et al. (2014). For liquid net worth we sum checking and savings balances, money market funds, certificates of deposit, treasury bills, and stocks outside of pension funds, while subtracting debts in the forms of credit and store cards, student loans, medical or legal debt, and debt owed to family. Illiquid assets reflect home and other real estate equity, IRA/pension holding, non-government bonds, insurance equity, and the net value of any business, farm, or vehicles.

Measured expenditures include shelter, utilities, food, gasoline, health insurance and medical expenses, education, child care, public transportation, and vehicles spending for purchases, repairs, insurance and parking. Spending on shelter equals rent payments for renters; for homeowners we set it to 6 percent of respondent's valuation of the home. Summing categories, expenditures average 58.3 percent of after-tax income for our sample. Unless stated otherwise, our results reflect spending on all these categories. But our results are robust if we exclude spending on the durable categories of vehicle purchases and repair.

Our sample reflects only the PSID's nationally representative core sample, including its "split-off" families and PSID sample extensions to better represent dynasties of recent immigrants. All results reflect PSID longitudinal family weights. We restrict our sample to households with heads ages 25 to 64 and for which we can measure hand-to-mouth status from wealth and earnings for at least three surveys. We exclude households with less than \$2,000 in annual earnings plus transfers, after-tax income, or expenditures. (All nominal variables are converted to 2009 CPI-deflated dollars.) Appendix A2 details the impact of these sample restrictions.

# 4 Empirical Results

Guided by predictions of the canonical consumption-savings model discussed above, in this section we analyze empirically the consumption growth, APC and MPC of hand-to-mouth consumers. We find that, contrary to the predictions of the canonical model, $H2M$ households exhibit lower consumption growth and a higher APC. We show that these patterns, as well as the apparent larger consumption response to income changes of low-wealth households, are driven by permanent differences between households. In a sequence of empirical exercises, we argue that these differences reflect disparities in target wealth across households that are likely to stem from differences in preferences rather than income processes.

## 4.1 Identifying the Hand-to-Mouth

Various measures have been introduced to identify households in the data that are likely to have high marginal propensities to consume. The early and influential paper by Zeldes (1989) stratified households by net worth. Specifically, Zeldes considered a household "constrained" if its net worth was less than two months of its labor earnings. Following Zeldes, we therefore define a household as hand-to-mouth based on net worth (denoted $H2M_{NW}$) if their net worth is less than two months labor earnings.

Kaplan et al. (2014) (henceforth KVW) pursue an alternative measure of constraints focused on liquidity rather than wealth. They divide assets into net illiquid wealth versus net liquid wealth. They classify a household as constrained if its liquid wealth is close to a borrowing limit, which they set equal to 18.5% of its annual earnings, or if its liquid wealth is close to zero. More exactly, they define constrained households as those with negative liquid wealth within one week of earnings of the borrowing limit, or non-negative, but small, liquid wealth equal to a week or less of earnings. The latter criteria is designed to identify those at a "kink" in the budget set near zero liquid assets due to a wedge between borrowing and saving interest rates. Note that KVW's definition focuses only on liquid net worth, and is designed to include households potentially with substantial total net worth (the "wealthy hand-to-mouth"). We therefore assign households to be wealthy hand-to-mouth (denoted $H2M_{LIQ}$) if they are not $H2M_{NW}$, but have liquid wealth that satisfies the KVW criteria.

In our PSID sample, an average of 40.2% of the households (pooling across waves) are hand-to-mouth, with 22.7% denoted $H2M_{NW}$ and 17.5% denoted $H2M_{LIQ}$. That is, 17.5% of the sample is liquidity constrained according to the KVW definition, but have sufficient total net worth to be considered unconstrained by the Zeldes measure. As Table 1 shows, 16.6% of the sample is both net worth and liquidity constrained, which we assign to the low-net-worth $H2M_{NW}$ category; that is, 74% of the $H2M_{NW}$ group would also satisfy the KVW liquidity-constrained definition.[6] We also constructed these shares for the seven waves of the Survey of Consumer Finance (SCF) from 1998 to 2016. The respective household shares for not hand-to-mouth, $H2M_{NW}$, and $H2M_{LIQ}$ are 62.5%, 25.0%, and 12.5%, similar to our counts from the PSID.

Table 1: Hand-to-Mouth Groups

| | Not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|
| Shares | 59.7% | 22.7% | 17.5% |

| | By LIQ (KVW) | |
|---|---|---|
| By NW (Zeldes) | Not $H2M$ | $H2M$ |
| Not $H2M$ | 59.7% | 17.5% |
| $H2M$ | 6.1% | 16.6% |

## 4.2 Characteristics of the Hand-to-Mouth

We first provide some summary statistics for the hand-to-mouth in Table 2. Specifically, we compute statistics based on whether a household is designated as one of our hand-to-

[6] For comparison, Zeldes classified 29% of his (earlier) PSID sample as hand-to-mouth by his net-worth definition. KVW classify 31% of their Survey of Consumer Finance sample as liquidity constrained, compared to 34.1% in our PSID sample (spread over both our measures). KVW classify 20% percent as "wealthy hand-to-mouth," compared to 17.5% for our PSID sample.

mouth measures in a given year. This implies that the same household may be represented in multiple columns, albeit in different waves of the survey.

First compare the hand-to-mouth based on net worth ($H2M_{NW}$) in the second column to those not hand-to-mouth in the first column. These hand-to-mouth are 7 years younger on average; their earnings and incomes are only half as much; and of course their wealth, both liquid and illiquid, is much lower. Turning to the wealthy hand-to-mouth ($H2M_{LIQ}$), we see they are not really so wealthy. In particular their median net worth is only 30 percent that of households not classified hand-to-mouth by either measure. By other measures, they are intermediate to the groups in columns 1 and 2. They more closely resemble those not hand-to-mouth in age, but better resemble the poor hand-to-mouth in earnings and income.

Recall from the Euler equation (1), a potential source of differences in consumption growth rates is heterogeneity in expected rates of return:[7] If low-asset households face a lower marginal return on savings, this could push them towards lower expected consumption growth. The variable High Liquid Debt in Table 2 reports the fraction of households, by group, that have balances on credit cards, store credit, student loans, medical or legal bills, or loans from family that sum to at least one month of household earnings. A large share of hand-to-mouth households exhibit such high debts. More exactly, two-thirds of $H2M_{NW}$ and over half of $H2M_{LIQ}$ households do, compared to only a fourth for those not hand-to-mouth. The bulk of such debts, especially credit card debt, charge high interest rates. This suggests that many households classified hand-to-mouth do face a high marginal return to saving.[8]

## 4.3 Empirical Strategy

In Sections 4.4 to 4.8 we document five facts about the behavior of the hand-to-mouth. For each fact, we follow a three-step empirical strategy, with additional robustness checks described in Section 4.9.

We first regress our variable of interest on the two indicators of $H2M$ status. Take, as an example, log consumption growth between years $t$ and $t+2$ (as the PSID is biennial) for household $i$, $\Delta \ln c_{i,t+2}$. The benchmark specification (omitting the constant) is:

$$\Delta \ln c_{i,t+2} = \beta_{NW} H2M_{t,NW} + \beta_{LIQ} H2M_{t,LIQ} + \boldsymbol{\delta}' \boldsymbol{D}_t + \boldsymbol{\gamma}' \boldsymbol{X}_{i,t} + \varepsilon_{i,t+2}. \tag{3}$$

[7]See Fagereng, Guiso, Malacrino and Pistaferri (2020), Calvet, Bach and Sodini (2019b), Fagereng, Holm, Moll and Natvik (2019).

[8]PSID surveys for 2011 and later allow us to separately identify credit card debt. Households categorized as hand-to-mouth are twice as likely to have credit card debt of a month's earnings or more. The incidence is 29.2% and 30.6% respectively for $H2M_{NW}$ and $H2M_{LIQ}$, compared to 14.5% for households not hand-to-mouth by net worth or liquid wealth.

Table 2: Summary Characteristics of the Hand-to-Mouth

| | Not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|
| Age | 46.6 | 39.8 | 44.5 |
| Income | 96,660 | 46,781 | 64,058 |
| Earnings | 88,908 | 44,664 | 55,695 |
| Liq Wealth (median) | 13,918 | - 7,719 | - 2,731 |
| Net Worth (median) | 175,823 | - 2,498 | 50,389 |
| High Liquid Debt | 24.7% | 66.1% | 54.4% |
| Sample Shares | 59.7% | 22.7% | 17.5% |

Note: All figures in 2009 dollars. Sample is PSID 1999-2015, with $H2M$ status observed at least three times. High Liquid Debt equals one for households with credit card, store credit, student loans, medical or legal bills, or loans from family that sum to a month's or more of earnings, zero otherwise.

Growth rates, here for consumption, are log differences between year $t$ and the subsequent wave in year $t+2$, where we divide those differences by two to annualize the growth rates. Our benchmark results include all categories of spending described in Section 3; but in Section 4.9 we show these are robust to excluding the durable categories of vehicle purchases and repair. $H2M_{t,k}$, for $k = NW, LIQ$, takes value one if household $i$ is $H2M_{t,k}$ in *period* $t$, that is, at the initial period of the growth rate; so coefficients $\beta_{NW}$ and $\beta_{LIQ}$ reveal each group's *differential* consumption growth compared to households hand-to-mouth by neither measure. $\boldsymbol{D}_t$ is a vector of year dummies; and $\boldsymbol{X}_{i,t}$ is a vector of household demographics, namely: a quadratic in age, two change-in-marital-status dummies (marriage and separation), and two change in family size dummies (increase and decrease). When the left-hand side variable of interest is a level, rather than a growth rate, we include a cubic in age and dummies to reflect two categories for marital status, five for family size ($\{1, 2, 3, 4, \geq 5\}$), and three for race (black, white, other). Race and age are those of the household head.

Regression equation (3) estimates to what extent having low assets or liquidity predicts the variable of interest. Other than demographic controls, it assumes the outcome of interest depends only on current wealth or liquidity. This is consistent with the standard model in which agents are ex ante identical (conditional on demographics), but differ in their current asset position due to a sequence of idiosyncratic income realizations.

This baseline specification frequently yields results counter to the standard model. Motivated by the discussion in Section 2, the next step in our empirical strategy is to explore whether permanent (or persistent) differences across households influence the mapping between $H2M$ status and observed outcomes. The panel dimension of the PSID allows us to control for permanent differences. To this end, our second specification adds household fixed effects to equation (3). When adding fixed effects, we drop the race dummies.

As we shall see, in many cases adding the fixed effects changes the estimated $\beta$ significantly, and typically brings the predictions closer to the standard model. This raises the question of what the fixed effects capture. Our third specification strives to answer this by including observables in the benchmark specification equation (3) that stand in for the household's fixed effect. The observables we add are the frequencies that a household is coded as hand-to-mouth by each measure over the entire sample:

$$\Delta \ln c_{i,t+2} = \sum_{k \in \{NW, LIQ\}} \beta_k H2M_{t,k} + \sum_{k \in \{NW, LIQ\}} \alpha_k \mathrm{Fr}H2M_k + \boldsymbol{\delta}' \boldsymbol{D}_t + \boldsymbol{\gamma}' \boldsymbol{X}_{i,t} + \varepsilon_{i,t+2}, \quad (4)$$

where $\mathrm{Fr}H2M_{i,k} \in [0,1]$ is the fraction of household-$i$ observations they are classified as $H2M_k$, $k = NW, LIQ$.

The coefficients $\beta_k$ capture the role of current wealth and liquidity, while the $\alpha_k$ reveal whether a persistent tendency to be hand-to-mouth is also informative. A household may be hand-to-mouth due to bad luck or because they have a low asset-to-income target. Those more frequently hand-to-mouth are interpreted as having a low target for net worth or liquidity. However, given the time sample of up to 17 years, some of that average frequency undoubtedly reflects shocks as well as ex ante targets. The specification establishes whether two households with similar assets and demographics behave differently, and if this difference is correlated with whether those asset positions are typical for the households.

## 4.4 Fact 1: H2M Do *Not* Have Higher Consumption Growth

As discussed in Section 2, a constrained household's Euler equation holds as an inequality implying, all else equal, higher expected consumption growth. Moreover, even if the borrowing constraint is not binding, a low-wealth household should exhibit high expected growth in consumption as it rebuilds assets (see Figure A1 in Appendix A1.) In this subsection, we document that the hand-to-mouth do not display higher growth in consumption. In fact, those frequently hand-to-mouth have lower average consumption growth. Adding this control brings the impact of *current* hand-to-mouth status in line with the standard model.

Table 3 presents results for regression equation (3) relating (annualized) log growth in consumption from $t$ to $t+2$ on the dummies indicating $H2M$ status in $t$ as well as the controls described in Section 4.3. Starting with column (1), which omits household fixed effects and the frequency controls, we see there is little difference in future consumption growth between the $H2M_{NW}$ and those with higher net worth, while the wealthier hand-to-mouth ($H2M_{LIQ}$) show about a percentage point lower consumption growth than the other groups.

Table 3: Consumption and Income Growth for the Hand-to-Mouth

| | Consumption Growth | | | Income Growth | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $H2M_{NW}$ | .003 | .025 | .025 | .012 | .033 | .038 |
| | (.004) | (.006) | (.007) | (.004) | (.007) | (.008) |
| $H2M_{LIQ}$ | -.009 | .003 | .002 | .010 | .025 | .028 |
| | (.004) | (.005) | (.005) | (.004) | (.006) | (.006) |
| Fraction time $H2M_{NW}$ | | | -.038 | | | -.045 |
| | | | (.009) | | | (.009) |
| Fraction time $H2M_{LIQ}$ | | | -.025 | | | -.043 |
| | | | (.007) | | | (.008) |
| Fixed Effects | No | Yes | No | No | Yes | No |

Note: Sample size is 19,351. Growth rates are annualized. Not-$H2M$ group is omitted in all regressions. Sample is PSID 1999-2015, with $H2M$ status observed at least three times. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

But these estimated effects change notably when we control for household fixed effects in column (2). Fixed effects control for (permanent) differences between households, including differences in preferences, rates of return, and consumption uncertainty. Controlling for fixed effects, low-net-worth households have a significantly higher rate of consumption growth – the coefficient on $H2M_{NW}$ is 2.5 log points – as anticipated by the standard model of savings. Including fixed effects, the point estimate on $H2M_{LIQ}$ is essentially zero, suggesting that the wealthier hand-to-mouth do not have different consumption growth going forward than wealthy households with more liquid wealth. One interpretation is that the wealthy hand-to-mouth need not reduce consumption in order to build up a buffer stock of precautionary saving, as they have the option of converting illiquid to liquid wealth in response to larger shocks to income.

The third column in Table (3) provides a sense of why including fixed effects has a large impact. Here we replace the fixed effects with controls for how frequently a household is denoted hand-to-mouth over the sample, thereby capturing a household's tendency to have low net worth or liquidity. Including the frequency of $H2M$ status brings the baseline coefficients in line with the fixed-effects estimates. Moreover, conditional on current $H2M$ status, household frequently designated as $H2M_{NW}$ or $H2M_{LIQ}$ have significantly *lower* consumption growth. This predictably low growth is consistent with $H2M$ households having lower targets for net worth or liquidity relative to income, as would obtain if they exhibit a lower discount factor (relative to return on savings), a higher IES, or less anticipated consumption volatility.[9]

The right panel of Table 3 repeats the three specifications of equation (3) but with log growth in income (earnings plus financial income) as the outcome variable. Standard consumption smoothing arguments suggest that a household that anticipates higher future income should draw down assets or increase debt today. Hence, low-wealth individuals may anticipate relative faster income growth compared to their higher wealth counterparts. For income growth, the specification without fixed effects suggests that both the $H2M_{NW}$ and the $H2M_{LIQ}$ each have about a one percentage point higher growth rate than the non-$H2M$. Adding the fixed effect increases the differences by a factor of two to three. Conditional on current hand-to-mouth status, an individual that frequently finds itself designated as $H2M_{NW}$ or $H2M_{LIQ}$ tends to have significantly *lower* income growth. Interestingly, households that tend (on average) to have low net worth or liquidity do not have a steeper income profile, as suggested by consumption smoothing logic; in fact, the opposite is true.

To sum up Fact 1, being hand-to-mouth does not predict higher consumption growth. However, this fact conflates two underlying outcomes: (i) Households frequently observed as hand-to-mouth display significantly less consumption growth, while (ii) controlling for that hand-to-mouth tendency, currently being $H2M_{NW}$ does predict significantly faster consumption growth. We consider several robustness checks in Section 4.9 with respect to measures of expenditures and controls as well as presenting results stratifying households by age or permanent income. In all cases, these summary statements continue to apply.

## 4.5 Fact 2: H2M Have Higher APCs

As discussed in Section 2, for a given set of preferences, the average propensity to consume is a useful guide to the distance to a household's target wealth to income. In particular,

[9] One concern with the specification including frequencies of $H2M$ status is that these measures capture frequencies over the household's entire sample, including future periods. Hence, it may be that the frequencies represent future negative income draws, and this drives the negative covariance between realized consumption growth and the frequencies. We have re-estimated the regression using a frequency measures based solely on past periods and found a similar pattern in terms of signs, albeit with smaller magnitudes for point estimates. Similarly, if current assets affect consumption choices beyond what is controlled for by the $H2M$ indicators, the frequency measure may reflect lagged income draws that are correlated with this omitted variable. Including a polynomial in lagged income as well as measures of income growth over the entire sample as additional controls yields similar results.

households below their target wealth should have a low APC. In Table 4, we report the results of regressing APC at time $t$ on lagged $t-2$ measures of hand-to-mouth status and controls for specifications in levels as described in Section 4.3.[10]

Table 4: The Average Propensity to Consume

| | (1) | (2) | (3) |
|---|---|---|---|
| $H2M_{NW}$ | .065 | -.007 | -.022 |
| | (.010) | (.010) | (.015) |
| $H2M_{LIQ}$ | .077 | .005 | .005 |
| | (.012) | (.009) | (.011) |
| Fraction | | | .157 |
| time $H2M_{NW}$ | | | (.022) |
| Fraction | | | .191 |
| time $H2M_{LIQ}$ | | | (.025) |
| Fixed effects | No | Yes | No |

Note: Sample size is 19,350. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

We see in Column (1) that the average propensity to consume is *higher* for hand-to-mouth households. That is, the hand-to-mouth continue to draw down, rather than build, their buffer stock of savings relative to their wealthier or more liquid counterparts. This is counter to the model of Section 2 if targeted assets-to-income do not differ across households.

