The Macroeconomic Implications of Coholding Liquid Assets and Debt

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Abstract

This paper highlights the importance of the joint distribution of liquid assets and debt in understanding the consumption response of households to income changes. We show that grouping households across the distribution of liquid wealth, as is typically done, confounds two very different types of households. True hand-to-mouth households with low liquid wealth due to low liquid assets, and households with low liquid wealth due to high debt. The former type has a high marginal propensity to consume while the latter type has a high marginal propensity to repay debt. We add a cash-in-advance constraint to a standard consumption-savings model which generates the co-holding of liquid assets and debt observed in the data and matches the empirically observed marginal propensities to consume and repay debt. We apply our model to the study of stimulative fiscal policy and illustrate the role that the joint distribution of assets and debt plays in the aggregate marginal propensity to consume.

*Boutros: Bank of Canada. Mijakovic: European University Institute. The presented views are those of the authors, not necessarily of the Bank of Canada. This paper subsumes "Household Finances and Fiscal Stimulus in 2008" (Boutros, 2019) and benefited from discussions with Manuel Adelino, Lukas Altermatt, David Berger, Zahi Ben-David, Francesco Bianchi, Mory Elsaify, Daniel Greenwald, Andrea Lanteri, David Min, and James Pinnington. Version 2023.3.2.

1 Introduction

In the United States, 75% of households report having a credit card, and 50% report regularly borrowing on their credit card by revolving balances month-to-month. Of those that borrow on their credit cards, at an average rate of 14%, more than 40% report simultaneously holding liquid assets such as cash. These facts, and others, have been well documented in the household finance literature since Gross and Souleles (2002).

Another established literature documents the consumption response of households to stimulative fiscal transfers designed to increase aggregate demand. Across a number of studies, the average propensity to consume out of such cheques is estimated to be around one-third (Fuchs-Schuendeln and Hassan, 2016). Most of the early studies used survey questions that asked households whether they used the cheques to increase spending, increase saving, or pay down debt, with the latter two responses often grouped together since both increase wealth.

In this paper, we build on the household finance literature to take seriously the dichotomy between increasing saving and paying down debt using transfers from macroeconomic stimulus programs. We add a cash-in-advance constraint, in the style of Lucas (1982), to a standard consumption-savings model, which generates a desire for coholding. In each period, households target a specific amount of wealth to ensure consumption over time, which may necessitate borrowing. Simultaneously, households target a specific amount of liquid assets due to the cash-in-advance constraint, which generates fully rational coholding of liquid assets and debt.

We discipline our model using detailed data on marginal propensities to consume (MPC) and repay debt (MPRD) from the New York Fed Survey of Consumer Expectations (SCE). Calibrating the liquidity-in-advance constraint to the literature and targeting only one moment of the liquid debt distribution, this rather simple model generates behavior very much in line with the empirical evidence. Comparing the model's propensities to consume and repay debt across the individual and joint distributions of liquid assets and debt to those in the data, the model is able to replicate both the level and slope of each relationship without explicitly targeting them. This lends credence to the mechanism we use and allows us to easily compare our model to the standard model since, under specific parametrizations, they are equivalent.

Similar to previous studies (Bunn et al., 2018; Christelis et al., 2019; Fuster et al., 2021), we find that the MPC is flat in liquid wealth, which stands at odds with the predictions of standard buffer-stock models. We resolve the apparent disconnect between data and theory by studying the joint distribution of liquid assets and debt. In the model, as in

the data, debt dampens the marginal propensity to consume. All else equal, a decrease in wealth due to an additional dollar of liquid debt decreases the marginal propensity to consume and increases the marginal propensity to repay debt. On the other hand, in line with most existing theoretical models, a decrease in wealth due to the removal of one dollar of liquid assets increases the marginal propensity to consume. Our model allows us to examine these two events separately, whereas in a standard model which only considers the net wealth position, a decrease in wealth will always increase the marginal propensity to consume.

Building on this key insight regarding the relationship of the marginal propensity to consume and debt, our model allows us to match the behavior of low-wealth households along the joint distribution of liquid assets and debt. We document that grouping households across the distribution of liquid wealth confounds two very different types of households, true hand-to-mouth households with low liquid wealth due to low liquid assets, and households with low liquid wealth due to high debt. Typically, hand-to-mouth status is measured using net liquid wealth, but our analysis sheds light on the two types of households with low liquid wealth. The former type has a high MPC while the latter type has a low MPC.

Households with low liquid wealth due to low liquid assets have larger MPCs because these true hand-to-mouth households are near their borrowing constraints. The contribution of our model is to study households with low liquid wealth due to high debt; for example, households in the top quintile of both liquid assets and liquid debt, but the lowest quintile of liquid wealth. These households are heavy credit card revolvers and use positive fiscal transfers to pay down their debt. This finding is a possible resolution to the disagreement between several papers in the literature regarding the relationship between liquidity and the marginal propensity to consume. We provide additional evidence for this classification by showing that low liquid wealth households with high liquid debt primarily use income windfalls to repay debt instead of consuming. While previous studies provided suggestive evidence for the relevance of debt holdings for MPCs (e.g. Jappelli and Pistaferri (2014); Sahm et al. (2015); Boutros (2019)), rich data on households' balance sheet composition paired with detailed splits of the usage of income windfalls across spending, saving, and debt repayments allow us to characterize precisely the relation between MPCs and the joint distribution of liquid assets and debt.

We apply our model to the study of stimulative fiscal policy, again highlighting the role that the joint distribution of assets and debt plays in the aggregate marginal propensity to consume. Following the logic above for individual households, for a given level of aggregate wealth, a higher level of aggregate debt implies a lower aggregate marginal

propensity to consume. Targeting fiscal stimulus towards less liquid households will only increase the aggregate consumption response if the targeted households are truly hand-to-mouth households with less liquidity coming from low liquid assets and low liquid debt. If fiscal stimulus ends up in the hands of households with high liquid debt, then regardless of liquid assets and net liquid wealth, the transfer will be used to pay down debt, not increase consumption. As we show, although this is optimal from the household's perspective and therefore must be individually welfare-improving, this behavior may not be in line with the short-run policy objective of immediately increasing aggregate consumption.

This paper relates to the literature on co-holding of liquid assets and debt. Several theoretical explanations of the co-holding puzzle have been put forward (Bertaut et al., 2009; Telyukova and Wright, 2008; Telyukova, 2013; Fulford, 2015; Druedahl and Jørgensen, 2018; Gorbachev and Luengo-Prado, 2019). We build on the idea proposed in Telyukova (2013) that households co-hold debt and assets due to liquidity demand. Our contribution is to integrate this mechanism into a standard consumption-savings model to generate endogenous coholding and study its implications for fiscal policy. Our model generates coholding of liquid assets and debt, while the model built in Kaplan and Violante (2014) generates coholding of liquid and illiquid wealth. Kosar et al. (2022) also focus on understanding the relevance of debt for stimulative fiscal transfers. Their model builds on the sovereign debt default literature and they show that by using transfers to reduce debt, households increase their individual welfare by reducing the likelihood of default. Relative to these papers, our focus is on studying the marginal propensities to consume and repay debt along the the joint distribution of liquid assets and debt.

Our paper also contributes to the empirical literature on marginal propensities to consume by proposing a potential resolution to conflicting evidence on the slope of the MPC across the liquid wealth distribution. Several papers find a flat MPC across the distribution of liquid wealth (Bunn et al., 2018; Christelis et al., 2019; Fuster et al., 2021). At the same time, Jappelli and Pistaferri (2014) and Sala and Trivin (2021) provide suggestive evidence for decreasing MPCs across the distribution of debt while a set of other papers studies debt responses to income changes explicitly (Agarwal et al., 2007; Sahm et al., 2015; Boutros, 2019; Coibion et al., 2020; Fagereng et al., 2021) We show that studying the joint distribution of liquid assets and debt is key to understand households' consumption responses. Studying either assets, debt or net wealth in isolation is not sufficient to characterize consumption behaviour. Moreover, we provide evidence that the relevant debt statistic is credit card debt.

