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The Macroeconomic Implications of Coholding

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Abstract

Around one-third of U.S. households are coholders with both liquid assets and revolving credit card debt, yet macroeconomic models typically summarize their balance sheets by net liquid wealth. We show that, holding net liquid wealth fixed, the underlying gross positions of liquid assets and debt are important determinants of how households consume, save, and deleverage out of transitory income gains. In particular, households with more debt consume less and deleverage more. We build a model that reproduces these patterns through endogenous coholding generated by a liquidity-in-advance constraint and use it to show that coholding changes standard conclusions about fiscal and monetary policy. Accounting for coholders reverses the prediction that targeting transfers to low-income households generates more immediate consumption than untargeted transfers because many targeted households use transfers to repay debt. Coholding also weakens monetary transmission through saving rates and strengthens it through borrowing rates.

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1 Introduction

Modern macroeconomic models increasingly recognize the importance of household heterogeneity in determining aggregate economic outcomes and understanding responses to fiscal and monetary policy. Central to this heterogeneity is the distribution of wealth across households, which shapes consumption and saving decisions. The literature has traditionally focused on *net total* wealth positions when modeling household behavior, while more recent contributions highlight the role of *net liquid* wealth (Kaplan and Violante, 2014). These approaches implicitly assume that, for a given level of net wealth, the underlying gross positions of assets and liabilities are either irrelevant or degenerate. However, a substantial body of evidence from household finance suggests this assumption may be problematic. In the United States, around one-third of households regularly cohold revolving credit card debt and cash-like liquid assets, a pattern that models focusing on net positions alone cannot capture (Gross and Souleles, 2002; Telyukova, 2013).

In this paper, we integrate the concept of coholding from the household finance literature into a macroeconomic context and study the relevance of the joint distribution of liquid assets and debt for macroeconomic policy.[1] Empirically, we document two facts about household balance sheets and their relationship with responses to income gains. First, the distribution of liquid wealth is underpinned by a rich, non-degenerate joint distribution of liquid assets and liquid debt. Second, conditional on net liquid wealth, higher liquid debt is associated with a lower marginal propensity to consume out of income and a higher marginal propensity to deleverage, so that net liquid wealth alone does not summarize how households use marginal income.

To examine the macroeconomic implications of these empirical facts, we construct a quantitative model that endogenously generates coholding behavior. The model incorporates two key innovations: explicit saving and borrowing decisions as distinct controls, and a liquidity-in-advance constraint that creates rational demand for liquid assets even while holding debt. Calibrated to household balance sheet moments, the model reproduces key untargeted patterns in the marginal propensities to consume (MPC), save (MPS), and deleverage (MPD) across the joint distribution of liquid assets and debt. We use the calibrated model to study how coholding affects fiscal and monetary policy transmission. Accounting for coholding reveals differences in both policy exposure and consumption responsiveness among households with the same net liquid wealth, challenging policy assessments based on net positions alone.

[1] In our empirical analysis, liquid assets refer to balances in checking and savings accounts, and liquid debt refers to credit card debt.

In the first part of the paper, we use the Survey of Consumer Finances and the Survey of Consumer Expectations to document the prevalence of coholding and its impact on the marginal propensities to consume, save, and deleverage. Our main contribution is documenting that for a given level of net liquid wealth, higher credit card debt dampens the marginal propensity to consume. To illustrate this distinction, consider two households with zero net liquid wealth: one holds neither liquid assets nor credit card debt, while the other holds \$5,000 in both. Although their net positions are identical, the first is a conventional hand-to-mouth household with few liquid resources, while the second is a coholder with offsetting gross positions. Our empirical results indicate that this distinction matters: the coholder has a significantly lower MPC than the hand-to-mouth household. For example, around the median of the net liquid wealth distribution, the reported MPC falls by almost half between the lowest and highest debt quartiles. This negative relationship between debt and the MPC extends across the distribution of net liquid wealth.

This analysis has direct implications for recent advances in macroeconomics that emphasize the importance of correctly identifying high-MPC households to evaluate macroeconomic policies. Our findings challenge the conventional approach of using low net liquid wealth to identify hand-to-mouth households with high MPCs. This approach confounds two distinct groups: true hand-to-mouth households with low net positions and low gross positions, and coholding households with low net positions due to large and offsetting gross positions. In the 2016 SCF, excluding coholders reduces the share of hand-to-mouth households from 37% to 24%.

Further, we extend our analysis beyond the marginal propensity to consume to also study the marginal propensities to save and deleverage. Recent open-ended survey responses from households, especially coholders, have highlighted a clear distinction between the choice to save and the choice to deleverage (Colarieti, Mei and Stantcheva, 2025; Batista, Mao and Sussman, 2024). Traditionally, the literature has focused on the marginal propensity to consume, grouping the propensities to save and deleverage into a residual marginal propensity to increase wealth. This aggregation obscures how households adjust the two sides of their balance sheets, with different implications for liquidity and future interest payments. We document how both responses vary across the joint distribution of liquid assets and debt. Unconditionally, higher liquid debt is associated with a larger propensity to deleverage, while higher liquid assets are associated with a larger propensity to save. Holding the other side of the liquid balance sheet fixed, an additional dollar of liquid debt raises the MPD by nearly four times as much as an additional dollar of liquid assets lowers it. As a result, coholders with dampened MPCs have larger MPDs, using income gains to repair their balance sheets as opposed to increasing con-

sumption. Our model shows that these coholders, having repaired their balance sheets, display larger consumption responses in the medium to long term.

The second part of the paper develops a model that endogenously features both true hand-to-mouth and coholding households. Households make separate saving and borrowing decisions, allowing us to study both net liquid wealth and the underlying gross positions. They face a liquidity-in-advance constraint, in the style of Svensson (1985), that reflects real-life frictions in paying for certain goods using credit. This constraint creates a demand for liquid assets to finance future purchases, even when households wish to borrow to smooth current consumption. Combined with the standard buffer-stock motive for net wealth, this liquidity motive gives households a distinct demand for both liquid assets and liquid debt. As *ex ante* identical households are exposed to heterogeneous income shocks, a subset becomes true hand-to-mouth households while another subset becomes coholders.

This difference in behavior reflects distinct underlying constraints. True hand-to-mouth households are consumption-constrained because they have few resources overall and use positive income shocks primarily to increase consumption. In contrast, coholders are typically satisfied with their current consumption level but are financing it using a costly combination of assets and debt. When they receive a positive income shock, they largely maintain their consumption level but optimize their financing by reducing expensive debt, which allows them to increase consumption in the future. This consumption smoothing behavior is fundamentally different from that of the true hand-to-mouth, yet looking only at net liquid wealth positions would not allow us to distinguish between these groups. Our empirical findings on the joint distribution of assets and debt and their relationship to consumption behavior can be used immediately to improve measurement of household constraints.

Key to our theoretical contribution is the parsimonious addition of a single parameter: the strength of the liquidity-in-advance constraint. In a simple stylized model, we show that this parameter dictates the allocation of a coholder's liquid wealth between liquid assets and debt without affecting its level. In the quantitative model, we jointly estimate the discount factor and the liquidity parameter by matching median net liquid wealth and the 75th percentile of liquid debt. The calibrated model is successful in several untargeted dimensions, including moments of the joint distribution of liquid assets and debt, which determines who is exposed to a policy, and the marginal propensities to consume, save, and deleverage over this joint distribution, which determine how strongly households respond.

Our model then allows us to study the implications of coholding for macroeconomic

policy. To assess the policy consequences of looking only at net positions, we compare our model with a net liquidity benchmark in which households never cohold. Differences in policy transmission arise from two sources: households' exposure to the policy, and their response per unit of exposure. Models focusing on net positions summarize the liquid balance sheet relevant to both margins by net liquid wealth. With coholding, however, two households with the same net liquid wealth can differ along both. We conduct these exercises in partial equilibrium to isolate household-level responses to policy and discuss how these responses can be incorporated into a general equilibrium analysis.

With respect to fiscal policy, coholding affects which households are reached by targeted transfers and how these transfers are used in the short and long run. Coholders have lower short-run MPCs and higher MPDs than hand-to-mouth households while making up a large share of households with low net liquid wealth. In our model, transfers targeted to households with low income or low net liquid wealth reach so many coholders that they generate a smaller immediate consumption response than untargeted transfers. In contrast, models focusing on net positions predict that the same programs nearly double the response relative to untargeted transfers. Over the medium term, however, coholders who repay debt save on interest payments and consume more than the full transfer. We also show that direct debt relief, which the fiscal authority can base on observed debt balances, has medium-run effects similar to targeting net liquidity, since both reach indebted households that use the transfer to repay debt.

For monetary policy, coholding changes both households' exposure and responsiveness to interest rates, even conditional on net liquid wealth. First, in a net liquidity model, the sign of a household's net position determines whether it faces the saving or borrowing rate, whereas coholders face both rates irrespective of their net position. Second, households with the same net liquid wealth can have different MPCs due to their gross positions, and hence different intertemporal substitution responses. The transactional role of liquid assets, for example, dampens the responsiveness to the saving rate. At the aggregate level, there is an additional distributional channel. A net liquidity model cannot reproduce the joint distribution of liquid assets and debt generated by coholding, and in our calibration the two models also generate different distributions of net liquid wealth. These distributional differences change the aggregate exposure to saving and borrowing rates. The quantitative importance of these channels depends on the pass-through of interest rates, which is strong for credit card rates but weak for deposit rates (Bräuning and Stavins, 2025; Drechsler, Savov and Schnabl, 2017). We find that under measured pass-through, coholding shifts monetary transmission away from the saving rate toward the borrowing rate. The saving rate channel accounts for almost all of the response in the net

liquidity model but less than half in the coholding model.

Related Literature We contribute to the large literature on marginal propensities to consume by studying the role of gross positions alongside net wealth. On the empirical side, much of this literature studies how MPCs vary with assets or wealth (Bunn, Le Roux, Reinold and Surico, 2018; Kueng, 2018; Christelis, Georgarakos, Jappelli, Pistaferri and Van Rooij, 2019; Jappelli and Pistaferri, 2020; Fagereng, Holm and Natvik, 2021; Fuster, Kaplan and Zafar, 2021; Ganong, Jones, Noel, Farrell, Greig and Wheat, 2023; Graham and McDowall, 2026), while other contributions examine the role of debt (Jappelli and Pistaferri, 2014; Sala and Trivin, 2021; Kosar, Melcangi, Pilossoph and Wiczer, 2022). Closest to our emphasis on joint positions, Fagereng, Onshuus and Torstensen (2024) use Norwegian administrative data to show that the consumption response to job loss depends on the interaction of liquid assets and total debt. We systematically study the role of gross positions for the response to transitory income gains and show that credit card debt predicts MPCs conditional on net liquid wealth. Beyond consumption, a number of other papers document how households adjust debt in response to income changes (Agarwal, Liu and Souleles, 2007; Sahm, Shapiro and Slemrod, 2010, 2015; Boutros, 2019; Coibion, Gorodnichenko and Weber, 2020; Fagereng et al., 2021). Colarieti et al. (2025) use open-ended surveys to show that households distinguish saving from debt repayment, two responses often grouped together in macroeconomic models. We complement this evidence by emphasizing that the allocation between saving and deleveraging varies across gross positions and by developing a model with distinct saving and borrowing decisions that generates behavior consistent with these findings.

On the theoretical side, we contribute a model in which households make distinct borrowing and saving decisions. In the two-asset models of Kaplan and Violante (2014) and Kaplan, Moll and Violante (2018), as in standard incomplete markets models, liquid wealth is one net quantity and borrowers are the households for which it is negative. Since saving and repaying debt are separate decisions in our model, the marginal propensity to deleverage is a distinct object from the marginal propensity to save. Most closely related to this paper are Kosar et al. (2022) and Lee and Maxted (2026), who also study the role of debt in the transmission of fiscal and monetary policy. Kosar et al. (2022) introduce a debt price schedule into a standard incomplete markets model and show that households use transfers to reduce debt and lower the interest rate they pay. Lee and Maxted (2026) show that, in an economy with present bias, credit card borrowers do not need to be close to their borrowing constraint to have an elevated marginal propensity to consume. In these papers a household is either a saver or a borrower, and the interest rate it faces follows from the sign of its net liquid position. In the data, however, households

with the same net liquid wealth use a windfall differently depending on their gross debt and gross assets. We identify our mechanism from this variation, and it determines the incidence of fiscal and monetary policy in the model.

Finally, we bring the coholding literature from household finance into a macroeconomic setting and show that the structure of household balance sheets is important for understanding macroeconomic policy. We build on the idea in Telyukova (2013) that households cohold debt and assets due to liquidity demand, and embed this mechanism in a workhorse consumption-saving model to study its macroeconomic implications. In Appendix C, we evaluate several other explanations of coholding against our evidence (Bertaut, Haliassos and Reiter, 2009; Telyukova and Wright, 2008; Telyukova, 2013; Fulford, 2015; Druedahl and Jørgensen, 2018; Gorbachev and Luengo-Prado, 2019).

2 Empirical Facts

Household wealth plays a central role in determining consumption, saving, and borrowing behavior. Traditional macroeconomic analysis focuses primarily on net wealth positions, assuming that the underlying gross positions are either irrelevant or can be summarized by the net position alone. We challenge this assumption by documenting two key empirical facts. First, the distribution of liquid wealth is underpinned by a rich joint distribution of liquid assets and liquid debt, in which households with identical net liquid wealth positions hold vastly different combinations of gross assets and liabilities. The coholding of liquid assets and debt is a persistent household state, with the same households observed coholding across waves of panel data. Second, these gross positions determine how households use marginal income. Conditional on net liquid wealth, liquid debt dampens the marginal propensity to consume, and both sides of the balance sheet determine the marginal propensity to deleverage, so that net wealth is not a sufficient statistic for the response to marginal income. In this section, we also discuss the implications of coholding for the measurement of households with high MPCs using only liquid wealth, and in the following sections we develop a quantitative model to match these facts and perform policy analysis.

2.1 Fact 1: The Joint Distribution of Liquid Assets and Debt

We examine the joint distribution of liquid assets and liquid debt using the 2016 wave of the Survey of Consumer Finances.[2] In Panel (a) of Figure 1, each point represents a household's gross positions. Roughly two-thirds of households lie along either axis, indicating that they have either positive liquid assets and no liquid debt or positive liquid debt and no liquid assets. The remaining one-third have sizable positive positions in both liquid assets and liquid debt. These households are coholders, or borrower-savers, defined as households whose liquid assets and liquid debt each exceed 10% of monthly income.[3] Focusing only on net wealth masks this heterogeneity in underlying gross positions.

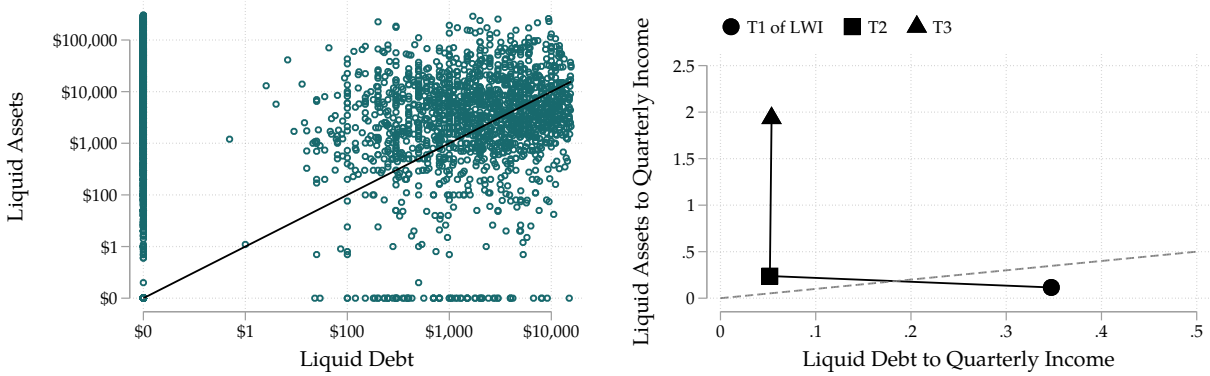
Panel (b) of Figure 1 plots average liquid assets and liquid debt within each tercile of the net liquid wealth distribution, normalized by quarterly income. Households in the lowest tercile hold small but positive liquid assets alongside substantial credit card debt, whereas households in the highest tercile hold substantial liquid assets and very little debt. Households in the middle tercile hold roughly the same amount of liquid debt as those in the highest tercile and far fewer liquid assets. Moving from the lowest tercile to the highest therefore traces out an L-shape, and we refer to the joint distribution of liquid assets and liquid debt as the L-distribution.

The coholding of liquid assets and liquid debt is a well-documented phenomenon in household finance (Telyukova, 2013; Bertaut et al., 2009; Fulford, 2015; Gorbachev and Luengo-Prado, 2019; Gathergood and Olafsson, 2022; Colarieti et al., 2025). We focus here on documenting that it is a persistent state at both the aggregate and the individual level, and Appendix A.1 describes coholding in the SCF in more detail. At the aggregate level, the share of households engaged in coholding has remained remarkably stable across SCF waves from 2001 to 2019, fluctuating around one-third of households for the entire period, and the same L-distribution appears in the earlier and later waves. At the individual level, the panel dimension of the PSID allows us to follow the same households over time. Using the 2011–2019 waves, over which credit card debt is measured biennially, and the same definition of coholding as in the SCF, we find that a household observed coholding in one wave coholds again two years later with probability 0.65, compared to an unconditional coholding rate of 0.29 in the PSID. Figure 2 shows this recurrence

[2] Liquid assets are defined as funds held in checking and savings accounts. Liquid debt denotes revolving credit card debt. We restrict the sample to households aged 25 to 65.

[3] This follows the thresholds used in the literature, such as the \$500 cutoff of Telyukova (2013), which Druedahl and Jørgensen (2018) index to income and which corresponds to roughly 11% of mean monthly after-tax income. Appendix A.1 shows that the share of coholders remains sizable, and follows the same path over time, under alternative thresholds and when households are additionally required to report carrying a balance habitually.

Figure 1: The Joint Distribution of Liquid Assets and Debt



(a) Joint Scatter of Gross Positions

(b) Mean (a, d) by Net Liquid Wealth Tercile

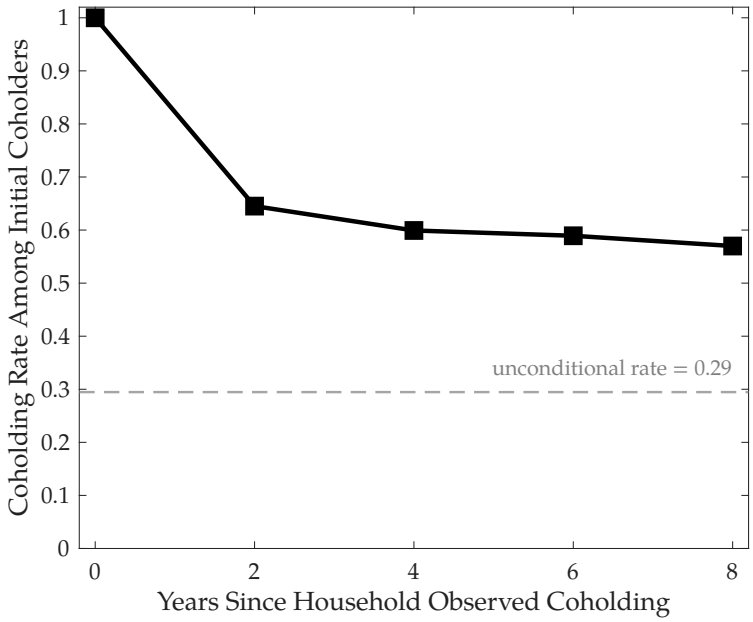
Notes: Data from the 2016 SCF. Panel (a) is a scatter of liquid assets against liquid debt. Observations below the 1st or above the 95th percentile for liquid assets, debt, or net liquid wealth are excluded. Both axes use a log scale for positive values. Panel (b) plots mean liquid assets and liquid debt, normalized by quarterly income, across terciles of net liquid wealth by income (LWI). Terciles are computed after trimming LWI at its 1st and 95th percentiles.

at horizons up to eight years. A household observed coholding today is roughly twice as likely as a randomly drawn household to be coholding eight years from now. This is qualitatively consistent with previous studies documenting recurrence of coholding in U.S. survey data and Finnish bank data (Gorbachev and Luengo-Prado, 2019; Vihriälä, 2020).