Controlling for fixed effects, reported in Column (2), essentially eliminates any differences in APCs between the groups. That is, a given household's APC does not depend on whether it was most recently hand-to-mouth. Column (3) documents that it is those households frequently hand-to-mouth that exhibit relatively high APCs. As with fixed effects, the most recent hand-to-mouth status is then no longer significant in predicting a household's APC. These results are consistent with the hypothesis that frequently hand-to-mouth households have significantly lower targets for assets or liquidity relative to income.

We discuss robustness checks and alternative specifications in Section 4.9. In particular, we examine APCs by hand-to-mouth status dividing households by age and by long-term earnings. The conclusions from Table 4 continue to apply, namely that it is frequently

[10]We measure household APC by its expenditures relative to after-tax income, including asset income. But in Section 4.9 we show findings are robust to excluding durable categories.

being hand-to-mouth, not the most recent status, that predicts household APC; though magnitudes are somewhat smaller when households are separated by long-term income.

### 4.6 Fact 3: It is Frequently-H2M that have Higher MPCYs

Conditional on fundamentals (preferences and income process), the model of Section 2 clearly predicts the MPC is declining in cash-on-hand. The empirical evidence on the cross-sectional relationship is very mixed,[11] reflecting the challenge of identifying sizeable, purely transitory income shocks in data sufficiently rich to stratify by wealth. Here we examine household responses to all measured changes in income, transitory and permanent. We refer to this data moment as a marginal propensity to consume out of income – MPCY for short. We first highlight why the MPCY can speak qualitatively to the marginal propensity to consume out of cash on hand.[12] We then take advantage of the panel attribute of the PSID to show that, while hand-to-mouth households do exhibit higher MPCYs, it is a household's propensity to be seen as hand-to-mouth, not its recent status, that predicts a higher MPCY.

Suppose we observe $\Delta c_t \equiv c_t - c_{t-1}$. From the consumption function, $\Delta c_t = \mathcal{C}(x_t, y_t) - \mathcal{C}(x_{t-1}, y_{t-1})$. Approximating the consumption function around $(x_{t-1}, y_{t-1})$, we have

$$\begin{aligned} \mathcal{C}(x_t, y_t) - \mathcal{C}(x_{t-1}, y_{t-1}) &\approx \mathcal{C}_x \Delta x_t + \mathcal{C}_y \Delta y_t \\ &= MPC * R\Delta a_t + MPCY \Delta y_t, \end{aligned} \tag{5}$$

where $C_x$ and $C_y$ are evaluated at $(x_{t-1}, y_{t-1})$, the second line uses $x_t = Ra_t + y_t$, and we define $MPCY \equiv MPC + \mathcal{C}_y$ as the marginal propensity to consume out of a change in income. Recall that holding $x$ constant, $\mathcal{C}_y$ captures consumption's response to anticipated future income following today's $y$ realization. If $y$ is $iid$, $\mathcal{C}_y = 0$, while if $y$ is persistent and the individual is not constrained, then $\mathcal{C}_y > 0$. Hence, we expect $MPCY \geq MPC$ to hold in the data.

To scale the responses, divide (5) through by $y_{t-1} + ra_{t-1}$ to obtain:

$$\frac{\Delta c_t}{y_{t-1} + ra_{t-1}} \approx MPC \frac{R\Delta a_t}{y_{t-1} + ra_{t-1}} + MPCY \frac{\Delta y_t}{y_{t-1} + ra_{t-1}}, \tag{6}$$

where MPC and MPCY are evaluated at $(x_{t-1}, y_{t-1})$.[13] In the model of Section 2 the MPCY

[11] See Havranek and Sokolova (2019) for a recent meta-study.

[12] That reasoning is an analog to its by use by Blundell, Pistaferri and Preston (2008) as a key moment to identify propensities to spend out of transitory versus permanent income.

[13] Recalling that $a_t$ denotes start of period $t$ assets, we have $\Delta a_t = ra_{t-1} + y_{t-1} - c_{t-1}$. Hence, $\Delta a_t$ is in the individual's $t-1$ information set. If the growth rate of income is $iid$ (that is, log income is a random walk), then the first term on the right of (6) is orthogonal to $\Delta y_t/(y_{t-1} + ra_{t-1})$. If income follows a random walk,

monotonically decreases in assets $a$ for a given set of parameters.

Table 5: Marginal Propensity to Consume out of Income

Dependent variable is $\Delta c/(y+ra)$

| | OLS | | | IV | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\Delta y/(y+ra)$ | .037 | .018 | .066 | .080 | .043 | .095 |
| | (.008) | (.009) | (.013) | (.020) | (.021) | (.041) |
| $\Delta y/(y+ra) \times H2M_{NW}$ | .044 | -.018 | -.032 | .038 | -.076 | -.055 |
| | (.019) | (.024) | (.024) | (.038) | (.059) | (.059) |
| $\Delta y/(y+ra) \times H2M_{LIQ}$ | .017 | -.023 | -.026 | .066 | -.022 | -.022 |
| | (.020) | (.022) | (.022) | (.047) | (.051) | (.051) |
| $\Delta y/(y+ra)$ | | .117 | .153 | | .189 | .182 |
| $\times$Fraction time $H2M_{NW}$ | | (.040) | (.036) | | (.085) | (.085) |
| $\Delta y/(y+ra)$ | | .089 | .114 | | .209 | .184 |
| $\times$Fraction time $H2M_{LIQ}$ | | (.042) | (.039) | | (.101) | (.100) |
| $\Delta y/(y+ra)\times$ APC | | | -.074 | | | -.069 |
| | | | (.017) | | | (.059) |

Note: Sample size is 19,351. $H2M$ indicators are lagged (t-2) values, APC is Tornqvist of current and lagged APCs. Instruments for IV estimates are employment status at (t-2) and changes in weeks worked and annual hours for each of head and spouse. Regressions also include $H2M$ dummies, in addition to the controls described in Section 4.3. Columns (2), (3), (5) and (6) include fractions of time $H2M_{NW}$ and $H2M_{LIQ}$; (3) includes APC.

In Table 5 we regress the (normalized) change in consumption on the (normalized) change in household earnings, dummies for $H2M_{NW}$ and $H2M_{LIQ}$ status at $t-2$, as well as interactions for the change in earnings with each of those dummies.[14] Earnings are broadly defined to include transfer income. (See Appendix A2 for details.) All regressions include year, age and demographic controls as described in Section 4.3. The normalization factor is the average of household earnings in period $t$ and $t-2$. To be clear, the coefficient on $\Delta y/(y+ra)$ gives the MPCY for non-$H2M$ households, while the coefficients on the interacted terms give the *differential* for each group's MPCY relative to non-$H2M$. Columns (1)-(3) in the

a regression of consumption growth on income growth, within a sample of individuals of similar $(x_{t-1}, y_{t-1})$ and consumption functions, provides an estimate of MPCY.

[14]Our estimates of spending responses to income perhaps most parallel results in Fisher, Johnson, Smeeding and Thompson (2019), who also examine spending responses to income stratifying PSID households by assets.

table report OLS estimates. Columns (4)-(6) report IV estimates, discussed below.

The point estimates in Column (1) suggest a considerably higher MPCY for low net-worth individuals compared to those not hand-to-mouth, but only modestly higher for the low-liquidity. The estimated MPCYs are actually fairly low for all households, as anticipated by the empirical literature (e.g., Blundell et al., 2008, Straub, 2019, Fisher et al., 2019). Column (2) includes our measures for frequency of $H2M$ status. With these controls, current hand-to-mouth status no longer predicts MPCY. Rather, conditional on current status, it is those households frequently hand-to-mouth, by net worth or liquidity, that have clearly higher MPCYs. The final column implies that those with a higher APC tend to have a lower MPCY. In our benchmark model, a high APC is associated with a level of assets above one's target, which should imply a lower MPC. The impact of being frequently hand-to-mouth on MPCY, if anything, is even stronger controlling for APC.

One concern is that the right-hand-side variable $\Delta y$ is measured with error, generating attenuation bias in the data moment MPCY. To address this, we reestimate each specification instrumenting for changes in earnings using lagged employment status, changes in weeks worked and in annual hours for both the head and the spouse. This will correct for that attenuation bias, assuming measurement error in earnings changes is orthogonal to these instruments.[15] But it should also be kept in mind that this source of variation may have different implications for the persistence of the income change, thus altering the magnitude and interpretation of the MPCY moment. The IV results, reported in Table 5 Columns (4)-(6), tell a similar story to the OLS. The baseline magnitudes are now higher, consistent with attenuation bias in the OLS specification.[16] While standard errors are larger, the IV estimates continue to show that it is those households frequently hand-to-mouth, either measured by net worth or liquid wealth, that display significantly larger MPCYs.

## 4.7 Fact 4: H2M Have More Volatile Consumption and Income

In the model of Section 2, low-wealth households are subject to higher anticipated consumption volatility given the absence of a buffer stock of savings. But, alternatively, low-wealth

[15] Note that the instruments are not designed to correct for the endogeneity of labor supply, only measurement error. Our goal is to establish whether and to what extent low-wealth consumers have expenditure changes that are more or less correlated with income changes. This is distinct from separately identifying the simultaneous choices of consumption and labor supply.

[16] Nevertheless, the point estimates are quite small; specifically, they imply an increase in spending that is only a fraction 0.08 of an earnings increase for non-$H2M$ households. While this magnitude is understated given the PSID does not measure all expenditures, that should have a fairly modest effect as the average APC for our sample is 0.58. Moreover, if income is persistent, then the MPCY estimated in these regressions should be an upper bound on the MPC out of a transfer. In recent work with the PSID data, Fisher et al. (2019) similarly report low estimates for MPCY.

households might have lower volatility of income, thereby leading them to desire less precautionary savings.[17] In this subsection we document that is not the case – hand-to-mouth households display *more* volatile growth in both income and consumption. Moreover, it is those households that are frequently hand-to-mouth, either by net worth or liquid assets, who display significantly more volatile income and consumption growth. This implies that other origins are required for the heterogeneity in targeted savings across households.

To explore these relationships in our PSID sample, we regress the absolute value of consumption growth, $|\Delta \ln c|$, and income growth, $|\Delta \ln (y + ra)|$, on lagged hand-to-mouth status as well as the controls outlined in Section 4.3. Specifically, if the growth rate is calculated between waves $t$ and $t+2$ of the survey, the hand-to-mouth indicators are computed on period $t$ data. This specification is designed to capture whether a hand-to-mouth household today faces greater or lesser uncertainty about the future than a non-$H2M$ household.

The results are reported in Table 6, first for consumption growth, then income. From Column (1), we see that the hand-to-mouth, especially the poor hand-to-mouth, face more variable future consumption growth. For context, the means of the dependent variables $|\Delta \ln c|$ and $|\Delta \ln (y + ra)|$ are both about 0.14. Thus the coefficients on $H2M_{NW}$ and $H2M_{NW}$ of 2.7% and 1.0% represent increases respectively of about 19% and 7% of that mean. But these effects are dramatically reduced for $H2M_{NW}$ status and eliminated for $H2M_{LIQ}$ once we either include individual fixed effects, Column (2), or control for fraction of surveys a household is $H2M_{NW}$ or $H2M_{LIQ}$, Column (3). From the specification in Column (3), we see it is households that are frequently hand-to-mouth, by either measure, that have notably more volatile consumption growth.

Results for volatility in income growth are presented in Columns (4) to (6) of the table. These largely parallel those for consumption: (i) Hand-to-mouth households exhibit greater income uncertainty over the subsequent two years; (ii) those effects are eliminated (for $H2M_{NW}$) or are sharply reduced (for $H2M_{LIQ}$) by controlling for a household's fixed effect or its tendencies to be hand-to-mouth; and (iii) being frequently hand-to-mouth by either net worth or liquid assets is associated with considerably more volatile income growth.[18]

In Section 4.9 we consider robustness of these results to alternative measures of volatility,

[17] In this case, they would also display higher APCs and lower consumption growth and MPCs, as shown in Figure A2 in Appendix A1.

[18] If a household faces a hard constraint in consecutive periods then its consumption must necessarily track income; that is, if a household is literally hand-to-mouth, then $c = y + ra$. This suggests that an interesting moment is the volatility of the difference in consumption growth from income growth as a function of hand-to-mouth status. In an earlier working paper (Aguiar, Bils and Boar (2019)) we additionally regress the absolute value of the difference $|\Delta \ln c - \Delta \ln (y + ra)|$ on lagged hand-to-mouth status. The hand-to-mouth, especially those frequently hand-to-mouth, also exhibit significantly more volatile consumption-income ratios. This is suggestive that households measured hand-to-mouth are not literally hand-to-mouth.

Table 6: Consumption and Income Volatility for the Hand-to-Mouth

| | $\lvert\Delta \ln (c)\rvert$ | | | $\lvert\Delta \ln (y + ra)\rvert$ | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $H2M_{NW}$ | .027 | .010 | .009 | .021 | .005 | .003 |
| | (.004) | (.004) | (.005) | (.004) | (.004) | (.006) |
| $H2M_{LIQ}$ | .010 | -.002 | -.002 | .025 | .013 | .009 |
| | (.003) | (.003) | (.004) | (.004) | (.004) | (.005) |
| Fraction | | | .031 | | | .030 |
| time $H2M_{NW}$ | | | (.007) | | | (.009) |
| Fraction | | | .027 | | | .036 |
| time $H2M_{LIQ}$ | | | (.008) | | | (.010) |
| Fixed Effects | No | Yes | No | No | Yes | No |

Note: Sample size is 19,105. Growth rates are annualized. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

alternative measures of spending, and to the impact of measurement error in expenditure and income. But we continue to see that the households who are frequently hand-to-mouth predictably exhibit more uncertain income and consumption.

Given that income heterogeneity is a natural explanation for differences in targeted savings, in Appendix A1.1 we simulate the standard savings model allowing households to differ by income process. We calibrate that heterogeneity by first dividing PSID households into two roughly equal-sized groups based on how frequently they are $H2M_{NW}$. For each group we estimate an earnings process, allowing group-specific means, life-cycle growth, and volatility for persistent and transitory income shocks. Most notably, those frequently hand-to-mouth have much larger transitory shocks to their earnings. We then simulate the savings model under each of the two income processes to reveal whether frequent $H2M$ status reflects that group's differential income process. The model's predictions for being hand-to-mouth are precisely opposite the data. That is, the empirical income process for the frequently hand-to-mouth, given its large transitory income risk, in the model predicts *lower* likelihood of being hand-to-mouth. So the exercise, consistent with the evidence presented in this subsection, indicates that differences in income processes are not a particularly compelling explanation for why certain households are frequently hand-to-mouth.

## 4.8 Fact 5: H2M Are More Elastic at Extensive Spending Margin

The savings problem of Section 2 suggests that a households' low wealth relative to income may reflect poor luck, its income process, or its preferences – specifically a high rate of time preference or a high IES. Sections 4.4 to 4.6 imply differences in asset targets, not just luck, are important for explaining the hand-to-mouth, while Section 4.7 suggests differences in income processes do not align with the implied target differences. In this section, we look at detailed consumption behavior of low-wealth individuals to shed further light on why they appear to have lower asset targets.

More specifically, we examine households "extensive" margin for various consumption categories; that is, whether a broad category is consumed at all.[19] We first show that households who are frequently hand-to-mouth allocate their spending differently, spreading it over fewer categories than other households exhibiting the same total spending. These differences for a static choice problem not only imply that hand-to-mouth households differ in preferences from non-$H2M$, but also those differences extend beyond rates of time discounting.

Furthermore, for a given change in household spending, adjustment in the number of categories consumed (the extensive margin) comprises more of that change for households that are frequently hand-to-mouth, with spending per category (the intensive margin) comprising less. Those close to adjustment on an extensive margin may exhibit a highly elastic response of total spending to changes in inter-temporal prices. The fact that adjustment on the extensive margin may alter the price elasticity is a familiar concept in economics. This idea has been applied to macro-labor markets by Rogerson (1988) and to portfolio choice by Grossman and Laroque (1990). Chetty and Szeidl (2007) make a related argument in the context of risk preference in the presence of consumption commitments. In Appendix A4, we provide a simple example of how the results presented in this section are suggestive of a relatively high IES for those prone to adjust spending at the extensive margin, a group that empirically aligns with those frequently hand-to-mouth.

Consider nondurable expenditure at two adjacent dates, $c_{t-1}$ and $c_t$. Suppose spending in period $t$ is divided among $N_t$ discrete goods: $c_t = \sum_{n=1}^{N_t} x_{n,t}$, where $x_{n,t}$ is the amount devoted to good $n$ in period $t$. A similar decomposition can be done for period $t-1$.

In this spirit, we divide nondurable expenditure into the categories listed in Table 7.[20] For each category, we list the share of total nondurable expenditure as well as the fraction of households who report positive spending on that category in a given survey. The final two columns are the average probability of addition or deletion of that category, respectively. We

[19] See Michelacci, Paciello and Pozzi (2019) for an analysis of the extensive margin of expenditure in the Kilts-Nielsen Consumer Panel.

[20] We exclude basic utilities like water, heat, and electricity as these may be included in rental contracts.

can have a finer decomposition of expenditure into distinct categories using the Consumer Expenditure Survey (CE). In Appendix A2 we report the CE counterpart of Table 7.