Finally, our fiscal policy analysis adds to the literature on debt-dependent fiscal mul-

tipliers. Previous studies primarily find multipliers that are increasing in the level of debt, often based on micro-level evidence (Dynan et al., 2013; Mian et al., 2013; Klein, 2017; Baker, 2018; Bernardini and Peersman, 2018; Demyanyk et al., 2019; Bernardini et al., 2020). Our results do not necessarily contradict this literature as we focus on credit card debt only, while most of the existing literature focuses on either aggregate debt or other debt components.

2 The Prevalance and Relevance of Credit Card Debt

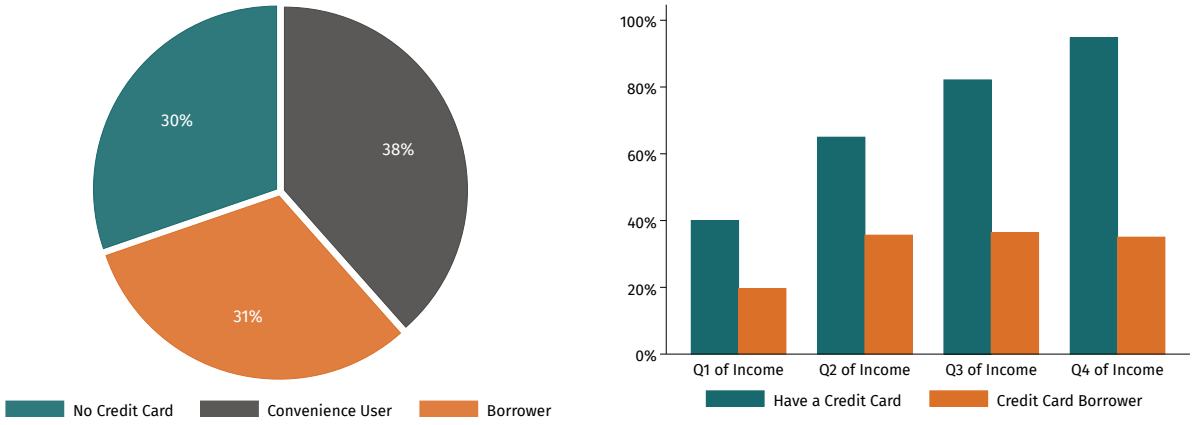
2.1 Credit Card Debt and the Coholding Puzzle

The coholding of low-return cash and high-interest credit card debt was first documented by Gross and Souleles (2002). Since then, a number of possible explanations have been proposed which implicitly assume household's are performing suboptimally or irrationally, ranging from financial illiteracy to self control (Lehnert and Maki, 2002; Bertaut and Haliassos, 2002; Haliassos and Reiter, 2005; Zinman, 2007). Alternatively, in this paper, we take the stance that households are fully rational coholders due to a specific demand for liquidity (Telyukova, 2013), which will be discussed further in the next section.

To establish a baseline set of facts regarding coholding in the United States, we use the Survey of Consumer Finances, a nationally representative sample of US households fielded roughly every four years. Figure 1a plots the distribution of credit card holders in the SCF. According to the survey, roughly 70% of households have credit cards, but 40% of households are convenience users who 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 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 to revolve debt on their credit cards. On the intensive margin, Figure 2a plots the average level of liquid assets and debt for each quartile of income. In the lowest quartile of income, households hold roughly $2,500 in liquid debt and $2,250 in liquid assets, yielding a negative net liquid wealth. In the second quartile, liquid assets and debt both increase to just under $5,000, and net liquid wealth is zero; similarly, net liquid wealth is only slightly a few hundred dollars for those in the third quartile of income, but liquid assets and debt both increase to almost $7,000. In the top quartile of income, liquid assets increase to almost $15,000, while liquid debt increases to only $10,000, yielding a positive net liquid wealth of just over $5,000.

Figure 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: Source: 2016 SCF.

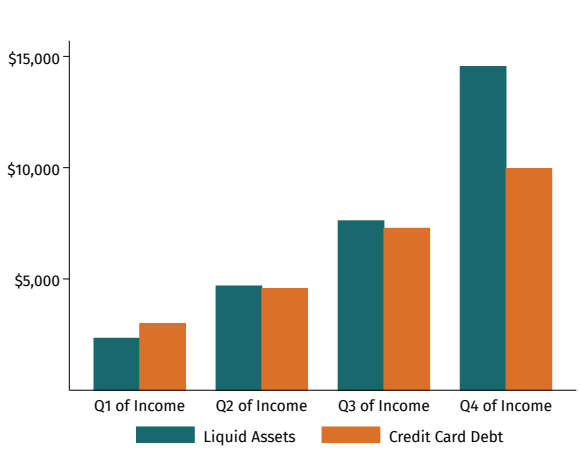
Figure 2b provides additional detail into the degree of coholding for each income quartile. In the lowest income quartile, only 10% of households report no coholding, and just under 40% report holding enough liquid assets to completely pay off their credit card debt. As income increases, the fraction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

2.2 Relevance for the Propensities to Consume, Save, and Repay Debt

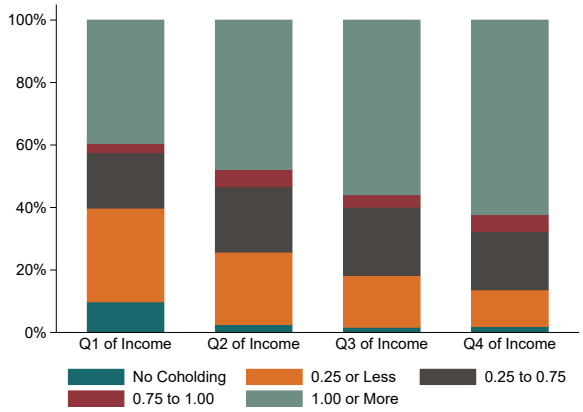
Having established the prevalence of credit card debt and the tendency for credit card holders to cohold liquid assets, we turn to the relevance of coholding for the propensities to consume, save, and repay debt out of transitory income shocks. A large literature focuses especially on the marginal propensity to consume, surveyed in Fuchs-Schuendeln and Hassan (2016), and a number of papers have documented a flat relationship between liquidity and the propensity to consume (Bunn et al., 2018; Christelis et al., 2019; Fuster et al., 2021). This relationship is also found in the New York Fed's Survey of Consumer Expectations, which includes modules that collect information on household balance sheets and propensities to consume, save, and repay debt out of a hypothetical 10% increase in annual income.

Figure 3 plots the distribution of propensities to consume and repay debt in the data. The average MPC is 0.19, slightly lower than the average from estimates of the MPC out of stimulus cheques in 2001 and 2013, and the average MPRD is 0.38. In both cases, there is a large mass of households who report zero MPC and MPRD. Panels (a) and (b) in Figure

Figure 2: Intensive Margin of Liquid Assets and Credit Card Debt



(a) Average Liquid Assets and Debt



(b) Ratio of Liquid Assets to Liquid Debt for Credit Card Borrowers

Notes: Source: 2016 SCF.