2.2 Fact 2: Gross Positions and Marginal Propensities

We next analyze how the joint distribution of liquid assets and debt affects household responses to income changes. Most studies in the literature focus exclusively on the marginal propensity to consume (MPC), treating the residual (non-consumption) portion of income shocks allocated toward saving or deleveraging as a homogeneous increase in wealth. We extend this approach by separately examining the propensities to save and deleverage, recognizing that households may allocate income shocks differently across these margins. For this analysis, we use the Survey of Consumer Expectations (SCE), a nationally representative survey of U.S. households fielded by the Federal Reserve Bank of New York, which has been used extensively in studies such as Fuster et al. (2021). Detailed information on the dataset is provided in Appendix A.2. To elicit marginal propensities across spending, saving, and deleveraging, we use a hypothetical income shock question included in the SCE. Respondents are asked:

Figure 2: Persistence of Coholding in the PSID



Notes: Recurrence among households observed coholding at a given wave, defined as the probability of coholding h years later, $P(\text{cohold}_{t+h} \mid \text{cohold}_t)$. The probability is pooled over all coholder-waves and computed among households present at the later wave. Coholding is defined as liquid assets and credit card debt each exceeding 10% of monthly income. The dashed line is the unconditional coholding rate. PSID 2011–2019, biennial, weighted by the family weight.

> *"Suppose next year you were to find your household with 10% more income than you currently expect. What would you do with the extra income?"*

Participants report both a qualitative breakdown and a quantitative allocation of the additional income, specifying what share they would consume (MPC), save (MPS), or use to reduce debt, the marginal propensity to deleverage (MPD).

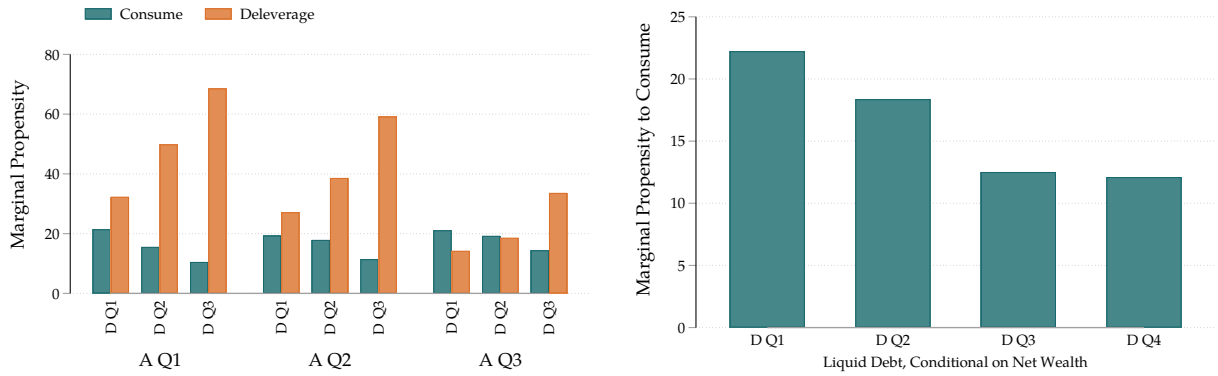
A potential concern is whether households' stated consumption intentions accurately reflect their actual behavior. A growing body of evidence suggests that survey-based marginal propensities are indeed informative. For the 2008 stimulus payments, Parker and Souleles (2019) compare self-reported consumption responses with actual consumption responses and find that the reported use of stimulus payments is highly informative about the actual spending response. Similarly, Bunn et al. (2018) document comparable magnitudes for self-reported and hypothetical MPCs, while Shapiro and Slemrod (2003) and Sahm et al. (2010) show that *ex ante* intended and *ex post* reported responses are closely aligned. Finally, Colarieti et al. (2025) provide further validation by "cross-validating" survey responses against observed behavior across a range of settings. They show that when hypothetical scenarios resemble common, real-world financial situ-

ations, stated intentions closely mirror actual outcomes, including not only consumption responses but also debt repayment behavior.

2.2.1 The Marginal Propensity to Consume

Panel (a) of Figure 3 plots the average propensities to consume and deleverage along the joint distribution of liquid assets and liquid debt. In this analysis, we double-cut the data by dividing households into terciles of liquid assets and, within each asset tercile, into terciles of liquid debt. The key insight from this figure is that even after controlling for liquid assets, increasing liquid debt consistently dampens the marginal propensity to consume while increasing the propensity to deleverage. This relationship holds across all terciles of liquid assets, including households in the highest tercile who typically have large positive net wealth positions. This pattern is surprising from the perspective of standard consumption-saving models. Holding liquid assets fixed, households with more debt have lower net liquid wealth and would therefore typically be expected to have higher MPCs. To distinguish the role of debt from that of net liquid wealth, the regressions below and Panel (b) compare households with the same net position directly.

Figure 3: Marginal Propensities and the Joint Distribution of Liquid Wealth



(a) MPC and MPD by (a, d) Tercile

(b) MPC of Borrowers at Median Wealth, by Debt

Notes: SCE 2015–2019. Panel (a) plots the average MPC and MPD by tercile of liquid assets and, within each asset tercile, by tercile of liquid debt. Panel (b) plots the average MPC by quartile of liquid debt for households with positive liquid debt in the middle quintile of the net liquid wealth distribution. Households in the same quintile with no liquid debt have an average MPC of 21.3%. Both panels use SCE survey weights.

To quantify these relationships more precisely, we estimate a series of linear regression models. Table 1 presents our baseline results, with the marginal propensity to consume in Panel A and the marginal propensity to deleverage, discussed below, in Panel B. In

Column (1) of Panel A, we regress the marginal propensity to consume on liquid debt, finding a strong negative relationship: a $1,000 increase in liquid debt is associated with a 0.215 percentage point decrease in the MPC. This relationship is both economically meaningful and statistically significant at the 1% level. The key result in the remaining columns is that only the debt side of the balance sheet predicts the MPC. In Column (2), we add liquid assets so that the two gross positions enter jointly. In Column (3), we replace liquid assets with net liquid wealth, and the coefficient on liquid debt then compares households with the same net position. The coefficient on liquid debt is −0.214 and −0.209 percentage points per $1,000 in the two specifications, respectively, while the coefficient on liquid assets in Column (2) and on liquid wealth in Column (3) is 0.005 in both cases and statistically insignificant. Column (4) adds illiquid assets and debt, income, housing tenure, and measures of financial literacy. With these controls, the coefficient on liquid debt is −0.192 percentage points per $1,000 and significant at the 1% level, while the coefficient on liquid wealth is again small and insignificant.

Panel (b) of Figure 3 shows how the MPC varies with liquid debt among borrowers with similar net liquid wealth. Focusing on households with liquid debt around the median of the net liquid wealth distribution, we observe a clear negative relationship between liquid debt and the MPC. Among these households, those in the lowest quartile of liquid debt have an MPC of 22.2%, while those in the highest quartile have an MPC of only 12.1%. This substantial difference in consumption behavior would be missed by approaches that characterize households solely by their net wealth position.

In Appendix A.3, we show that the negative relationship between liquid debt and the MPC does not depend on the linear specification. When we include balance sheet positions as quantile groups instead of levels, the MPC declines monotonically with liquid debt. The results are also robust to additional controls, including home equity lines of credit. We also find a similar relationship outside the United States. In Appendix A.4 we revisit the Italian and Dutch survey evidence of Jappelli and Pistaferri (2014) and Christelis et al. (2019), respectively, and extend their analyses to account for both liquid assets and debt. In both countries, higher liquid debt is associated with a lower MPC conditional on net liquid wealth.

2.2.2 The Marginal Propensity to Deleverage

Panel B of Table 1 reports the same four specifications with the MPD as the outcome. The deleveraging margin is a first-order use of marginal income: the average household allocates roughly 39% of the hypothetical windfall to reducing debt, compared to 17% to consumption. In Column (3), a $1,000 increase in liquid debt is associated with a 0.697

Table 1: Regressions of Marginal Propensities on Household Liquid Balance Sheet

	(1)	(2)	(3)	(4)
Panel A: Marginal propensity to consume				
Liquid debt	−0.215***	−0.214***	−0.209***	−0.192***
	(0.035)	(0.035)	(0.039)	(0.039)
Liquid assets		0.005		
		(0.014)		
Liquid wealth			0.005	0.003
			(0.014)	(0.015)
Mean of dependent variable	16.7	16.7	16.7	16.6
Adj. R^2	0.034	0.033	0.033	0.049
Panel B: Marginal propensity to deleverage				
Liquid debt	0.992***	0.941***	0.697***	0.722***
	(0.075)	(0.074)	(0.080)	(0.077)
Liquid assets		−0.244***		
		(0.021)		
Liquid wealth			−0.244***	−0.171***
			(0.021)	(0.023)
Mean of dependent variable	39.0	39.0	39.0	39.2
Adj. R^2	0.129	0.160	0.160	0.202
Demographics	X	X	X	X
Illiquid assets/debt				X
Other financial variables				X
N	3,388	3,388	3,388	3,236

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Coefficients express percentage point changes in the marginal propensity per \$1,000. Demographic controls include age, gender, race, marital status, education, geography, and survey date. Financial controls include income, housing tenure, and financial literacy.

percentage point increase in the MPD, holding net liquid wealth fixed. The coefficient remains similar when we add the full set of controls in Column (4). Together with the MPC results, this shows that households with more debt at the same net position allocate less of an income gain to consumption and more to debt repayment.

Liquid assets also help explain repayment behavior. In Column (2), where both gross positions enter jointly, higher liquid assets are associated with a lower MPD for a given debt balance. Thus, while the coefficient on liquid assets is small and statistically insignificant for the MPC, both assets and debt predict the deleveraging response.

A potential concern is that the survey question does not specify which type of debt households intend to repay. Appendix A.3 examines this issue by comparing the roles of

credit card and mortgage debt. Although households with mortgage debt report somewhat higher MPDs, larger mortgage balances do not predict higher MPDs. In contrast, both the extensive and intensive margins of liquid debt holdings are strongly associated with the MPD. These results provide suggestive evidence that reported MPDs primarily reflect credit card repayment.

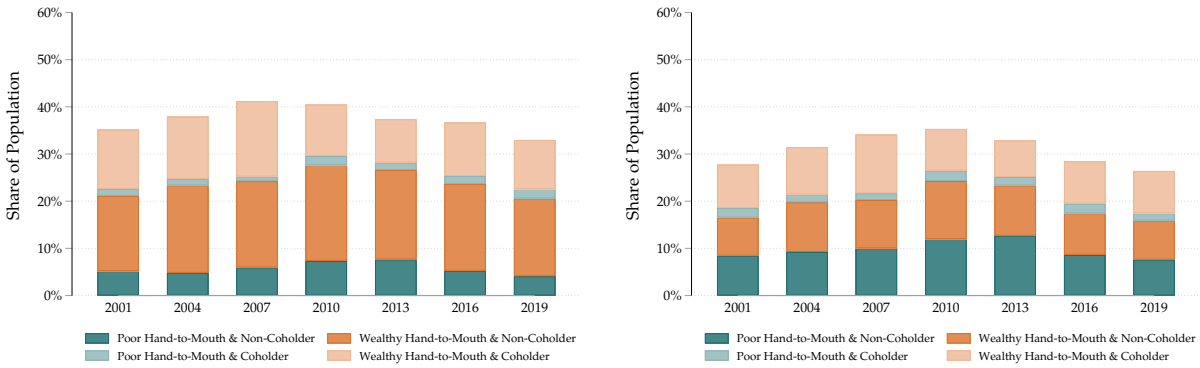
2.3 Coholding and the Measurement of Constrained Households

Our findings on the prevalence of coholding and how liquid debt dampens the MPC have important implications for identifying financially constrained households in macroeconomic models. The fraction of "spender" or "hand-to-mouth" households, i.e., those with large and immediate consumption responses to income shocks, serves as a critical calibration target in heterogeneous agent models. Since hand-to-mouth status is a latent variable, researchers typically proxy it using observable balance sheet characteristics, particularly low levels of net liquid wealth.

In seminal work, Kaplan and Violante (2014) and Kaplan, Violante and Weidner (2014) classify a household as hand-to-mouth when its net liquid wealth places it at one of the two kinks of its budget constraint: zero liquid wealth or the borrowing limit. They further distinguish poor hand-to-mouth households, who hold no illiquid wealth, from wealthy hand-to-mouth households, who hold positive illiquid wealth. Our analysis suggests that classifying households by net liquid wealth confounds two distinct groups: true hand-to-mouth households with low net and gross positions, and coholders with low net positions but substantial gross positions on both sides of the balance sheet. Figure 4 illustrates this distinction by decomposing hand-to-mouth households, classified as in Kaplan et al. (2014), into coholders and non-coholders over time. Both panels apply the same thresholds and differ only in what counts as liquid wealth. Panel (a) uses our definition of checking and savings accounts net of credit card debt, while Panel (b) uses the broader definition of Kaplan et al. (2014), which also includes money market accounts, cash, and directly held stocks, bonds, and mutual funds.

The evidence suggests that failing to account for coholding may substantially overcount the share of true "hand-to-mouth" households with high MPCs. In 2016, 36.6% of households would be classified as hand-to-mouth based on net liquid wealth, but excluding coholders reduces this share to 23.7%. Most of this reduction comes from wealthy hand-to-mouth households who are also coholders. With the broader definition of liquid wealth, the share of hand-to-mouth households decreases from 28.5% to 17.4% when excluding coholders. Since liquid debt dampens the MPC and raises the MPD conditional

Figure 4: Coholding and Hand-to-Mouth Households



(a) Narrow Definition of Liquid Wealth

(b) Broad Definition of Liquid Wealth

Notes: Following Kaplan et al. (2014), a household is hand-to-mouth if its net liquid wealth is either (i) between zero and half of biweekly income, or (ii) negative and within half of biweekly income of the borrowing limit, which is assumed to equal one month of income. A hand-to-mouth household is labeled wealthy if it holds positive illiquid wealth and poor otherwise. Coholders are defined as in Section 2. SCF waves 2001–2019, households aged 25–65.

on net liquid wealth, coholders counted as hand-to-mouth respond to marginal income differently from true hand-to-mouth households, using a larger share of it to repay debt. We return to this point in Section 6, where it matters for the design of targeted fiscal transfers, and demonstrate that a model which classifies households by net liquid wealth overstates the consumption response to transfers targeted at households with low net liquid wealth.

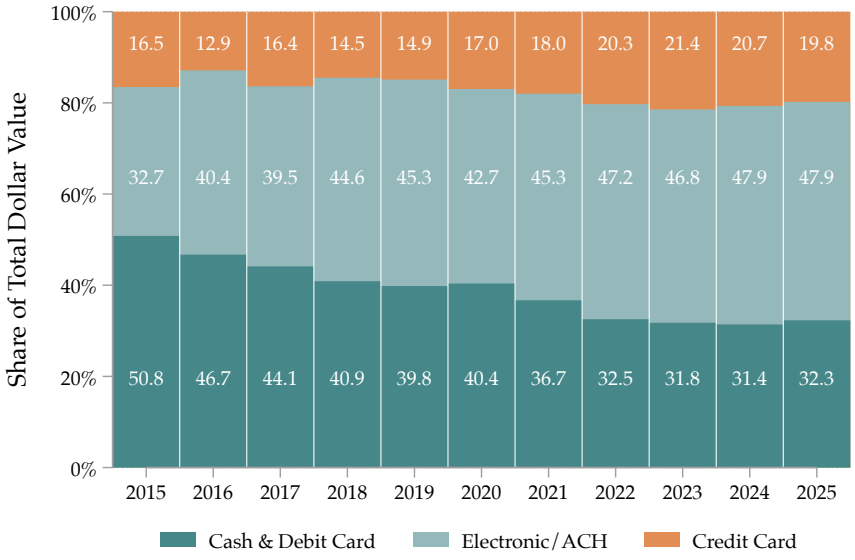
3 Liquidity in Advance and the Desire for Coholding

A simple liquidity motive that requires households to pay part of their consumption using liquid assets can explain both facts documented in Section 2. To illustrate the mechanism, we present a simple three-period model of consumption, saving, and borrowing in which the only non-standard ingredient is a liquidity-in-advance constraint. We first characterize the optimal portfolios of liquid assets and debt, and show that households with the same net wealth can hold different gross positions. We then show how these gross positions shape the consumption response to an unanticipated windfall and to changes in the saving and borrowing rates. All proofs and derivations are provided in Appendix B.

3.1 Mechanism

To motivate this liquidity demand, Figure 5 plots the value share of transactions by payment instrument as reported in the 2015 to 2025 waves of the Survey and Diary of Consumer Payment Choice. In our analysis, liquid debt most closely corresponds to credit cards, while liquid assets encompass cash & debit card and electronic/ACH payments. Together, liquid asset transactions account for roughly four-fifths of transacted dollars over our sample. These payment methods are commonly used for rent, utilities, and other recurring expenses (Greene and Stavins, 2022). Although there has been a marked shift from cash to digital payments over the sample, the majority of that transition has been to payments made directly from bank accounts, and the credit card share increased only from 16.5% to 19.8%.

Figure 5: Value Share of Transactions by Payment Instrument



Notes: Value shares of transactions by payment instrument, from the 2015 to 2025 waves of the Survey and Diary of Consumer Payment Choice. Cash & Debit Card comprises cash, checks, money orders, and debit cards. Electronic/ACH comprises bank account number payments, online banking bill payments, mobile payment apps, and account-to-account transfers. Credit Card comprises credit and charge cards. Shares are rescaled to exclude payments categorized as prepaid/gift/EBT, income deductions, or other in the original source, which together account for between 2% and 5% of transacted value each year. Source: Table 6 of the 2025 SDCPC Tables, Federal Reserve Bank of Atlanta.

The need to pay for some goods and services using liquid assets gives households a reason to hold liquidity even while borrowing. The logic is closely connected to the macroeconomic money demand literature, where cash is held because of its transactional role. Classic cash-in-advance models such as Lucas (1982) and Svensson (1985)

explain why households are willing to hold zero-return money instead of only investing in higher-yield assets. In the same way, a liquidity-in-advance constraint explains why households demand liquid assets in order to pay for part of their consumption, even while wishing to borrow from their future selves, which generates demand for liquid debt (Telyukova and Wright, 2008; Zinman, 2007). Telyukova (2013) uses the Consumer Expenditure Survey to provide evidence of liquidity demand as a resolution to the coholding "puzzle," finding that households that spend more on goods requiring liquid assets are those most likely to cohold liquid assets and credit card debt. More recently, direct qualitative survey evidence has confirmed that coholders explicitly prefer to hold a relatively expensive mix of cash and credit card debt for transactional purposes (Batista et al., 2024; Colarieti et al., 2025). Appendix C reviews alternative explanations of coholding and assesses them against the evidence of Section 2. In what follows, we use a minimal three-period model to illustrate the liquidity motive for coholding.

3.2 Setup: Three-Period Model

The household lives for three periods, has logarithmic utility over consumption, and can simultaneously save in a liquid asset, a_{t+1}, and borrow in liquid debt, d_{t+1}, which carries an interest wedge $\delta > 0$ over the return on saving. It solves:

$$\max_{\{c_t, a_{t+1}, d_{t+1}\}_{t=1}^{3}} \sum_{t=1}^{3} \beta^{t-1} \log c_t,$$

subject to, for $t \in \{1, 2, 3\}$,

1. the budget constraint, $c_t + a_{t+1} - d_{t+1} = y_t + R\, a_t - (R + \delta)\, d_t$,
2. the borrowing constraint, $d_{t+1} \leq \phi$, and
3. the liquidity-in-advance constraint, $\theta\, c_t \leq a_t$,

together with $a_{t+1} \geq 0$, $d_{t+1} \geq 0$, and the terminal condition $a_4 = d_4 = 0$. The parameter $\theta \in (0, 1)$ is the share of consumption that must be paid for out of liquid assets. Because the liquid assets available at t were chosen at $t-1$, liquidity must be carried across periods in advance of spending.

We make a set of simplifying assumptions to ease the exposition of the coholding motive. The quantitative model in Section 4 relaxes these assumptions. We normalize the discount factor and the gross return on saving to one, $\beta = R = 1$, and assume that income in the last period is zero, $y_3 = 0$. The household enters period 1 with initial resources

$x_1 \equiv y_1 + a_1 - (1+\delta)d_1$, where a_1 is large enough such that the liquidity-in-advance constraint does not bind in the first period. We also assume that the borrowing constraint never binds.

In any optimum, no debt is carried into the final period, and a household that borrows holds liquid assets equal to exactly its liquidity requirement:

$$d_2 > 0 \quad \Longrightarrow \quad a_2 = \theta c_2.$$

Since a household that borrows pays the premium δ on the marginal unit of debt, it has no reason to hold cash beyond what its own spending plan requires.

3.3 Optimal Portfolios

To characterize the optimal portfolio of liquid assets and debt, we first define the thresholds:

$$\underline{x} \equiv \frac{1+\theta(2\delta+1)}{\big[2+\theta(\delta-1)\big](1+\delta)}, \qquad \overline{x} \equiv \frac{1+\theta}{2-\theta}.$$

The optimal portfolios are then given by the following proposition.