Table 7: Nondurable Expenditure Categories

| Category | Share | Positive | Add | Drop |
|---|---|---|---|---|
| Food at home | 0.346 | 1.00 | 0.00 | 0.00 |
| Food away | 0.154 | 0.95 | 0.03 | 0.03 |
| Gasoline | 0.138 | 0.93 | 0.03 | 0.03 |
| Car insurance | 0.106 | 0.93 | 0.03 | 0.02 |
| Health insurance | 0.076 | 0.73 | 0.09 | 0.09 |
| Education | 0.055 | 0.30 | 0.11 | 0.13 |
| Doctors | 0.034 | 0.80 | 0.09 | 0.09 |
| Prescription drugs | 0.022 | 0.80 | 0.09 | 0.09 |
| Childcare | 0.019 | 0.12 | 0.04 | 0.05 |
| Hospital | 0.015 | 0.28 | 0.15 | 0.16 |
| Other transport | 0.015 | 0.30 | 0.17 | 0.18 |
| Other utilities | 0.009 | 0.17 | 0.08 | 0.11 |
| Bus & train | 0.005 | 0.08 | 0.03 | 0.03 |
| Parking | 0.003 | 0.09 | 0.05 | 0.04 |
| Taxi | 0.002 | 0.05 | 0.03 | 0.02 |

Our first exercise explores whether the hand-to-mouth consume a different number of distinct categories conditional on total nondurable expenditure. That is, do the hand-to-mouth allocate a given level of expenditure differently between the number of goods versus average spending per good? To explore this, we regress the log number of categories with positive expenditure on log total expenditure as well as our $H2M$ dummies, adding year dummies and the demographic controls. The presence of total expenditure as a regressor controls for the Engel curve for variety of categories with respect to total spending. Note that under time-separability, the number of goods is a static decision conditional on total expenditure, and is therefore independent of time preference and borrowing constraints.

The results are reported in Table 8. Columns (1) and (2) use the PSID and our benchmark measures of $H2M$ status. The CE does not have as detailed wealth data as the PSID, so we cannot construct identical measures of $H2M$ in the CE. Instead, we construct a measure that uses only liquid assets, which is denoted in the table as $H2M_{KVW}$; it is defined as having liquid assets within one week of earnings of the borrowing limit or a positive position less than one week of earnings. (This is exactly the hand-to-mouth measure in Kaplan et al. (2014).) The final column estimates the impact of $H2M_{KVW}$ on the log number of categories in our CE sample. For comparison, we construct the same measure in the PSID sample and report the CE regression implemented in the PSID sample in the third column.

Table 8: Number of Categories Consumed

Dependent variable is $\ln N_t$

| | PSID (1) | PSID (2) | PSID (3) | CE (4) |
|---|---|---|---|---|
| $\ln c$ | .204 | .201 | .202 | .456 |
| | (.006) | (.006) | (.006) | (.002) |
| $H2M_{NW}$ | -.051 | -.028 | | |
| | (.008) | (.006) | | |
| $H2M_{LIQ}$ | -.036 | -.007 | | |
| | (.006) | (.005) | | |
| Fraction time $H2M_{NW}$ | | -.043 | | |
| | | (.014) | | |
| Fraction time $H2M_{LIQ}$ | | -.080 | | |
| | | (.017) | | |
| $H2M_{KVW}$ | | | -.043 | -.115 |
| | | | (.005) | (.002) |
| Observ. | 26,178 | 26,178 | 26,178 | 192,299 |

Note: Categories restricted to nondurables and services. Households on average spend on 8.9 of 17 categories in PSID, on 12.1 of 27 categories in the CE. Regressions include the controls described in Section Standard errors clustered at household level for PSID.4.3.

The estimates show a clear pattern that low-wealth and low-liquidity households consume fewer categories of goods conditional on a given level of total expenditure. This pattern is established for both measures of $H2M$ status, as well as for $H2M_{KVW}$ status in the PSID and in the CE. The effect is also economically significant. For instance, comparing the coefficients for total expenditure and for being hand-to-mouth based on net worth, we see that the $H2M_{NW}$ coefficient is opposite in sign and one-fourth the magnitude of that for $\ln c$. That implies that being the status of $H2M_{NW}$ predicts the same impact on number of categories as a 25% reduction in total spending.

The second column of the table includes how frequently we see a household to be hand-to-mouth in the PSID. Households that are frequently hand-to-mouth, by either measure, are the ones who consume fewer categories of goods, conditional on total expenditure. Once we include a household's fraction of time as hand-to-mouth, the current $H2M$ status is much less relevant, especially being hand-to-mouth based only on liquidity, which becomes statistically insignificant. Thus, as with the results above detailing consumption growth, consumption volatility, and APCs, it is a household's propensity to be hand-to-mouth, not its current $H2M$ status, that is key to predicting household spending behavior.

Our next set of results concern the elasticity of the number of goods to a change in total expenditure. To explore this, we regress $\Delta \ln N_t$ on $\Delta \ln c_t$, interacting the growth of total expenditure with our $H2M$ indicators.[21] This specification tests whether *at the margin* of changing total nondurable expenditure, the hand-to-mouth allocate additional spending differently than the non-$H2M$ along the extensive versus intensive margins.

The results are reported in Table 9. We see from Column (1) that the category elasticity is higher for the $H2M_{NW}$.[22] The second column interacts expenditure growth with how frequently a household is hand-to-mouth. This clearly shows that it is actually those who are regularly hand-to-mouth, by either measure, that are much more likely to adjust on the extensive margin in changing their total expenditure. Once we include the fractions of time $H2M_{NW}$ and $H2M_{LIQ}$, the current $H2M$ indicators are no longer relevant.

The results of Tables 8 and 9 document heterogeneity across consumers in the relevance of the extensive margin of consumption, and this heterogeneity is correlated with the tendency to have low assets or liquidity. As noted above, the elasticity of total expenditure to a relative price (or interest rate) change may be sensitive to whether the adjustment is primarily occurring along the extensive or intensive margins. The empirical results therefore suggest that differences in the effective IES are a plausible candidate for explaining why some households are prone to $H2M$ status. After reviewing some robustness checks on our empirical results, in Section 5 we will allow for such differences as one candidate in calibrating preference heterogeneity.

## 4.9 Robustness Checks

In this section we examine robustness of our results to several measurement issues: (i) the type of goods in expenditures; (ii) measurement error in income and expenditure; (iii) the measure of volatility in expenditure; and (iv) dividing the sample by age and long-term earnings. The results continue to align qualitatively, and usually quantitatively, with those

[21] The regressions also include the hand-to-mouth indicators as well as the year and demographic controls. $H2M_NW$ and $H2M_LIQ$ are both as of $t-1$, where a period is two years. The coefficients are all annualized.

[22] In Appendix A3.3 we explore this further by decomposing the growth in nondurable consumption between $t-1$ and $t$ into an intensive change, reflecting the change in spending on goods consumed in both periods, and an extensive margin reflecting the adding and dropping goods. There we see that the extensive margin is about twenty percent more important for $H2M_{NW}$ households.

Table 9: Regression of $\Delta \ln N_t$ on $\Delta \ln c_t$

Dependent variable is $\Delta \ln N_t$

| | (1) | (2) |
|---|---|---|
| $\Delta \ln c$ | .132 | .116 |
| | (.006) | (.007) |
| $\Delta \ln c \times H2M_{NW}$ | .036 | -.019 |
| | (.012) | (.019) |
| $\Delta \ln c \times H2M_{LIQ}$ | .013 | -.022 |
| | (.013) | (.016) |
| $\Delta \ln c \times$ Fraction time $H2M_{NW}$ | | .089 |
| | | (.025) |
| $\Delta \ln c \times$ Fraction time $H2M_{LIQ}$ | | .074 |
| | | (.027) |

Note: Sample size is 19,351. Regressions include controls for $H2M$ status, in addition to the controls described in Section 4.3. Column (2) also controls for fraction time in each $H2M$ status. Standard errors clustered at household level.

presented above, including that households frequently hand-to-mouth display lower consumption growth, higher APCs, higher MPCYs, and more volatile spending.

### 4.9.1 Excluding Durables

Our empirical results in Sections 4.4 to 4.7 include all categories of spending available in the PSID beginning with the 1999 wave. This includes two categories that reflect NIPA durables: vehicle purchases and leases, and vehicle repair. In Appendix A3.1 we explore robustness of the results to excluding these two categories. Table A6 gives results for consumption growth, $\Delta \ln c$, and volatility of that growth, $|\Delta \ln c|$. These results align with those from the text above – households that are frequently $H2M_{NW}$ or $H2M_{LIQ}$ show both significantly lower and more volatile consumption growth. However, the effects for nondurable consumption volatility are actually larger. The coefficients on $H2M_{NW}$ and $H2M_{LIQ}$ increase to 0.048 and 0.053, both equalling about a third of the mean nondurable $|\Delta \ln c|$.

Excluding durable categories has little impact on the estimated effects of a household's $H2M$ status for its APC or MPCY. Households frequently $H2M_{NW}$ or $H2M_{LIQ}$ continue to show both higher APCs, Table A7, and higher MPCYs, A8, though the effects on APC are perhaps a little stronger excluding durables.

### 4.9.2 Tests of Measurement Error

One caveat with the volatility measures is that they also capture error in the measures of consumption and income. Such error is undoubtedly significant (see, for example, Bound, Brown, Duncan and Rodgers, 1994, Aguiar and Bils, 2015, and Carroll, Crossley and Sabelhaus, 2015). However, it is less clear that the magnitude of the error varies with hand-to-mouth status, which is relevant for the exercises performed above. To explore this, we posit that measurement error is *iid* over different waves of the survey. If the persistence of the true variable is similar across hand-to-mouth status, then the observed autocorrelation will be lower for the group with the greater mis-measurement.

Table 10 reports the estimated auto-regressive coefficients for the growth of income and consumption for each hand-to-mouth status. Specifically, we compute the correlation of growth between years $t-4$ and $t-2$ and the growth between $t-2$ and $t$ for each group defined by period $t-2$ hand-to-mouth status. Looking across the rows, there is little evidence that the hand-to-mouth have a significantly lower autocorrelation for either income or consumption. Under the assumption that the true process is the same for all groups, this suggests that classical measurement error (in logs) is not more or less severe for the $H2M$ households.

Table 10: Autocorrelation of Income and Spending Growth

| | Not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|
| $\rho(\Delta \ln y_t^d, \Delta \ln y_{t-1}^d)$ | -.336 | -.251 | -.390 |
| | (.022) | (.023) | (.031) |
| $\rho(\Delta \ln c_t, \Delta \ln c_{t-1})$ | -.372 | -.380 | -.348 |
| | (.012) | (.021) | (.025) |

Note: Regressions include the controls described in Section 4.3. Standard errors are clustered at household level. For brevity of exposition, we denote $y^d \equiv y + ra$.

### 4.9.3 Consumption Volatility in Levels, rather than Growth Rates

We find in Section 4.7 that households who are frequently $H2M$ show more volatile spending as measured by the absolute value of the two-year growth rates in their spending. Here we consider whether they also exhibit more volatility in the level of consumption as measured by the standard deviation in their expenditures. We first compute the standard deviation of each households log expenditure over the sample.[23] We regress the household-level standard

[23]More exactly, we first regress log expenditure on our set of controls, which include age effects and year dummies. We then compute the standard deviation of the residuals for each household.

deviation on its frequency of hand-to-mouth status.[24] The coefficients for fraction of time $H2M_{NW}$ and $H2M_{NW}$ are 0.034 (standard error 0.010) and 0.088 (standard error 0.014), respectively. There coefficients represent respectively 13% and 34% of the mean standard deviation across households of 0.259. Thus, using this alternative measure of consumption volatility, we continue to see that frequently hand-to-mouth households display more volatile spending, and this is especially true for households frequently $H2M_{LIQ}$.

#### 4.9.4 Dividing the Sample by Age and Income

From Table 2, households that are frequently hand-to-mouth are on average younger and have lower earnings. In Appendix A3.2 we examine rates of spending growth, volatility of spending, APCs, and MPCYs dividing the sample between households with heads aged 25 to 39 and those aged 40 to 64. (Recall that the regressions reported in the benchmark tables also include age controls.) In Appendix A3.2 we also examine spending growth after dividing households with respect to long-term earnings.[25] Of course, there is no presumption that differences in preferences are orthogonal to earnings.[26] But it is useful to examine high and low-earnings households separately because it partially controls for: (a) the possibility of scale effects in savings returns, and (b) a differential importance of government savings (e.g., Social Security) in discouraging savings.

The results above qualitatively, and largely quantitatively, continue to hold when dividing households by age or long-term income. We point to appendix tables A9 to A14 for the detailed results. Here we highlight the takeaways, especially any discrepancies from the results for the full sample.

As above, consumption growth is predictably lower for those households that are frequently hand-to-mouth. But, while frequency of being $H2M_{NW}$ strongly predicts lower consumption growth within all groups, for $H2M_{LIQ}$ this effect is only strongly significant for the households ages 25 to 39 and those in the lower quintiles of earnings. Being frequently hand-to-mouth, by either measure, continues to predict a higher APC even within age or earnings group. But these effects, while still significant, are about forty percent smaller in magnitude estimated within earnings groups, rather than for the full sample. As reported above, MPCYs are higher for households that are frequently hand-to-mouth. Splitting the

[24] Each household constitutes one observation, resulting in 3,849 household observations. We weight households by the number of surveys underlying their standard deviation as well as their PSID sampling weight.

[25] Long-term earnings is defined by a household's average natural log of earnings after removing year dummies and a cubic function of the head's age.

[26] In fact, Dynan, Skinner and Zeldes (2004) argue that an important reason that lower-income households save less may reflect a lower demand for precautionary savings. This aligns with our conclusions, and those of Calvet et al. (2019a) that the behavior of hand-to-mouth households is consistent with a high IES.

samples, we see that being frequently $H2M_{NW}$ predicts especially higher MPCYs for households that are ages 40 to 64 or in the bottom two quintiles of long-term earnings. Finally, while frequently being hand-to-mouth is, in general, associated with more volatile growth in expenditures, frequent $H2M_{NW}$ status does not predict higher volatility for older households, nor does frequent $H2M_{LIQ}$ status predict higher volatility for high-earnings households.

# 5 Calibrating Preference Heterogeneity

The five facts documented in Section 4 indicate the importance of persistent differences across households in their targeted assets-to-income. By largely determining a household's propensity to have low net worth or liquidity, these differences will mask or reverse behavior for $H2M$-households as predicted by the standard model of homogeneous agents facing income shocks. A logical candidate to model such differences is through heterogeneity in the stochastic process generating income draws; however, the results of Sections 4.7 and 4.9.3 indicate that this, at least on its own, is not a fruitful avenue to pursue. An alternative is heterogeneous preference parameters. A number of papers have found evidence that discount factors vary across individuals.[27] The extensive margin analysis of Section 4.8 suggests a role for IES differences across individuals, as does prior empirical work.[28]

In this section, we explore a quantitative model in which household's differ in these two key parameters. The purpose is threefold: (i) explore whether and to what extent key moments of the wealth distribution, filtered through a state-of-the-art model, suggest heterogeneity in discount factors or IES; (ii) examine whether a degree of preference heterogeneity can bring our empirical results from Section 4 to better align with predictions of precautionary savings models; and (iii) study the implications of that calibrated heterogeneity for describing behavior that is key to macroeconomic policy, such as the MPC distribution.

As noted in Section 2, it is difficult to distinguish impatience ($\beta$) from a high IES ($\sigma$) when the interest rate is less than the discount rate.[29] One approach to disentangle the two parameters would be to introduce interest rate "shocks" to the standard model of Section 2 and try to match the responses to the corresponding empirical moments. As is well known,

[27] This includes evidence from surveys designed to elicit respondent preferences, e.g., Barsky, Juster, Kimball and Shapiro (1997), Parker (2017), and also from structural econometric estimates, with Calvet et al. (2019a) being a recent example.

[28] Both Barsky et al. (1997) and Calvet et al. (2019a) find evidence for heterogeneity in the IES as well as the rate of time discount. The latter work estimates a standard deviation in the IES across Swedish households of 0.99.

[29] Also noted above, a low market return to savings acts like a low $\beta$ in discouraging household savings. We calibrate heterogeneity in households "internal return" to savings purely as differences in $\beta$'s. This is partly for parsimony. But it also reflects that in households classified hand-to-mouth in the data disproportionately hold debt charging high rates (see Section 4.2), providing a high marginal return to saving.

such an exercise is difficult empirically, particularly when consumers are not necessarily on their Euler equation. Even if they are, it is not obvious which interest rate is the empirically relevant rate for consumption-savings decisions of the hand-to-mouth.

An alternative is to move to a two-asset model, using portfolio choices to distinguish IES effects from the discount factor's. A consumer with a high IES is sensitive to interest rate differences across assets. Moreover, a high-IES consumer has a lower need for liquidity. That is, a high-IES agent cares less about *when* consumption occurs and so is more willing to tie up savings in illiquid assets. It is also useful to distinguish high-IES behavior from that driven by risk aversion, as achieved by Epstein-Zin preferences. The model of Kaplan and Violante (2014) (henceforth KV) uses Epstein-Zin preferences and includes a meaningful liquidity decision; so we therefore employ their model.

## 5.1 Model Environment

In this section, we recap the key elements of the KV model, which we take directly from their paper, but augment by allowing for preference heterogeneity.[30]

Agents live 58 years, or $J = 232$ quarters, spending $J^w = 152$ at work and $J^r = 80$ in retirement. Consumer $i$ has Epstein-Zin preferences given recursively at age $j$ by:

$$V_{ij} = \left[ (c_{ij}^{\phi} s_{ij}^{1-\phi})^{1-1/\sigma_i} + \beta_i \left\{ \mathbb{E} V_{i,j+1}^{1-\gamma} \right\}^{\frac{1-1/\sigma_i}{1-\gamma}} \right]^{\frac{1}{1-1/\sigma_i}},$$

where $c$ is nondurable consumption; $s$ is the service flow from durables (described below); $\gamma$ is the coefficient of relative risk aversion, which we set to 4 as in KV; and $\sigma$ is the intertemporal elasticity of substitution. Note that we allow the time-preference parameter $\beta$ and $\sigma$ to vary by individual. Following KV, we set $\phi = 0.85$, which is based on the ratio of housing expenditures to total consumption in the US National Income and Product Accounts.