4 plot the relationship between the marginal propensities to consume, save, and repay debt, across the distribution of assets and debt, respectively. The marginal propensity to consume is essentially flat with respect to liquid assets and decreases sharply with liquid debt. As liquid assets or debt increase, most of the change in behavior comes from exchanging the propensity to save with the propensity to increase wealth. To estimate this relationship more precisely, we estimate the following specification:

$$Y_i = \beta_0 + \beta_1 A_i + \beta_2 D_i + \gamma X_i + u_i,$$

where Y_i is one of Spend, Save, or Repay Debt, A_i is liquid assets in thousands of dollars, D_i is liquid debt in thousands of dollars, and X_i is a vector of controls for age, gender, race, marital status, education, geography, and survey date. The regression also uses survey weights provided by the Survey of Consumer Expectations to make the sample nationally representative.

In the first column of Table 1, we verify that the propensity to consume is flat in liquid assets. The estimate is both statistically and economically insignificant; increasing liquid assets by \$1 increases the MPC by only 0.03 percentage points (pp). On the other hand, increasing liquid debt by \$1 increases the MPC by 0.24 pp. Together, these estimates imply that a \$1 increase in liquid wealth due to increasing liquid assets has a negligible impact on the propensity to consume, while the same increase from a reduction in debt will meaningfully increase the propensity to consume.

Liquid assets are more relevant for the propensities to save and repay debt. The

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

	(1) Spend	(2) Save	(3) Repay Debt
Liquid Assets	0.0346	0.231***	-0.265***
	(0.0219)	(0.0308)	(0.0296)
Liquid Debt	-0.243***	-0.674***	0.918***
	(0.0523)	(0.0818)	(0.111)
N	2,578	2,578	2,578
R^2	0.069	0.119	0.174

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

marginal propensity to save increases by 0.23 pp for a $1 increase in liquid assets, but decreases by 0.67 pp for a $1 increase in liquid debt. Again, this implies that a change in net liquid wealth from an increase in assets or decrease in debt will have opposite predictions for the propensity to save. The same also holds true for the propensity to repay debt, which is the most sensitive to both changes in liquid assets and debt. Increasing liquid assets by $1 decreases the propensity to repay debt by 0.27 pp, while increasing liquid debt by $1 decreases the propensity to repay debt by 0.92 pp.

3 Model

To explore the prevalence of credit card debt and the implications of coholding on the response to income shocks, we build a model of consumption and savings in which households optimally and rationally hold both liquid assets and debt. We extend an otherwise standard model to include two states to represent distinct financial instruments for saving and borrowing, instead of a single state representing net wealth.

3.1 Household Optimization

Each household lives for an infinite number of periods and has preferences over time given by discount factor β. The household values consumption according to a standard utility function with risk aversion given by γ and seeks to maximize expected lifetime utility,

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t),$$

by choosing consumption, saving, and borrowing, subject to an intertemporal budget constraint:

$$c_t + \frac{a_{t+1}}{R} - \frac{d_{t+1}}{R+\delta} = y_t + a_t - d_t.$$

In this model, the household makes distinct choices for saving, a_{t+1}, at rate $R \equiv 1+r$, and borrowing, d_{t+1}, at a premium δ over the saving rate. Both financial instruments must be weakly positive and debt is limited by an exogenous borrowing limit, ϕ. Net wealth is defined as $w_t \equiv a_t - d_t$ and, when $\delta = 0$, the budget constraint collapses to that of the standard model in which only the net level of wealth is relevant.

Our model neither incorporates a life-cycle nor an illiquid asset. This modeling choice is motivated by several empirical facts. First, the life-cycle dimension does not substantially affect MPCs in the SCE nor does it affect co-holding patterns, as explained in Telyukova (2013). Second, illiquid wealth is not too relevant for marginal propensities either. This holds for both illiquid assets, such as housing, but also illiquid debt, such as mortgages. This observation will later on guide our calibration strategy.

3.2 Liquidity-in-Advance Constraint

The key innovation of our model is the addition of a liquidity-in-advance constraint:

$$\theta c_t \leq a_t.$$

This constraint requires that the household holds a measure of liquid assets commesurate with its choice of consumption. Note that from the perspective of the time t household, consumption is a choice and the level of liquid assets is a state, but the level of liquid assets is a choice in the previous period. Thus households have control over both aspects of the liquidity-in-advance constraint.

This constraint captures the theory developed and tested in Telyukova and Wright (2008) and Telyukova (2013). The core idea is that a fraction of household consumption can only be paid for using the liquid asset. Telyukova uses the Survey of Consumer Expenditures and partitions goods by their ability to be purchased using cash. She finds that households who spend more on these goods are those most likely to hold large amounts of cash and cohold credit card debt. While we use a liquidity-in-advance constraint to remain as close as possible to a standard model of consumption and savings, she builds a model in which every period is divided into two stages and the money demand decision is made explicitly prior to consumption.

The intuition behind this mechanism for the demand for liquidity is very similar to the

notion of demand for money from the macroeconomic literature. Indeed, the liquidity-in-advance constraint we use is inspired directly by Lucas (1982), and Telyukova (2013) notes that "it is useful to think about consumer debt through the lens of modern monetary economics." In the money demand literature, money is held due to its transactional value, resolving the puzzle of coholding zero-return cash instead of positive-return government bonds. Similarly, households demand liquid assets in order to transact for a fraction of their consumption goods, and the household simultaneously wishes to borrow from its future self, generating a demand for liquid debt.

3.3 Recursive Formulation and Computational Details

Stated recursively, the household's problem is to find the policy functions for consumption, saving, and borrowing, given by $c(a,d,y), a'(a,d,y),$ and $d'(a,d,y)$, respectively, to maximize its value function,

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

subject to the exogenous income process, detailed below, and the budget and liquidity-in-advance constraints. We solve the model using 100 gridpoints for assets and debt.

In standard models, the propensity to consume out of income shocks is typically calculated by assuming that the shock appears as an increase in assets. In our case, this would have unwanted implications for the liquidity-in-advance constraint. Instead, to analyze the impact of income shocks, we introduce a fourth state variable, Δ, that represents a one-period income shock and enters directly into the budget constraint. The marginal propensities to consume, save, and repay debt are the difference between the policy functions with the shock minus the policy functions without the shock, divided by the size of the shock. While technically the "marginal" propensity implies that $\Delta \to 0$, we follow the terminology in the literature of marginal propensities for shocks small relative to income.

4 Coholding and marginal propensities

This section analyses the role of coholding in our model for the determination of marginal propensities to consume, save and repay debt. We first describe our calibration strategy and validate our model against the data. We then illustrate the importance of considering the distribution of assets and debt jointly for the gradient between marginal propensities

and net liquid wealth.

4.1 Calibration

The model is calibrated to monthly frequency. Table 2 presents the calibrated parameters. We select a standard value of risk aversion $\gamma = 2$. We take the interest rate on savings and the interest rate spread on credit card debt from Telyukova (2013) and set it to $r = 0.0033$ and $\delta = 0.0074$, respectively. This corresponds to an annual interest rate on saving of 4 percent and an annual interest rate on credit card debt of 14 percent. We also base the share of liquid consumption on the detailed analysis in Telyukova (2013) and set it to $\theta = 0.683$. Borrowing is allowed up to approximately two months of average monthly income, $\phi = 2.2$, in line with the analysis by Kaplan and Violante (2014) who find a limit of 74 percent of quarterly income. We take the income process from Gelman (2021) who estimates an AR-1 income process using financial accounts data. This yields a persistence parameter $\rho = 0.096$ and variance of the innovation $\sigma_y^2 = 0.039$. This process is meant to capture transitory variations in income and abstract from permanent differences across households.