Proposition 1 (Optimal portfolios)**.** *The optimal period-2 portfolio falls into one of three regimes, ordered by initial resources relative to future income, x_1/y_2.*

(i) Coholders $\big(x_1/y_2 < \underline{x}\big)$ *hold both liquid assets and debt:*

$$a_2 = \frac{\theta\big[(1+\delta)x_1 + y_2\big]}{3(1+\delta\theta)}, \qquad d_2 = a_2 - w_2, \qquad w_2 = \frac{2x_1}{3} - \frac{y_2}{3(1+\delta)},$$

where $w_2 \equiv a_2 - d_2$ is net liquid wealth.

(ii) Hand-to-mouth households $\big(\underline{x} \le x_1/y_2 < \overline{x}\big)$ *hold no debt, but the liquidity constraint binds, $w_2 = a_2 = \theta c_2$, with c_2 determined by the binding constraint.*

(iii) Permanent-income households $\big(x_1/y_2 \ge \overline{x}\big)$ *hold no debt, the liquidity constraint is slack, and consumption is fully smoothed: $c_1 = c_2 = c_3$ and $w_2 = a_2 = (2x_1 - y_2)/3$.*

Households with sufficiently low initial resources relative to future income cohold. They borrow to smooth consumption in the first period and hold liquid assets to finance consumption in the second period. Households with high initial resources relative to future income are permanent-income households. For them, neither constraint binds and the model reduces to the textbook consumer, who holds liquid assets, carries no debt, and

smooths consumption perfectly. In the intermediate regime, hand-to-mouth households hold no debt and just enough liquid assets to meet the liquidity requirement. The constraint prevents them from fully smoothing consumption, but the borrowing premium makes it optimal not to borrow to relax it.

3.4 Net Wealth and the Composition of the Balance Sheet

We next show that net liquid wealth does not uniquely determine a household's holdings of liquid assets and debt, and that the liquidity requirement can change these gross positions without changing net wealth.

Proposition 2 (Net wealth does not determine gross positions)**.**

(a) Households with the same net liquid wealth may hold different gross positions: at a given $w_2 > 0$, a coholder holds $a_2 = w_2 + d_2$ with $d_2 > 0$, while a hand-to-mouth household holds $a_2 = w_2$ and $d_2 = 0$.

(b) A coholder's net liquid wealth, $w_2 = 2x_1/3 - y_2/[3(1+\delta)]$, is independent of θ, while both gross positions $a_2 = \theta c_2$ and $d_2 = a_2 - w_2$ increase in θ.

Part (a) is the model counterpart of the first fact documented in Section 2. Households with different combinations of initial resources and future income can have the same net liquid wealth but different gross positions. A household with low future income relative to its initial resources covers its liquidity needs out of its own assets and holds no debt. A household with high future income relative to its resources borrows against that income while holding liquid assets for future spending, so that both sides of its balance sheet are larger at the same net position. The restriction to $w_2 > 0$ ensures that both cases are present, since for $w_2 \leq 0$ every household coholds.

Part (b) shows that the net wealth of a coholder is independent of the tightness of the liquidity-in-advance constraint governed by θ. Instead, the constraint dictates the allocation between liquid assets and liquid debt. Specifically, a higher θ scales up a coholder's assets and debt one-for-one, leaving the net position unchanged. Only in the intermediate regime, where the constraint binds but the household holds no debt, does θ affect net wealth directly. The main determinant of net wealth is, instead, the ratio of initial resources x_1 to future income y_2, that is, a standard intertemporal motive.

3.5 Response to Income Windfalls

We next examine how these differences in gross positions affect households' responses to an income windfall, providing the model counterpart to the second empirical fact.

Consider a small, unanticipated windfall ε received in period 1, before the household has chosen its portfolio. Since the liquidity requirement is slack in the first period, the household's response is the same whether the windfall arrives as income or as liquid assets. Both increase initial resources x_1. We define the marginal propensities to consume, save, and deleverage as:

$$MPC \equiv \frac{\partial c_1}{\partial x_1}, \qquad MPS \equiv \frac{\partial a_2}{\partial x_1}, \qquad MPD \equiv -\frac{\partial d_2}{\partial x_1}.$$

Proposition 3 (Gross positions determine marginal propensities)**.** *Consider a small, unanticipated windfall that leaves the household in its initial portfolio regime. A coholder has marginal propensities:*

$$MPC = \tfrac{1}{3}, \qquad MPS = \frac{\theta(1+\delta)}{3(1+\delta\theta)}, \qquad MPD = \frac{2-\theta+\delta\theta}{3(1+\delta\theta)}.$$

A hand-to-mouth household has marginal propensities:[4]

$$MPC \approx 1, \qquad MPS \approx 0, \qquad MPD = 0.$$

Hence, for a coholder and a hand-to-mouth household at the same net liquid wealth,

$$MPC_{\text{coholder}} < MPC_{\text{hand-to-mouth}} \qquad \text{and} \qquad MPD_{\text{coholder}} > MPD_{\text{hand-to-mouth}},$$

so that debt dampens the marginal propensity to consume and raises the marginal propensity to deleverage.

To illustrate the magnitudes of the marginal propensities, we use the calibrated parameter values of $\theta = 0.08$ and $\delta = 0.035$ discussed in the next section. A coholder consumes approximately 33% of a windfall, saves 3%, and uses 64% to repay debt, while a hand-to-mouth household consumes effectively all of it. The coholder smooths consumption across periods and uses most of the remaining resources to repay debt since this is the highest-return use. The hand-to-mouth household, instead, does not hold any debt and prefers to consume the windfall, other than a small amount allocated to relaxing the liquidity-in-advance constraint.

[4]The exact propensities are $MPS = \theta\,\partial c_2/\partial x_1$, $MPC = 1 - MPS$, and $MPD = 0$, where $MPS = O(\theta^2)$ and $MPC = 1 - O(\theta^2)$. For the calibrated parameter values of θ and δ, the share saved is below 0.5%.

3.6 Response to Interest Rates

This simple model also allows us to understand which interest rate governs a household's current consumption. Let R_a and R_d denote the gross saving and borrowing rates on the portfolio chosen in period 1, so that the period-2 budget constraint becomes $c_2 + a_3 - d_3 = y_2 + R_a a_2 - R_d d_2$. We evaluate all derivatives at the baseline values $R_a = 1$ and $R_d = 1 + \delta$.

Proposition 4 (Gross positions determine interest rate exposure)**.** *Consider a small change in R_a or R_d that leaves the household in its initial portfolio regime. A coholder's period-1 consumption responds according to:*

$$\frac{\partial c_1}{\partial R_a} = 0, \qquad \frac{\partial c_1}{\partial R_d} = -\frac{y_2}{3R_d^2} < 0.$$

A hand-to-mouth household's period-1 consumption responds according to:[5]

$$\frac{\partial c_1}{\partial R_a} \approx 0, \qquad \frac{\partial c_1}{\partial R_d} = 0.$$

A permanent-income household's period-1 consumption responds according to:

$$\frac{\partial c_1}{\partial R_a} = -\frac{y_2}{3R_a^2} < 0, \qquad \frac{\partial c_1}{\partial R_d} = 0.$$

Hence, for a coholder and a hand-to-mouth household at the same net liquid wealth, the consumption of the coholder responds only to the borrowing rate, while the consumption of the hand-to-mouth household responds to neither rate.

A coholder finances its marginal unit of period-1 consumption with debt, so its current consumption is governed by the borrowing rate. It also holds liquid assets, but to pay for consumption in period 2 rather than to save. A higher saving rate lowers the cost of carrying this liquidity and raises a_2 and c_2, but leaves c_1 unchanged. The hand-to-mouth household is at the kink between saving and borrowing and responds to neither rate, apart from a small effect through the cost of its liquidity requirement. Only the permanent-income household, who holds liquid assets to save, responds to the saving rate. Without a liquidity requirement, $\theta = 0$, every household with positive net liquid wealth is a permanent-income household, so the sign of net wealth determines which rate a household faces. With a liquidity requirement, coholders with positive net liquid wealth are instead exposed to the borrowing rate, which we return to in Section 7.

[5] As in Footnote 4, the exact derivative is of second order in θ: $\partial c_1/\partial R_a = -\theta\, \partial c_2/\partial R_a$, where $\partial c_2/\partial R_a = O(\theta)$, so that $\partial c_1/\partial R_a = O(\theta^2)$. For the calibrated parameter values of θ and δ, the response is about 1% of that of a permanent-income household with the same future income.

3.7 Discussion

Together, Propositions 2 and 3 provide the model counterpart of the two facts documented in Section 2, while Proposition 4 shows that the same gross positions also determine which interest rate governs current consumption. Overall, two households with the same net wealth but different debt respond differently to the same windfall or the same change in interest rates. The classic dichotomy of the consumption literature uses net wealth to tell apart the permanent-income household, who is unconstrained and has a low marginal propensity to consume, from the hand-to-mouth household, who is constrained and has a high marginal propensity to consume. The coholder, who can relax its liquidity requirement by borrowing, smooths consumption like a permanent-income household, but has low net wealth because it borrows. As a result, a measure of hand-to-mouth status based on net wealth pools households that spend transfers and do not respond to interest rates with coholders that use transfers to repay debt and respond strongly to the borrowing rate.

These results are, however, derived in closed form in a stylized environment, and the predictions are sharper than what we may expect in richer settings. With income risk, households move between portfolio regimes as shocks arrive, and their behavior can no longer be characterized by fixed thresholds for initial resources relative to future income. Marginal propensities also vary within regimes, reflecting households' liquidity needs, expected income, and proximity to the borrowing limit. We study these features in the quantitative model of the next section.

4 Model

To study the macroeconomic implications of coholding, we embed the mechanism of the stylized model in a quantitative model of consumption, saving, and borrowing in which coholding arises endogenously. The quantitative model extends the stylized model by introducing uninsurable idiosyncratic income risk, an occasionally binding borrowing limit, and the ability to substitute between goods purchased with liquid assets and goods purchased with credit.

4.1 Environment and Financial Markets

The model environment is populated by a continuum of infinitely lived households that are *ex ante* identical. Time is discrete and the model period is one quarter. Households re-

ceive stochastic income, y_t, whose logarithm follows a first-order autoregressive process,

$$\log y_t = \rho_y \log y_{t-1} + \sigma_y \varepsilon_t, \qquad \varepsilon_t \sim N(0,1).$$

A representative financial institution serves households by inelastically providing two financial instruments. Households can save in a one-period liquid asset, a_{t+1}, and simultaneously borrow in one-period liquid debt, d_{t+1}. The rate of return on saving is $R_a = 1+r$, and there is a positive wedge between borrowing and saving, $\delta > 0$, such that $R_d = R_a + \delta$.

4.2 Households

Households take as given their stochastic income process and the interest rates set by the financial institution. Each household then makes consumption, saving, and borrowing decisions subject to its budget constraint, borrowing constraint, and liquidity-in-advance constraint.

Consumption and Utility Households consume two types of goods, those that can be purchased with credit (c_1) and those that must be paid for out of liquid assets (c_2). Consumption is aggregated through a CES function,

$$C(c_1, c_2) = \left[(1-\theta)^{\frac{1}{\eta}} c_1^{\frac{\eta-1}{\eta}} + \theta^{\frac{1}{\eta}} c_2^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}},$$

where η is the elasticity of substitution between the two goods and θ is the share parameter. Since both goods have the same price, a household that can purchase both goods freely spends a share θ of its consumption on the second good, and the aggregator equals total spending, $C = c_1 + c_2$.

Households derive utility from consumption and have standard time preferences governed by a discount factor, β, with lifetime utility given by:

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\gamma}}{1-\gamma},$$

with $C_t \equiv C(c_{1,t}, c_{2,t})$.

Resource Constraints In each period, the household's budget constraint equates total resources to expenditure:

$$y_t + a_t - d_t = c_{1,t} + c_{2,t} + \frac{a_{t+1}}{R_a} - \frac{d_{t+1}}{R_d}.$$

Resources consist of income, y_t, and liquid assets, a_t, net of liquid debt, d_t. On the expenditure side, the household chooses consumption of both types of goods ($c_{1,t}$ and $c_{2,t}$), saves into the liquid asset at price R_a^{-1}, and borrows with liquid debt at price R_d^{-1}.[6]

The household is subject to an exogenous borrowing constraint that limits its debt to a fraction ϕ of average income, $\bar{y} \equiv E[y_t]$:

$$d_{t+1} \leq \phi \bar{y}.$$

In addition, both financial instruments must be weakly positive. Net wealth is defined as $w_t \equiv a_t - d_t$.

Liquidity-in-Advance Constraint As in the stylized model of Section 3, the key ingredient in our model is a liquidity-in-advance constraint, which requires that certain consumption goods, c_2, be purchased using liquid assets:

$$c_{2,t} \leq a_t.$$

This constraint ensures that households must have sufficient liquidity on hand before they can consume these goods. At the unconstrained allocation, $c_{2,t} = \theta\,(c_{1,t} + c_{2,t})$, so the constraint takes the form $\theta c_t \leq a_t$ of the stylized model, and θ plays the same role in both models. Relative to the stylized model, in which a fixed share θ of consumption must be paid for out of liquid assets, the elasticity of substitution η governs the degree to which households can substitute between goods paid for out of liquid assets and goods purchased with credit.

We note that this is an intertemporal "in-advance" constraint because the choice of consumption today, $c_{2,t}$, is subject to the liquid assets chosen in the previous period. This timing is consistent with Svensson (1985): the household chooses liquidity before it observes the state variables required to choose consumption. In contrast, the timing in Lucas (1982) is such that the household observes all state variables and then chooses liquidity and consumption. As Svensson (1985) argues, this form of the constraint generates more realistic demand for liquidity, as the household's choice is "in advance" of the resolution of uncertainty.

Optimization The household's problem can be expressed using recursive notation. The

[6]The timing of the budget constraint differs from that of the stylized model in Section 3. Here, a_t and d_t denote face values, inclusive of interest, so that they directly measure the resources available at the beginning of the period, which is convenient for the recursive formulation.

household chooses consumption, saving, and borrowing,

$$V(a, d, y) = \max_{c_1, c_2, a', d'} u(C) + \beta E[V(a', d', y')|y]$$

subject to an exogenous income process, y', and each of the constraints described above:

1. Budget constraint:
$$y + a - d = c_1 + c_2 + \frac{a'}{R_a} - \frac{d'}{R_d}$$

2. Borrowing constraint:
$$d' \leq \phi \bar{y}$$

3. Liquidity-in-advance constraint:
$$c_2 \leq a$$

This optimization problem can generate rational coholding of liquid assets and liquid debt. Households hold liquid assets to satisfy the liquidity-in-advance constraint for future consumption, while simultaneously borrowing to smooth consumption over time. The desired level of net wealth arises from standard buffer-stock mechanisms, while the desired level of liquid assets is driven by the expected level of consumption and the liquidity-in-advance constraint. Together, these generate a desired level of liquid debt, resulting in coholding behavior despite the interest rate wedge.

5 Calibration and Model Validation

This section presents the baseline calibration of the model and evaluates the calibrated model against the data. We calibrate external parameters to standard values in the literature and estimate the discount factor and the liquidity-in-advance parameter to match two moments of the distributions of liquid wealth and debt, which identify the two parameters jointly. The calibrated model is also able to match several untargeted empirical facts of Section 2 regarding the joint distribution of liquid assets and debt, the persistence of coholding, and the marginal propensities to consume and deleverage.

5.1 External Calibration

The model is calibrated to a quarterly periodicity. Income, preferences, and interest rates are calibrated to standard values in the literature summarized in Table 2. Preferences are

logarithmic in the consumption aggregate. We set the elasticity of substitution between cash and credit goods to $\eta = 0.2976$, as estimated in Telyukova (2013). The quarterly real return on saving is $r = 0.0025$, corresponding to an annual rate of 1%, in line with the long-run real return on short-term safe assets (Jordà, Knoll, Kuvshinov, Schularick and Taylor, 2019) and standard in heterogeneous agent models of household consumption (e.g., Kaplan and Violante, 2022; Laibson, Maxted and Moll, 2025). The quarterly spread on credit card borrowing is $\delta = 0.035$, so that the annual credit card rate of roughly 15% matches the average rate paid by households that revolve credit card debt in the 2016 SCF. Borrowing is allowed up to approximately three-quarters of average quarterly income, $\phi = 0.74$, in line with the analysis by Kaplan and Violante (2014). Log income follows an AR(1) process with quarterly persistence $\rho_y = 0.967$ and innovation standard deviation $\sigma_y = 0.130$, taken from Guerrieri and Lorenzoni (2017).

Table 2: External Calibration

Parameter		Value	Source
γ	Risk aversion	1	Standard
η	Elasticity in C aggregator	0.2976	Telyukova (2013)
r	Interest rate	0.0025	Jordà et al. (2019)
δ	Credit card spread	0.035	SCF (2016)
ϕ	Borrowing limit ($\times$ mean income)	0.74	Kaplan and Violante (2014)
ρ_y	Persistence of log income	0.967	Guerrieri and Lorenzoni (2017)
σ_y	SD of income shocks	0.130	Guerrieri and Lorenzoni (2017)

5.2 Internal Calibration

We estimate the discount factor β and the liquidity-in-advance parameter θ to match moments of the distributions of liquid wealth and debt observed in the data. The stylized model of Section 3 suggests that net wealth is driven primarily by the discount factor, as in standard models, while the degree of coholding, and thus the underlying joint distribution of gross positions, is driven by the liquidity-in-advance constraint. Our targets are the median of net liquid wealth, normalized by quarterly income, which is 0.105 in the 2016 SCF, and the 75th percentile of normalized liquid debt, which is 0.138.[7]

We estimate the parameters by classical minimum distance, choosing $(\hat{\beta}, \hat{\theta})$ so that

[7]We normalize by quarterly income to bring the scaling in line with our model. We choose to match the wealth distribution in the SCF rather than the SCE because it provides a more accurate picture of revolving credit card debt and explicitly asks respondents if they revolve credit card debt. Table A.1 compares household characteristics across SCE and SCF and shows that coholding shares are nevertheless similar.

model-implied moments equal their empirical counterparts. Since the system is exactly identified, this estimator coincides with the simulated method of moments, and the choice of weight matrix is irrelevant. For inference, we report the worst-case standard errors of Cocci and Plagborg-Møller (2025).

The discount factor is estimated at 0.9714, with a standard error of 0.0004, and θ at 0.0795, with a standard error of 0.0015. The model matches both targets, with a median net liquid wealth of 0.105 and a 75th percentile of liquid debt of 0.138, as reported in Column (1) of Table 3.

Table 3: Internal Calibration

	Data	(1)	(2)	(3)	(4)
Parameters					
β		0.9714	0.9606	[0.9683]	0.9832
		(0.0004)			
θ		0.0795	[0.2000]	0.1832	[0]
		(0.0015)			
Moments					
w_{50}	0.105	**0.105**	**0.105**	0.214	**0.105**
d_{75}	0.138	**0.138**	0.659	**0.138**	0.000

Notes: Column (1) reports the baseline estimates of both parameters, with the worst-case standard errors of Cocci and Plagborg-Møller (2025) in parentheses. In Columns (2) and (3), one parameter is fixed at the value shown in square brackets, and the other is chosen to match a single moment. Column (4) shows the net liquidity model with θ fixed at zero and β chosen to match median net liquid wealth (see Section 5.3). Moment values in bold are targeted in that column.

The model does not require an extremely low discount factor to induce borrowing. Households borrow not only to smooth consumption over time, which is driven by preferences, but also because within a given period they wish to both satisfy the future liquidity-in-advance constraint and finance current consumption. This generates demand for debt without the need for impatience.