Earnings are given by the exogenous process:

$$\ln y_{ij} = \chi_j + \alpha_i + z_{ij},$$

where $\chi_j$ is a deterministic function of age, $j$, and $\alpha_i$ is an individual fixed effect. The idiosyncratic risk is represented by $z_{ij}$, which is a random walk. KV estimate a fourth-order polynomial for $\chi_j$ using the PSID. The variance of the fixed effect is set to 0.18 and the variance of the (mean-zero) quarterly innovations to random walk $z_{ij}$ is set at 0.003 to match the age profile of the cross-sectional variance in earnings. The income process yields

[30] We thank the authors for sharing their code.

mean earnings equal to $53,000 dollars.

Two assets are available. Liquid asset $m$ has an annual after-tax return:

$$r_m(m) = \begin{cases} 5.77\% \text{ if } m \in [\underline{m}_j, 0); \\ -1.41\% \text{ if } m \geq 0, \end{cases}$$

where $\underline{m}_j$ is an age- and income-specific borrowing limit.[31] Illiquid asset $a \geq 0$ has a higher return, but consumers must pay a fixed cost $\kappa$ to alter their stock of $a$. Again following KV, we set the illiquid after-tax return to 2.21% and $\kappa$ to $1,000. In addition to a financial return, illiquid assets generate a significant service flow.[32]

Consumption and rental housing are taxed at a rate of 7.2%. Earnings and assets are taxed, with the tax rate a function of earnings and the consumer's portfolio: $\mathcal{T}(y_{ij}, m_{ij}, a_{ij})$. Retirees receive social-security benefits given by $p(\chi_{J^w}, \alpha_i, z_{i,J^w})$; these are taxed according to the same function $\mathcal{T}$ faced by workers, but with $p$ replacing $y$ as an argument. We refer the reader to KV for the exact functional forms and parameters for $\mathcal{T}$ and $p$.

## 5.2 Calibrating the Hand-to-Mouth

In calibrating preferences we strive to generate realistic $H2M$ behavior while adding heterogeneity parsimoniously, so as to depart minimally and intuitively from standard models with homogeneous preferences. We therefore take a conservative approach and consider three preference specifications. We have explored calibrations with four types, but typically find that two of the groups are nearly identical with no significant improvement in fit.

A preference type is a pair $(\beta, \sigma)$ representing time preference and IES. In all cases, we set risk aversion to $\gamma = 4$, as in KV. With three types, the potential parameter space is the positive orthant of $\mathbb{R}^8$. In addition to the preference parameters, we also calibrate each type's share of the population. To minimize the computational burden, we restrict attention to a finite grid for both $\beta$ and $\sigma$. Specifically, the annualized $\beta$ takes values on an equally spaced 16-point grid ranging between 0.85 and 1.00. This interval captures a wide range of discount factors considered in the literature. The IES takes values in $\{0.5, 1.0, 1.5\}$. This is a sparse grid, but again includes common parameter choices.[33] In particular, 0.5 and 1.0 are

[31] Specifically, for $j \leq J^w$, $\underline{m}_j = 0.74 y_j$. For $j > J^w$, $m_j = 0$.

[32] KV calibrate the fixed cost to match the fact that one-third of households in the Survey of Consumer Finance are hand-to-mouth. We keep their value of $\kappa$, but will calibrate preference parameters to match the shares of hand-to-mouth observed in our PSID sample. The service flow is given by: $s_{ij} = \zeta a_{ij} + h_{ij}$, where $h_{ij} \geq -\zeta a_{ij}$ represents housing services obtained from a rental market. KV set $\zeta = 1\%$, quarterly. The units of rental housing $h$ are normalized such that the relative price of $c$ to $h$ is one.

[33] This allows us to collapse the parameter space to one dimension spanning forty-eight preference combinations. Given the partial equilibrium nature of the model, we can solve and simulate life cycles separately

standard in the macroeconomics literature.[34] The higher number of 1.5, used by KV, is more common in the finance literature employing Epstein-Zin preferences. For reference, KV set all agents to $\beta = 0.941, \sigma = 1.5$. We search over for the three population weights that best match five moments:[35] the shares of the pooled sample that are $H2M_{NW}$ and $H2M_{LIQ}$ and the mean ratio of net-worth to income conditional on being observed in each of the three $H2M$ statuses. These empirical targets are reported in the first row of Table 11. We heavily weight the $H2M$ shares to ensure hitting those moments.

The second row of Table 11 describes the population in the calibrated model. This population is comprised of three types of agents. Each type's respective share, together with its preference parameters, are detailed in rows 3-5. These rows are discussed below. From the second row, we see that the population moments for shares of agents $H2M_{NW}$ and $H2M_{LIQ}$ replicate the empirical moments nearly exactly. The calibrated wealth-to-income moments track their empirical counterparts, but less precisely. One one hand, the average wealth-to-income ratio of the non-$H2M$ is 2.7 in the calibration, roughly half that of the data. On the other, average wealth conditional on $H2M$ status is higher than in the data. The $H2M_{NW}$ in the data are fairly indebted (averaging $-0.37$), while in the model the ratio is only $-0.05$. The $H2M_{LIQ}$ are richer in the model as well. Appendix A5 presents the simulated moments for each element of the full grid of 48 preference types. Any set of preferences that generates a significant share of $H2M_{LIQ}$ overstates the ratio of net worth to income for that group, typically by a substantial amount.[36]

The middle three rows of Table 11 indicate the preference types comprising the overall population and their type-specific ergodic moments. Row three reports that most agents, 84.3% of the model population, have $\beta = 0.94$ and $\sigma = 0.5$. These preferences are typical of those employed in macroeconomics – a low IES combined with slight impatience relative to the market return on illiquid savings. The second type listed is both highly impatient and highly elastic ($\beta = 0.86, \sigma = 1.5$). These comprise 11.4% of the population. The remaining 4.4% of agents exhibit $\beta = 0.93, \sigma = 1.5$, preferences close to the original KV specification.

for each agent type. To obtain an ergodic distribution, we simulate each preference type 50,000 times. Model moments are annualized from the quarterly simulations so as to be comparable to PSID moments.

[34] Havrnek (2015), in a meta-study of the literature's IES estimates, report a median estimate of 0.5.

[35] Specifically, for each possible triplet chosen from the 48 possible preference combinations, we search over the 3-dimensional probability simplex for the relative shares that minimize the distance between model and empirical moments. We then select the triplet and associated shares that has the smallest distance.

[36] In Appendix A5 we also present an alternative calibration that targets median, rather than mean, wealth-to-income ratios for each of the not-$H2M$, $H2M_{NW}$, and $H2M_{LIQ}$. The dominant group, 68%, is patient and inelastic with $\beta = 0.94$, $\sigma = 0.5$. Most of the balance, 29%, are moderately patient and elastic with $\beta = 0.92$ and $\sigma = 1.5$. A small remainder of 3% is impatient and moderately elastic, $\beta = 0.88$ and $\sigma = 1.0$. This calibration, while precisely hitting the share of each group by $H2M$-status, misses to the same extent or more in terms of wealth: it understates median net worth-to-income by about half for the not-$H2M$ while overstating it by double for the $H2M_{LIQ}$.

Table 11: Type-Specific Moments

| Type | Share | Frequency $H2M_{NW}$ | Frequency $H2M_{LIQ}$ | Net Worth to Income: not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|---|---|---|
| Data (PSID) | | 22.7% | 17.5% | 5.18 | -0.37 | 2.70 |
| Calibration | | 22.8% | 17.5% | 2.68 | -0.05 | 3.44 |
| $\beta = 0.94, \sigma = 0.5$ | 84.3% | 11.8% | 19.1% | 2.72 | -0.01 | 3.62 |
| $\beta = 0.86, \sigma = 1.5$ | 11.4% | 99.3% | 0% | 0.47 | -0.08 | – |
| $\beta = 0.93, \sigma = 1.5$ | 4.4% | 26.3% | 33.5% | 1.26 | 0.02 | 1.61 |
| Single agent model: | | | | | | |
| $\beta = 0.92, \sigma = 0.5$ | | 26.5% | 20.3% | 1.71 | 0.01 | 2.05 |

The simulated moments by preference type show that the relatively patient agents ($\beta = 0.94$) that constitute most of the population are infrequently $H2M_{NW}$, and, when not $H2M$, hold wealth equal to 2.7 times their income, close to the population average. On the other hand, the impatient-elastic types (row 4) nearly always exhibit low-net worth. In fact, they are net debtors on average. The third group holds moderate levels of assets, but frequently find themselves in one of the $H2M$ groups.

For comparison, the final row of Table 11 reports results restricting to a single preference type. The preferences that minimize the distance between simulated and empirical moments have $\beta = 0.92$ and $\sigma = 0.5$. To capture the shares that are hand-to-mouth, the single-agent preferences are relatively impatient. But, as a result, the wealth of the non-$H2M$ is far too low and so is the aggregate wealth-to-income ratio, even though the single-agent model implies, counterfactually, that the average $H2M_{NW}$ agent is not indebted.

Table 12: Calibrated Preference Heterogeneity

| | Calibrated Share | Share of Not $H2M$ | Share of $H2M_{NW}$ | Share of $H2M_{LIQ}$ |
|---|---|---|---|---|
| $\beta = 0.94, \sigma = 0.5$ | 84.3% | 97.0% | 45.0% | 91.7% |
| $\beta = 0.86, \sigma = 1.5$ | 11.4% | 0.13% | 49.6% | 0% |
| $\beta = 0.93, \sigma = 1.5$ | 4.4% | 2.86% | 5.4% | 8.3% |

Table 12 displays the preference mix *within* each $H2M$ status. The first column repeats the preference shares for the overall simulated population, with rows corresponding to types. The remaining three columns report each type's share of those observed, respectively, non-$H2M$, $H2M_{NW}$, and $H2M_{LIQ}$ in the pooled simulation. For example, the "standard" patient-inelastic type comprises nearly all, 97%, of those observed non-$H2M$, a group holding much of the wealth in the economy at any point in time. Despite infrequently being poor hand-to-mouth, the patient-inelastic still constitute 45% of $H2M_{NW}$ by virtue of their dominant share of the population. They constitute most, 92%, of those observed in $H2M_{LIQ}$ status. By contrast, those who are impatient and elastic make up half of those seen poor hand-to-mouth, which is more than four times their 11.4% share of the population mix. Finally, those patient and elastic skew heavily toward being observed $H2M_{LIQ}$. Their importance in this group is nearly double that of their population share.

Tables 11 and 12 provide a sense of the relative importance of bad luck versus preferences in determining who are the hand-to-mouth. Roughly half of the poor hand-to-mouth are in that state nearly all of the time. The combination of impatience and high IES result in a low level of target savings. The remaining half of the $H2M_{NW}$ cycle in and out of that status due to income realizations. For the wealthy hand-to-mouth, a significant fraction are illiquid due to their relative willingness to substitute inter-temporally. However, the vast majority of the wealthy hand-to-mouth are low IES agents that hold significant assets on average, and occasionally find themselves short of liquidity due to the path of income realizations.

## 5.3 Revisiting Consumption Behavior: Model versus Data

Table 3 documented that, absent controls for type (either fixed effects or frequency of hand-to-mouth status), being hand-to-mouth does not predict faster consumption growth. This runs counter to the standard model without preference heterogeneity. However, once we control for fixed effects or the frequency of $H2M$ status, the data do show being currently $H2M_{NW}$ predicts faster growth. In particular, those prone to being hand-to-mouth have lower consumption growth, making this an important control variable in determining the impact of current $H2M$ status. In the model simulation, despite differences in initial wealth positions and the permanent nature of income shocks, the fraction of time spent in $H2M$ status largely reflects differences in preferences. Specifically, 74% of the variation in the frequency of time being $H2M_{NW}$ and 36% of the variation in the frequency of time being $H2M_{LIQ}$ is accounted for, in terms of $R^2$, by preferences alone. Differences in initial wealth and the contemporaneous realization of income shocks only account for an added 7% of variation in how frequently $H2M_{NW}$, and for only 16% in $H2M_{LIQ}$.

In Table 13, we replicate the empirical exercise examining consumption growth by $H2M$ status. The first three columns reproduce the empirical results from Table 3, while the final

Table 13: Consumption Growth: Data vs. Model

| | Data | | | Model | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $H2M_{NW}$ | .003<br>(.004) | .025<br>(.006) | .025<br>(.007) | -.004 | .004 | .005 |
| $H2M_{LIQ}$ | -.009<br>(.004) | .003<br>(.005) | .002<br>(.005) | -.007 | -.006 | -.006 |
| Fraction time $H2M_{NW}$ | | | -.038<br>(.009) | | | -.016 |
| Fraction time $H2M_{LIQ}$ | | | -.025<br>(.007) | | | -.019 |
| Fixed effects | No | Yes | No | No | Yes | No |

Note: Columns labeled "Data" reproduce the empirical estimates in Table 3; those labeled "Model" are corresponding estimates from model-generated data.

three report the counterparts to those same regressions estimated on our model-simulated data.[37] The first model column indicates that current $H2M$ status predicts modestly lower consumption growth. By including a fixed effect in the column (2), the predicted growth rate for the $H2M_{NW}$ increases by 0.8 percentage points per year, while that for $H2M_{LIQ}$ remains nearly unchanged. Column (3), while dropping the fixed effect, adds fractions of time spent in each $H2M$ status as additional controls. We see that those agents frequently $H2M_{NW}$ exhibit lower consumption growth on average, consistent with the data. Including these controls increases the coefficient on being currently $H2M_{NW}$, similarly to adding fixed effects. While those that are frequently $H2M_{LIQ}$ do have lower average consumption growth, consistent with the data, including this control does not affect the coefficient on current $H2M_{LIQ}$ status. This reflects that those frequently $H2M_{LIQ}$ are relatively likely to be preference type $\beta = 0.93, \sigma = 1.5$; but they are a small share of the total population.

In Table 14, we revisit how the average propensity to consume varies with $H2M$ status. As with consumption growth, the model's $H2M_{NW}$ behavior tracks that of their empirical counterparts. In particular, $H2M_{NW}$ exhibit higher APCs with no controls for preference

[37] More exactly, in this subsection we estimate equations (3) and (4) with the model generated data. The table reports results using the full working life-cycle, but results are quite similar if we restrict to individual histories of 17 years, as in the PSID. These statements also apply to the APC results reported in Table 14.

Table 14: Average Propensity to Consume: Data vs. Model

| | Data | | | Model | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $H2M_{NW}$ | .065<br>(.010) | -.007<br>(.010) | -.022<br>(.015) | .085 | .002 | -.001 |
| $H2M_{LIQ}$ | .077<br>(.012) | .005<br>(.009) | .005<br>(.011) | .005 | -.004 | -.003 |
| Fraction time $H2M_{NW}$ | | | .157<br>(.022) | | | .163 |
| Fraction time $H2M_{LIQ}$ | | | .191<br>(.025) | | | .175 |
| Fixed effects | No | Yes | No | No | Yes | No |

Note: Columns labeled "Data" reproduce the empirical estimates in Table 4; those labeled "Model" are corresponding estimates from model-generated data.

heterogeneity. However, including fixed effects or controlling for frequency $H2M_{NW}$ eliminates this effect. This reflects that those frequently $H2M_{NW}$ show considerably higher APCs, very much like seen in the data. Those frequently $H2M_{LIQ}$ also show much higher APCs, with this effect similar in magnitude to what we estimate from the PSID.

Taking stock, the two-asset KV quantitative model, re-calibrated only to allow a limited set of plausible patience and inter-temporal elasticity parameters, does surprisingly well in matching the behavior of those frequently $H2M_{NW}$, a group that empirically shows especially low expected consumption growth as well as high APCs and high MPCY's. The model allows us to pinpoint a willingness to substitute inter-temporally as well as impatience as crucial characteristics behind the observed behavior of these households. The model is a more limited success in matching behavior of those $H2M_{LIQ}$; but it does capture the tendencies of those frequently $H2M_{LIQ}$ to display lower consumption growth and higher APCs.

## 5.4 Implications of Preference Heterogeneity

Using the calibrated model, we address how preference heterogeneity affects the cross-sectional distributions of marginal propensities to consume and sensitivities of consumption to interest rates, both key objects to macroeconomic policy.

Table 15: Aggregate MPC and IES

| | Weighted Average | Not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|---|
| MPC out of $500 | .09 | .02 | .31 | .07 |
| IES | .46 | .51 | .51 | .25 |

The first row of Table 15 computes the marginal propensity to consume out of a $500 transfer. This is a pure transfer, not offset by taxes.[38] The average MPC is fairly small at 9%. For the non-$H2M$, the MPC is only 2%. This reflects that the non-$H2M$ are relative wealthy and liquid, and therefore close to the boundary to adjust their portfolios. For 12 percent of the non-$H2M$ the transfer actually leads to *reduced* consumption by inducing the agent to deposit in the illiquid asset. Given that requires a fixed cost, the agent cuts consumption to increase the amount deposited. The MPCs for the hand-to-mouth, especially poor hand-to-mouth, are larger – the $H2M_{NW}$ and $H2M_{LIQ}$ respectively have average MPCs of 31% and 7%. Thus the results clearly reinforce the conventional view of a relatively high MPC for those with low-wealth, while attaching much less importance to being $H2M$ based solely on low liquidity.[39]

Table 16: Breakdown of Aggregate MPC

| | Population Share | MPC out of $500 | MPC if not $H2M$ | MPC if $H2M_{NW}$ | MPC if $H2M_{LIQ}$ |
|---|---|---|---|---|---|
| $\beta = 0.94, \sigma = 0.5$ | 84.3% | .031 | .018 | .087 | .044 |
| $\beta = 0.86, \sigma = 1.5$ | 11.4% | .494 | .011 | .503 | – |
| $\beta = 0.93, \sigma = 1.5$ | 4.4% | .227 | .111 | .213 | .378 |

Table 16 shows the role played by preference heterogeneity in the MPCs. Each row reflects a distinct preference type. The first column repeats the population share for each type. The remaining columns report the average MPC, then MPCs conditional on being not

[38]Using the policy functions, we subtract consumption conditional on a liquid asset position of $m$ from that for position $m$ plus 500, dividing this difference by $500. This is equivalent to randomly giving a fraction of the simulated population $500, then regressing the change in consumption on the amount received (either zero or $500). The coefficient is therefore the percentage consumed by the recipients.