The only parameter that we calibrate inside the model is the discount factor β, using the 75th percentile of liquid debt-to-income in the SCF as a target. Liquid debt is defined as credit card debt, measured by the balance due after the last statement was paid. Liquid assets are defined as the sum of checking and savings accounts plus idle money in brokerage accounts. We target the 75th percentile instead of the median because the median household does not hold any liquid debt. Moreover, we target moments from the SCF instead of the SCE because the SCF provides a more accurate picture of *revolving* credit card debt, whereas the SCE only asks about the current stock of total credit card debt. Note that key moments of our analysis are predominantly untargeted: the distribution of liquid assets-to-income, the share of co-holders and levels and slopes of marginal propensities to consume, save and repay debt. We compute the latter by simulating quarterly responses to an unanticipated change in income of roughly 10 percent of average monthly income.[1]

4.2 Results

Table 3 reports the results of our calibration exercise. As our primary calibration target, the model matches the 75th percentile of liquid debt holdings exactly. Both in the data

[1]Note that we compute MPCs out of lump-sum changes in income while the SCE asks about income changes which are proportional to income. Recomputing MPCs out of proportional income changes yields similar results.

Table 2: Baseline calibration

Parameter	Description	Value	Source/Target
External			
γ	Risk aversion	2	Standard
r	Interest rate	0.0033	4.00% APR
δ	Credit card spread	0.0074	9.63% APR
θ	Share of liquid consumption	0.683	Telyukova (2013)
ϕ	Borrowing limit	2.2	74% of quarterly income
ρ_y	Persistence of y_t	0.096	Gelman (2021)
σ_y^2	Variance of innovation in y_t	0.039	Gelman (2021)
Internal			
β	Discount factor	0.9926	75th pct. of liquid debt-to-income

and the model, a household at the 75th percentile of the distribution holds debt equal to 42 percent of monthly income. At the same time, and despite its simplicity, the model matches fairly well untargeted distributional moments. Consistent with the data, the median household holds a negligible level of liquid debt at six percent of monthly income. On the asset side, the model slightly overstates the holdings of liquid assets. The median household in the model holds liquid assets worth 87 percent of monthly income compared to 51 percent in the data. This also translates into liquid wealth holdings which are somewhat larger than in the data. Moving on to the joint distribution of liquid assets and debt, the model generates a sensible share of co-holders. 37 percent of households co-hold liquid assets and debt in the model compared to 25 percent in the data.[2]

With respect to marginal propensities to consume, repay debt and save, the model generates average propensities that are very close to the empirically observed ones. The average household in the model consumes around 14 percent of an unexpected income windfall, uses 39 percent to repay debt and saves the remainder. The model matches particularly well the average MPRD, which is 37 percent in the data. The average MPC generated by the model is slightly lower than in the data, but close to the one generated by a conventional two-asset model with a liquid and illiquid asset (Kaplan and Violante, 2014). This is particularly noteworthy as our model does not require the presence of wealthy, but illiquid households – commonly referred to as wealthy hand-to-mouth – to generate high MPCs.

[2]We define co-holders as households whose liquid asset and debt holdings exceed 10 percent of average monthly income.

Table 3: Comparison of model and data moments

	Data	Model
Targeted		
75th pct of liquid debt	0.42	0.42
Untargeted		
Median liquid debt	0	0.06
Median liquid assets	0.51	0.87
Median liquid wealth	0.21	0.74
% of co-holders	25	37
Avg. MPC	18.7	13.6
Avg. MPRD	37.3	38.6
Avg. MPS	44.0	49.1

Notes: Liquid assets, debt and wealth are expressed relative to monthly income. Liquid assets are defined as the sum of checking and savings accounts plus idle money in brokerage accounts. Liquid debt is defined as credit card debt, measured by the balance due after the last statement was paid. Balance sheet data are taken from the SCF.

4.3 Marginal Propensities and the Distribution of Liquid Assets and Debt

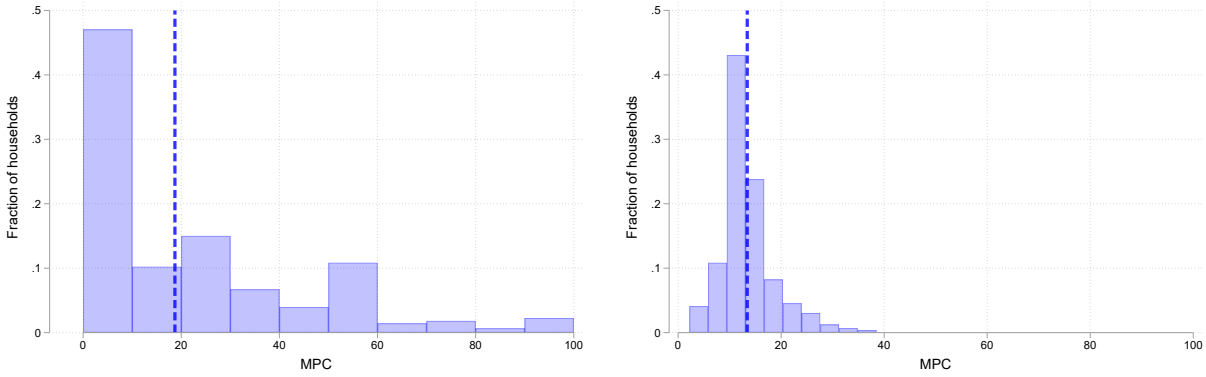
So far, we compared selected moments of the distribution of liquid assets, debt and marginal propensities across model and data. Now, we extend our analysis to the full distribution of these variables and study how marginal propensities vary across different levels of assets and debt, both jointly and in isolation.

We begin by examining the distributions of MPCs and MPRDs in the model and in the data. Panel (a) of Figure 3 shows that the model reproduces the right-skewness of the MPC distribution. While most households have MPCs close to zero, a non-negligible mass has substantially higher MPCs, indicating hand-to-mouth behavior. With respect to the MPRD, the model generates the empirically observed bi-modality (Panel (b) of Figure 3). Most households either do not repay any debt at all in response to an income windfall, potentially because they do not hold any debt, or they use almost all of it to repay debt, with few households in-between.

We next exploit the granularity of the data and inspect to what extent the model matches the marginal propensities across the distribution of liquid assets, debt and wealth. Figure 4 shows that irrespective of the underlying distribution, the slopes of the marginal propensities are closely aligned between model and data. Starting from the distribution

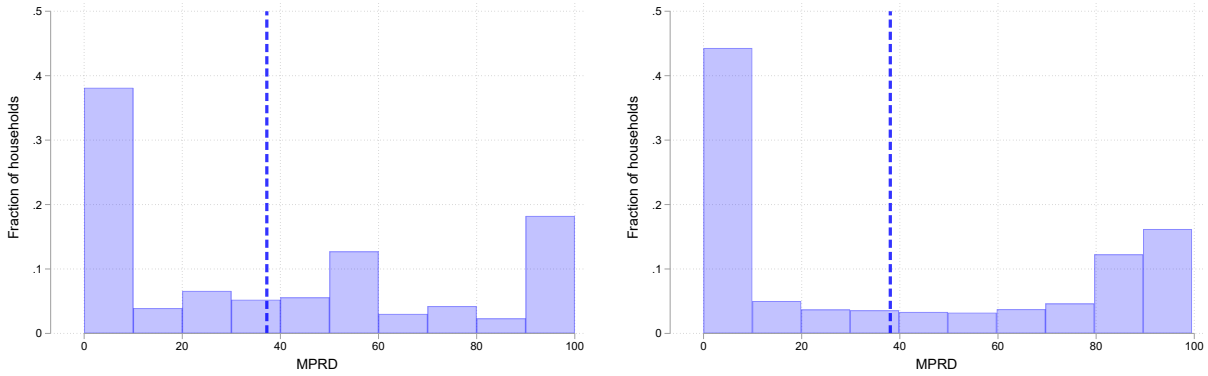
Figure 3: Comparison of Marginal Propensities in the Data and Model

(a) Marginal Propensity to Consume



(i) Data (ii) Model

(b) Marginal Propensity to Repay Debt



(i) Data (ii) Model

of liquid assets, the MPC is relatively flat and fluctuates around its average level. The MPRD is decreasing in the level of assets while the MPS is increasing. With respect to the distribution of liquid debt, the MPC is slightly decreasing in the level of debt. As for liquid assets, the MPRD and MPS move in opposite directions. The MPRD is increasing while the MPS is decreasing in debt. Finally, the behavior of marginal propensities across the distribution of liquid wealth is particularly illustrative. The MPC is similar across all levels of wealth. This stands in stark contrast to the predictions of conventional models which assign high MPCs to low-wealth, or liquidity-constrained households. In our model, a large share of low-wealth households holds substantial amounts of debt, reducing their consumption response in favor of higher debt repayments. Conventional models, instead, classify households as either savers or debtors, thereby abstracting from co-holding and masking substantial differences across allegedly hand-to-mouth households.