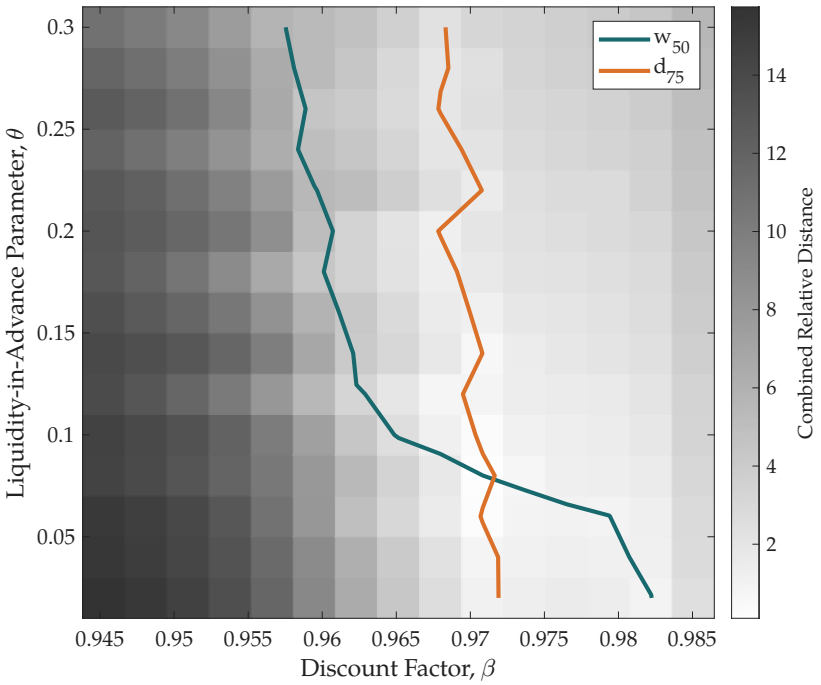
Joint Identification of (β, θ) In the stylized model, a coholder's net wealth does not depend on θ, so each moment would identify one parameter. In the quantitative model, however, the two moments identify the parameter pair only jointly. We show this using the partial identification exercises in Columns (2) and (3) of Table 3 and the heatmap in Figure 6.

Columns (2) and (3) of Table 3 fix one parameter at a value different from its baseline estimate and adjust the other to match a single moment. In both cases the exercise

matches the targeted moment, but misses the other moment by a wide margin. In Column (2), θ is fixed at 0.20, and the discount factor falls to 0.961 to match median net liquid wealth, but the 75th percentile of liquid debt rises to 0.659, more than four times its data value. In Column (3), β is fixed at 0.9683, and θ rises to 0.183 to match the debt percentile, but median net liquid wealth rises to 0.214, roughly twice its data value.

Figure 6 plots the combined relative distance between model and data moments over the (β, θ) plane, together with the parameter pairs that match each moment individually. Each moment on its own is consistent with a curve of parameter pairs. Along the curve that matches median net liquid wealth, a higher discount factor requires a lower θ. Matching the debt percentile, instead, requires a discount factor in a relatively narrow range around 0.97. The two curves intersect only once, at the estimated point, jointly identifying the two parameters.

Figure 6: Joint Identification of (β, θ)



Notes: The heatmap plots the combined relative distance between the model-implied and data moments, $|\Delta w_{50}|/w_{50} + |\Delta d_{75}|/d_{75}$, over the (β, θ) plane. Lighter cells indicate parameter pairs at which both moments are closer to their data values. The teal line shows the locus of parameter pairs that exactly match the wealth target w_{50}, and the orange line the locus that exactly matches the debt target d_{75}.

5.3 Net Liquidity Benchmark

To understand how coholding changes the effects of fiscal and monetary policy, we compare our model to a standard model without coholding. We obtain this benchmark by setting $\theta = 0$, removing the liquidity-in-advance constraint. We keep all other parameters unchanged except for the discount factor, which we recalibrate to match median net liquid wealth. Without the liquidity-in-advance constraint, households have no reason to hold liquid assets while borrowing at a higher interest rate, so no household coholds. Each household's balance sheet can therefore be summarized by its net liquid wealth, with a kink at zero reflecting the wedge between borrowing and saving rates. We refer to this benchmark as the *net liquidity* model.[8]

Column (4) of Table 3 reports the calibration, which requires $\beta = 0.9832$ compared to 0.9714 in the coholding model. The net liquidity model matches the wealth target but cannot match the liquid debt moment. Specifically, it generates too little liquid debt, and the 75th percentile of liquid debt is zero. Without the demand for liquidity, the model also needs more patient households to match median wealth, and as a result has more wealth at the top, with mean liquid assets of 0.71 quarters of income compared to 0.16 in the coholding model.

5.4 Model Validation

We next evaluate the calibrated model against the two empirical facts documented in Section 2. With the exception of the two targeted moments, every comparison is untargeted. The validation exercises assess both the balance sheet positions that shape households' exposure to policy and the marginal propensities that govern their responses.

5.4.1 Validation 1: The Joint Distribution and Persistence of Coholding

We first assess how well the model reproduces the joint distribution of liquid assets and debt and the persistence of coholding. Although the calibration only targets the median of net liquid wealth and the 75th percentile of liquid debt, the model also captures several untargeted features of the distribution. The coholding share is 35.7% in the model, compared to 34.2% in the 2016 SCF (Panel A of Table 4). Mean liquid debt holdings are 0.202 quarters of income in the model, compared with 0.167 in the data.

Panel B of Table 4 compares the liquid balance sheet composition in the model and the data to assess how well the model captures the L-distribution documented in Figure 1b.

[8]Models with additional assets, including illiquid assets, also fall in this category if they summarize the household's liquid position by net liquid wealth alone.

For each household, we calculate the share of its gross liquid position, $a + d$, held as debt and average this share within terciles of net liquid wealth. Households in the lowest tercile hold roughly two-thirds of their gross position as debt, 64% in the data and 74% in the model. This share falls to 9% and 7%, respectively, in the middle tercile, and to 3% and 0% in the highest tercile. The model therefore successfully captures the decline in the debt share across the net liquid wealth distribution.

Table 4: Validation 1: The Joint Distribution and Persistence of Coholding

Panel A: Coholding and Debt

	Coholding share	Mean liquid debt
Data	0.342	0.167
Model	0.357	0.202

Panel B: Debt Share of the Gross Position

	T1 (bottom)	T2	T3 (top)
Data	0.64	0.09	0.03
Model	0.74	0.07	0.00

Panel C: Persistence of Coholding

	Uncond. rate	$h = 2$	$h = 4$	$h = 6$	$h = 8$	Ratio
Data	0.29	0.65	0.60	0.59	0.57	2.2
Model	0.35	0.76	0.64	0.56	0.50	2.2

Notes: Panel A reports the share of coholders and mean liquid debt normalized by quarterly income. Panel B reports the share of the gross liquid position held as debt ($d/(a + d)$), averaged within terciles of net liquid wealth relative to quarterly income. The sample includes households with a positive gross position within the 1st–95th percentiles of normalized net liquid wealth. Both panels use the 2016 SCF with sample weights. Panel C reports the unconditional coholding rate and the recurrence of coholding at biennial horizons ($P(\text{cohold}_{t+h} \mid \text{cohold}_t)$). The ratio is the two-year recurrence divided by the unconditional rate. Data are from the PSID 2011–2019 with family weights.

The second component of Fact 1 is the persistence of coholding. To construct the model counterpart of Figure 2, we simulate a long panel of households and classify coholders using the same threshold as in the data. Since the PSID observes households every two years, we sample the simulated panel at the same frequency and compute the share of initial coholders who also cohold in the subsequent observations.

Panel C of Table 4 compares the recurrence of coholding in the model and the data. The two-year recurrence of coholding is 0.76 in the model, compared to 0.65 in the PSID. The unconditional coholding share is also higher in the model and closely matches the SCF. Relative to the unconditional coholding rate, however, the two-year recurrence is

2.2 times as high in both. At longer horizons, recurrence declines somewhat faster in the model. Persistent coholding therefore naturally emerges in the model from the liquidity motive together with the persistence of income, without being explicitly targeted in the calibration.

5.4.2 Validation 2: Marginal Propensities

Having assessed households' balance sheet positions, we next examine their responses to additional resources by comparing marginal propensities to consume and deleverage in the model and the data. We simulate a one-time windfall equal to 10% of the household's annual income, matching the size of the hypothetical gain in the SCE question. We assume that the windfall is deposited into liquid assets before households make consumption decisions, so it is immediately available to finance goods subject to the liquidity-in-advance constraint.[9] We compute the propensities by comparing consumption and debt choices with and without the windfall.

Panel A of Table 5 groups borrowers by quintile of liquid debt relative to income, with quintiles computed separately within each sample. The average MPC is 21% in the model, somewhat above the 17% in the SCE. Among borrowers, the MPC falls and the MPD rises with debt in both the data and the model. The model closely matches how borrowers use a windfall to repay debt, with an average MPD of 54% compared to 48% in the data, although the rise across quintiles is steeper in the model, from 8% to 92% compared to 26% to 65% in the data. The model also overstates the MPC of borrowers with little debt, at 32% in the lowest quintile compared to 19% in the data.

The model is less successful in comparing borrowers with households that hold no liquid debt. Controlling for the level of net liquid wealth, households without liquid debt have an MPC that is 3.2 percentage points higher than that of borrowers in the SCE, but 3.5 percentage points lower in the model. The model's success is therefore concentrated in the variation among borrowers. The MPD of households without liquid debt cannot be compared directly, since the survey asks about paying down any debt and most of these households hold mortgages, auto loans, or student loans, which the model abstracts from.

Panel B estimates regressions similar to those of Section 2 in both the data and the model across three specifications. Liquid debt is standardized within each sample, such that the coefficients show the percentage point change in the marginal propensity associated with a one standard deviation increase in liquid debt.[10] The data regressions also

[9] The results are similar when the one-time windfall is instead received as income, which relaxes the liquidity-in-advance constraint only from the following period on: the average MPC is 19% rather than 21%, borrowers' average MPD is 56% rather than 54%, and the coefficients in Panel B of Table 5 are similar.

[10] We use bin fixed effects rather than a linear wealth control since, in some cases, the linear control is close

include the standard SCE demographic controls, which are not explicitly modeled.

Without additional balance sheet controls, a one standard deviation increase in liquid debt lowers the MPC by 2.6 percentage points in the data and 2.9 in the model, and raises the MPD by 11.8 and 30.2 percentage points, respectively. The second specification adds fixed effects for terciles of liquid assets and is the regression counterpart of Panel (a) of Figure 3, which compares households with more and less debt within the same asset tercile. The same increase in debt lowers the MPC by 2.5 percentage points in the data and 4.9 in the model, and raises the MPD by 10.8 and 19.5. The third instead adds fixed effects for quintiles of net liquid wealth and is the counterpart of Panel (b), which compares households with the same net wealth. This directly tests whether net liquid wealth is a sufficient statistic for marginal propensities. In both the data and the model, the coefficients keep their sign and significance, with debt lowering the MPC by 1.2 percentage points in the data and 2.2 in the model and raising the MPD by 4.0 and 10.2. With liquid assets or net liquid wealth held fixed, the model's coefficients are about twice as large as in the data, consistent with the steeper gradient across debt quintiles in Panel A.

The regression without fixed effects also distinguishes the coholding model from the net liquidity model of Section 5.3. In the net liquidity model, a household's balance sheet reduces to its net liquid wealth, and the model inherits the standard prediction that households with less liquid wealth have higher MPCs. Since more debt means lower net wealth, a one standard deviation increase in liquid debt raises the MPC by 2.3 percentage points in the net liquidity model, whereas it lowers the MPC by 2.6 in the data and 2.9 in the coholding model. Further, since repaying debt and saving are the same decision in the net liquidity model, and only households with negative net wealth have any debt to repay, borrowers also use much less of a windfall to repay debt, with an average MPD of 32% compared to 48% in the data and 54% in the coholding model.

Overall, the model reproduces key untargeted features of both empirical facts. It matches several moments of the joint distribution of liquid assets and debt, including the prevalence and persistence of coholding, which determine who is exposed to a policy, as well as how the marginal propensities to consume and deleverage vary with liquid debt, which determines how strongly households respond.

to collinear with debt and the resulting coefficient is unstable. This more closely mirrors the nonparametric comparisons in Figure 3.

Table 5: Validation 2: Marginal Propensities and Liquid Debt

Panel A: Borrowers by Liquid Debt Quintile

		Q1	Q2	Q3	Q4	Q5	Average
Liquid Debt	Data	0.04	0.13	0.32	0.74	3.00	0.85
	Model	0.03	0.10	0.26	0.62	1.47	0.50
MPC	Data	0.19	0.18	0.14	0.12	0.10	0.14
	Model	0.32	0.30	0.23	0.13	0.12	0.22
MPD	Data	0.26	0.38	0.51	0.58	0.65	0.48
	Model	0.08	0.26	0.62	0.84	0.92	0.54

Panel B: Marginal Propensities and Liquid Debt

			Net Liquidity	Asset FE		Net Wealth FE	
	Data	Model	Model	Data	Model	Data	Model
MPC	-2.55^{***}	-2.93^{***}	2.27^{***}	-2.51^{***}	-4.88^{***}	-1.16^{*}	-2.15^{***}
	(0.41)	(0.01)	(0.02)	(0.41)	(0.01)	(0.52)	(0.02)
MPD	11.78^{***}	30.15^{***}	11.56^{***}	10.76^{***}	19.46^{***}	4.04^{***}	10.21^{***}
	(0.89)	(0.02)	(0.03)	(0.87)	(0.03)	(1.01)	(0.03)
N	3,388	1,000,000	1,000,000	3,388	1,000,000	3,388	1,000,000

Notes: Panel A includes households with positive liquid debt, grouped by quintile of liquid debt relative to quarterly income, with quintiles computed separately within the data and the model. Entries are group means, with liquid debt in quarters of income and the MPC and MPD as shares of the windfall. The last column averages over all borrowers. Panel B reports OLS regressions of the indicated marginal propensity, in percentage points, on liquid debt across three specifications over the full sample of households: without fixed effects; fixed effects for terciles of liquid assets; and fixed effects for quintiles of net liquid wealth. Liquid debt is measured in dollars and normalized to mean zero and unit variance within each sample. Standard errors are reported below each coefficient. Data regressions include the standard SCE demographic controls (age, gender, race, marital status, education, survey date, state). Throughout, the shock is 10% of the household's own annual income, transferred to liquid assets. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

6 Fiscal Policy

We now turn to the analysis of fiscal policy in the presence of coholders. Traditional models used to study fiscal stimulus summarize a household's liquid balance sheet by a single number, net liquid wealth. Kaplan and Violante (2014), for example, note that in the SCF, one could define borrowers in two ways: households with negative net liquid wealth, or households with credit card debt, independent of their other balances. Around 17% of working-age households are borrowers according to the first definition and 37% according to the second. Their model cannot distinguish these groups because it "only speaks

to net holdings of liquid wealth." These are net liquidity models in our terminology, and we compare our model to the net liquidity model of Section 5.3.

Since net liquidity models cannot distinguish coholders from hand-to-mouth households, they may misidentify the households most responsive to fiscal transfers. We use our model to quantify the policy implications of this distinction. We first study the transmission of direct stimulus payments and illustrate the pitfalls of targeting transfers using standard measures of household liquidity. We then examine the dynamic trade-off between consumption and deleveraging, before turning to debt relief as an alternative to targeted transfers. Even though our analysis is in partial equilibrium, we view it as the natural starting point since understanding how coholding shapes household-level responses is a prerequisite for any general equilibrium analysis. Appendix D.2 reports the intertemporal marginal propensities to consume, save, and deleverage, which are the household-side inputs to such an analysis.

6.1 Targeting Stimulus: Net versus Gross Liquidity

Stimulative fiscal transfers are an important policy tool employed to increase aggregate demand during economic downturns. These policies have been popular in the United States in the last 25 years in different forms, from rebates to stimulate specific sectors (e.g., automobile rebates) to direct cash transfers in 2001, 2008, and 2020–2021.

We compare an untargeted program, in which every household receives a one-time $1,200 transfer deposited into its liquid asset account, with targeted programs that send the same transfer to the bottom 30% of households by income, net liquidity, or gross liquidity. We define *gross liquidity* as the sum of liquid assets and liquid debt, which provides a simple one-dimensional measure that distinguishes households with small gross positions from coholders with offsetting assets and debt.

The $1,200 transfer matches the size of the 2020 Economic Impact Payment and is smaller than the windfall considered in Section 5.4. Since spending responses decrease in transfer size, the untargeted program generates an average marginal propensity to consume of 32%, compared to 21% in the validation exercise. This response lies within the range of quarterly responses estimated after the 2001 rebate (Johnson, Parker and Souleles, 2006). To assess what a fiscal authority relying on a net liquidity model would conclude, we simulate the same targeted programs in the net liquidity model of Section 5.3.

Figure 7 reports the impact consumption response of each targeted program relative to the untargeted program. In the net liquidity model, targeting the bottom 30% of the income distribution raises the impact of the stimulus program by 76%, while targeting

the bottom 30% of the net liquidity distribution raises it by 92%. This reflects the standard intuition that high-MPC households tend to have low income and low net liquid wealth, and targeting either group therefore substantially increases the consumption response. In practice, net liquid wealth is difficult for fiscal authorities to observe, whereas income is readily available from tax returns. The 2020 Economic Impact Payments, for example, were phased out based on income. In the net liquidity model, income targeting is a reasonable proxy for targeting net liquidity directly.

The coholding model makes starkly different predictions for targeted transfers. Targeting the bottom 30% of the income distribution generates only 60% of the untargeted consumption response, while targeting by net liquidity performs modestly better, at 63%. This difference comes from the presence of coholders. Households with low income and low net wealth disproportionately hold credit card debt, so both programs reach coholders who use most of the transfer to deleverage instead of increasing consumption. Targeting gross liquidity, instead, largely avoids this problem by isolating true hand-to-mouth households, and yields a consumption response that is 51% higher than under the untargeted program. Gross liquidity, however, is no more directly observable to the fiscal authority than net liquid wealth. Thus, among readily implementable targeting rules, untargeted transfers may be the most effective policy tool to stimulate aggregate consumption in the presence of coholders.[11]

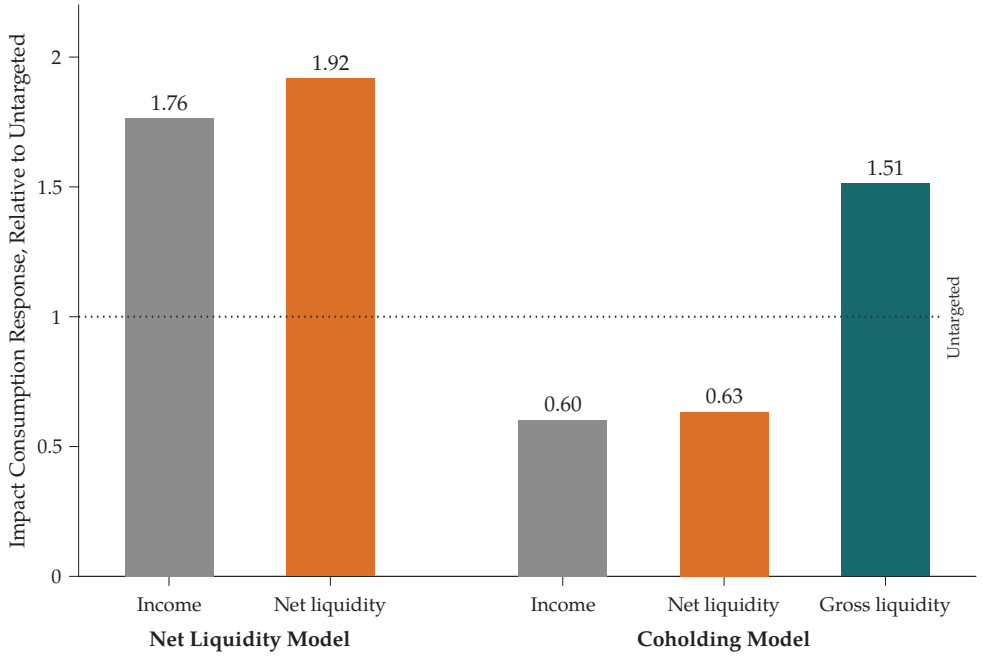
6.2 The Dynamics of Stimulus: Consumption and Credit Card Debt

We now turn to the dynamic effects of targeted stimulus. Figure 8 reports the cumulative consumption and debt responses to the different programs in the coholding model over seven years.[12] Panel (a) begins by restating the impact responses from Figure 7 in levels. On impact, the gross liquidity program generates a consumption response equal to 49% of the transfer, compared with 32% under the untargeted program and 21% under the net liquidity program. Over time, however, the ranking reverses. Under the gross liquidity program, almost the full transfer is consumed within two years, after which the consumption path converges toward that of the untargeted program. By contrast, the net liquidity program has the smallest initial response, but overtakes the untargeted program after about three and a quarter years and ultimately generates a cumulative consumption response equal to 114% of the transfer.

[11] These conclusions are not specific to a $1,200 transfer. Appendix D.1 shows similar patterns for transfers ranging from $600 to $5,000.

[12] For simplicity, we omit the response of the income-targeted program, which looks similar to that of the net liquidity program.