[39]Johnson, Parker and Souleles (2006) find that nondurable consumption increased by 37 cents per dollar in response to the income tax rebates of 2001, while Parker, Souleles, Johnson and McClelland (2013) found an increase of nondurable spending of 12.8 cents on a dollar in response to the economic stimulus payments of 2008. In neither case was this response monotonic in liquid assets.

hand-to-mouth, $H2M_{NW}$ or $H2M_{LIQ}$.

The first-row gives MPCs for the dominant preference type: patient and inelastic. For these standard macro preferences, not only is the MPC close to zero for those not hand-to-mouth, it is even small for those having low net-worth (8.7%) or low liquid liquidity (4.4%). As a result, the average MPC for this group is only about 3%. The second row reports much higher MPCs for the impatient, elastic type. These consumers have an average MPC of 49.4%, reflecting both that they are nearly always $H2M_{NW}$ and that they have high MPCs conditional on being so.[40] The third row represents patient-elastic types. Recall that this type is similar to agents in the original KV paper. These consumers display an average MPC of 22.7%.[41] These consumers have the highest MPCs, averaging 11%, when not hand-to-mouth. Their MPCs when observed $H2M_{NW}$ are intermediate to those of the other types when $H2M_{NW}$. Most notably, when observed as $H2M_{LIQ}$, these fairly patient, but elastic consumers display MPCs nearly an order of magnitude higher, 37.8%, than the patient, less elastic $H2M_{LIQ}$. Having a high IES makes them more likely to consume their rebate, rather than adjust their asset portfolio. Comparing Tables 15 and 16 thus reveals that asset positions alone give only a partial picture of MPCs. Heterogeneity in preferences, either in discount factors or inter-temporal elasticities, combined with asset positions, generates much more dispersion in MPCs.

A variance decomposition provides another perspective on the role of preference heterogeneity in MPCs. The variance of MPCs across individuals in the simulated population is 0.044. We can decompose this number into the amount contributed by within-type variation and that explained by type differences. Letting $i \in I$ index individuals, $j \in J$ type, and $s_j$ denoting the population share of type $j$, we have:

$$Var(MPC_i) = \sum_j s_j Var(MPC_i|j) + \sum_j s_j \left(\mathbb{E}[MPC_i|j] - \mathbb{E}[MPC]\right)^2 .$$

The first term on the right is the weighted sum of within-type variances. The second term captures how the conditional mean MPC varies by type. For the simulation, the average within-type variance is 0.021, or 49% of the total.[42] The remaining 51% reflects the differ-

[40] Recall from Section 2 that, conditional on assets, MPCs are higher if consumers are less patient or more elastic. In particular, see Figure A1 in Appendix 2.

[41] The benchmark rebate coefficient in KV is 0.15, somewhat lower than the MPC here of 0.227. The difference largely stems from the KV agents being more patient ($\beta = 0.94$ vs. $\beta = 0.93$). It also reflects that the KV rebate coefficient captures a slightly different experiment. Specifically, they randomly assign a rebate to half the population in quarter $t$ and to the remaining half in period $t + 1$. Thus, everyone is eventually treated, and the control group in the first quarter increases consumption in anticipation of the transfer. This lowers the rebate coefficient. Performing our experiment using the KV calibration generates an unanticipated transfer MPC of 0.16 out of $500.

[42] Similarly, for the single-type calibration, the variance of MPC is 0.024, close to the within-type variance

ences in means across types, which total 0.022. Hence, half of the total variation is accounted for purely by preference heterogeneity. Even for within-type dispersion in MPCs, the distribution of preferences plays an important role. In particular, the within-type variance for the patient/inelastic agents is only 0.015, while it is 0.044 and 0.082 for the impatient and patient elastic types, respectively. That is, a high inter-temporal elasticity is crucial to generating a highly dispersed cross-section of MPCs within preference type.

The immense literature estimating MPCs often stratifies households by their assets or liquid assets. Our model results imply this misses much dispersion in MPCs that projects on preferences. Of course, generally there is no way to condition such estimates on household preferences. But the facts from Section 4 suggest that, with panel data, household propensity to appear hand-to-mouth might serve as a useful proxy for such heterogeneity. With this motivation, we report results in Table 17 from regressing an agent's model MPC in the simulated data on both it current $H2M$ status and its propensity to be hand-to-mouth.

The first column in Table 17 includes only current $H2M_{NW}$ and $H2M_{LIQ}$ status. As anticipated by the findings in Table 15, being hand-to-mouth by either measure implies a much larger MPC, by about 0.14. When we include agent fixed-effects in column (2), which should capture much of the impact of permanent preference differences, the estimated impact of $H2M_{NW}$ is cut by nearly two-thirds to 0.044, while that of $H2M_{LIQ}$ is only modestly reduced. Column (3) replaces the fixed effects with controls for fraction of observations the agent is $H2M_{NW}$ and $H2M_{LIQ}$. As with all our PSID findings, these controls reduce the coefficients for the current $H2M$-measures just as do fixed effects. Moreover, both fraction of time $H2M_{NW}$ and $H2M_{LIQ}$ strongly predict a higher MPC, with coefficients respectively of 0.190 and 0.267. Although we have no experiment to identify a household's MPC in the PSID panel, these findings do roughly align with our results from Table 5 that those households frequently $H2M_{NW}$ and $H2M_{LIQ}$ show considerably larger changes in spending coinciding with changes in income (higher MPCYs).

The final row of Table 15 reports the average IES. Because the consumer's problem is solved for a fixed set of interest rates, we do not have a policy function with respect to interest rate changes. This would require solving the model with a specific stochastic process for interest rates. We therefore consider the thought experiment of a one-time unanticipated small change in the one-period liquid interest rate (for both borrowing and saving). For consumers at an interior solution to their Euler equation, this response is governed by $\sigma$. Those with zero liquid assets, who face a discontinuity in the interest rate schedule, and those at their borrowing constraint are assumed to be insensitive to small changes in interest

in the heterogenous population.

Table 17: MPC as Function of $H2M$-status

| | (1) | (2) | (3) |
|---|---|---|---|
| $H2M_{NW}$ | .137 | .044 | .044 |
| $H2M_{LIQ}$ | .147 | .133 | .133 |
| Fraction time $H2M_{NW}$ | | | .190 |
| Fraction time $H2M_{LIQ}$ | | | .267 |
| Fixed effects | No | Yes | No |

Note: All regressions include a cubic age polynomial. The MPC is defined as the slope of the consumption function.

rates and are assigned an IES of zero.[43] We abstract from the fact that in a richer model, with interest rate shocks, a change in the rate may induce portfolio rebalancing, altering the response of consumption to the interest rate change.

This experiment yields an effective IES for the total population of 0.46. That value is close to the $\sigma$ of the type that predominates as 84% of the population and in line with the standard one-agent macroeconomic calibration. The effective IES of the poor hand-to-mouth is slightly higher, at 0.51. This reflects that the majority of this group has $\sigma = 1.5$, combined with the fact that only 36.7 percent of the $H2M_{NW}$ are at the constraint. Thus, the poor hand-to-mouth may be relatively responsive to changes in the inter-temporal terms of trade, despite their proximity to borrowing constraints. Those who are $H2M_{LIQ}$ tend to bunch at zero liquid assets, due to the discontinuity in the interest rate schedule, or at the borrowing constraint; more exactly, 52.4 percent of the $H2M_{LIQ}$ are at zero or the lower bound. Hence, despite eight percent of this group having $\sigma = 1.5$, its average effective IES is only 0.25.

These results suggest that the poor hand-to-mouth are not less sensitive to interest rates; if anything, they are more responsive. This abstracts from capital gains or losses due to interest rate policy shifts (as in Auclert, 2019). Nevertheless, it suggests that the $H2M_{NW}$ may be effective targets of policies that alter the inter-temporal terms of trade such as the Car Allowance Rebate System (aka cash-for-clunkers) of 2009 or sales-tax holidays. These results are also relevant for the optimal timing of insurance. For example, progressivity in social security benefits provides some insurance against adverse lifetime income shocks, but

[43] This implies that those optimized at zero liquidity or at the negative constraint are strictly constrained.

are only paid out after the eligibility age. The lack of precautionary savings of the poor hand-to-mouth suggests they would find that delay costly. However, to the extent these households are relatively elastic inter-temporally, then the policy's impact on their welfare may hinge mostly on its generosity and little on its timing.

# 6 Conclusion

A workhorse model of savings in the literature has consumers self-insuring their income risk via a non-contingent asset subject to a borrowing constraint. This model has a number of predictions for the spending of low-asset households; namely, they should exhibit a lower average propensity to consume and higher expected consumption growth, as well as a higher marginal propensity to consume. But these predictions are masked or muddled in the data if differences in asset holdings also reflect heterogeneity in preferences. We show that, if either a low discount factor or a high IES drives households to hold few assets, then these hand-to-mouth households can display higher APCs and lower spending growth. Moreover, such households have relatively high MPCs, even if they are at their target level of assets.

We see in the data that $H2M$ households actually display higher APCs and no faster spending growth than households with more assets, consistent with an important role for preference heterogeneity. These statements apply to households we label as hand-to-mouth based on their low net worth, or those we label as hand-to-mouth based only on their lack of liquid assets (the wealthier hand-to-mouth). In addition, low-asset households exhibit more volatile spending and adjust their spending to a greater extent by varying the number of categories consumed. The latter finding cannot be explained by heterogeneity in discount factors, but is consistent with low-asset households exhibiting a higher IES *because* they have a more active extensive margin to vary consumption.

Strikingly, all the "puzzles" we see in spending by $H2M$ households project on a household's tendency to be hand-to-mouth, not on its current asset position. That is, it is households that tend to hold few assets, in terms of liquid or illiquid, that display higher APCs, lower spending growth, more volatile spending, and more volatility in terms of categories of spending. Furthermore, it is households that are often hand-to-mouth, especially by net worth, that display the largest responses of spending to changes in their earnings. We view these findings as consistent with important, relatively stable, differences in preferences for hand-to-mouth versus other households.

To identify the source and consequences of this preference heterogeneity we consider the two asset setting in Kaplan and Violante (2014), where agents allocate wealth between liquid and illiquid assets, but allow for heterogeneity both in households' discount factors and IES.

A high-IES household holds less liquidity to avoid fluctuations in their consumption, thereby allowing us to distinguish a high IES from impatience. To match empirical targets, we find that most of the model population, 84%, must exhibit quite standard preferences with a high discount factor of 0.94 and a low IES of 0.5. But to explain the significant share of households in the data with low net worth or low liquid wealth, the model requires that the balance of the population have a high IES of 1.5, with many also having a low discount factor. Most notably, half of the poor hand-to-mouth are both impatient and have a high IES even though those preferences comprise only 11% of the calibrated population.

We find, from our two-asset model, that preference heterogeneity plays a major role in differences in MPCs across consumers. Differences in preferences, independent of shocks, explain a full half of the dispersion in MPCs in the model. Finally, our model shows that the poor hand-to-mouth exhibit as high an effective IES as the balance of the population, reflecting the large share of poor hand-to-mouth with inter-temporally elastic preferences. Thus poorer households may be as responsive to inter-temporal terms of trade, despite their proximity to borrowing constraints.

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# Appendices for "Who Are the Hand-to-Mouth?"

## A1 Predictions of the Consumption Model

The theoretical analysis in Section 2 suggests that low wealth individuals exhibit a high marginal propensity to consume, a low average propensity to consume and high expected consumption growth. The analysis also establishes a role for preferences ($\beta R$ and $\sigma$) and the income process in shaping this relationship. To present the key predictions of the model that we test in the empirical analysis, we solve the model numerically. Specifically, following Krueger et al. (2016), we postulate that income evolves according to:

$$
\begin{aligned}
\ln y_t &= z_t + \varepsilon_t \\
z_t &= \rho z_{t-1} + \eta_t,
\end{aligned}
$$

where $\varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right)$, $\eta_t \sim N\left(0, \sigma_\eta^2\right)$ and we set $\rho = 0.97$, $\sigma_\eta = 0.20$ and $\sigma_\varepsilon = 0.23$.

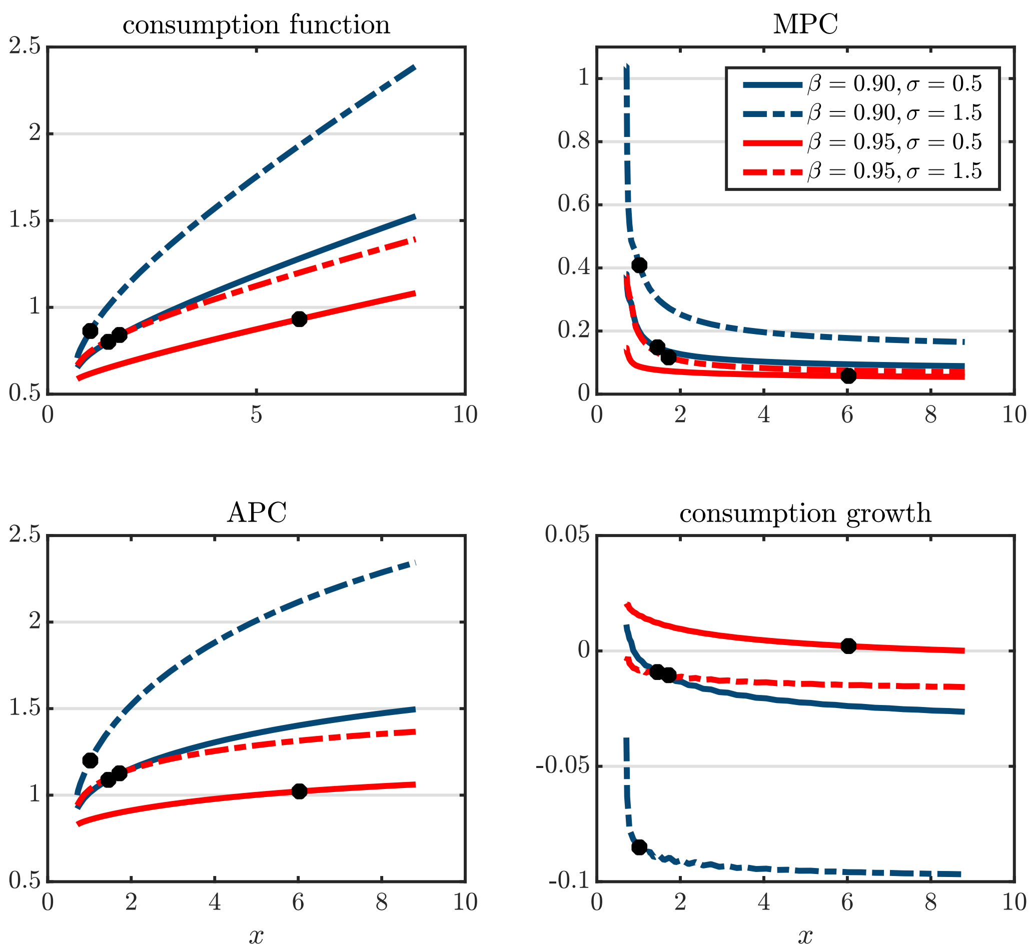
We set $R = 1.04$ and begin our analysis by exploring the role of preferences. Specifically, we consider two alternative values for $\beta \in \{0.90, 0.95\}$. We also let the IES take on two possible values $\sigma \in \{0.5, 1.5\}$.[44] Note that for a given individual, preferences are fixed, but, given the two-dimensional heterogeneity, there are four possible preference configurations. We load the heterogeneity on preference parameters, but the alternative discount factors can also proxy for (permanent) differences in financial returns. That is, if an individual has access to a high-return savings vehicle that another individual with the same preferences lacks, then $\beta R$ will differ across the two in the same fashion as a difference in discount factors. A separate issue is if returns vary by scale, say, due to a fixed cost of access. In this case, the level of assets will also reflect variation in returns, mitigating the negative impact of wealth on expected consumption growth described below. We discuss this point in more detail in the empirical section.

In the top left panel of Figure A1 we plot $C(., \bar{y})$ against $x$, where $\bar{y}$ is the ergodic mean of the income process. The fact that $y$ is held constant implies that $a$ is varying as we move along the horizontal axis. The four lines represent the four alternative preference parameterizations. The large dot represents the ergodic mean $x^*$ for each set of preferences.

The consumption functions are strictly increasing and concave. For a given level of resources, consumption is decreasing in $\beta$ and increasing in the IES. The reason that consumption is increasing in the IES is that $\beta R < 1$ in all specifications. Hence, there is an incentive

[44] Havrnek (2015) conducts a meta-study of IES estimates in the literature, reporting a median of 0.5. Kaplan and Violante (2014), citing the asset-pricing literature, choose an IES of 1.5.

Figure A1: The Consumption Policy Function – Role of Preferences




Note: The top left panel depicts $\mathcal{C}(\cdot, y)$ as a function of $x$, with $y$ set to its mean value in all panels. The top right panel depicts $\partial\mathcal{C}(x, y)/\partial x$ as a function of $x$. The bottom left depicts $\mathcal{C}(x, y)/(y + ra)$ as a function of $x$. The bottom right panel depicts $\mathbb{E}\ln\left(\frac{\mathcal{C}(x',y')}{\mathcal{C}(x,y)}\right)$ as a function of $x$, where the expectation is over $y'$ conditional on $y = \overline{y}$ with $x' = Ra' + y'$ and $a' = x - \mathcal{C}(x, a)$.

to front-load consumption, and this incentive increases with the inter-temporal elasticity of substitution. Note that two alternative preference specifications yield very similar consumption functions and associated target assets. Specifically, the case of ($\beta = 0.9, \sigma = 0.5$) and ($\beta = 0.95, \sigma = 1.5$) track each other closely. This highlights that relative impatience and a high elasticity both push towards a low target level of assets.