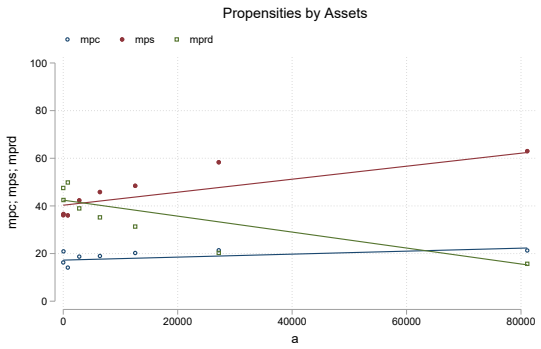
To illustrate the importance of considering the joint distribution of assets and debt, Figure 5 plots averages propensities by asset and debt quartile. This figure is informative about the heterogeneity of propensities across debt levels, holding assets fixed. Abstracting for a moment from the debt dimension, both data and model show that MPCs are relatively stable across the distribution of assets while the MPS is increasing and the MPRD is decreasing, in line with Figure 4. Once we zoom into the distribution of debt for a given asset quartile, we see that across most levels of assets, the MPC is decreasing in debt, while the MPRD is increasing. This stands in contrast to what conventional models would predict. More debt, holding assets constant, implies lower wealth, and thus a higher MPC. In our model, however, households have a strong desire to repay debt due to high interest rates.[3]

Next, we revisit the regression analysis performed in Section 2.2. Instead of performing the regression analysis on observational data, we now perform the same analysis on a simulated cross-section of households from the model. To ensure consistency between the data- and model-based regressions, we first partial out the effect of household characteristics that we observe in the data but that we do not capture in the model. We then use the adjusted marginal propensities in the regressions. Table 4 compares the estimated coefficients across data and model. The model captures the relation between marginal propensities and liquid debt relatively well, in particular for the MPC. It predicts that 1000$ more in debt reduces the MPC by 0.31 compared to 0.23 in the data. Different from the data, the model predicts that a higher stock of liquid assets is associated with a lower

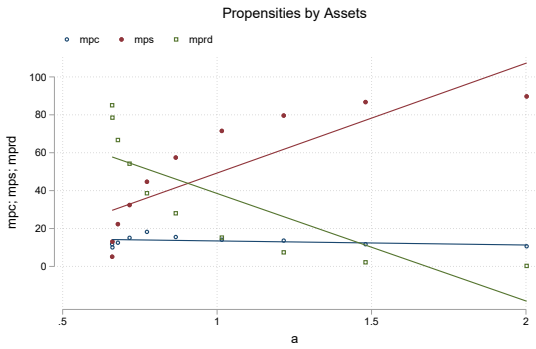
[3]Note that the model does not match the right tail of co-holding, i.e. households that simultaneously hold very high levels of assets and debt which results in missing bars in the right panel of Figure 5.

Figure 4: Marginal Propensities Across the Distributions of Balance Sheet Items

(a) Liquid Assets

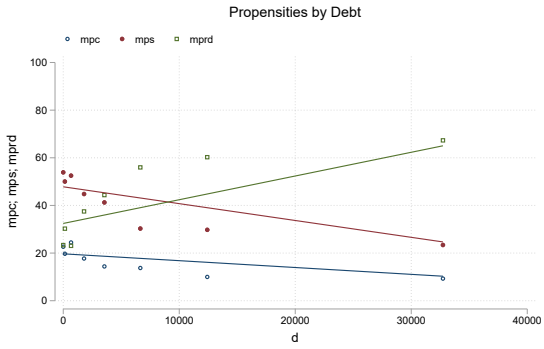


(i) Data

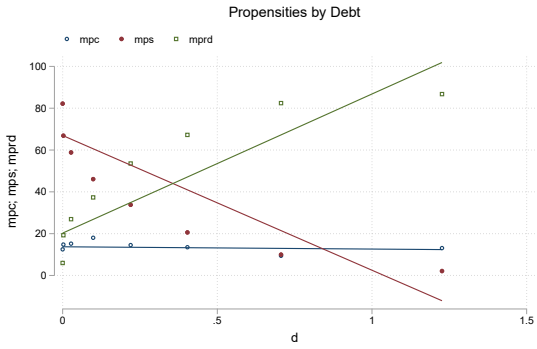


(ii) Model

(b) Liquid Debt

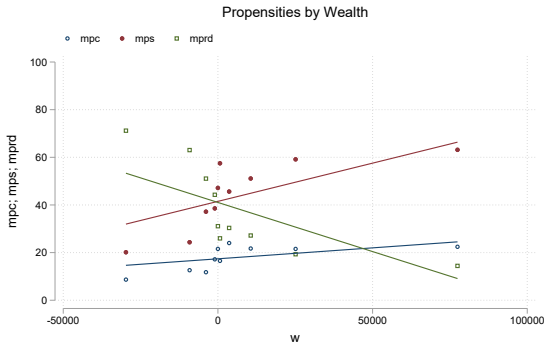


(i) Data

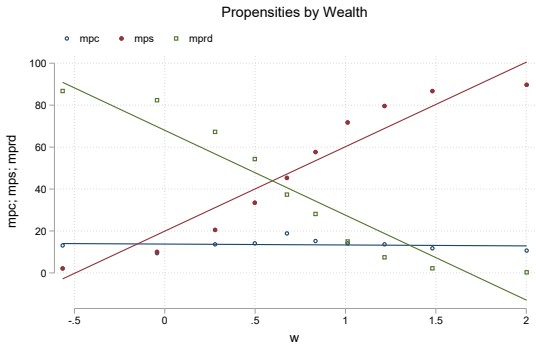


(ii) Model

(c) Net Liquid Wealth

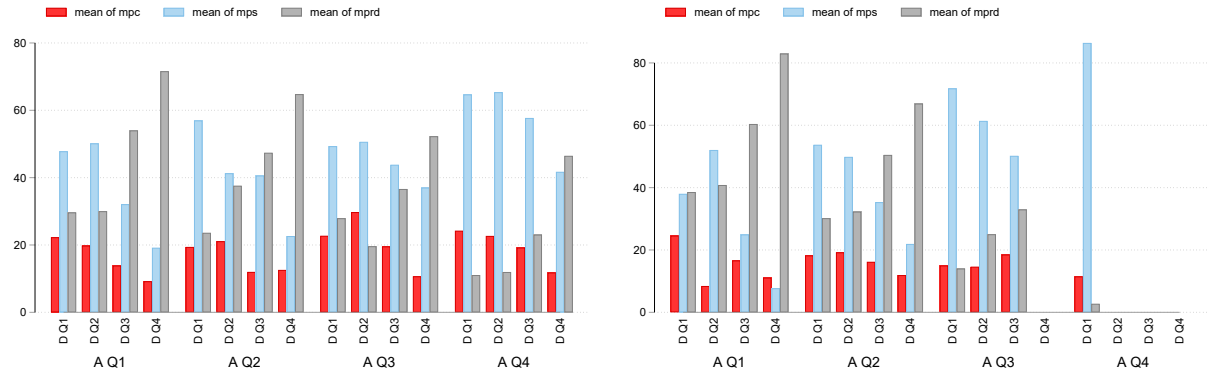


(i) Data



(ii) Model

Figure 5: Marginal propensities across the joint distribution of assets and debt



(a) Data

(b) Model

MPC. It therefore preserves the traditional role of liquidity as insurance against temporary income changes. With regards to marginal propensities to save and repay debt, the model agrees with the data on the sign of the relation with liquid assets and debt, but not on the magnitude. This is explained by the fact that the model does not match well the joint distribution of assets and debt in *levels*, in particular the respective right tails of the distributions. However, note that the model captures the idea that liquid assets and debt explain relatively more of the variation in the MPS and MPRD than in the MPC, as indicated by the higher R-squared.