Figure 7: Targeted Transfers Across Models

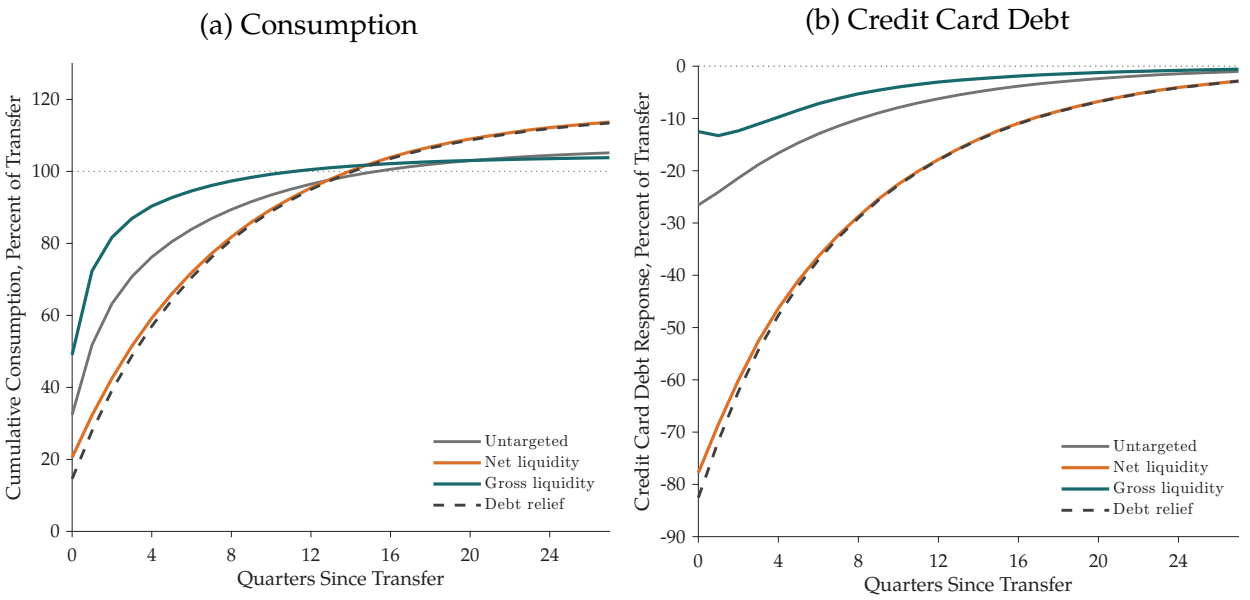


Notes: Impact consumption response to a one-time $1,200 transfer targeted to the bottom 30% of households by the indicated statistic, relative to the response to an untargeted transfer of the same size. The left group reports results from the net liquidity model of Section 5.3. The right group reports results from the coholding model.

Panel (b) illustrates the source of these differences by plotting the response of credit card debt. On impact, the net liquidity program generates a debt response equal to 78% of the transfer, compared with only 27% under the untargeted program and 13% under the gross liquidity program. Across all programs, the deleveraging response is short-lived, with households reversing more than half of the initial debt decrease within two years by re-borrowing. This closely mirrors the pattern documented by Agarwal et al. (2007) in credit card account data following the 2001 rebate. Credit card balances fell shortly after the rebates arrived, debt paydown peaked and then unwound as households re-borrowed, and spending increased with delay, a sequence they describe as "counter to the canonical Permanent-Income model." In our model, this re-borrowing simply reflects households returning toward their target debt positions.

Even though deleveraging is transitory, it lowers households' interest payments and thereby creates a persistent increase in the resources available for consumption. The net liquidity program reaches the largest share of coholders, who initially use the transfer to pay down costly credit card debt. In doing so, they effectively earn a high return through avoided interest payments, and the resulting savings finance higher consumption over the medium term. Depending on the fiscal authority's objective, each program

Figure 8: Dynamic Responses to Stimulus: Consumption and Credit Card Debt



Notes: Dynamic responses of aggregate consumption (Panel (a)) and aggregate credit card debt (Panel (b)) to four fiscal programs: an untargeted $1,200 transfer, $1,200 transfers targeted to the bottom 30% of households by net liquidity or gross liquidity, and a debt relief program, which forgives each indebted household's credit card balance up to $1,200. Responses are expressed as a percentage of the total transfer, or of the total debt forgiven under debt relief, and reported by quarter.

may therefore be optimal, and comparing programs requires specifying both the desired outcome and the horizon.

6.3 Debt Relief as Consumption Stimulus

Our analysis suggests that the choice of program depends on the fiscal authority's objective. Targeting by gross liquidity produces the strongest immediate consumption response, but gross liquidity, like net liquid wealth, is not observed by the fiscal authority. Since income is a poor proxy for gross liquidity, targeting low-income households misses many of the households with the highest MPCs, as in Kaplan et al. (2014).[13] Untargeted transfers therefore generate the largest immediate response among implementable programs. If the goal is instead to increase consumption over the medium or long term, targeting according to net liquidity is preferable. Targeting by income generates a nearly identical response, since both programs largely reach indebted households who use the transfer to repay debt.

In addition to transfers, fiscal authorities have also experimented with various debt re-

[13] In their model, the underlying reason is the presence of wealthy hand-to-mouth households, whereas in our model it is the presence of coholders.

lief policies during economic downturns, including mortgage relief in 2008, student debt relief and payment pauses in 2020, and credit card payment pauses in Canada (Ganong and Noel, 2020; Dinerstein, Yannelis and Chen, Forthcoming; Allen, Clark, Li and Vincent, 2022). These advances into consumer credit markets demonstrate a willingness of governments to implicitly target borrowers instead of the broad population. Our model allows us to compare such debt relief policies with direct cash transfers. We consider a program that forgives each indebted household's outstanding credit card balance up to $1,200, matching the size of the transfer programs. The resulting consumption and debt dynamics are shown by the dashed lines in Figure 8.

Debt relief generates dynamics that are similar to those of the net liquidity program. After one quarter, households keep 83% of the initial debt reduction, compared with 78% under the net liquidity transfer, and subsequently re-borrow along a similar path. On the consumption side, the two programs also converge to nearly the same cumulative response, 113% and 114% of the program cost.[14] The main difference lies in the on-impact consumption response. Under the transfer program, households consume 21% of the transfer immediately, while under debt relief, the consumption response is only 15%.

In a net liquidity model, a dollar of debt relief and a dollar of cash transferred to the same household have identical effects on the household's net position, so the model cannot distinguish between the two instruments by construction. In the coholding model, by contrast, debt relief and cash transfers are distinct interventions. Their similar medium-run effects arise because the two policies largely target the same households. Households with low net wealth also tend to be highly indebted. The different contemporaneous effects, however, primarily reflect the liquidity-in-advance constraint. Only the cash transfer provides immediately spendable resources, and as a result, the marginal propensity to consume is higher out of a cash transfer than out of debt relief.

Like income, debt balances are observed by the fiscal authority and can serve as the basis for relief programs (Allen et al., 2022). Debt relief therefore provides another implementable way to reproduce the higher medium-run consumption effects of net liquidity targeting, although with a weaker response on impact than a cash transfer to the same households.

7 Monetary Policy

We now turn to the implications of coholding for the transmission of monetary policy. Monetary policy affects household consumption partly through its effects on the return

[14] The two instruments are close at other program sizes as well; see Appendix D.1.

to liquid assets and the cost of liquid debt. We show that net liquid wealth masks two important aspects of this transmission: which households are exposed to each rate, and how strongly their consumption responds to rate changes. First, while in net liquidity models the sign of the household's net position determines whether it faces the saving or the borrowing rate, coholders face both rates simultaneously. Monetary policy also passes through differently to the two sides of the household balance sheet. Pass-through to credit card rates is close to one-for-one (Bräuning and Stavins, 2025), whereas pass-through to deposit rates is weak (Drechsler et al., 2017). Second, households with identical net liquid wealth can have different MPCs due to their underlying gross positions. For households adjusting along an Euler equation, the resulting substitution response is stronger when the MPC is low (Auclert, 2019). The gross position therefore determines both the relevant rate exposure and, through the MPC, how strongly a change in intertemporal prices translates into current consumption.[15]

These channels would remain operational even if the two models generated identical distributions of net liquid wealth. In our comparison, however, there is an additional distributional channel. Although both models match the same median net liquid wealth, they generate different overall distributions of net liquid wealth, and therefore also liquid assets and debt. The differences below thus combine the effects of gross positions conditional on net wealth with differences in the overall balance sheet distributions.

We first compare the aggregate consumption response across the coholding model and the net liquidity model. Under symmetric pass-through, the net liquidity model predicts an aggregate response roughly twice as large as the coholding model due to a much stronger response to the change in the saving rate. Under measured pass-through, the aggregate difference between the models is much smaller, since pass-through to the saving rate is weak. We then show that the relatively modest aggregate difference masks substantial differences in incidence. In the net liquidity model, transmission primarily operates through the saving rate channel, while in the coholding model, the borrowing rate channel dominates. As in our fiscal policy analysis, these exercises are conducted in partial equilibrium.

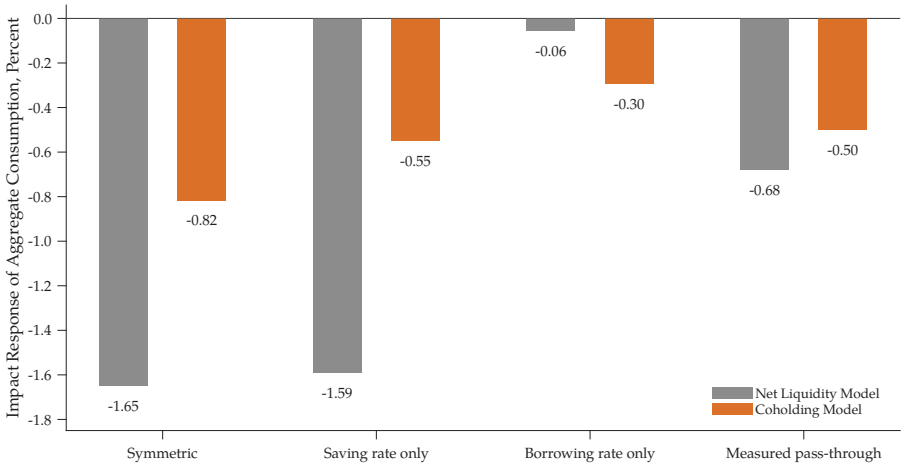
7.1 Aggregate Effects of Monetary Policy

We study a persistent contractionary monetary policy shock that raises interest rates by 100 annualized basis points on impact, with quarterly persistence $\rho_r = 0.97$. Figure 9 re-

[15]There is no contemporaneous cashflow effect from monetary policy shocks since the timing of our model is such that interest rates affect the return on saving and cost of borrowing today.

ports the contemporaneous aggregate consumption response in the coholding model and the net liquidity model under four pass-through scenarios. The first imposes full pass-through to both the saving and borrowing rates, as in models where a single policy rate moves all interest rates one-for-one. The next two isolate the saving and borrowing rate channels by allowing the shock to pass through fully to one rate while holding the other fixed. The last scenario imposes measured pass-through in which the borrowing rate rises by 100 basis points and the saving rate by 40 basis points, consistent with estimates in the literature (Bräuning and Stavins, 2025; Drechsler et al., 2017).

Figure 9: Aggregate Consumption Responses by Pass-Through Scenario



Notes: The figure reports the contemporaneous percentage change in aggregate consumption following a persistent contractionary monetary policy shock of 100 annualized basis points on impact, with quarterly persistence $\rho_r = 0.97$, across the coholding model and the net liquidity model. Under "Symmetric," the saving rate and the borrowing rate both increase by 100 basis points. Under "Saving rate only," the saving rate increases by 100 basis points and the borrowing rate is unchanged. Under "Borrowing rate only," the borrowing rate increases by 100 basis points and the saving rate is unchanged. Under "Measured pass-through," the borrowing rate increases by 100 basis points and the saving rate by 40 basis points. The net liquidity model is described in Section 5.3.

Under symmetric pass-through, aggregate consumption falls by 0.82% in the coholding model, compared to 1.65% in the net liquidity model. Accounting for coholding therefore roughly halves the aggregate consumption response. Since, in both models, the response to the symmetric shock is approximately the sum of the responses to the shocks to the individual rates, we can separate the effects of the saving and borrowing rates on this gap.

The one-rate experiments show that coholding shifts monetary transmission from the saving rate to the borrowing rate channel. A shock to the saving rate reduces aggregate consumption by 1.59% in the net liquidity model but only 0.55% in the coholding model. The difference reflects different underlying motives for holding assets. In the net liquidity

model, every household with positive net liquid wealth is on the saving Euler equation and holds its liquid assets only for intertemporal saving. In the coholding model, households also hold liquid assets to pay for consumption, and this transactional role of liquid assets dampens the consumption responsiveness to the saving rate.

The comparison flips for a shock to the borrowing rate. Aggregate consumption decreases by 0.30% in the coholding model, but only 0.06% in the net liquidity model. In the coholding model, households are exposed to the borrowing rate shock throughout the net liquid wealth distribution, including coholders with positive net liquid wealth. In the net liquidity model, instead, only households with negative net liquid wealth are exposed.

Exposure and responsiveness explain different parts of the gap between the models. Households with liquid debt account for 24% of aggregate consumption in the coholding model but only 4% in the net liquidity model, while their consumption falls by about 1% following a borrowing rate shock in both models. The gap in the borrowing rate channel therefore comes entirely from exposure. For the saving rate, the difference lies instead in the responsiveness among savers. Households with liquid assets and no debt account for about three quarters of consumption in both models, but their consumption falls by 2.06% in the net liquidity model and by only 0.69% in the coholding model.[16]

In practice, however, monetary policy does not pass through symmetrically to household interest rates. Under measured pass-through, aggregate consumption decreases by 0.50% in the coholding model and by 0.68% in the net liquidity model. The difference between the models is much smaller than under symmetric pass-through since weak pass-through to deposit rates weakens the saving rate channel, which is the dominant channel in the net liquidity model. The similarity, however, disappears once we look beyond the aggregate response. The saving rate channel accounts for 92% of the response in the net liquidity model but less than half of the response in the coholding model. Monetary policy therefore operates primarily through the saving rate in the net liquidity model and through the borrowing rate in the coholding model.[17]

[16]Part of this gap arises because savers in the net liquidity model hold more liquid assets, with a median of 0.60 quarters of income compared to 0.13 in the coholding model, and the response to the saving rate increases with assets in both models. Giving savers in the net liquidity model the asset distribution of the coholding model, however, closes only about 30% of the gap. The remainder reflects the reduced responsiveness due to the transactional motive for holding liquid assets.

[17]The aggregate response in the net liquidity model is also more sensitive to pass-through to deposit rates, which is weak and differs across banks (Drechsler et al., 2017). Each additional 10 percentage points of pass-through to the saving rate lowers aggregate consumption by a further 0.16% in the net liquidity model, compared to 0.06% in the coholding model.

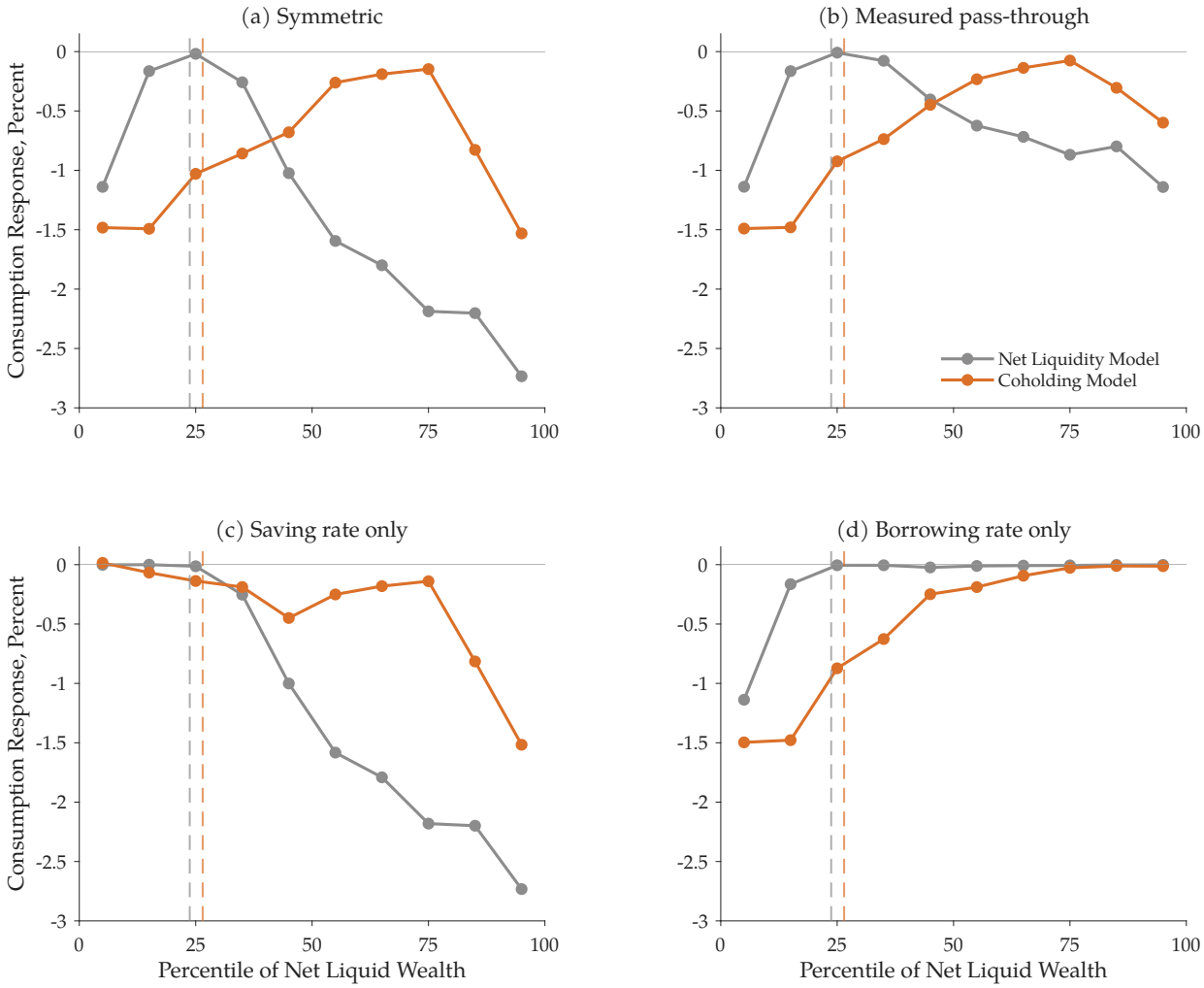
7.2 The Incidence of Monetary Policy

We next examine how the consumption response to monetary policy varies across the distribution of net liquid wealth. Panel (a) of Figure 10 shows the contemporaneous consumption response across deciles of net liquid wealth under the symmetric pass-through scenario. In both models, the consumption response is negative and hump-shaped, but the location of the weakest response and the relative strength of the two tails differ. In the coholding model, consumption declines most strongly at the top and bottom of the distribution, while the response is close to zero around the eighth decile. In the net liquidity model, the response is strongest at the top of the distribution and weakest around the third decile. This corresponds to zero net liquid wealth, where households are constrained at the kink between saving and borrowing, and do not adjust consumption through intertemporal substitution. In the coholding model, instead, the response is weakest at substantially positive wealth, reflecting that the net position does not uniquely identify either households' interest rate exposure or their MPC. Panel (b) shows that under measured pass-through, the patterns are qualitatively similar, but the consumption response is weaker in the right tail since pass-through to the saving rate is lower.

The bottom panels show the saving and borrowing rate scenarios. For the saving rate, the response is concentrated at the top of the distribution in both models, but is substantially larger and extends farther down the distribution in the net liquidity model. Positive net liquid wealth implies that a household is on the saving Euler equation in the net liquidity model, but not necessarily in the coholding model. For the borrowing rate, the consumption response is concentrated at the bottom in both models. In the net liquidity model, the consumption response is effectively zero above the second decile since only households with negative net liquid wealth face the borrowing rate. In the coholding model, instead, the consumption response remains negative up to the seventh decile. Coholders with zero or positive net liquid wealth still hold liquid debt and may therefore be on the borrowing Euler equation.