In the top right panel we plot $MPC(., \bar{y})$ against $x$. As discussed in the main text, for each preference specification, the MPC is strictly decreasing in $x$, reflecting the concavity of $\mathcal{C}$. Looking across preferences at a given level of resources, the MPC is decreasing in $\beta$ and increasing in the IES. For an intuition for why MPC is so sensitive to preferences, consider an increase of $x$ in period $t$ holding constant $y$. To map out the response of consumption, consider the unconstrained Euler equation $\mathbb{E}_t \left\{ (\beta R)^k (c_{t+k}/c_t)^{-\gamma} \right\} = 1$ for $k \geq 1$. A small increase in $x$ given $y$ can be accommodated by increasing $c_{t+k}$ proportionally at all $k \geq 0$. While this new allocation satisfies the Euler equation wherever it holds, it is not a true optimal response as it ignores the fact that in some states the Euler equation may not be satisfied with equality. Nevertheless, it is a useful thought exercise to provide some intuition. As the increase is proportional in every period, the initial level change in consumption (the discrete version of the MPC) is increasing in the initial level of consumption. For a given $x$, the more front loaded is consumption, the greater the MPC. Hence, for a given $x$, the MPC is increasing in the IES and decreasing in $\beta$, as depicted in the figure.

Interestingly, for low $\beta$ preferences, the IES has a fairly big impact on the MPC for asset levels near the target. For the relatively patient specifications, the impact on MPC is primarily intermediated through the large difference in target wealth. This reflects that as $\beta R \to 1$, there is less of an incentive to inter-temporally substitute consumption, and the IES becomes less relevant in determining steady state assets.

The bottom left pannel of Figure A1 depicts the APC as a function of $x$. For fixed preferences, this relationship is monotonic.[45] However, for a given $x$, there is substantial variation across preference specifications. Recall that an APC of one implies stationary assets given an income level; hence, the APCs at the respective mean assets are clustered near one (it is not exact as APC is a nonlinear function of $x$, and also because $x^*$ is integrated over the ergodic distribution of $y$ as well as $x$). We will use the fact that comparing individuals across wealth positions for a given APC identifies variation due to preferences.

Lastly, the bottom right panel plots the expected consumption growth as a function of $x$, still for $y = \overline{y}$.[46] Expected log consumption is computed by integrating over the policy

[45] The relationship is monotonic for the mean income level, which is the case depicted. However, for the lowest income states we do find that the APC eventually declines in $a$ as $a$ becomes very large. This reflects the presence of $a$ in the denominator of the APC.

[46] By definition, the average consumption growth integrated over the ergodic distribution of $x$ and $y$ is

function for each possible draw of next period's earnings, with transition probabilities conditional on mean $y$ today and next period assets governed by the policy function associated with $(x, \overline{y})$.

We next consider the role of income volatility. To that end, we set $\beta = 0.95$ and $\sigma = 0.5$ and consider a calibration of the income process that exhibits higher volatility. Specifically, we consider an income process where the standard deviation of the transitory component of income is three times as large. Figure A2 depicts the consumption policy function, the MPC, the APC and the expected consumption growth as functions of $x$ for the baseline income process, labelled "low risk" and for the riskier income process.

The top left panel shows that consumption is decreasing in income risk, reflecting a larger demand for precautionary savings. This also manifests in a higher expected consumption growth, as shown in the bottom right panel. Higher income risk induces more curvature in the consumption function for low levels of assets and thus implies a higher MPC. Lastly, the bottom left panel shows that the APC is decreasing in the volatility of income.

## A1.1 Target Savings and Heterogeneity in Income Processes

A natural hypothesis is that some agents face less idiosyncratic income risk and in response hold less precautionary savings. Similarly, some could face a steeper life-cycle profile of earnings, and therefore desire to borrow rather than save. Both points suggest differences in income processes as a potential explanation for the persistent hand-to-mouth. However, the preceding analysis indicates that the frequently hand-to-mouth have lower income growth and more volatility. Given the plausibility of the income-difference hypothesis, a closer study is warranted. Hence, in this subsection we explore in greater detail the relative income processes for the frequently hand-to-mouth.

To this end, we divide the PSID sample in half based on the frequency of $H2M$ status over the sample. The median household finds itself in either $H2M$ status two times. We therefore group the 55.6 percent of the sample that are hand-to-mouth two times or less in the "Below Median" category, and the remaining 44.4 percent in the "Above Median."[47]

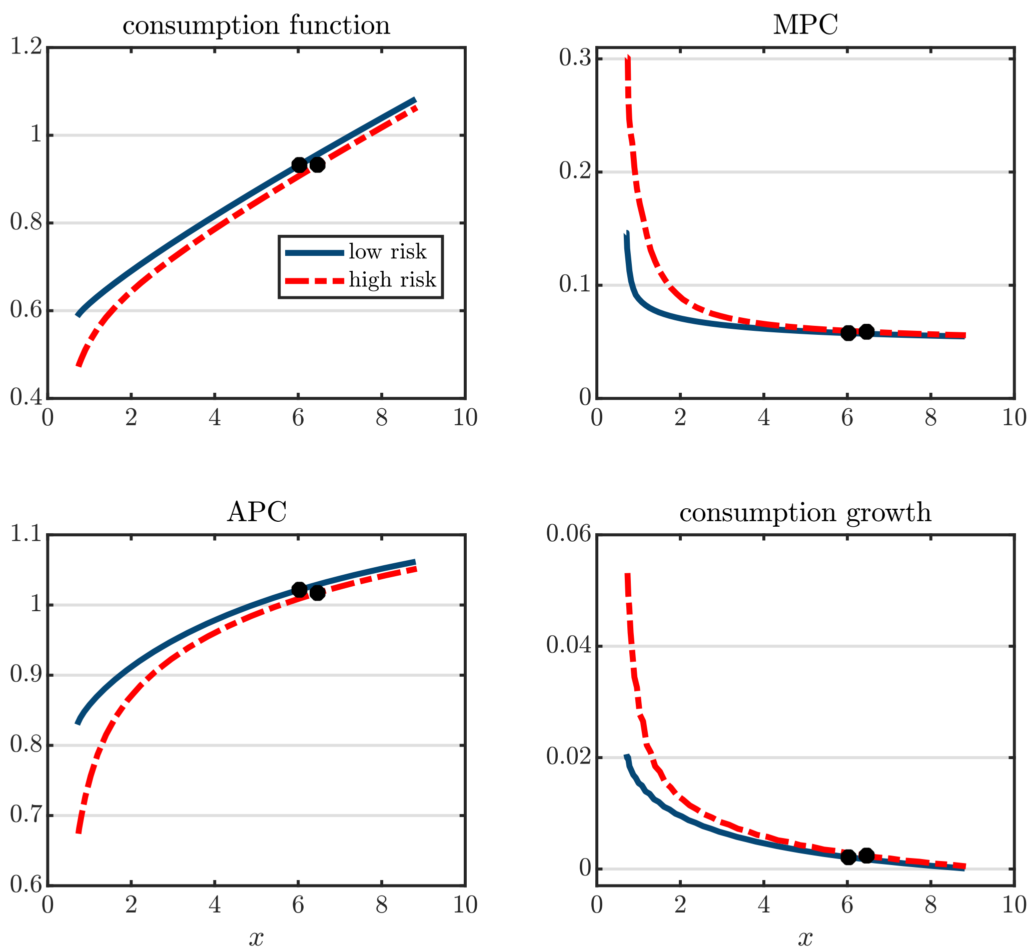
For each subsample we estimate a standard specification of the process for household earnings. Specifically, we estimate:

$$\ln y_{ijt} = \beta_t + \mathbf{X_{ijt}} \boldsymbol{\gamma} + \tilde{y}_{ijt},$$

zero. Integrated over income states, the average expected consumption growth at $x^*$ is much closer to zero.

[47]We have also performed the analysis splitting only on the frequency of just $H2M_{NW}$ status and found similar patterns.

Figure A2: The Consumption Policy Function – Role of Income Risk




Note: The top left panel depicts $\mathcal{C}(\cdot, y)$ as a function of $x$, with $y$ set to its mean value in all panels. The top right panel depicts $\partial\mathcal{C}(x, y)/\partial x$ as a function of $x$. The bottom left depicts $\mathcal{C}(x, y)/(y + ra)$ as a function of $x$. The bottom right panel depicts $\mathbb{E} \ln \left(\frac{\mathcal{C}(x',y')}{\mathcal{C}(x,y)}\right)$ as a function of $x$, where the expectation is over $y'$ conditional on $y = \overline{y}$ with $x' = Ra' + y'$ and $a' = x - \mathcal{C}(x, a)$.

where $y_{ijt}$ is total after-tax labor earnings for household $i$ in wave $t$ with a head of age $j$, $\beta_t$ is a year fixed effect, $\boldsymbol{X}$ is a vector of demographic controls, and $\tilde{y}_{ijt}$ is the residual income that we analyze below in a second stage. The vector $\boldsymbol{X}$ includes a cubic in age (normalized to zero at 25), as well as dummy controls for educational attainment (for less than high school, high school, some college, and college degree), the number of earners ($0, 1$ or $2$), family size ($1, 2, 3, 4$, or $5+$), and three race categories. We estimate the specification for each subsample separately. The results are reported in Table A1. The coefficients are similar across the two groups. The frequently hand-to-mouth have a slightly shallower age profile, in line with Table 3, but the difference is small relative to the standard errors.

Table A1: First-Stage Income Process Parameters

| | Rarely $H2M$ | Frequently $H2M$ |
|---|---|---|
| Age-25 | .057 | .046 |
| | (.005) | (.005) |
| (Age-25)$^2$ | -.002 | -.002 |
| | (<.001) | (<.001) |
| (Age-25)$^3$ | (<.001) | (<.001) |
| | (<.001) | (<.001) |
| Observations | 14,438 | 11,515 |

Note: Not reported are controls for education, household status, number of earners, family size and time.

We now study the residual income process $\tilde{y}_{ijt}$, estimating the standard specification:

$$\tilde{y}_{ij} = \alpha_i + \epsilon_{ij} + \nu_{ij}$$
$$\epsilon_{ij} = \rho\epsilon_{ij-1} + \eta_{ij},$$

where $\alpha_i$ is a mean-zero household fixed effect with cross-sectional variance $\sigma^2_\alpha$; $\epsilon$ is a persistent AR(1) process with parameter $\rho$; and $\nu$ and $\eta$ are mean-zero *iid* shocks with variances $\sigma^2_\nu$ and $\sigma^2_\eta$, respectively. All shocks are assumed to be orthogonal. We estimate the parameter vector $\{\rho, \sigma_k\}$, where $k = \alpha, \nu, \eta$ by method of moments. We follow Tonetti (2011) and use the (available) covariances between agents of ages $j$ and $j'$ as moments.[48] The results are reported in Table A2, along with bootstrapped 95% confidence intervals.

[48]See Tonetti (2011) for details. We are grateful to Chris Tonetti for sharing the Matlab code to compute the estimates.

Table A2: Residual Income Process Parameters

| | Rarely $H2M$ | Frequently $H2M$ |
|---|---|---|
| $\rho$ | .909 | .948 |
| | [.484 .958] | [.781 .961] |
| $\sigma_\eta^2$ | .045 | .020 |
| | [.017 .141] | [.016 .067] |
| $\sigma_\nu^2$ | .022 | .131 |
| | [.000 .127] | [.077 .144] |
| $\sigma_\alpha^2$ | .161 | .063 |
| | [.082 .214] | [.035 .101] |

Note: The table reports point estimates of the parameters of the income process and the 95% confidence interval in brackets.

We see that households frequently hand-to-mouth have less volatile innovations to the AR(1) coefficient, but with slightly more persistence. Together the estimates indicate an unconditional variance of $\epsilon$ is 0.26 for the rarely hand-to-mouth compared to 0.20 for the frequently hand-to-mouth. Thus the frequently hand-to-mouth have slightly less long-run uncertainty. On the other hand, variance of the *iid* component of earnings is more than five times as large for the frequently hand-to-mouth.

To put these differences in perspective, we simulated the standard model under each of the residual income processes, that estimated for households infrequently hand-to-mouth and that estimated for those frequently so, separately for each of our four preference specifications. This reveals whether frequent $H2M$ status reflects the differential income process for these households. To focus on the differences in uncertainty, we normalized both income processes to have an unconditional mean of one and set the borrowing constraint at zero for each exercise. The fixed effect is set equal to zero. In Table A3, we report the frequency of $H2M_{NW}$ status (computed as $a' < y/6$, as in the data) and average wealth divided by average income.

In all simulations, the model's predictions for frequency of $H2M$ status is opposite the data. That is, the empirical income process for the frequently hand-to-mouth predicts less frequent hand-to-mouth status in the model. There is no clear pattern with respect to average wealth. Recall that the frequently $H2M$ income process has much more transitory risk. This generates a large incentive to save near the borrowing constraint and quickly exit the low-asset region. This explains the infrequent $H2M$ status. Far from the constraint,

Table A3: Simulated Moments for Alternative Income Specifications

| | Frequency $H2M$ | | Wealth/Earnings | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $\beta = 0.95, \sigma = 0.5$ | .016 | .008 | 9.647 | 8.137 |
| $\beta = 0.95, \sigma = 1.5$ | .260 | .126 | 1.885 | 1.447 |
| $\beta = 0.90, \sigma = 0.5$ | .271 | .135 | .148 | .925 |
| $\beta = 0.90, \sigma = 1.5$ | .955 | .616 | .058 | .207 |

Note: The columns labelled (1) use the residual income process parameters estimated for the Rarely Hand-to-Mouth reported in Table A2, setting $\sigma_{\alpha}^{2} = 0$; the columns labelled (2) use the income parameters estimated for the Frequently Hand-to-Mouth. $H2M$ status in the model is whether the agent has assets $a$ less than two months of annual earnings, $y/6$. Wealth/Earnings is the ergodic mean of $a$, where the mean of income has been normalized to one in each simulation.

however, the fact that the empirical $H2M$ income process has slightly less persistent risk plays a role, making the prediction for the long-run mean of wealth depend on the preference specification.

# A2 Data Appendix

## A2.1 Description of PSID sample

Our primary data source is the Panel Study of Income Dynamics (PSID) biennial surveys from 1999 to 2015. The advantage of the PSID for our purposes is that it provides measures of income, assets, and expenditures. Income measures were a focus of the PSID from it onset in 1968 (hence its name). The PSID introduced a module to measure assets and liabilities in 1984 that reappeared every five years. Beginning 1999 the PSID includes a wealth module in every survey. That is one reason we begin our sample in 1999. The second reason is that the PSID first began surveying households on a number of expenditure categories, beyond food and housing, with the 1999 survey.

We focus here on our variable constructions for the key variables of earnings, income, wealth, and expenditures. We then detail the sample restrictions we employ.

The analysis separately considers earnings income and a broader measure of after-tax income that includes net income from assets, including owner-occupied housing. We measure earnings by wage and salary income, net of payroll taxes, plus the head of household's labor component of income from any unincorporated business, and one half of family farm income. We add to these earnings any receipts of government transfer payments from AFDC, supplemental security income, other welfare payments, veteran's pensions, unemployment benefits, worker's compensation, or social security benefits. To construct after-tax income, we first sum taxable income (earnings, net profits from business or farm, and income from assets), transfer income, and social security income for the husband and wife as well as other family members. From this we subtract the family's federal and state income tax liabilities as measured by the TAXSIM program. For homeowners we then add 6 percent of the respondent's assessed value of their home to account for the implicit rent on their home, while subtracting payments for property taxes, mortgage interest, and home insurance.

We define a household net worth as the sum of its liquid and illiquid assets net of debts. We treat liquid net worth as the sum of balances in checking or savings accounts, money market funds, certificates of deposit, holdings of treasury bills and other government savings bonds, the value of stocks outside of pension funds, minus the value of all debts. The values for checking or savings accounts, money market funds, certificates of deposit, treasuries and other government bonds are multiplied by 1.055, to reflect cash holdings that are not reported in the survey. See Foster, Schuh and Zhang (2013) for justification. Illiquid wealth is the sum of a household's home equity, equity in other real estate, holdings of IRAs and other pensions, the value of bonds (not including treasury or other government bonds), insurance holdings, the value of any business or farm net of debts, and the value of any vehicles (including motor homes), boats, and trailers net of debt owed. These distinctions for liquid versus illiquid assets largely follow Kaplan et al. (2014), while fitting within the grouping of assets within the PSID questionnaire. Our stratification of households into not hand-to-mouth, hand-to-mouth by net worth, and hand-to-mouth by liquid wealth are based on these measures of assets relative to our broad measure of earnings, as discussed at the beginning of Section 4.

Our base measure for expenditures includes spending categories for shelter, utilities (by type), food for consumption at home, food for consumption away from home, gasoline, health insurance, medical expenses (separately for doctors, hospitals, and prescription drugs), education, child care, purchases or lease of vehicles, vehicle repair, vehicle insurance, parking, and public transportation (by type). Spending on shelter reflects rent payments for renters; for homeowners we set it to 6 percent of respondent's valuation of the home. Our measure of nondurable and services spending excludes spending on vehicles or their repair from the base measure. Beginning with the 2005 survey, the PSID added categories for home repairs, home furnishings, clothing, vacations, recreation, and telecommunications. We consider robustness to this broader measure in judging households spending relative to income (APC). Our base measure of expenditures relative to after-tax income averages 58.3 percent. For the broader measure available beginning with the 2005 survey, this average is 73.2 percent.