Table 4: Regressions of Marginal Propensities on Household Liquid Balance Sheet: Data vs Model

	Data			Model		
	Spend	Save	Repay Debt	Spend	Save	Repay Debt
Liquid Assets	0.037	0.214***	-0.250***	-0.280***	2.511***	-2.290***
	(0.021)	(0.030)	(0.028)	(0.009)	(0.041)	(0.042)
Liquid Debt	-0.229***	-0.640***	0.870***	-0.310***	-2.837***	3.174***
	(0.053)	(0.080)	(0.110)	(0.013)	(0.046)	(0.050)
N	2578	2578	2578	9800	9800	9800
adj. R2	0.015	0.073	0.110	0.058	0.549	0.551

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Wealth and debt expressed in thousand USD. Model variables rescaled to match absolute level of pct75 of debt.

Finally, we perform a simple exercise to illustrate that the composition and not just the level of wealth matters for marginal propensities. We first regress marginal propensities on liquid wealth alone. We then add liquid debt to the regression. A statistically

significant coefficient on liquid debt then suggests that the amount of debt held matters for marginal propensities beyond its mechanical effect on the level of wealth. Tables 5 and 6 report the results of this exercise. Across both data and model, higher liquid debt, holding liquid wealth fixed, is associated with a lower MPC. Notably, the model predicts that for a given level of wealth, $1000 more in debt reduces the MPC by twice as much as $1000 more in wealth, holding debt fixed. The importance of considering assets and debt jointly also emerges from an inspection of the R-squared. Including liquid debt on top of liquid wealth in the regression substantially increases the variation that is explained by the regressors.

Table 5: Regressions of Marginal Propensities on Liquid Wealth and Debt: Data

	(1) Spend	(2) Spend	(3) Save	(4) Save	(5) Repay Debt	(6) Repay Debt
Liquid Wealth	0.070***	0.037	0.288***	0.214***	-0.357***	-0.250***
	(0.018)	(0.021)	(0.028)	(0.030)	(0.028)	(0.028)
Liquid Debt		-0.193**		-0.426***		0.621***
		(0.060)		(0.089)		(0.118)
N	2578	2578	2578	2578	2578	2578
adj. R2	0.008	0.015	0.058	0.073	0.082	0.110

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Wealth and debt expressed in thousand USD. Model variables rescaled to match absolute level of pct75 of debt.

Table 6: Regressions of Marginal Propensities on Liquid Wealth and Debt: Model

	(1) Spend	(2) Spend	(3) Save	(4) Save	(5) Repay Debt	(6) Repay Debt
Liquid Wealth	0.000	-0.280***	2.666***	2.511***	-2.710***	-2.290***
	(0.005)	(0.009)	(0.017)	(0.041)	(0.019)	(0.042)
Liquid Debt		-0.590***		-0.326***		0.884***
		(0.021)		(0.081)		(0.084)
N	9800	9800	9800	9800	9800	9800
adj. R2	-0.000	0.058	0.548	0.549	0.547	0.551

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Wealth and debt expressed in thousand USD. Model variables rescaled to match absolute level of pct75 of debt.

5 The Implications of Coholding for Fiscal Policy

This section studies the implications of co-holding for fiscal policy through the lens of our model. If the goal of fiscal policy is to raise aggregate demand, conventional models suggest to target households that hold low levels of liquidity as low liquidity is generally associated with high marginal propensities to consume. However, we have also shown that low liquidity can be associated with high levels of debt, which depresses the marginal propensity to consume. Hence, we will revisit the conventional logic of targeting the least liquid households with a particular focus on the joint distribution of liquid assets and debt.

5.1 Description of Fiscal Policy Experiment

We study a scenario in which the government sends debt-financed lump-sum transfers of 10 percent of average monthly income to parts of the population. Size-wise, this is in the ballpark of conventional fiscal programs, but somewhat lower than the latest rounds of stimulus checks that were sent out in response to the pandemic. To understand the implications of coholding for targeted policies, we study four different variants of the policy. In three of them, transfers are targeted towards the bottom 10, 30 and 50 percent of the income distribution. In the fourth scenario, everybody receives the transfer. Moreover, we also compare targeting based on income to targeting based on liquid wealth. While the latter is difficult to implement in practice, it sheds light on the importance of considering the composition and not just the level of wealth.

Table 7: Summary of Fiscal Policy Experiment Results

	Income-based		Wealth-based	
Targeted population	$\frac{\Delta C}{T}$	$\frac{\Delta D}{T}$	$\frac{\Delta C}{T}$	$\frac{\Delta D}{T}$
Bottom 10%	14.4	-58.0	13.5	-86.0
Bottom 30%	14.3	-49.1	12.1	-78.3
Bottom 50%	14.0	-46.7	13.6	-66.2
All	13.6	-39.3	13.6	-39.3

Notes: This table reports changes in aggregate consumption and debt relative to the transfer size for different fiscal policies. Transfers are debt-financed and lump-sum. The transfer size is 10 percent of average monthly income.

5.2 Results

Table 7 reports the results of this experiment. Focusing on income-based targeting first, the consumption response is similar across all scenarios at roughly 14 percent. In contrast to conventional wisdom, targeting based on income is therefore ineffective in generating higher stimulus. In a world in which households co-hold liquid assets and debt, targeting policies run the risk of confounding true and fake hand-to-mouth households. This is further exemplified by the wealth-based policies which produce similarly low MPCs across all variants.

However, targeting does matter for the portion of stimulus that is not consumed. The more concentrated the transfers are towards the bottom of the income distribution, the larger is the share of funds used for debt repayment. Broad-based policies, instead, primarily increase savings. This is further amplified once wealth is targeted.