The different incidence profiles reflect how net wealth maps into gross positions in the two models. In the net liquidity model, households near zero net liquid wealth hold little gross wealth and are off the Euler equation, while households in the tails are on either the saving or borrowing Euler equation and have low MPCs. In the coholding model, the same net position can reflect offsetting holdings of liquid assets and debt. Low net liquid wealth therefore conflates true hand-to-mouth households, who hold few liquid assets and have high MPCs, with coholders, who have larger gross positions and lower MPCs. These households have different marginal responses and are differently exposed to monetary policy despite having similar net liquid wealth. Consequently, sufficient statistics

Figure 10: Consumption Response to Monetary Policy by Net Liquid Wealth



Notes: The figure reports the mean contemporaneous percentage change in household consumption within each decile of net liquid wealth following a persistent contractionary monetary policy shock of 100 annualized basis points, with quarterly persistence $\rho_r = 0.97$, across the coholding model and the net liquidity model. Under "Symmetric," the saving rate and the borrowing rate both increase by 100 basis points. Under "Saving rate only," the saving rate increases by 100 basis points and the borrowing rate is unchanged. Under "Borrowing rate only," the borrowing rate increases by 100 basis points and the saving rate is unchanged. Under "Measured pass-through," the borrowing rate increases by 100 basis points and the saving rate by 40 basis points. Dashed lines indicate the midpoint of households with zero net liquid wealth. The net liquidity model is described in Section 5.3.

constructed from MPCs and interest rate exposures sorted only by net liquid wealth will mismeasure the incidence of monetary policy wherever coholding is prevalent.

8 Conclusion

We build a quantitative model of household consumption, saving, and borrowing based on insights from the household finance literature on the coholding of credit card debt and liquid assets. We use the model to understand the empirical evidence on the marginal propensities to consume, save, and deleverage, an exercise that is infeasible in standard models that only consider net wealth positions instead of the joint distribution of liquid assets and debt. We adapt the standard model by adding a parsimonious liquidity-in-advance constraint and, without explicitly targeting them, generate relationships between the marginal propensities to consume, save, and deleverage and the joint distribution of liquid assets and debt that largely resemble the data.

For the study of fiscal policy, the model's key insight is that there are two groups of households with low liquid wealth: the true hand-to-mouth, who have low net liquid wealth and low liquid assets, and the coholders, who have low net liquid wealth and high liquid assets. These households appear identical if considering only net liquid wealth, but behave very differently in response to transitory income shocks. The former have a large MPC and the latter have a low MPC. Coholders have a low MPC because it is optimal for them to deleverage instead of increasing consumption. This has important implications for fiscal stimulus policy, especially as household indebtedness grows.

Relatedly, coholding also changes monetary policy transmission by enriching households' exposure to interest rate changes and their responsiveness to those changes. Gross, not just net, liquid wealth determines exposure, particularly when monetary policy passes through differently to saving and borrowing rates. Consumption responses also depend on the underlying composition of balance sheets, so households with the same net liquid wealth can differ both in their exposure and in how strongly they respond. Accounting for coholding therefore changes the aggregate consumption response predicted by net liquidity models.

Future work will continue to study the implications of coholding for optimal fiscal and monetary policy, especially in a general equilibrium environment with aggregate shocks and endogenous supplies of assets and debt.

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A Empirical Appendix

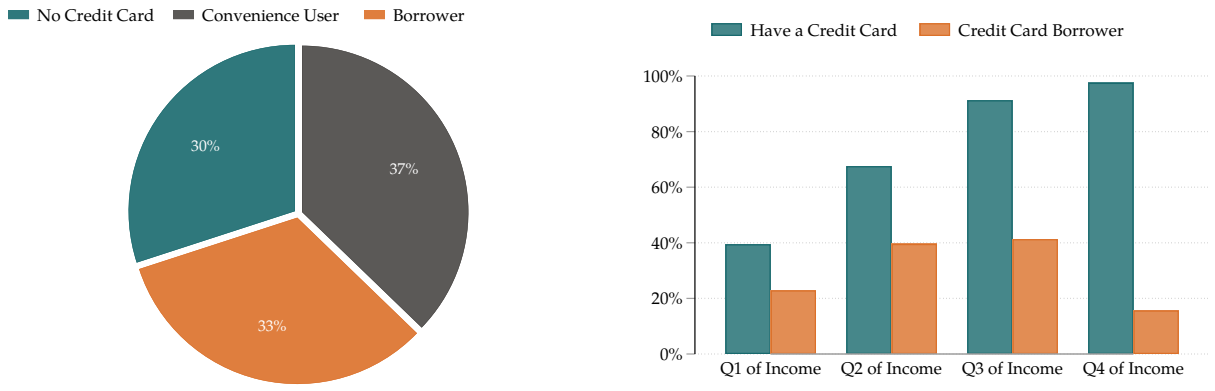
A.1 Coholding of Liquid Assets and Credit Card Debt in the SCF

The coholding of low-return liquid assets and high-cost credit card debt has been thoroughly documented in the household finance literature. To establish a baseline set of facts regarding coholding in the United States, we use the Survey of Consumer Finances (SCF), a nationally representative sample of U.S. households fielded roughly every three years. We restrict our sample to households aged 25–65 with annual income above $1,000.

The SCF questionnaire design enables us to distinguish between households that use credit cards for convenience and those that revolve debt. Specifically, respondents report their total credit card balance after the most recent payment, which allows us to infer revolving behavior. The survey also includes a direct question about whether the household typically carries a balance from month to month. We define liquid assets as funds held in checking and savings accounts.

Figure A.1a plots the distribution of credit card holders in the SCF. According to the survey, roughly 70% of households have credit cards, but 37% of households are convenience users that report paying their entire balance in full and therefore never borrow on their credit cards. Almost one-third of all households report having at least one credit card and paying less than the full statement balance each month.

Figure A.1: Extensive Margin of Credit Card Holding and Borrowing in the United States



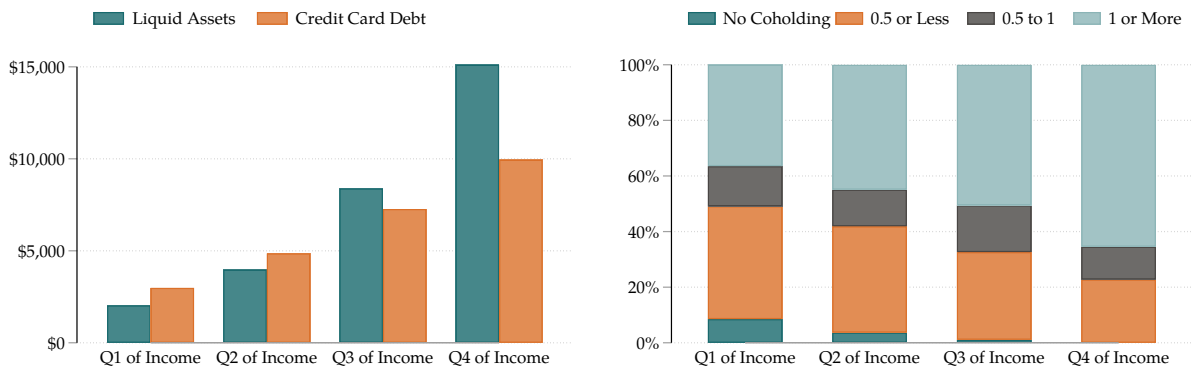
(a) Fraction of Credit Card Holders

(b) Credit Card Holders by Income Quartile

Notes: Data from the 2016 SCF.

Figure A.1b shows that credit card holders and borrowers are found across the entire distribution of income. In fact, higher-income households are both more likely to have credit cards and, except for the last quartile, to revolve debt on their credit cards.

Figure A.2: Intensive Margin of Coholding for Credit Card Borrowers



(a) Average Liquid Assets and Debt

(b) Ratio of Liquid Assets to Liquid Debt

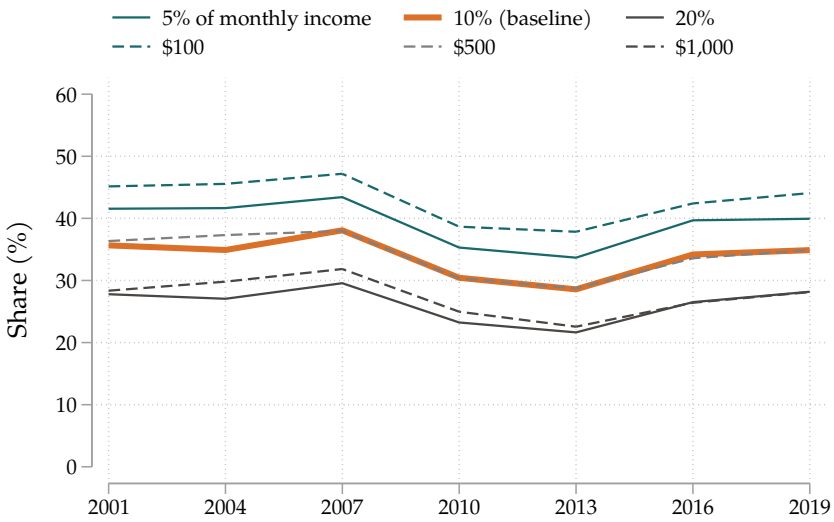
Notes: Data from the 2016 SCF. In the left panel, we additionally restrict the sample to households between the 1st and 95th percentiles of the liquid asset, debt, and wealth distributions.

We next focus on the subset of credit card users who are borrowers and study the composition of their balance sheets on the intensive margin. Figure A.2a plots the average level of liquid assets and debt in each quartile of income. In the lowest quartile of income, households hold roughly $3,000 in liquid debt and $2,000 in liquid assets, yielding a negative net liquid wealth. Liquid assets and debt both increase for higher quartiles, and in the top quartile of income, liquid assets amount to $15,000, while liquid debt amounts to $10,000, yielding a positive net liquid wealth.

Figure A.2b provides additional detail for the degree of coholding for each income quartile. In the lowest income quartile, only 10% of households report no coholding, and just under 40% report holding enough liquid assets to completely pay off their credit card debt. As income increases, the share of coholders increases; for the top income quartile, over 60% of households report enough liquid assets to completely pay off their credit card debt, while under 2% report no coholding.

Figure A.3 reports the share of coholders across several waves of the Survey of Consumer Finances from 2001 to 2019. The share of households engaged in coholding has remained remarkably stable over this period. It also follows the same pattern over time under alternative thresholds, whether relative to monthly income or in dollars, although its level falls as the threshold rises.

Figure A.3: Share of Coholders Under Alternative Thresholds



Notes: Data from triennial SCF waves between 2001 and 2019. Share of households whose liquid assets and liquid debt each exceed the indicated threshold, relative to monthly income (solid lines) or in dollars (dashed lines). The baseline definition, 10% of monthly income, is drawn thicker.

A.2 Household Balance Sheets in the SCE

The New York Fed Survey of Consumer Expectations (SCE) is a monthly online survey of a rotating panel of around 1,300 households. It collects information on household expectations and decisions on a variety of topics and provides detailed accounts of household income, balance sheets, and demographics.

We combine the monthly SCE core survey with two additional modules at lower frequency, the Spending Survey and the Household Finance Survey, which contain information on marginal propensities and household balance sheets. Our merged dataset covers the period 2015–2019 at annual frequency. We restrict the analysis to households aged 25–65 with income above $1,000. We drop households for which we do not observe income, marginal propensities, or liquid assets and debt. For the regression analysis and figures, we also jointly trim the top 1% of the liquid asset and debt distributions, and the top 1% and bottom 1% of the liquid wealth distribution. Liquid assets are defined as the current value of savings in checking or savings accounts. Liquid debt is defined as outstanding debt on credit cards.

Table A.1 compares household balance sheets in the SCE and the SCF. On average, households in the SCE hold fewer liquid assets but carry more liquid debt than those in the SCF. They also report lower total assets and higher total debt. At the median, however,

liquid and total wealth levels are broadly similar across the two surveys. Household income distributions are also closely aligned. Coholding behavior appears somewhat more prevalent in the SCF.

Table A.1: Comparison of SCE and SCF

	SCE				SCF			
	Mean	p25	p50	p75	Mean	p25	p50	p75
Liquid assets	17.68	0.00	1.60	13.11	22.19	0.50	3.20	12.50
Liquid debt	9.07	0.00	1.30	7.50	2.88	0.00	0.00	2.20
Liquid wealth	8.61	-4.20	0.00	10.00	19.31	0.00	1.20	10.16
Total assets	445.74	15.00	185.90	472.00	718.63	26.10	176.70	457.00
Total debt	134.96	5.20	37.00	143.00	114.79	3.00	44.95	153.60
Total wealth	309.05	-1.20	91.00	317.00	603.83	8.25	81.44	307.08
Income	103.51	33.00	64.00	109.00	111.05	31.39	60.76	105.31
Coholder share	0.32	–	–	–	0.34	–	–	–
Observations	3558				4580			

Notes: This table compares the distribution of household balance sheets and income (in thousands of USD) between the SCE and SCF. All statistics are weighted using survey weights. Liquid assets include funds held in checking and savings accounts, while liquid debt refers to credit card debt. Households are classified as coholders if they hold more than 10% of their monthly income in both liquid assets and liquid debt. The SCE data cover the period 2015–2019; the SCF data refer to the year 2016.

Table A.2 compares observable characteristics of households that cohold liquid assets and credit card debt with those that do not, using data from the SCE. Coholders are similar in age to non-coholders but are more likely to be male and college-educated. They also exhibit slightly higher levels of financial literacy. These patterns challenge the notion that coholding arises primarily from limited financial literacy or lower educational attainment. Coholders have lower average but higher median income and tend to hold more in both liquid assets and debt. They are also more likely to own a home and carry a mortgage.

A.3 Additional Evidence on Marginal Propensities and Household Characteristics

This section presents additional evidence on marginal propensities to consume, save, and deleverage, as well as their relationship with household characteristics.

Robustness. Columns (1)–(2) of Table A.3 report additional coefficients of the regressions estimated in Table 1. Columns (3)–(6) display results for the marginal propensity to

Table A.2: Comparison of Coholders and Non-Coholders in the SCE

	Coholders				Non-coholders			
	Mean	p25	p50	p75	Mean	p25	p50	p75
Panel A: Household characteristics								
Age	46.2	37.0	47.0	56.0	46.4	36.0	47.0	57.0
Female	0.46				0.50			
College degree	0.40				0.34			
Financial literacy	5.5	5.0	6.0	7.0	5.2	4.0	5.0	7.0
Homeowner	0.77				0.66			
Mortgage	0.49				0.38			
Panel B: Financials								
Income	90.6	45.0	74.0	110.0	109.5	30.0	58.0	100.0
Liquid assets	22.2	2.0	7.0	21.6	15.6	0.0	0.0	9.0
Liquid debt	12.3	2.0	5.0	12.0	7.6	0.0	0.0	4.0
Liquid wealth	9.9	-4.7	1.0	15.2	8.0	-4.0	0.0	9.0
Total assets	433.5	93.0	265.0	565.0	451.4	5.0	160.0	414.0
Total debt	118.4	14.0	60.0	175.0	142.6	2.7	30.0	120.0
Total wealth	315.5	16.0	133.0	405.0	306.1	-4.6	68.3	283.0
Observations	1195				2363			

Notes: This table compares households that cohold liquid assets and debt with those that do not in the SCE. All statistics are weighted using survey weights. Balance sheet variables and income are expressed in thousands of USD. Liquid assets include funds held in checking and savings accounts; liquid debt refers to credit card debt. Households are defined as coholders if they hold more than 10% of their monthly income in both liquid assets and liquid debt. The data cover the period 2015–2019.

save (MPS) and the marginal propensity to deleverage (MPD). Columns (7)–(12) present regressions in which liquid debt and wealth are included as quantile groups instead of levels. To separate the extensive from the intensive margin of debt holding, households with no liquid debt form the comparison group, and households with positive liquid debt are split into terciles. The results indicate that the marginal propensity to consume (MPC) decreases monotonically with debt, even when estimated nonparametrically.

Home Equity Lines of Credit. Next, we analyze the role of home equity lines of credit (HELOCs) in the determination of marginal propensities. We retrieve information on HELOCs from the housing module of the SCE, which is fielded once a year for a subset of the core sample. This analysis is subject to several caveats. First, the availability of HELOC data restricts the sample to roughly one-fifth of the baseline. Second, HELOCs may not be measured at the same point in the year as other balance sheet items. Third, we are unable to distinguish between home equity loans and HELOCs. For simplicity, we refer to both as HELOCs.

Table A.3: Regressions of Marginal Propensities on Household Characteristics

	in '000 USD						Quantiles					
	(1) Spend	(2) Spend	(3) Save	(4) Save	(5) Deleverage	(6) Deleverage	(7) Spend	(8) Spend	(9) Save	(10) Save	(11) Deleverage	(12) Deleverage
Liquid debt	-0.209***	-0.192***	-0.486***	-0.529***	0.697***	0.722***						
	(0.039)	(0.039)	(0.066)	(0.064)	(0.080)	(0.077)						
Liquid wealth	0.005	0.003	0.240***	0.167***	-0.244***	-0.171***						
	(0.014)	(0.015)	(0.024)	(0.026)	(0.021)	(0.023)						
Liquid debt T1 ($d > 0$)							-1.549	-0.946	-5.882**	-5.541**	7.510***	6.554**
							(1.468)	(1.465)	(2.035)	(2.036)	(2.015)	(2.004)
Liquid debt T2 ($d > 0$)							-6.077***	-5.469***	-10.081***	-8.785***	16.229***	14.312***
							(1.267)	(1.234)	(2.301)	(2.371)	(2.281)	(2.328)
Liquid debt T3 ($d > 0$)							-7.929***	-7.292***	-15.092***	-14.949***	23.077***	22.274***
							(1.570)	(1.603)	(3.110)	(3.302)	(3.248)	(3.438)
Liquid wealth Q2							1.952	0.721	7.822**	7.083*	-9.835**	-7.882*
							(1.524)	(1.552)	(2.856)	(2.969)	(3.029)	(3.155)
Liquid wealth Q3							2.067	2.334	17.973***	15.821***	-20.003***	-18.138***
							(1.632)	(1.659)	(3.019)	(3.170)	(3.154)	(3.299)
Liquid wealth Q4							1.293	1.600	29.449***	24.073***	-30.707***	-25.669***
							(1.471)	(1.512)	(2.982)	(3.302)	(3.001)	(3.326)
Illiquid assets Q2		2.154		6.776*		-8.590**		2.048		5.052		-6.763*
		(1.912)		(3.144)		(3.324)		(1.892)		(3.102)		(3.238)
Illiquid assets Q3		2.522		10.645**		-12.775**		1.945		7.192		-8.750*
		(2.112)		(3.738)		(3.972)		(2.087)		(3.735)		(3.906)
Illiquid assets Q4		2.811		17.224***		-19.593***		1.963		13.235**		-14.753***
		(2.325)		(4.118)		(4.289)		(2.316)		(4.056)		(4.176)
Illiquid debt Q2		-2.505		-11.161***		13.789***		-1.545		-9.126***		10.783***
		(1.486)		(2.275)		(2.379)		(1.468)		(2.299)		(2.391)
Illiquid debt Q3		-2.492		-15.181***		17.793***		-1.347		-13.240***		14.697***
		(1.654)		(2.647)		(2.965)		(1.637)		(2.584)		(2.854)
Illiquid debt Q4		-0.600		-15.420***		16.103***		0.559		-13.936***		13.455***
		(1.839)		(3.228)		(3.391)		(1.848)		(3.140)		(3.272)
Log income		-2.102**		2.118		-0.098		-1.969**		1.963		-0.081
		(0.714)		(1.292)		(1.275)		(0.705)		(1.306)		(1.270)
Mortgager		-5.207*		0.220		4.678		-5.386**		0.586		4.485
		(2.068)		(3.728)		(4.014)		(2.055)		(3.604)		(3.840)
Homeowner		-2.911		-1.788		4.396		-2.616		-0.782		3.088
		(1.888)		(3.196)		(3.418)		(1.875)		(3.131)		(3.321)
Moderate financial literacy		-0.007		3.816		-3.587		0.126		4.191		-4.104
		(1.764)		(2.738)		(2.960)		(1.739)		(2.732)		(2.903)
High financial literacy		2.802		2.190		-4.757		2.662		1.784		-4.218
		(1.961)		(3.055)		(3.336)		(1.932)		(3.043)		(3.252)
Constant	6.400	16.501**	16.273	11.387	77.473**	72.267**	6.959	16.191*	7.624	4.330	85.554***	79.687***
	(5.697)	(6.299)	(25.409)	(25.334)	(24.044)	(24.791)	(6.083)	(6.481)	(24.997)	(24.708)	(22.754)	(23.393)
N	3388	3236	3388	3236	3388	3236	3388	3236	3388	3236	3388	3236
R2	0.053	0.072	0.147	0.187	0.177	0.222	0.069	0.086	0.194	0.220	0.248	0.277

Notes: Heteroskedasticity-robust standard errors in parentheses. $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$. Additional controls include age, gender, race, marital status, education, geography, and survey date. Balance sheet variables enter the regression either in thousands of USD or in quantile groups. Liquid wealth, illiquid assets, and illiquid debt enter in quartiles, with the lowest quartile as the comparison group, and liquid debt in terciles computed conditional on positive debt, with households holding no liquid debt as the comparison group. Mortgager refers to households with a mortgage. Homeowner refers to households that own a home without having a mortgage. Households are classified as moderately (highly) financially literate if more than half (all) of the questions on financial literacy were answered correctly.