In addition to controlling for year and age effects, our regression analysis includes controls for marital status (single or married/cohabiting), race (three values), and family size. Family size takes five distinct values, with 5 representing family sizes of 5 and above. For regressions in growth form, e.g., growth rate of expenditures over two years, the controls reflect year and age dummies, and a set of dummies for the conceivable changes in marital status and for whether family size increased, stayed the same, or decreased.

Respondents report earnings, income, and taxes for the previous calendar year, whereas they report assets and liabilities as of the interview. Expenditures are reported for differing time frames. Among categories available from the 1999 survey, education spending is for the prior calendar year, health spending (including health insurance) for the previous two calendar years, and vehicle spending for since the survey two years prior. Other categories are in terms of the household's usual (typically monthly) expenditures. We treat these variables as aligned with respect to the previous calendar year, with assets viewed as end of period. We deflate nominal variables by the corresponding CPI measured in 2009 dollars.

Our sample reflects only the PSID's nationally representative core sample (i.e., we use the Survey Research Center sample, excluding the Survey of Economic Opportunity.). This sample includes "split-off" families from the orignal sample as well as the PSID sample extensions to better represent the families of immigrants and recent immigrants. Throughout the analysis we employ the PSID longitudinal family weights, which are designed to correct for non-random sample attrition as well as failures to draw an entirely random sample.

We restrict our sample to households with heads ages 25 to 64. We exclude households with less than $2,000 (2009 $'s) in any of annual earnings (including transfer receipts), after-tax income, or annual expenditures. We also exclude households with extreme responses on expenditures in which food purchases for consumption at home are zero, or spending on housing and food (home and away) is less than 5% or greater than 90% of total expenditures. Finally, we include only households whose $H2M$ status, from their earnings and asset information, can be measured for at least three surveys. Table A1 displays the impact of these restrictions sequentially for our resulting sample, both in terms of households and number of observations. It also shows the sample impact of examining two-year growth rates, such as income or expenditure growth.

Table A4: Impact of Sample Restrictions

| Restriction | Households | Observations |
|---|---|---|
| Ages 25 to 64 | 7,572 | 35,766 |
| Earnings & Inc.$\geq$\$2000 | 7,476 | 34,641 |
| Expenditures$\geq$\$2000 | 7,472 | 34,565 |
| No odd spending | 7,341 | 33,325 |
| $H2M$ status 3+ times | 4,907 | 27,134 |
| WRT 2-year changes | 4,767 | 21,569 |

Note: PSID data, 1999 to 2015 survey waves.

### A2.2 Description of the Consumer Expenditure Survey Sample

We employ a sample derived from the Consumer Expenditure Surveys (CE) to augment our evidence from the PSID that low-asset houshold concentrate their spending on a narrower set of categories. We make use of the CE data on income, assets, and expenditure from survey years 1996 to 2016.

The CE surveys households on their expenditures for up to four consecutive quarters. We only include households that were surveyed in the fourth interview. In this interview they are asked about asset and debt holdings and about their income over the previous 12 months. The CE does not provide information on households pensions, and is more limited than the PSID in collecting information on some other forms of illiquid assets. Therefore, we stratify households by assets only with respect to their liquid assets, using the definition in Kaplan et al. (2014) for households that are hand-to-mouth. The asset information for liquid assets parallels that in the PSID. It includes the household's balances in checking or savings accounts, money market funds, certificates of deposit, holdings of treasury bills and other government savings bonds, the value of stocks outside of pension funds. Debts include credit card and store credit debt, student loans, and medical or personal loans.

We express a household's assets relative to its annual income. That income sums household earnings, farm and business income, retirement payments including from social security, government transfers, and alimony receipts. Our income measure is before taxes. (The corresponding CE variable for after-tax income was eliminated after 2015.)

Each household's quarterly expenditures are divided into many distinct categories. To examine the share of categories purchased, we exclude durable categories as well as utilities (e.g., water, gas, electricity, trash collection) that we view as tied to the choice of housing. The resulting 27 nondurable categories are listed in Table A5. The table reports the fraction of households that spend on the category in a quarter, as well as the average fraction adding or dropping the category in a quarter.

Table A5: Nondurable Expenditure Categories, CE

| Category | Share | Positive | Add | Drop |
|---|---|---|---|---|
| Food at home | 0.289 | 1.00 | 0.00 | 0.00 |
| Motor fuel | 0.113 | 0.92 | 0.01 | 0.01 |
| Food away from home | 0.097 | 0.86 | 0.06 | 0.06 |
| Telephone services | 0.072 | 0.96 | 0.02 | 0.02 |
| Health insurance | 0.067 | 0.61 | 0.04 | 0.03 |
| Motor vehicle insurance | 0.052 | 0.61 | 0.12 | 0.12 |
| Professional services | 0.035 | 0.52 | 0.14 | 0.13 |
| Video and audio – services | 0.034 | 0.74 | 0.04 | 0.04 |
| Tuition, other school fees, and childcare | 0.034 | 0.19 | 0.06 | 0.06 |
| Tobacco and smoking products | 0.026 | 0.28 | 0.04 | 0.04 |
| Public transportation | 0.020 | 0.24 | 0.11 | 0.11 |
| Tenants' and household insurance | 0.016 | 0.33 | 0.08 | 0.08 |
| Personal care services | 0.015 | 0.68 | 0.10 | 0.10 |
| Club memberships, fees for sports, lessons or instructions | 0.014 | 0.33 | 0.10 | 0.10 |
| Prescription drugs | 0.014 | 0.44 | 0.12 | 0.11 |
| Information processing other than telephone services | 0.013 | 0.52 | 0.07 | 0.06 |
| Alcoholic beverages at home | 0.012 | 0.40 | 0.09 | 0.09 |
| Admission tickets | 0.012 | 0.45 | 0.14 | 0.14 |
| Motor vehicle fees | 0.012 | 0.49 | 0.19 | 0.18 |
| Lodging away from home – hotel | 0.011 | 0.19 | 0.12 | 0.12 |
| Household operations – nondurables | 0.010 | 0.24 | 0.09 | 0.09 |
| Laundry and other apparel services | 0.009 | 0.40 | 0.10 | 0.11 |
| Financial and legal services | 0.009 | 0.29 | 0.12 | 0.13 |
| Alcoholic beverages away from home | 0.008 | 0.32 | 0.10 | 0.10 |
| Hospital and related services | 0.005 | 0.06 | 0.05 | 0.05 |
| Elderly care, funeral and dating services | 0.002 | 0.02 | 0.02 | 0.02 |
| Medical supplies | 0.001 | 0.02 | 0.01 | 0.01 |

# A3 Additional Empirical Results

## A3.1 Results Excluding Durable Categories

Tables A6 and A7 report the impact of $H2M$ status on spending growth, spending volatility (absolute value of spending growth) and the APC excluding the durable categories of vehicles and vehicle repairs. Similarly, Table A8 provides estimates for MPCYs by $H2M$ status, excluding those categories. These robustness results are discussed in Section 4.9.

Table A6: Consumption Growth and Volatility for the Hand-to-Mouth, excluding Durables

| | Consumption Growth | | | $\lvert\Delta \ln c\rvert$ | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $H2M_{NW}$ | -.001 | .018 | .018 | .035 | .009 | .007 |
| | (.004) | (.007) | (.008) | (.004) | (.004) | (.005) |
| $H2M_{LIQ}$ | -.011 | .001 | .001 | .017 | -.003 | -.004 |
| | (.004) | (.006) | (.006) | (.004) | (.003) | (.004) |
| Fraction time $H2M_{NW}$ | | | -.034 | | | .048 |
| | | | (.009) | | | (.007) |
| Fraction time $H2M_{LIQ}$ | | | -.026 | | | .053 |
| | | | (.008) | | | (.008) |
| Fixed Effects | No | Yes | No | No | Yes | No |

Note: Sample size is 19,351. Growth rates are annualized. Not-$H2M$ group is omitted in all regressions. Sample is PSID 1999-2015, with $H2M$ status observed at least three times. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

## A3.2 Results Splitting by Age and by Long-term Income

Table A9 reports spending growth and volatility of that growth $|\Delta \ln c|$ by age group. The first age group includes households with heads ages 25 to 39. The second age group includes households with heads ages 40 to 64. Tables A10 and A11 conduct the same sample divisions in estimating the APC and MPCY effects of being hand-to-mouth. Tables A12, A13, and A14 similarly reports estimates dividing the sample instead by a household's long-term earnings. Long-term earnings are defined as a household's average natural log of earnings after removing a cubic function of the head's age and year dummies. Households are divided

Table A7: The Average Propensity to Consume excluding Durables

| | (1) | (2) | (3) |
|---|---|---|---|
| $H2M_{NW}$ | .070 | -.005 | -.026 |
| | (.011) | (.011) | (.017) |
| $H2M_{LIQ}$ | .086 | .006 | .005 |
| | (.012) | (.009) | (.012) |
| Fraction | | | .175 |
| time $H2M_{NW}$ | | | (.025) |
| Fraction | | | .209 |
| time $H2M_{LIQ}$ | | | (.026) |
| Fixed effects | No | Yes | No |

Note: Sample size is 19,350. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

between those in the lower two quintiles versus upper three. Section 4.9.4 discusses the estimates under these sample splits.

## A3.3 More on the Extensive Category Margin

The results of Tables 8 and 9 indicate that the hand-to-mouth consume fewer distinct categories, but move into and out of categories more elastically. To explore this further, we decompose the growth in nondurable consumption between $t-1$ and $t$ into three components: the change in spending on goods consumed in both periods (the "intensive" margin); the addition of new goods; and the dropping of old goods. In particular, suppose individual $i$ consumes $N_k$ categories of goods in period $k = t-1, t$. Let $I$ denote the set of categories consumed in both $t-1$ and $t$. Let $A$ denote the set of categories added in period $t$, and $D$ the set of categories dropped between $t-1$ and $t$. Hence, $N_{t-1} = I \cup D$ and $N_t = I \cup A$. Let $x_{n,k}$ denote expenditure on good $n$ in period $k = t-1, t$, always expressed in period $t$

Table A8: Marginal Propensity to Consume out of Income, excluding Durables

Dependent variable is $\Delta c/(y+ra)$

| | (1) | (2) | (3) |
|---|---|---|---|
| $\Delta y/(y+ra)$ | .035 | .015 | .056 |
| | (.009) | (.010) | (.016) |
| $\Delta y/(y+ra) \times H2M_{NW}$ | .041 | -.013 | -.022 |
| | (.021) | (.027) | (.026) |
| $\Delta y/(y+ra) \times H2M_{LIQ}$ | .005 | -.038 | -.039 |
| | (.024) | (.027) | (.027) |
| $\Delta y/(y+ra)$ | | .100 | .129 |
| $\times$Fraction time $H2M_{NW}$ | | (.045) | (.043) |
| $\Delta y/(y+ra)$ | | .101 | .123 |
| $\times$Fraction time $H2M_{LIQ}$ | | (.052) | (.048) |
| $\Delta y/(y+ra)\times$ APC | | | -.063 |
| | | | (.021) |

Note: Sample size is 19,351. $H2M$ indicators are lagged (t-2) values, APC is Tornqvist of current and lagged APCs. Regressions also include dummies for $H2M$ status, in addition to the controls described in Section 4.3. Columns (2) and (3) include fractions of time $H2M_{NW}$ and $H2M_{LIQ}$; (3) includes APC. Standard errors clustered at household level.

prices. We decompose growth in expenditure between $t-1$ and $t$ as follows:

$$\begin{aligned}\frac{c_t - c_{t-1}}{0.5(c_t + c_{t-1})} &= \frac{\sum_{n\in N_t} x_{n,t} - \sum_{n\in N_{t-1}} x_{n,t-1}}{0.5(c_t + c_{t-1})} \\ &= \underbrace{\frac{\sum_{n\in I}(x_{n,t} - x_{n,t-1})}{0.5(c_t + c_{t-1})}}_{\text{Intensive}} + \underbrace{\frac{\sum_{n\in A} x_{n,t}}{0.5(c_t + c_{t-1})}}_{\text{Add}} + \underbrace{\frac{-\sum_{n\in D} x_{n,t-1}}{0.5(c_t + c_{t-1})}}_{\text{Drop}}.\end{aligned}$$

To obtain the contribution of the sub-components, we individually regress the three measures on the right-hand side of this decomposition on the total growth rate of nondurable expenditure defined on the left-hand side. Mechanically, the coefficients from the three regressions will add up to one. We run this decomposition for the pooled group of individuals in the PSID, as well as the non-hand-to-mouth and the hand-to-mouth separately.

Table A15 reports the results. The estimates indicate that the hand-to-mouth households

Table A9: Consumption Growth and Volatility by Age

| | Consumption Growth | | | | $\lvert\Delta \ln c\rvert$ | | | |
|---|---|---|---|---|---|---|---|---|
| | Ages 25 to 39 | | Ages 40 to 64 | | Ages 25 to 39 | | Ages 40 to 64 | |
| | (1) | (2) | (1) | (2) | (1) | (2) | (1) | (2) |
| $H2M_{NW}$ | .003 | .020 | .005 | .032 | .012 | -.015 | .034 | .030 |
| | (.006) | (.009) | (.006) | (.011) | (.006) | (.008) | (.007) | (.010) |
| $H2M_{LIQ}$ | -.007 | .009 | -.011 | -.001 | .015 | -.001 | .022 | .009 |
| | (.006) | (.008) | (.005) | (.007) | (.007) | (.008) | (.007) | (.008) |
| Fraction time $H2M_{NW}$ | | -.032 | | -.046 | | .050 | | .005 |
| | | (.011) | | (.013) | | (.014) | | (.013) |
| Fraction time $H2M_{LIQ}$ | | -.038 | | -.016 | | .035 | | .036 |
| | | (.013) | | (.009) | | (.016) | | (.011) |

Note: Sample size is 8,323 for ages 25-39, 11,028 for 40-64. Growth rates are annualized. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

Table A10: Average Propensity to Consume by Age

| | Ages 25 to 39 | | Ages 40 to 64 | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $H2M_{NW}$ | .049 | -.056 | .079 | .012 |
| | (.013) | (.023) | (.015) | (.019) |
| $H2M_{LIQ}$ | .066 | -.012 | .088 | .015 |
| | (.016) | (.018) | (.015) | (.014) |
| Fraction time $H2M_{NW}$ | | .198 | | .115 |
| | | (.032) | | (.031) |
| Fraction time $H2M_{LIQ}$ | | .191 | | .196 |
| | | (.033) | | (.032) |

Note: Sample size is 8,323 for ages 25-39, 11,027 for 40-64. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

Table A11: Marginal Propensity to Consume out of Income by Age

Dependent variable is $\Delta c/(y+ra)$

| | Ages 25 to 39 | | | Ages 40 to 64 | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $\Delta y/(y+ra)$ | .037 | .016 | .094 | .038 | .017 | .046 |
| | (.016) | (.017) | (.027) | (.009) | (.011) | (.014) |
| $\Delta y/(y+ra) \times H2M_{NW}$ | .047 | .027 | -.023 | .034 | -.096 | -.088 |
| | (.027) | (.035) | (.035) | (.029) | (.045) | (.044) |
| $\Delta y/(y+ra) \times H2M_{LIQ}$ | .026 | -.012 | -.033 | .011 | -.037 | -.033 |
| | (.032) | (.038) | (.037) | (.025) | (.027) | (.027) |
| $\Delta y/(y+ra)$ | | .047 | .145 | | .227 | .229 |
| $\times$Fraction time $H2M_{NW}$ | | (.053) | (.050) | | (.063) | (.064) |
| $\Delta y/(y+ra)$ | | .104 | .143 | | .087 | .102 |
| $\times$Fraction time $H2M_{LIQ}$ | | (.069) | (.067) | | (.056) | (.051) |
| $\Delta y/(y+ra)\times$ APC | | | -.118 | | | -.045 |
| | | | (.036) | | | (.017) |

Note: Sample size is 8,323 for ages 25-39, 11,028 for 40-64. $H2M$ indicators are lagged (t-2) values, APC is Tornqvist of current and lagged APCs. Regressions also include dummies for $H2M$ status, in addition to the controls described in Section 4.3. Columns (2) and (3) include fractions of time $H2M_{NW}$ and $H2M_{LIQ}$; (3) includes APC.

are relatively prone to adding and dropping goods as they adjust expenditure while those with higher wealth tend to operate more on the intensive margin. (The p-value of the tests that the elasticities are the same across the two groups are all well below one percent.)

# A4 The Extensive Margin and the IES: A Simple Two-Good Example

In this appendix we provide a simple model that links the extensive margin analysis of Section 4.8 and the inter-temporal elasticity of substitution. The example is designed to deliver a transparent and plausible explanation about why certain consumers are prone to be highly elastic at the margin in terms of total expenditure's response to relative price (including interest rate) movements.

Suppose there are two goods, $c_1$ and $c_2$ and utility is given by $u(c_1, c_2 - \underline{c}y)$, where $y$

Table A12: Consumption Growth and Volatility by Long-term Earnings

| | Consumption Growth | | | | $\|\Delta \ln c\|$ | | | |
|---|---|---|---|---|---|---|---|---|
| | Lower 2 quint. | | Upper 3 quint. | | Lower 2 quint. | | Upper 3 quint. | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (9) |
| $H2M_{NW}$ | .010 | .031 | .008 | .021 | .017 | .011 | .016 | .007 |
| | (.007) | (.012) | (.005) | (.008) | (.006) | (.008) | (.004) | (.006) |
| $H2M_{LIQ}$ | -.001 | .013 | -.010 | -.005 | .007 | -.004 | .004 | -.001 |
| | (.007) | (.010) | (.004) | (.006) | (.006) | (.007) | (.004) | (.004) |
| Fraction time $H2M_{NW}$ | | -.038 | | -.026 | | .011 | | .019 |
| | | (.014) | | (.011) | | (.012) | | (.009) |
| Fraction time $H2M_{LIQ}$ | | -.032 | | -.011 | | .029 | | -.0002 |
| | | (.013) | | (.008) | | (.014) | | (.009) |

Note: Sample size is 6,446 for lower quintiles, 12,905 for upper. Growth rates are annualized. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

Table A13: Average Propensity to Consume by Long-term Earnings

| | Lower two quintiles | | Upper three quintiles | |
|---|---|---|---|---|
| | (1) | (2) | (1) | (2) |
| $H2M_{NW}$ | .024 | -.021 | .029 | -.008 |
| | (.018) | (.028) | (.010) | (.013) |
| $H2M_{LIQ}$ | .087 | .026 | .029 | -.008 |
| | (.022) | (.022) | (.010) | (.013) |
| Fraction time $H2M_{NW}$ | | .087 | | .070 |
| | | (.022) | | (.018) |
| Fraction time $H2M_{LIQ}$ | | .162 | | .080 |
| | | (.043) | | (.021) |

Note: Sample size is 6,446 for lower quintiles, 12,904 for upper. Not-$H2M$ group is omitted in all regressions. Regressions include the controls described in Section 4.3. Standard errors are clustered at household level.