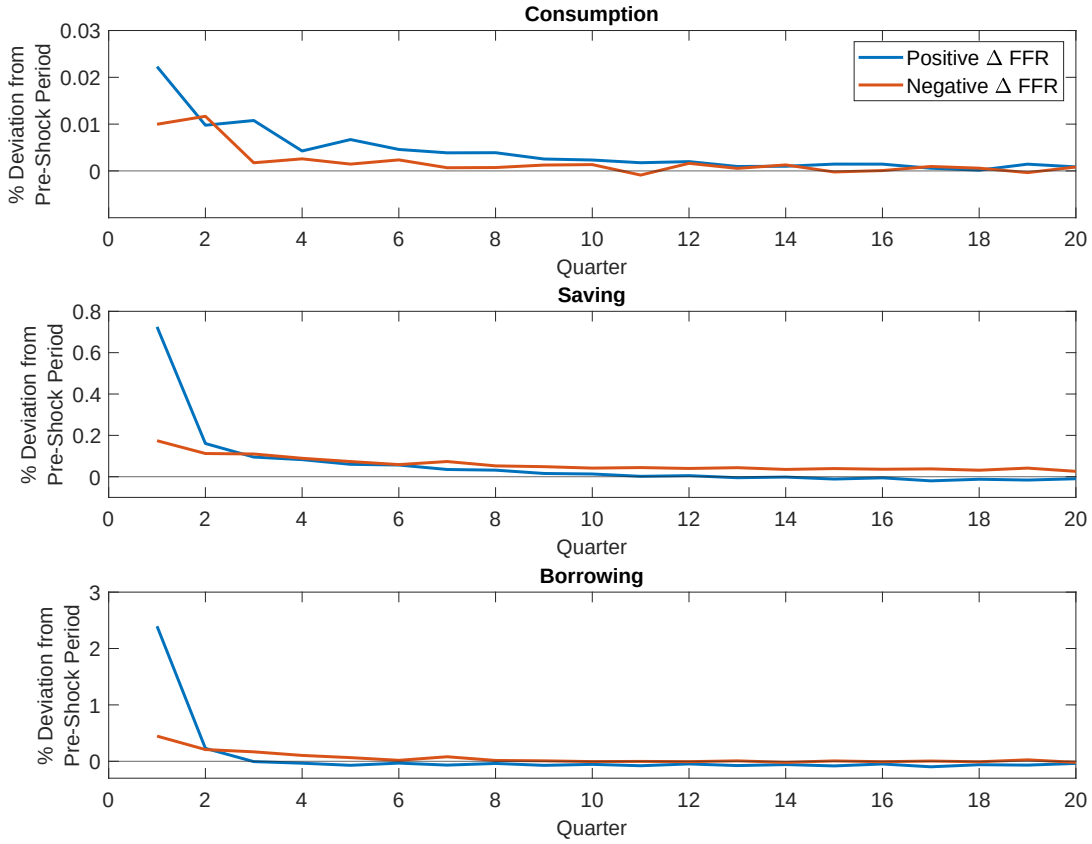
Taking stock, targeting fiscal stimulus towards less liquid households will only increase the aggregate consumption response if the targeted households are truly hand-to-mouth households with less liquidity coming from low liquid assets and low liquid debt. If fiscal stimulus ends up in the hands of households with high liquid debt, then regardless of liquid assets and net liquid wealth, the transfer will be used to pay down debt, not increase consumption. Although this is optimal from the household's perspective and therefore must be individually welfare-improving, this behavior may not be in line with the short-run policy objective of immediately increasing aggregate consumption.

6 The Implications of Coholding for Monetary Policy

Our model also allows for the analysis of monetary policy in a number of dimensions since households in the model make distinct saving and borrowing decisions while facing differential saving and borrowing rates. In this section, we continue with a partial equilibrium analysis, which isolates on the "direct effect" of interest rate changes on household behavior. While Kaplan et al. (2018) have demonstrated that in general equilibrium the "indirect effect" of interest rate changes on household behavior are the main driver of dynamics, our analysis sheds light on how allowing for coholding explicitly alters the transmission of monetary policy through household balance sheets.

The first set of experiments study shocks to each rate in the economy. Figure 7 plots the aggregate impulse response of consumption, saving, and borrowing to three shocks: (1) a 1% increase in the saving rate, holding fixed the borrowing rate, (2) a 1% increase in the borrowing rate, holding fixed the saving rate, and (3) a 1% increase in both the saving

Figure 6: Partial and Asymmetric Pass-Thru of Monetary Policy Shocks



Notes: Impulse responses of consumption, saving, and borrowing. In these specifications, pass-thru of a 1 pp shock to monetary policy is incomplete, leading to smaller shocks to the borrowing and savings rate. The "Negative Δ FFR" series is a -1 pp shock but reflected over the horizontal axis for the sake of comparison. Baseline calibration as described in Section 4.1.

and borrowing rates.

In Panel (a), a 1 pp shock to the saving rate increases consumption by 0.03% relative to the pre-shock period, while a 1 pp shock to the borrowing rate decreases consumption by 0.06%. When both rates increase by 1 pp, consumption decreases by roughly 0.03%, implying a nonlinearity in the shocks and that the borrowing rate effect dominates the saving rate effect. In Panel (b), a 1 pp shock to the savings rate increases saving by 0.6% and a 1 pp shock to the borrowing rate decreases saving by almost 0.2%, while a shock to both rates increases saving by almost 0.8%. In this case, the nonlinearity in combining shocks is even stronger, as the total effect is positive and larger than even the savings shock on its own. A similar pattern obtains in Panel (c) for borrowing: a shock to the savings rate and the combined shocks both increase by roughly 1.6%, while a shock to the only the borrowing rate decreases borrowing by 1%.

6.1 Imperfect Pass-Thru of Monetary Policy

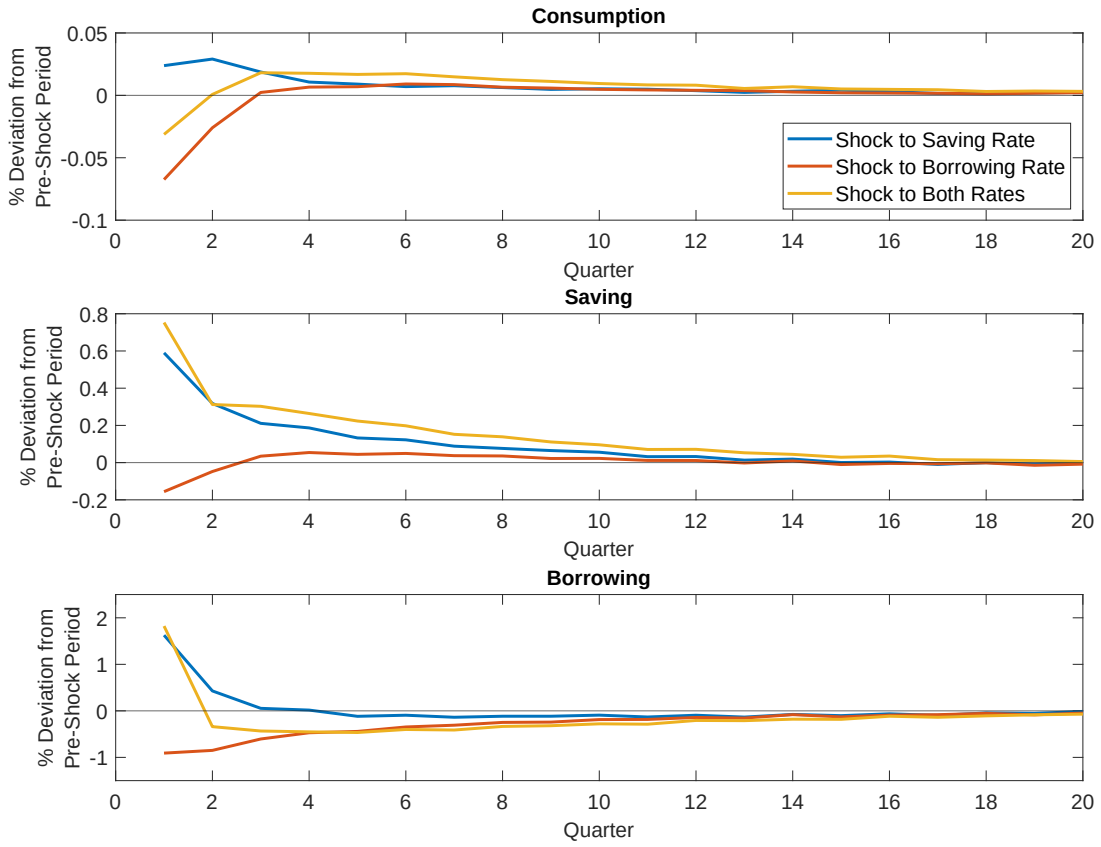
The model also allows us to study the impact of imperfect pass-thru to different interest rates in the economy. Table 8 presents estimates from a regression of changes in the Federal Funds Rate on changes in the deposit rate and credit card rate from 2000Q4 to 2022Q3. In panel (1), when all FFR changes are used in the estimates, a 1 percentage point increase/decrease in the FFR increases/decreases the borrowing rate by 0.4 pp and the saving rate by 0.05 pp. Focusing on positive changes to the FFR in panel (2), pass-thru to the savings rate is very similiar, 0.06 pp, while pass-thru to the borrowing rate increases to 0.52 pp. For negative changes to the FFR in panel (3), there is almost no pass-thru to the savings rate, 0.01 pp (with standard error 0.01 pp), while pass-thru to the borrowing rate decreases to 0.30 pp. Altogether, two key patterns emerge: there is less pass-thru to the savings rate than the borrowing rate, there is much more pass-thru of monetary policy increases versus decreases.