Table A.4 presents baseline regression results for the subsample of households with observed HELOCs, both with and without HELOCs included as a control. The inclusion of HELOCs has little impact on the results, as the estimated coefficients remain nearly identical across specifications. As with credit card debt, higher HELOC balances are associated with a lower MPC. However, the effect is more modest: an additional $1,000

in HELOC debt reduces the MPC by only 0.07 percentage points, compared to 0.26 percentage points for credit card debt. This difference likely reflects the substantially lower interest rates typically associated with HELOCs.

Table A.4: Regressions of Marginal Propensities on HELOCs

	(1) Spend	(2) Save	(3) Deleverage	(4) Spend	(5) Save	(6) Deleverage
Liquid Debt	-0.269***	-0.519***	0.793***	-0.261***	-0.521***	0.788***
	(0.065)	(0.127)	(0.139)	(0.064)	(0.127)	(0.139)
Liquid Wealth	-0.031	0.189***	-0.159**	-0.032	0.190***	-0.158**
	(0.025)	(0.051)	(0.050)	(0.025)	(0.051)	(0.050)
HELOC				-0.072***	0.023	0.049
				(0.021)	(0.037)	(0.043)
N	664	664	664	664	664	664
R^2	0.171	0.249	0.280	0.177	0.249	0.281

Notes: Heteroskedasticity-robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Additional controls include age, gender, race, marital status, education, geography, and survey date. Balance sheet variables enter the regression in thousands of USD.

Repaying Credit Card versus Mortgage Debt. The SCE question on marginal propensities to deleverage does not specify which type of debt households intend to repay. In our main analysis, we interpret the MPD as the marginal propensity to repay credit card debt. However, respondents may also have other types of debt, such as mortgages, in mind. Although the survey design does not allow us to definitively distinguish between these possibilities, this section provides suggestive evidence that households are primarily thinking about credit card debt.

To assess which debt type is most closely associated with intended deleveraging, we estimate three specifications in Table A.5. Column (1) includes the balances of liquid and housing debt, Column (2) instead includes indicators for holding each type of debt, and Column (3) includes both the balances and the indicators.

Column (1) shows that an additional $1,000 of liquid debt is associated with a 0.94 percentage point higher MPD, whereas the coefficient on housing debt is small and statistically insignificant. Column (2) shows that households with liquid debt have MPDs that are 21.8 percentage points higher than those of households without liquid debt. Households with housing debt also have higher MPDs, but the difference is substantially smaller, at 5.2 percentage points, and less precisely estimated. When balances and indicators are included jointly in Column (3), both liquid debt coefficients remain economically and statistically significant. In contrast, the housing debt balance has a small negative

coefficient, while the indicator for holding housing debt remains similar. Taken together, these results suggest that intended deleveraging is much more closely associated with liquid debt than with housing debt.

Table A.5: Marginal Propensities to Deleverage Across Types of Debt

	(1) MPD	(2) MPD	(3) MPD
Liquid assets	-0.242***	-0.241***	-0.225***
	(0.021)	(0.022)	(0.021)
Liquid debt	0.941***		0.695***
	(0.074)		(0.072)
Housing debt	-0.003		-0.012*
	(0.004)		(0.004)
Has liquid debt		21.818***	15.285***
		(1.632)	(1.745)
Has housing debt		5.150**	5.817**
		(1.652)	(1.845)
N	3377	3377	3377
R^2	0.177	0.173	0.211

Notes: Heteroskedasticity-robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Additional controls include age, gender, race, marital status, education, geography, and survey date. Balance sheet variables enter the regression in thousands of USD. 'Has housing debt' and 'Has liquid debt' are dummy variables that take the value one if the household has positive housing or liquid debt and zero otherwise.

A.4 Empirical Evidence from Other Datasets

This section explores whether our empirical results on the relation between marginal propensities and household liquid balance sheets are generalizable to other settings. For this purpose, we repeat our analysis using two alternative datasets, one for Italy (Jappelli and Pistaferri, 2014) and one for the Netherlands (Christelis et al., 2019).

A.4.1 Italian Survey of Household Income and Wealth

We first revisit the empirical evidence in Jappelli and Pistaferri (2014) (JP14). The authors find a negative gradient between the MPC and cash-on-hand, defined as financial assets plus income. They also provide suggestive evidence for indebted households having lower MPCs. We examine this relationship in more detail below.

The authors use the following question from the 2010 wave of the Italian Survey of Household Income and Wealth (SHIW) to elicit MPCs:

"Imagine you unexpectedly receive a reimbursement equal to the amount your household earns in a month. How much of it would you save and how much would you spend? Please give the percentage you would save and the percentage you would spend."

The question is broadly comparable to the one posed in the SCE, but does not distinguish between saving and repaying debt. For this reason, we only analyze the MPC. Empirically, we closely follow the strategy in JP14. We estimate a cross-sectional Tobit regression of the MPC on quantiles of financial wealth, financial debt, and a set of covariates that includes age, gender, marital status, education, location, and family size. Unlike JP14, we focus on financial wealth instead of cash-on-hand to be closer to the specification estimated in Table 1. However, our results are similar when we use cash-on-hand.

Financial wealth is composed of financial assets and debt. Financial assets include deposits, government securities, trade credit, and other securities. Financial debt includes liabilities to banks and financial companies, trade debt, and liabilities to other households. Most debt consists of bank liabilities, as credit cards are much less common in Italy than in the United States. These definitions are the closest available analogues to liquid wealth and debt from the SCE.

Table A.6 reports the results of this exercise. Column (1) shows that the MPC is decreasing in financial wealth, in line with the findings in JP14. Higher quintiles of the financial wealth distribution are associated with lower MPCs. Once we additionally control for the composition of financial wealth by including terciles of the financial debt distribution, we observe that for a given quantile of wealth, the MPC is again decreasing in the amount of debt. Note that here, the comparison group consists of households without financial debt and terciles are constructed conditional on holding positive amounts of financial debt.

A.4.2 CentER Internet Panel

We next revisit the evidence in Christelis et al. (2019) that uses the Dutch CentER Internet panel maintained by CentERdata at Tilburg University. As in JP14, the authors find a negative gradient between the MPC and cash-on-hand. MPCs are elicited through the following question:

"Imagine you unexpectedly receive a one-time bonus from the government equal to the amount of net income your household earns in three months. In the next 12 months, how would you use this unexpected income transfer?"

Table A.6: Regressions of MPC on Household Liquid Balance Sheet in SHIW

	(1) MPC	(2) MPC
Net financial wealth Q2	-0.025	-0.093***
	(0.022)	(0.023)
Net financial wealth Q3	-0.066***	-0.144***
	(0.018)	(0.019)
Net financial wealth Q4	-0.131***	-0.208***
	(0.018)	(0.020)
Net financial wealth Q5	-0.175***	-0.262***
	(0.019)	(0.021)
Financial debt T1 given pos. debt		-0.153***
		(0.022)
Financial debt T2 given pos. debt		-0.138***
		(0.024)
Financial debt T3 given pos. debt		-0.224***
		(0.026)
N	7950	7950
R^2	0.071	0.078

Notes: This table reports results from a Tobit regression of the MPC on household balance sheets and a set of covariates that includes age, gender, marital status, education, location, and family size. For net financial wealth quantiles, the first (lowest) quantile serves as the comparison group. For financial debt terciles, households without financial debt form the comparison group. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The survey allows households to choose between saving, repaying debt, durable consumption, and non-durable consumption. We focus on non-durable consumption as our measure of the MPC. Compared to the SCE, the income change is larger and the question explicitly mentions the horizon over which the money would be spent.

For the regression analysis, we closely follow the empirical strategy in Christelis et al. (2019). In particular, we estimate a cross-sectional OLS regression of the MPC on quantiles of financial wealth, financial debt (excluding mortgages), and a set of covariates that includes age, gender, and household size. Unlike Christelis et al. (2019), we focus on financial wealth and financial debt instead of cash-on-hand to be closer to the specification estimated in Table 1. However, our results also hold when we use cash-on-hand. Again, we focus on the closest available analogues to liquid wealth and debt from the SCE.

Table A.7 reports the results of this exercise. Column (1) shows that the MPC is moderately decreasing in financial wealth, in line with the findings in Christelis et al. (2019). Once we additionally control for the composition of financial wealth by including finan-

Table A.7: Regressions of Marginal Propensities on Household Balance Sheets in CentER

	(1) MPC	(2) MPC	(3) MPD	(4) MPD
Net financial wealth Q2	-0.010	-0.024	-0.106***	-0.052*
	(0.013)	(0.014)	(0.022)	(0.021)
Net financial wealth Q3	-0.038**	-0.054***	-0.102***	-0.038
	(0.013)	(0.014)	(0.022)	(0.023)
Net financial wealth Q4	-0.014	-0.030	-0.170***	-0.109***
	(0.014)	(0.015)	(0.022)	(0.022)
Low financial debt given pos. debt		-0.039**		0.142***
		(0.015)		(0.029)
High financial debt given pos. debt		-0.044**		0.171***
		(0.016)		(0.031)
N	1332	1332	1332	1332
R^2	0.025	0.034	0.071	0.118

Notes: This table reports results from an OLS regression of the MPC and MPD on household balance sheets and a set of covariates that includes age, gender, and household size. For net financial wealth quartiles, the first (lowest) quartile serves as the comparison group. For financial debt, households without financial debt form the comparison group. Low financial debt includes households with debt below the median conditional on positive debt. High financial debt includes households with debt above the median conditional on positive debt. Heteroskedasticity-robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

cial debt, we observe that for a given quartile of wealth, the MPC is again decreasing in the amount of debt. Due to the relatively small sample, we split households into three groups: no financial debt (around 80%), low financial debt holdings (below the median conditional on positive debt), and high financial debt holdings (above the median conditional on positive debt). The comparison group consists of households without financial debt. With respect to the MPD, we observe patterns similar to those in our baseline regression. The MPD is decreasing in net financial wealth but increasing in financial debt.

B Proofs

This appendix contains the derivations and proofs of Section 3. Let λ_t denote the multiplier on the period-t budget constraint, $\psi_t \geq 0$ that on the period-t liquidity constraint, and $\mu_{t+1} \geq 0$ that on $d_{t+1} \geq 0$. The non-negativity constraint on assets can be ignored, since the liquidity constraint already forces $a_t \geq \theta c_t > 0$ for $t = 2, 3$. Since $\psi_1 = 0$ by

assumption, the first-order conditions are

$$c_1^{-1} = \lambda_1, \qquad c_2^{-1} = \lambda_2 + \theta\psi_2, \qquad c_3^{-1} = \lambda_3 + \theta\psi_3, \tag{1}$$

$$\lambda_1 = \lambda_2 + \psi_2, \qquad \lambda_2 = \lambda_3 + \psi_3, \tag{2}$$

$$\lambda_1 = (1+\delta)\lambda_2 - \mu_2, \qquad \lambda_2 = (1+\delta)\lambda_3 - \mu_3, \tag{3}$$

with complementary slackness. Before turning to the proofs, we provide two intermediate results.

Two observations.

(O1) *No debt is carried into period 3.* The terminal budget constraint gives $c_3 = a_3 - (1+\delta)d_3 \leq a_3$, so $\theta c_3 < a_3$ and $\psi_3 = 0$. Then (2) gives $\lambda_2 = \lambda_3$ and (3) gives $\mu_3 = \delta\lambda_3 > 0$, hence $d_3 = 0$ and $c_3 = a_3$.

(O2) *A borrower coholds.* If $d_2 > 0$, then $\mu_2 = 0$, so (3) gives $\lambda_1 = (1+\delta)\lambda_2$ and (2) gives $\psi_2 = \lambda_1 - \lambda_2 = \delta\lambda_2 > 0$. By complementary slackness, the liquidity requirement binds, $a_2 = \theta c_2$.

Proof of Proposition 1.

(i) *Coholders.* With $d_2 > 0$, substituting the multipliers into (1) and using $\lambda_2 = \lambda_3$ from (O1) yields the intertemporal conditions $c_1 = c_3/(1+\delta)$ and $c_2 = c_3/(1+\delta\theta)$. Since $a_2 = \theta c_2$, the period-1 budget implies $d_2 = c_1 + \theta c_2 - x_1$. Using $d_3 = 0$ and $c_3 = a_3$, the period-2 budget becomes $c_3 = y_2 - (1-\theta)c_2 - (1+\delta)d_2$. Eliminating d_2 yields the consolidated constraint $(1+\delta)c_1 + (1+\delta\theta)c_2 + c_3 = (1+\delta)x_1 + y_2$, so that $c_3 = [(1+\delta)x_1 + y_2]/3$. The optimal portfolio therefore satisfies

$$a_2 = \frac{\theta[(1+\delta)x_1 + y_2]}{3(1+\delta\theta)}, \qquad d_2 = c_1 + a_2 - x_1, \qquad w_2 = a_2 - d_2 = \frac{2x_1}{3} - \frac{y_2}{3(1+\delta)}.$$

Finally, substituting the consumption choices into d_2 gives

$$d_2 = \frac{[1+\theta(1+2\delta)]y_2 - (1+\delta)[2+\theta(\delta-1)]x_1}{3(1+\delta)(1+\delta\theta)}.$$

Hence $d_2 > 0$ if and only if

$$\frac{x_1}{y_2} < \underline{x}, \qquad \underline{x} \equiv \frac{1+\theta(1+2\delta)}{(1+\delta)[2+\theta(\delta-1)]}.$$

(iii) *Permanent-income households.* With $d_2 = 0$ and $\psi_2 = 0$, (1)–(2) imply $\lambda_1 = \lambda_2 = \lambda_3$, so consumption is equal across periods. Using $d_3 = 0$ and $a_3 = c_3$ from (O1), the consolidated budget is $c_1 + c_2 + c_3 = x_1 + y_2$. Hence

$$c_1 = c_2 = c_3 = \frac{x_1 + y_2}{3}, \qquad w_2 = a_2 = x_1 - c_1 = \frac{2x_1 - y_2}{3}.$$

This allocation satisfies the liquidity requirement if and only if

$$\theta c_2 \leq a_2 \quad \Longleftrightarrow \quad \frac{x_1}{y_2} \geq \frac{1+\theta}{2-\theta} = \overline{x}.$$

(ii) *Hand-to-mouth households.* For $\underline{x} \leq x_1/y_2 < \overline{x}$, neither of the previous solutions is valid. By (O2), any household with positive debt must cohold. In the remaining case, therefore, $d_2 = 0$ and the liquidity constraint binds, $a_2 = \theta c_2$.

The first-order conditions imply $\lambda_1 = \lambda_2 + \psi_2, c_2^{-1} = \lambda_2 + \theta\psi_2, \lambda_2 = \lambda_3$. Using $c_1^{-1} = \lambda_1$ and $c_3^{-1} = \lambda_3$ to eliminate the multipliers gives $\frac{1}{c_2} = \frac{\theta}{c_1} + \frac{1-\theta}{c_3}$. The period budget constraints imply $c_1 = x_1 - \theta c_2, c_3 = y_2 - (1-\theta)c_2$. Substituting these expressions into the consumption condition and rearranging yields

$$3\theta(1-\theta)c_2^2 - 2[(1-\theta)x_1 + \theta y_2]c_2 + x_1 y_2 = 0.$$

The smaller root is the unique solution satisfying $c_1 > 0$, $c_2 > 0$, and $c_3 > 0$. Liquid assets and net liquid wealth are then $a_2 = w_2 = \theta c_2$. □

Proof of Proposition 2.

(a) Fix $w_2 > 0$. The coholder solution in Proposition 1 implies that this net wealth is obtained when $x_1 = \frac{3w_2}{2} + \frac{y_2}{2(1+\delta)}$. Substituting into the expression for liquid assets yields

$$a_2 = \frac{\theta\left[(1+\delta)w_2 + y_2\right]}{2(1+\delta\theta)}, \qquad d_2 = a_2 - w_2.$$

Thus, holding w_2 fixed, sufficiently high future income gives $a_2 > w_2$ and $d_2 > 0$. At

$$y_2^* = \left(\frac{2}{\theta} + 2\delta - 1\right) w_2,$$

the same expressions give $a_2 = w_2$ and $d_2 = 0$. This is the boundary between the coholding and hand-to-mouth regimes, where the liquidity constraint still binds.

(b) The results follow directly from the formulas for w_2, a_2, and d_2. □

Proof of Proposition 3. We differentiate the optimal choices with respect to x_1, remaining within each regime.

(i) *Coholders.* Consumption and assets are given by $c_1 = \frac{(1+\delta)x_1+y_2}{3(1+\delta)}$ and $a_2 = \frac{\theta c_3}{1+\delta\theta}$. Therefore:

$$MPC = \frac{\partial c_1}{\partial x_1} = \frac{1}{3}, \qquad MPS = \frac{\partial a_2}{\partial x_1} = \frac{\theta(1+\delta)}{3(1+\delta\theta)}, \qquad MPD = \frac{2-\theta+\delta\theta}{3(1+\delta\theta)} > 0,$$

where the latter follows from the period-1 budget constraint, $MPC + MPS + MPD = 1$.

(ii) *Hand-to-mouth households.* Within this regime, $d_2 = 0$ and $a_2 = \theta c_2$. Hence

$$MPD = 0, \qquad MPS = \theta\frac{\partial c_2}{\partial x_1}, \qquad MPC = 1 - MPS.$$

Differentiating the optimality condition $\frac{1}{c_2} = \frac{\theta}{c_1} + \frac{1-\theta}{c_3}$ using $c_1 = x_1 - \theta c_2$ and $c_3 = y_2 - (1-\theta)c_2$ gives $\frac{\partial c_2}{\partial x_1} = \frac{\theta c_1^{-2}}{c_2^{-2}+\theta^2 c_1^{-2}+(1-\theta)^2 c_3^{-2}}$. Therefore,

$$MPS = \frac{\theta^2 c_1^{-2}}{c_2^{-2} + \theta^2 c_1^{-2} + (1-\theta)^2 c_3^{-2}}.$$

The optimality condition implies $c_2^{-1} > \theta c_1^{-1}$, so the denominator exceeds $2\theta^2 c_1^{-2}$. Thus $MPS < 1/2$ and $MPC > 1/2$.

□

Proof of Proposition 4. With rates R_a and R_d on period-2 positions, the first-order conditions for a_2 and d_2 in (2) and (3) become $\lambda_1 = R_a\lambda_2 + \psi_2$ and $\lambda_1 = R_d\lambda_2 - \mu_2$, while all other conditions and (O1) are unchanged.

(i) *Coholders.* With $d_2 > 0$, $\mu_2 = 0$, so $\lambda_1 = R_d\lambda_2$ and $\psi_2 = (R_d - R_a)\lambda_2 > 0$. Using $\lambda_2 = \lambda_3$, (1) gives $c_1 = c_3/R_d$ and $c_2 = c_3/[1+\theta(R_d - R_a)]$. Since $a_2 = \theta c_2$, the period-1 budget gives $d_2 = c_1 + \theta c_2 - x_1$, and the period-2 budget becomes $c_3 = y_2 - (1 - \theta R_a)c_2 - R_d d_2$. Eliminating d_2 yields $R_d c_1 + [1+\theta(R_d - R_a)]c_2 + c_3 = R_d x_1 + y_2$, in which each term on the left equals c_3. Hence $c_3 = (R_d x_1 + y_2)/3$ and $c_1 = x_1/3 + y_2/(3R_d)$.

(ii) *Hand-to-mouth households.* With $d_2 = 0$ and $a_2 = \theta c_2$, the period budgets give $c_1 = x_1 - \theta c_2$ and $c_3 = y_2 - (1 - \theta R_a)c_2$. Eliminating the multipliers as in the proof of Proposition 1 gives

$$\frac{1}{c_2} = \frac{\theta}{c_1} + \frac{1-\theta R_a}{c_3},$$

which does not involve R_d, so $\partial c_1/\partial R_d = 0$. Differentiating this condition with respect to R_a gives $\partial c_2/\partial R_a = \theta y_2 c_3^{-2}/\left[c_2^{-2} + \theta^2 c_1^{-2} + (1-\theta R_a)^2 c_3^{-2}\right] > 0$, and therefore $\partial c_1/\partial R_a = -\theta\, \partial c_2/\partial R_a$, which is of order θ^2.