Table A14: Marginal Propensity to Consume out of Income by Long-term Earnings

Dependent variable is $\Delta c/(y + ra)$

| | Lower two quintiles | | | Upper three quintiles | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (1) | (2) | (3) |
| $\Delta y/(y + ra)$ | .077 | .042 | .122 | .018 | .009 | .048 |
| | (.019) | (.024) | (.032) | (.007) | (.008) | (.013) |
| $\Delta y/(y + ra) \times H2M_{NW}$ | .026 | -.058 | -.067 | .031 | .008 | -.001 |
| | (.029) | (.051) | (.046) | (.021) | (.024) | (.026) |
| $\Delta y/(y + ra) \times H2M_{LIQ}$ | -.037 | -.086 | -.081 | .052 | .032 | .021 |
| | (.036) | (.042) | (.040) | (.015) | (.019) | (.018) |
| $\Delta y/(y + ra)$ $\times$Fraction time $H2M_{NW}$ | | .144 | .173 | | .059 | .069 |
| | | (.072) | (.061) | | (.041) | (.042) |
| $\Delta y/(y + ra)$ $\times$Fraction time $H2M_{LIQ}$ | | .107 | .119 | | .064 | .081 |
| | | (.070) | (.064) | | (.043) | (.040) |
| $\Delta y/(y + ra)\times$ APC | | | -.093 | | | -.063 |
| | | | (.027) | | | (.022) |

Note: Sample size is 6,446 for lower quintiles, 12,905 for upper. $H2M$ indicators are lagged (t-2) values, APC is Tornqvist of current and lagged APCs. Regressions also include dummies for $H2M$ status, in addition to the controls described in Section 4.3. Columns (2) and (3) include fractions of time $H2M_{NW}$ and $H2M_{LIQ}$; (3) includes APC.

Table A15: Decomposition of Spending Growth by Hand-to-Mouth status

| Status | Not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|
| Intensive | 0.736 | 0.677 | 0.734 |
| Add | 0.116 | 0.138 | 0.114 |
| Drop | 0.148 | 0.186 | 0.152 |

Note: Regressions include the controls described in Section 4.3.

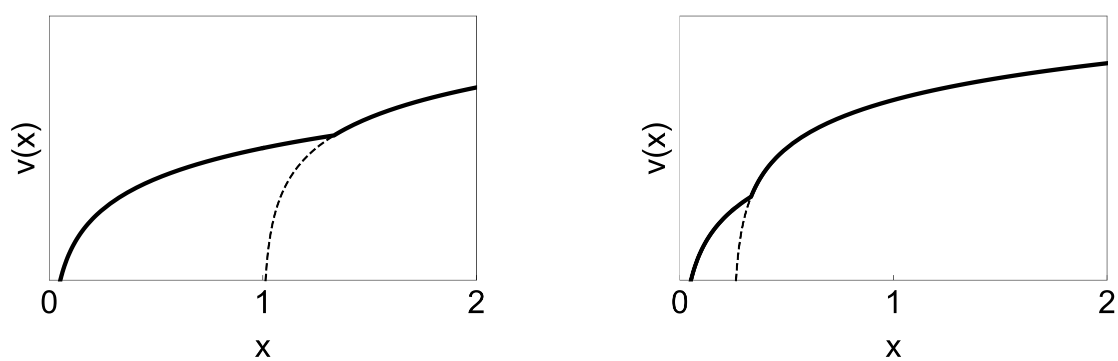
is average income and $\underline{c}$ is a parameter that captures a minimum consumption level as a fraction of income. To make things simple, suppose both goods trade at price 1 and period income is $y = 1$. We shall contrast two individuals with differing $\underline{c}$.

To make things concrete, let the indirect utility function over expenditure be given by:

$$v(x) = \max_{c_1, c_2} c_1^\rho + \mathbb{1}_{[c_2 > \underline{c}y]}(c_2 - \underline{c}y)^\rho$$
$$\text{subject to } c_1 + c_2 \leq x,$$

where $\mathbb{1}_x$ is an indicator function that takes value if $x$ is true and zero otherwise, and $\rho$ is a parameter. The key static decision is to consume both goods versus only good 1. Figure A3 plots $v(x)$ for $\underline{c} = 1$ (left panel) and $\underline{c} = 0.25$ (right panel). The decision between one versus two goods is to choose the max of the two alternatives (where the two-good option is depicted by the dashed line). Of course, the switch from one good to two occurs at much lower expenditures levels for low $\underline{c}$. That is, conditional on spending, the agent with low $\underline{c}$ is likely to consume fewer categories, just like the hand-to-mouth in the data. The key is whether the point at which the agent switches is far or close to the typical level of expenditure. Keep in mind that the decision in the static problem is invariant to monotonic transformations. Hence, one can make the convex kink as dramatic or negligible as one wishes without altering the decision of whether to consume the second good.

Figure A3: $v(x)$ as a function of $x$




(a) $\underline{c} = 1$ (b) $\underline{c} = 0.25$

To see how this affects the inter-temporal problem, suppose the individual has the following time-separable utility over two periods, $t = 1, 2$:

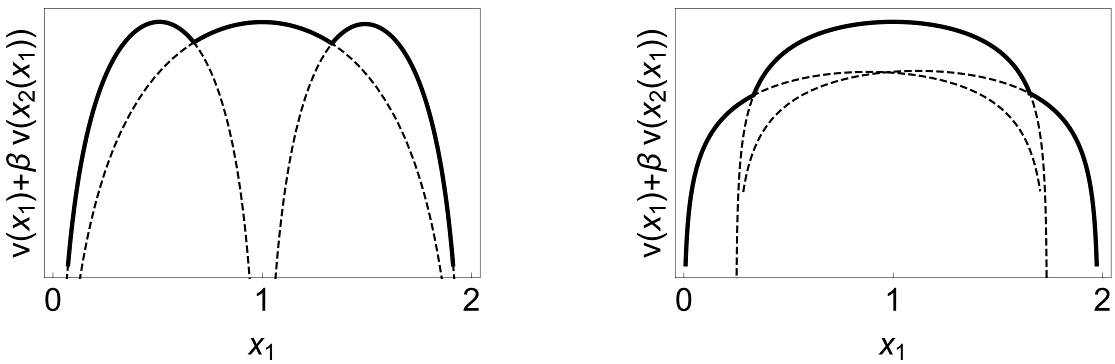
$$V(x_1) + \beta V(x_2), \tag{7}$$

where

$$V(x) = \frac{v(x)^{\frac{1-\gamma}{\rho}}}{1-\gamma}.$$

Given a deterministic income process, $y_t$, and an interest rate $R$, the consumer's problem is to maximize (7) subject to $x_1 + R^{-1}x_2 = y_1 + R^{-1}y_2$. Setting $\beta = R^{-1} = 0.98$ and $y_1 = y_2 = y = 1$, Figure A4 plots the value of the objective as we vary $x_1$ and letting $x_2(x_1) = (2 + r)y - Rx_1$. (We also set $\rho = 1/3$, $\gamma = 1.01$.)

Figure A4: $V(x_1) + \beta V(x_2(x_1))$ as a function of $x_1$



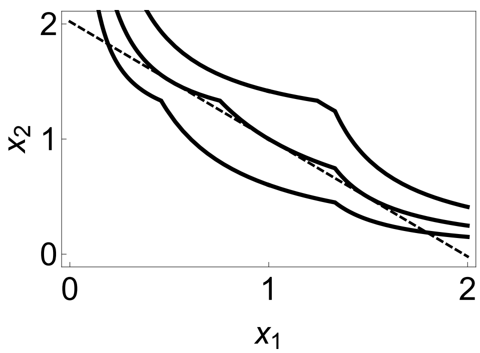

(a) $\underline{c} = 1$

(b) $\underline{c} = 0.25$

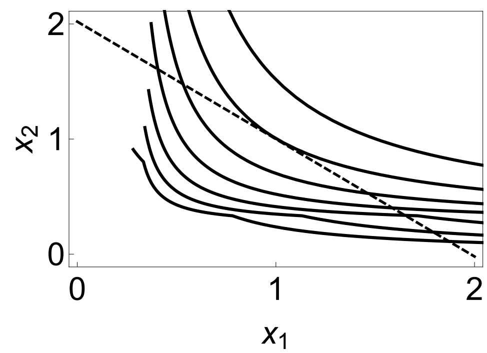
From left to right in Panel (a) of Figure A4, the dashed lines denote the value from (i) consuming one good in period 1 and two goods in period 2; (ii) consuming one good in both periods; and (iii) consuming two goods in period one and one good in period two. As drawn, the individual is indifferent over the three choices. The important point is that small movements in inter-temporal prices may lead to large shifts in first-period expenditure. In the right panel, the dashed lines denote the value from (i) consuming one good in period 1 and two goods in period 2; (ii) consuming two goods in both periods; and (iii) consuming two goods in period one and one good in period two. Here, consuming both goods in both periods is clearly optimal, and doing so is robust to small movements in the interest rate. The bottom line is that the agent with high $\underline{c}$ not only consumes fewer categories, but is also more likely to adjust at the extensive margin, similarly to the hand-to-mouth in the data.

Figure A5 plots the indifference curves for the two period problem. That is, it depicts points $(x_1, x_2)$ for constant $V(x_1) + \beta V(x_2) = \bar{V}$ for various values of $\bar{V}$. It also includes the budget line. Again, the non-convex portion is relevant for the left-hand $\underline{c}$, but not the right. Small changes in $R$ (the slope of the budget line), can have a big effect on the inter-temporal spending of the agent with low $\underline{c}$, who willingly shifts spending over time via adding or dropping the second good. Note that this is akin to this agent having a higher IES.

Figure A5: Indifference Curves




(a) $\underline{c} = 1$




(b) $\underline{c} = 0.25$

# A5 Additional Results from Quantitative Model

Table A16 reports the implied moments for the grid of preference types $(\beta, \sigma)$ we consider in the calibration.

Table A16: Type-Specific Moments Preference Grid

| | Frequency | Frequency | Net Worth to Income | | |
|---|---|---|---|---|---|
| Type | $H2M_{NW}$ | $H2M_{LIQ}$ | not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
| | | | $\sigma = 0.5$ | | |
| $\beta = 0.85$ | 0.93 | 0.01 | 0.62 | -0.06 | 0.59 |
| $\beta = 0.86$ | 0.91 | 0.01 | 0.70 | -0.06 | 0.72 |
| $\beta = 0.87$ | 0.88 | 0.02 | 0.82 | -0.05 | 0.87 |
| $\beta = 0.88$ | 0.85 | 0.03 | 0.97 | -0.05 | 1.01 |
| $\beta = 0.89$ | 0.79 | 0.05 | 1.15 | -0.04 | 1.13 |
| $\beta = 0.9$ | 0.70 | 0.09 | 1.34 | -0.03 | 1.33 |
| $\beta = 0.91$ | 0.51 | 0.16 | 1.51 | -0.00 | 1.58 |
| $\beta = 0.92$ | 0.26 | 0.20 | 1.70 | 0.01 | 2.04 |
| $\beta = 0.93$ | 0.16 | 0.20 | 2.15 | 0.00 | 2.78 |
| $\beta = 0.94$ | 0.11 | 0.19 | 2.72 | -0.00 | 3.61 |
| $\beta = 0.95$ | 0.08 | 0.18 | 3.41 | -0.00 | 4.45 |
| $\beta = 0.96$ | 0.05 | 0.19 | 4.27 | -0.00 | 5.19 |
| $\beta = 0.97$ | 0.03 | 0.19 | 5.16 | 8.38 | 6.15 |
| $\beta = 0.98$ | 0.01 | 0.19 | 6.10 | 0.02 | 6.92 |
| $\beta = 0.99$ | 0.00 | 0.19 | 7.03 | 0.04 | 7.63 |

| Type | Frequency $H2M_{NW}$ | Frequency $H2M_{LIQ}$ | Net Worth to Income: not $H2M$ | $H2M_{NW}$ | $H2M_{LIQ}$ |
|---|---|---|---|---|---|
| $\beta = 1$ | 0.00 | 0.20 | 7.94 | 0.06 | 8.21 |
| | | | $\sigma = 1$ | | |
| $\beta = 0.85$ | 0.98 | 0.00 | 0.37 | -0.07 | 0.44 |
| $\beta = 0.86$ | 0.98 | 0.00 | 0.37 | -0.07 | 0.45 |
| $\beta = 0.87$ | 0.97 | 0.00 | 0.39 | -0.07 | 0.41 |
| $\beta = 0.88$ | 0.96 | 0.00 | 0.44 | -0.07 | 0.42 |
| $\beta = 0.89$ | 0.94 | 0.01 | 0.54 | -0.07 | 0.55 |
| $\beta = 0.9$ | 0.92 | 0.02 | 0.70 | -0.05 | 0.78 |
| $\beta = 0.91$ | 0.83 | 0.06 | 0.87 | -0.02 | 1.03 |
| $\beta = 0.92$ | 0.39 | 0.19 | 0.97 | 0.01 | 1.33 |
| $\beta = 0.93$ | 0.27 | 0.28 | 1.49 | 0.01 | 1.95 |
| $\beta = 0.94$ | 0.17 | 0.33 | 2.35 | -0.00 | 3.11 |
| $\beta = 0.95$ | 0.08 | 0.37 | 3.67 | -0.01 | 5.12 |
| $\beta = 0.96$ | 0.03 | 0.34 | 5.31 | -0.00 | 7.52 |
| $\beta = 0.97$ | 0.00 | 0.32 | 6.94 | 0.01 | 9.41 |
| $\beta = 0.98$ | 0.00 | 0.34 | 8.36 | 0.08 | 10.8 |
| $\beta = 0.99$ | 0 | 0.33 | 9.74 | | 11.7 |
| $\beta = 1$ | 0 | 0.29 | 10.4 | | 13.0 |
| | | | $\sigma = 1.5$ | | |
| $\beta = 0.85$ | 0.99 | 0 | 0.56 | -0.07 | |
| $\beta = 0.86$ | 0.99 | 0 | 0.46 | -0.07 | |
| $\beta = 0.87$ | 0.99 | 0.00 | 0.47 | -0.07 | 0.67 |
| $\beta = 0.88$ | 0.98 | 0.00 | 0.40 | -0.07 | 0.68 |
| $\beta = 0.89$ | 0.98 | 0.00 | 0.41 | -0.07 | 0.42 |
| $\beta = 0.9$ | 0.96 | 0.00 | 0.41 | -0.06 | 0.36 |
| $\beta = 0.91$ | 0.91 | 0.03 | 0.56 | -0.04 | 0.67 |
| $\beta = 0.92$ | 0.39 | 0.18 | 0.78 | 0.02 | 1.00 |
| $\beta = 0.93$ | 0.26 | 0.33 | 1.25 | 0.02 | 1.60 |
| $\beta = 0.94$ | 0.16 | 0.41 | 2.44 | 0.01 | 3.23 |
| $\beta = 0.95$ | 0.07 | 0.43 | 4.62 | -0.01 | 6.46 |
| $\beta = 0.96$ | 0.01 | 0.39 | 7.40 | -0.01 | 9.88 |

| Type | Frequency $H2M_{NW}$ | Frequency $H2M_{LIQ}$ | Net Worth to Income not $H2M$ | Net Worth to Income $H2M_{NW}$ | Net Worth to Income $H2M_{LIQ}$ |
|---|---|---|---|---|---|
| $\beta = 0.97$ | 0.00 | 0.36 | 10.0 | 0.13 | 11.8 |
| $\beta = 0.98$ | 0 | 0.33 | 12.1 | 0 | 13.0 |
| $\beta = 0.99$ | 0 | 0.33 | 13.5 | 0 | 13.1 |
| $\beta = 1$ | 0 | 0.34 | 14.4 | 0 | 13.0 |

In Table A17 we pursue a different calibration strategy by targeting median net worth to median income ratios for hand-to-mouth groups, in addition to the frequency of each $H2M$ status. The top panel reports the fit of the model and the bottom reports the calibrated preference types and their respective shares.

Table A17: Alternative Calibration Strategy

**Panel A. Moments**

| Type | Frequency $H2M_{NW}$ | Frequency $H2M_{LIQ}$ | Median Net Worth to Income not $H2M$ | Median Net Worth to Income $H2M_{NW}$ | Median Net Worth to Income $H2M_{LIQ}$ |
|---|---|---|---|---|---|
| Data (PSID) | 22.7% | 17.5% | 2.30 | -0.07 | 0.98 |
| Calibration | 23.2% | 18.0% | 1.19 | -0.04 | 1.83 |

**Panel B. Calibrated Preference Heterogeneity**

| | Calibrated Share | Share of Not $H2M$ | Share of $H2M_{NW}$ | Share of $H2M_{LIQ}$ |
|---|---|---|---|---|
| $\beta = 0.94, \sigma = 0.5$ | 68.0% | 79.6% | 35.8% | 71.8% |
| $\beta = 0.88, \sigma = 1$ | 3.2% | 0.15% | 13.4% | 0.06% |
| $\beta = 0.92, \sigma = 1.5$ | 28.8% | 20.3% | 50.8% | 28.2% |