Figure 6 plots the aggregate impulse responses of consumption, saving, and borrowing to a 1 pp positive and negative change to the FFR based on based on the estimates in panels 2 and 3 of Table 8. For the sake of comparison, the impulse response for the negative shock is reflected across the horizontal axis.[4]

In response to a 1 pp increase in the FFR, the savings rate increases by 0.05 pp and the borrowing rate by 0.40 pp. Consumption increases by 0.02% relative to the pre-shock period. Saving increases by 0.7% and borrowing increases by 2.3%. On the other hand, in

[4]Specifically, the model is solved using the negative shock sequence, the IRFs are calculated, and the figure plots the IRFs multiplied by -1.

Figure 7: Monetary Policy Shocks: Changes in Saving and Borrowing Rates



Notes: Impulse responses of consumption, saving, and borrowing to 1 pp shocks to the savings and borrowing rates. Baseline calibration as described in Section 4.1.

Table 8: Estimates of Pass-Thru From Fed Funds Rate to Saving and Borrowing Rates

	(1) All FFR Changes		(2) Positive FFR Changes		(3) Negative FFR Changes	
	(a) Δ Savings Rate	(b) Δ CC	(a) Δ Savings Rate	(b) Δ CC	(a) Δ Savings Rate	(b) Δ CC
Δ FFR	0.05***	0.40***	0.06***	0.52***	0.01*	0.30***
	(0.00)	(0.07)	(0.01)	(0.16)	(0.01)	(0.11)
N	54	88	32	44	22	44
R^2	0.665	0.253	0.832	0.199	0.145	0.149

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

response to a 1 pp decrease in the FFR, the savings rate decreases by only 0.01 pp and the borrowing rate decreases by 0.30 pp. Consumption decreases by 0.01%, saving decreases by 0.2%, and borrowing decreases by 0.4%.

7 Conclusion

We build a quantitative model of household consumption, saving, and borrowing built on insights from the household finance literature on the coholding of credit card debt and liquid assets. The model is used to understand the empirical evidence on the marginal propensities to consume, save, and repay debt, which 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 repay debt and the joint distribution of liquid assets and debt that largely resemble the data.

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 wealth and low liquid assets, and the coholders, who have low net wealth and high liquid assets. These households appear identical if considering only net wealth, but behave very differently in response to transitory income shocks; the former have a large MPC and the second have a low MPC. Coholders have a low MPC because it is optimal for them to repay debt instead of increase consumption. This has massive implications for fiscal stimulus policy, especially as household indebtedness grows. 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 Further empirical evidence

This section explores to what extent our empirical results are generalizable by exploring other data sets.

A.1 Italian data

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 explore this in more detail now. The authors use the following question from the 2010 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 similar in spirit to the one posed in the SCE. However, there is no distinction between saving and repaying debt. Hence, we will only analyse the MPC. For the regression analysis, we closely follow the empirical strategy in JP14. In particular, we estimate a cross-sectional Tobit regression of the MPC on quantiles of liquid wealth, liquid debt and a set of covariates that includes age, gender, marital status, education, location and family size. Differently to JP14, we focus on liquid wealth and financial debt instead of cash-on-hand to be closer to the specification in the main body of the text. However, our results also hold when we use cash-on-hand instead of liquid wealth. Liquid, or 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 of liquid debt consists of bank liabilities, as credit cards are much less common in Italy than they are in the USA.

Table 9 reports the results of this exercise. Column 1 shows that the MPC is decreasing in liquid wealth, in line with the findings in JP14. The lower the quintile of the liquid wealth distribution, the higher is the MPC, compared to the fifth quintile which serves as the comparison group. Once we additionally control for the composition of liquid wealth by including terciles of the liquid debt distribution, we observe that for a given quantile of wealth, the MPC is again decreasing in the amount of debt that is held. This effect becomes stronger for higher quantiles of debt. Note that here, the comparison group consists of households without liquid debt and terciles are constructed conditional on holding positive amounts of liquid debt.

Table 9: Regressions of MPC on Household Liquid Balance Sheet

	(1) MPC	(2) MPC
I financial wealth quintile	0.175***	0.262***
	(0.019)	(0.021)
II financial wealth quintile	0.150***	0.169***
	(0.024)	(0.024)
III financial wealth quintile	0.109***	0.118***
	(0.020)	(0.020)
IV financial wealth quintile	0.044*	0.053**
	(0.019)	(0.019)
I financial debt tercile given pos. debt		-0.153***
		(0.022)
II financial debt tercile given pos. debt		-0.138***
		(0.024)
III financial debt tercile given pos. debt		-0.224***
		(0.026)
R-squared	0.071	0.078
Observations	7950	7950

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A.2 Dutch data

We next revisit the evidence in Christelis et al. (2019). The authors find a negative gradient between the MPC and cash-on-hand, defined as financial assets plus income. 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?

The survey allows households to choose between savings, 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 and a set of covariates that includes age, gender, and

household size. Differently to Christelis et al. (2019), we focus on financial wealth and financial debt instead of cash-on-hand to be closer to the specification in the main body of the text. However, our results also hold when we use cash-on-hand instead of liquid wealth. Note that financial debt excludes mortgage debt.

Table 10: Regressions of MPC on Household Liquid Balance Sheet

	(1) MPC	(2) MPC	(3) MPS	(4) MPS	(5) MPRD	(6) MPRD
II financial wealth quartile	-0.010	-0.024	0.088***	0.055*	-0.106***	-0.052*
	(0.013)	(0.014)	(0.023)	(0.024)	(0.022)	(0.021)
III financial wealth quartile	-0.038**	-0.054***	0.097***	0.058*	-0.102***	-0.038
	(0.013)	(0.014)	(0.023)	(0.025)	(0.022)	(0.023)
IV financial wealth quartile	-0.014	-0.030	0.143***	0.105***	-0.170***	-0.109***
	(0.014)	(0.015)	(0.025)	(0.026)	(0.022)	(0.022)
Low financial debt		-0.039**		-0.080**		0.142***
		(0.015)		(0.029)		(0.029)
High financial debt		-0.044**		-0.108***		0.171***
		(0.016)		(0.029)		(0.031)
R-squared	0.025	0.034	0.028	0.040	0.071	0.118
Observations	1332	1332	1326	1326	1332	1332

Notes: Heteroskedasticity-robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10 reports the results of this exercise. Column 1 shows that the MPC is decreasing in financial wealth, in line with the findings in Christelis et al. (2019). Households in higher quartiles of the financial wealth distribution have higher MPCs on average compared to the lowest quartile which serves as the comparison group. Once we additionally control for the composition of financial wealth by including measures of financial wealth, 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 percent), low financial debt holdings (below median conditional on positive debt) and high financial debt holdings (above median conditional on positive debt). The comparison group consists of households without financial debt. With respect to the MPS and MPRD, we observe similar patterns as in our baseline regression. The MPS is increasing in wealth, but decreasing in debt. The MPRD instead is decreasing in wealth but increasing in debt.