(iii) *Permanent-income households.* With $d_2 = 0$ and $\psi_2 = 0$, $\lambda_1 = R_a\lambda_2$ and $\lambda_2 = \lambda_3$, so $c_1 = c_3/R_a$ and $c_2 = c_3$. The consolidated budget is $R_a c_1 + c_2 + c_3 = R_a x_1 + y_2$, hence $c_3 = (R_a x_1 + y_2)/3$ and $c_1 = x_1/3 + y_2/(3R_a)$. □

C Alternative Theories of Coholding

Section 3 shows how transactional liquidity demand can generate coholding. This mechanism is strongly supported by survey evidence in which coholders report holding liquid assets alongside credit card debt for transactional purposes (Batista et al., 2024; Colarieti et al., 2025). However, other explanations have also been proposed, and since evidence suggests that more than one motive operates in parts of the population (Gathergood and Weber, 2014; Gathergood and Olafsson, 2022; Vihriälä, 2020), these explanations need not be mutually exclusive. We assess how well they account for the empirical findings in Section 2, including the prevalence and persistence of coholding, households' marginal propensities to consume and deleverage, and their distance from credit limits. Mechanisms that generate similar portfolios can imply different behavior along these other margins, allowing the evidence to distinguish between them. The comparisons below are based on the incentives implied by each mechanism. Rigorously establishing how well each explanation accounts for the evidence would require a quantitative evaluation of the competing models calibrated to the same empirical moments, which is outside the scope of this paper.

C.1 Credit Access Risk

Households may borrow while holding liquid assets in order to insure against a loss of access to credit. As Fulford (2015) documents, credit limits are volatile, and a household facing this risk borrows on its credit card and holds the proceeds as liquid assets while the credit line remains available. Gorbachev and Luengo-Prado (2019) support this idea by documenting that credit access risk correlates with coholding, while Druedahl and Jørgensen (2018) develop a quantitative model which formalizes this precautionary borrowing motive. This explanation is close to ours, since both assign the coholder a demand for liquidity. Under the precautionary motive, liquidity is valued as insurance against los-

ing future access to credit, whereas in our setting, households need liquidity to pay for consumption.

The marginal propensities documented in Section 2 and additional evidence on credit utilization help assess these motives. Credit access risk creates an incentive to keep a windfall as liquid assets, since funds used to repay debt may no longer be available if the credit line is subsequently reduced. Yet households with liquid debt allocate a substantial share of a windfall to debt repayment. Coholders also keep considerable unused credit. In the 2016 SCF, their median credit utilization is 40%, compared with 79% among households that borrow without holding liquid assets, and their median unused credit is roughly one month of income. These findings do not exclude precautionary borrowing, but suggest that coholding also reflects liquidity needs beyond protection against a loss of credit access.

C.2 Strategic Bankruptcy

Lehnert and Maki (2002) show that households anticipating bankruptcy have an incentive to cohold, since liquid assets up to exemption limits are protected in a filing while unsecured debt is discharged. They find balance sheet patterns consistent with this incentive across states with different exemption levels. Our evidence suggests that preparation for an imminent filing is unlikely to be the main explanation for coholding. Explaining coholding primarily through bankruptcy would require a substantial share of households to anticipate filing, given that roughly one-third cohold and that coholding is persistent over time. Furthermore, coholders typically retain substantial unused credit, as documented above, and households with liquid debt allocate a substantial share of a windfall to debt repayment. This response is difficult to reconcile with retaining assets while planning to discharge the same debt in bankruptcy.

C.3 Self-Control and Other Behavioral Explanations

Bertaut et al. (2009) build an accountant-shopper model in which a patient accountant restrains an impulsive shopper by leaving credit card balances unpaid, keeping the unused portion of the credit line, and with it the shopper's spending capacity, small. Gathergood and Weber (2014) find support for the mechanism in parts of the population, documenting that coholders are more financially literate than average and that coholding is associated with self-reported impulsive spending. Medina and Pagel (2025) provide experimental evidence consistent with self- or partner-control, finding that customers most responsive to saving nudges increase savings and reduce spending without changing their credit

card debt. Relatedly, Choi and Laschever (2018) document that non-cognitive ability predicts coholding. As an explanation of pervasive coholding, however, the model is difficult to reconcile with the evidence. Since disciplining self-control works by exhausting the credit line, coholders should operate close to their limits, while in the data they are the borrowers with the most unused credit. The model is also at odds with the evidence in Section 2 that households with more liquid debt consume less in response to a windfall and use it to repay debt instead. In the accountant-shopper model, debt repayment frees up the spending capacity that the unpaid balances are meant to restrict.

Present bias is another mechanism used to generate demand for high-cost revolving credit card debt, but the models built on it do not speak to why the same households simultaneously hold liquid assets. Laibson et al. (2025) and Lee and Maxted (2026) build models in which present-biased households borrow on credit cards while accumulating illiquid wealth because the long-run self plans to repay the balance and the short-run self postpones repayment, and Lee and Maxted (2026) find support for the mechanism in the SCF. However, explaining the evidence in Section 2 requires a model that tracks liquid assets and liquid debt separately. Our mechanism generates demand for liquid assets, and since the discount factor pins down net liquid wealth, a household that holds liquid assets for transactions borrows the difference (Section 3). Present bias instead generates the demand for debt itself, and the two mechanisms are not mutually exclusive.

D Model Appendix

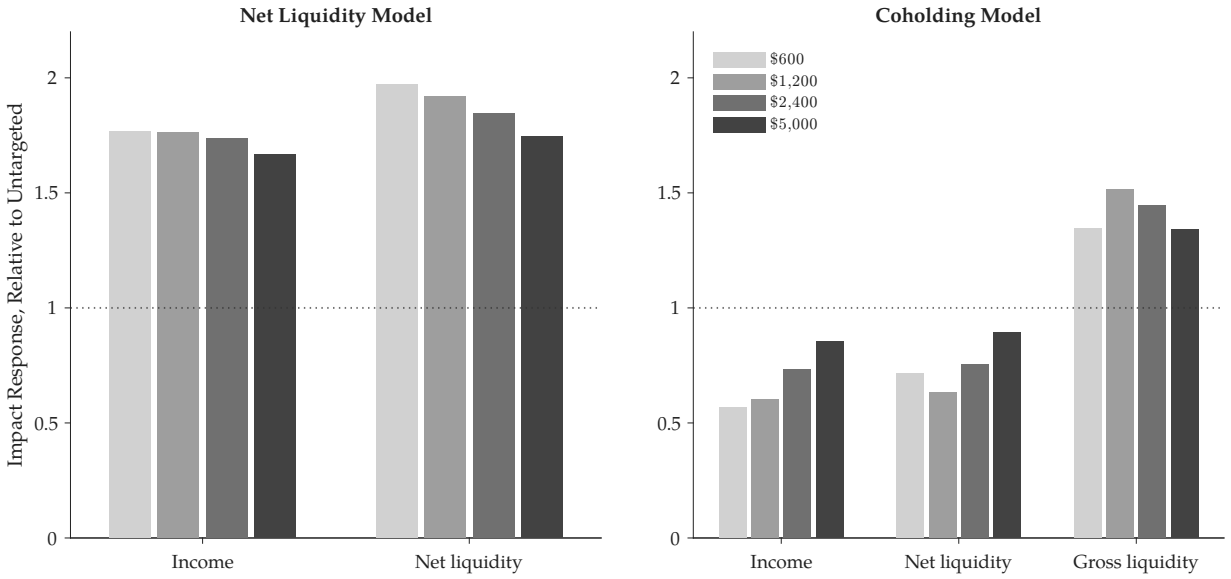
D.1 Targeted Transfers by Program Size

Figure D.1 repeats the analysis in Figure 7 for transfers of \$600, \$1,200, \$2,400, and \$5,000. In the net liquidity model, targeting by income or by net liquidity generates a stronger contemporaneous consumption response relative to untargeted transfers, irrespective of the transfer size. In the coholding model, instead, targeting transfers by income or net liquidity yields lower relative consumption responses for all transfer sizes, whereas transfers targeted by gross liquidity yield larger responses. Figure D.2 shows that the dynamic consumption responses in Figure 8 are also robust to different transfer sizes.

D.2 Intertemporal Marginal Propensities

The analysis in the main text is conducted in partial equilibrium and focuses on the response to transfers that arrive immediately. In this appendix, we report the full matrices

Figure D.1: The Payoff to Targeting by Program Size



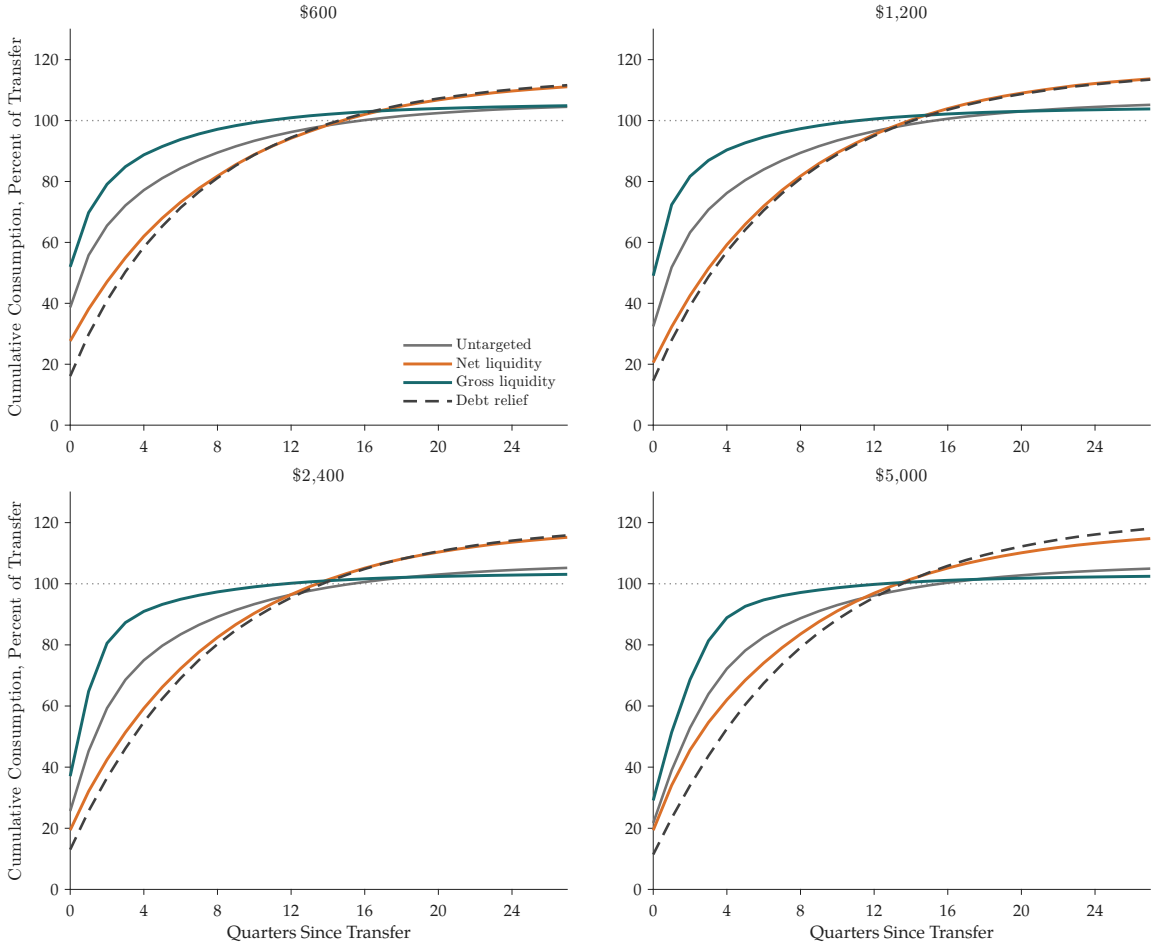
Notes: Impact consumption response to a one-time transfer of different sizes targeted to the bottom 30% of households by the indicated statistic, relative to the response to an untargeted transfer of the same size. The left group reports results from the net liquidity model of Section 5.3. The right group reports results from the coholding model.

of intertemporal marginal propensities to consume, save, and deleverage, which describe how households respond over time to transfers that arrive today or are announced for the future.

Column s of the intertemporal marginal propensity to consume (iMPC) matrix is the response of aggregate consumption in each quarter $t = 0, 1, 2, \ldots$ to a transfer that households learn about at $t = 0$ and receive at $t = s$. The first column, $s = 0$, is the response to an unanticipated transfer studied in the main text. The remaining columns capture the response to news about future transfers. The intertemporal marginal propensities to save (iMPS) and to deleverage (iMPD) are defined in the same way for liquid assets and liquid debt. Auclert, Rognlie and Straub (2024) show that the iMPC matrix is nearly sufficient to characterize the aggregate implications of household heterogeneity in general equilibrium. A model with only net liquid wealth delivers the iMPC and a single propensity to increase net wealth. Our model splits the latter into saving and deleveraging.

Panel (a) of Figure D.3 plots columns of the iMPC matrix. As in standard models, the response to an unanticipated transfer peaks on impact and decays over the following quarters. The response to an announced transfer rises in the quarters before it arrives, peaks at arrival, and decays afterward. Panel (b) shows how this anticipation is financed. Before the transfer arrives, the iMPD is negative: households borrow against the

Figure D.2: The Dynamics of Stimulus by Program Size

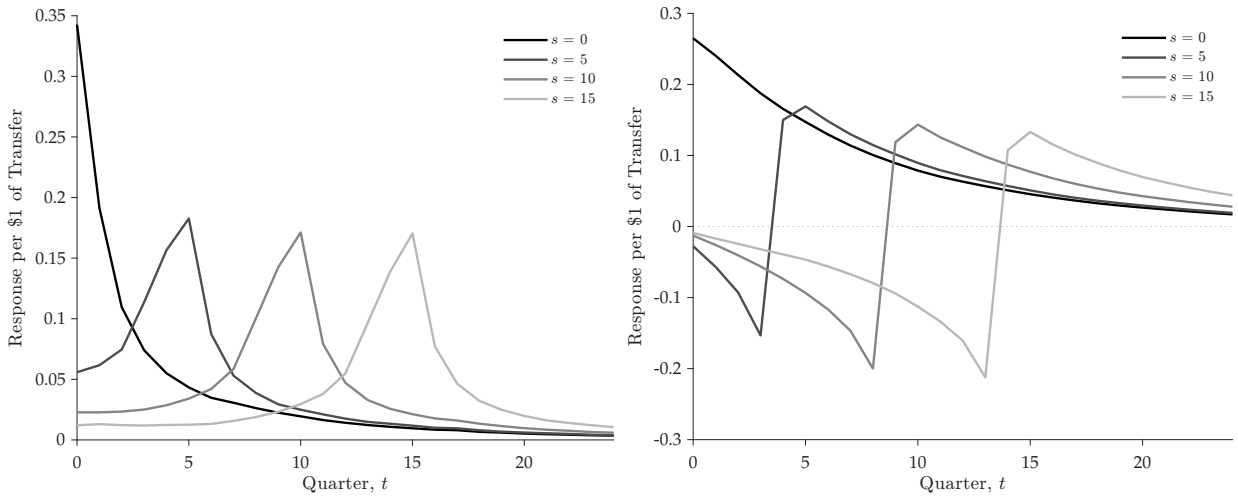


Notes: Dynamic response of aggregate consumption to four fiscal programs of different sizes: an untargeted transfer, transfers targeted to the bottom 30% of households by net liquidity or gross liquidity, and a debt relief program, which forgives each indebted household's credit card balance up to the transfer size. Responses are expressed as a percentage of the total transfer, or of the total debt forgiven under debt relief, and reported by quarter.

announced transfer and use the proceeds to consume. In the quarter before the transfer arrives, they repay this debt out of their liquid assets, which the transfer then replenishes, so that the iMPD turns positive one quarter ahead of the transfer. In a model with only net liquid wealth, the same anticipation would appear as a decline in net wealth, with no distinction between drawing down liquid assets and borrowing.

The aggregate matrices average over households with very different balance sheets. Figure D.4 splits the response to an unanticipated transfer into savers, who hold liquid assets and no liquid debt, and coholders. On impact, savers consume 39% of the transfer and save most of the rest, while coholders consume 24% and use 72% to repay debt. Savers then spend down their additional assets quickly, and after one year their cumula-

Figure D.3: Intertemporal Marginal Propensities to Consume and Deleverage



(a) Consume (b) Deleverage

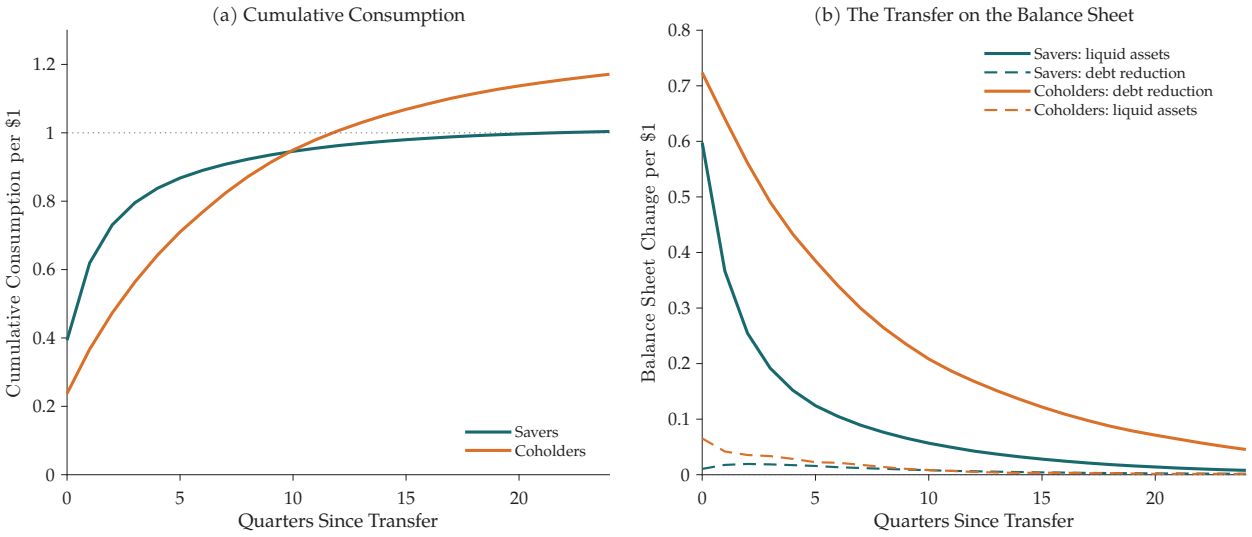
Notes: Columns $s \in \{0, 5, 10, 15\}$ of the aggregate iMPC matrix (left) and iMPD matrix (right), per dollar of transfer. Column s is the response in each quarter t to a transfer announced at $t = 0$ and received at $t = s$. Negative values of the iMPD indicate additional borrowing. The transfer equals \$1,000, or 8% of mean quarterly income.

tive consumption reaches 80% of the transfer, compared to 56% for coholders. Coholders instead reduce their debt persistently and consume the interest saved on it over time. Their cumulative consumption overtakes that of savers after about two and a half years and reaches 122% of the transfer after ten years, compared to 101% for savers. Deleveraging therefore delays the consumption response rather than reducing it, and the delay raises the total response since repaying credit card debt earns a higher return than holding liquid assets. This is the counterpart, for individual households, of the aggregate dynamics of Section 6.2.

The link between debt and aggregate demand is related to the theory of indebted demand of Mian, Straub and Sufi (2021). In our partial equilibrium setting, debt depresses the short-run consumption response to a transfer, and the repayment of debt raises consumption later through lower interest payments. In the general equilibrium model of Mian et al. (2021), debt repayment also shifts resources between borrowers and savers with different propensities to consume.

The implications of the decomposition into saving and deleveraging depend crucially on the supply of liquid assets and liquid debt. In standard one- or two-asset models, the interest rate adjusts in equilibrium such that a single financial intermediary supplies the market-clearing level of net assets. In the model of coholding with separate gross instruments for borrowing and saving, the exact specification of financial intermediaries will

Figure D.4: The Response to an Unanticipated Transfer: Savers and Coholders



Notes: Column $s = 0$ of the iMPC, iMPS, and iMPD matrices, computed separately for savers (households with liquid assets and no liquid debt, 61% of households) and coholders (34%), classified by their balance sheet when the transfer arrives. Panel (a) plots cumulative consumption per dollar of transfer. Panel (b) plots the change in liquid assets and the reduction in liquid debt relative to the baseline, per dollar of transfer.

determine the extent to which household coholding changes aggregate dynamics. This specification includes not only how interest rates are determined in equilibrium, but also which households own each financial intermediary and how dividends are distributed. Thus a full understanding of the implications of coholding in general equilibrium requires combining the household block developed in this paper with recent advances on the financial block, such as heterogeneous banks (Bellifemine, Jamilov and Monacelli, 2023) and endogenous credit spreads (Faccini, Lee, Luetticke, Ravn and Renkin, 2024), which we leave for future work.