Master thesis

Revisiting wealthy hand-to-mouth households

Estimation of consumption response to transitory income shocks

Abstract

Opposing the life-cycle permanent income hypothesis, empirical evidence suggests large sensitivity of consumption to windfall changes in income. Since the fraction of liquidity constrained households with net worth close to zero is too small to reconcile this observation, Kaplan, Violante and Weidner (2014) argue that collective research has overlooked so called wealthy hand-to-mouth households (W-HtM) by not differentiating between the liquidity of household assets. Holding only little liquid wealth despite owning substantial illiquid assets, W-HtM households are liquidity constrained and sensitive to transitory income shocks.

With the objective to provide empirical support, I revisit the W-HtM insight in a context other than the U.S. and test the author's main results on its reliability by employing their alternative identification strategy of HtM consumption behaviour on longitudinal Italian household data.

It shows that HtM households are a stable feature of the Italian population. Pooled over 2002–2016, every fifth household is classified as HtM with 9.3% being poor and 12.3% W-HtM households, whereas the traditional measure based on net worth only identifies a total of 9.6% HtMs. I confirm the observation that W-HtM are similar to unrestricted N-HtM households in terms of demographic characteristics and portfolio composition.

Furthermore, this thesis extends the literature by estimating the marginal propensity to consume out of a transitory income shock for the three different household types. As predicted by theory, poor and wealthy HtM households exhibit higher sensitivity compared to N-HtM households. The results are robust for different subsets and modifications of the identification strategy as well as to an analysis of direct survey questions on household's liquidity.

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1. Introduction

Being able to predict the consumption response to transitory income shocks of households is crucial for the design and evaluation of fiscal and monetary policies.

The cornerstone to analyse the joint dynamics of income and consumption is the life-cycle permanent income hypothesis (LC-PIH) associated with Franco Modigliani (1954) and Milton Friedman (1957). The model states that households base their consumption on the anticipated permanent component of their income (expected value of lifetime resources) and temporary fluctuations of income are balanced out by saving or borrowing. Opposing the theory, collective empirical evidence suggests large sensitivity of consumption to windfall changes in income (Souleles (1999); Parker, Souleles and Johnson (2013); Fagereng, Holm and Natvik (2019)). Furthermore, the LC-PIH fails to explain why (individual and aggregate) consumption growth responds to predictable changes in income ("excess sensitivity"), although a key prediction of the LC-PIH is that consumption growth is determined by the real interest rate and subjective time preference, not by the time pattern of income (Hall, 1978).

The literature tried to explain this puzzle through the existence of a considerable share of "hand-to-mouth" consumers (HtM) in the population that do not behave according to the LC-PIH. HtM households are liquidity-constrained in the sense that they spend all their available resources each pay-period but would prefer to consume more if they could easily access savings or cheaply take out a loan. Since HtM households cannot draw on such additional funds, they have a high marginal propensity to consume (MPC) out of temporary income changes.

To determine the fraction of HtM households in a population, the standard approach uses microeconomic portfolio data to identify the households with net worth close to zero (total assets minus liabilities). For most industrial countries, this traditional method identifies less than 10% of households living in such extreme financial position – a number too small to sufficiently explain the high sensitivity of aggregate consumption to transitory fiscal stimulus policies observed in the data (Kaplan and Violante, 2014).

By using an alternative approach to analyse survey data on household portfolios which investigates HtM behaviour through the lens of liquid and illiquid wealth, Kaplan, Violante and Weidner (2014), KVW, suggest that there exists a type of household, past macroeconomic models missed to consider: Wealthy hand-to-mouth households (W-HtM). This class consists of households which hold little to zero liquid assets, but substantial amounts of hard-accessible illiquid wealth (e.g. real estate, pension plans, life insurance). Like (poor) hand-to-mouth households (P-HtM), which hold neither liquid nor illiquid assets at the end of the pay period, W-HtM households behave in the same fashion by letting consumption track swings in disposable income. Therefore, identifying W-HtM households could be of substantial importance to explain the observed strong consumption responses to transitory income shocks.

For that, Kaplan, Violante and Weidner (2014) examine a single cross-section of household wealth data for several countries (USA, Canada, Australia, UK, Germany, France, Italy, and Spain) and show that the prevalence of W-HtM households is a common feature of the wealth distribution across countries.

However, only for the USA, the fraction of HtM households is determined and analysed over more than one year. And more importantly, only for the USA the marginal propensity to consume out of transitory income shocks depending on the household status is estimated.

Acknowledging the existence of a W-HtM household type is a highly meaningful insight with crucial implications for the design of fiscal and monetary policy. Thus, it is important to evaluate the prevalence of W-HtM households in the data and estimate the consumption response to transitory income shocks also in contexts other than the USA.

Estimating the consumption response of a windfall gain is challenging since it requires a longitudinal dataset with information on income, consumption and wealth at the household level. For European countries, the joint Household Finance and Consumption Survey (HFCS) provides the necessary information, but with only two waves starting in 2010 not sufficient time periods to apply KVW's proposed methodology. However, the HFCS is partly based on the Italian "Survey on Household Income and Wealth" (SHIW) by the Banca d'Italia, which contains a panel component and from 2002 onwards the necessary information on household's portfolio to link consumption, income and household wealth.

Using the biennial Italian "Survey on Household Income and Wealth" (SHIW) from 2002–2016, the objective of my thesis is to (1) briefly review existing literature and investigate the theories which are concerned with the consumption response to income shocks; (2) revisit the wealthy hand-to-mouth insight, identify W-HtM households in the data for each year using KVW's identification strategy and examine the robustness of the feature over time and for different sub-groups and to (3) extend existing literature and provide further empirical evidence by estimating the marginal propensity to consume from transitory income shocks for households with different HtM status.

2. Literature review

2.1 Standard Life-Cycle Permanent Income Hypothesis

There are good reasons for studying private consumption in detail. As it is by far the largest component of aggregate demand, private consumption has an important impact on the business cycle. Furthermore, economic welfare depends to a large part on consumption and its counterpart, savings, is a precondition for capital formation and long run growth. Consequently, it is of great importance to have a profound understanding of the joint dynamics of income and consumption to be able to successfully design and evaluate fiscal or monetary policies.

Keynes's General Theory (1936) is often considered to be the origin of research on aggregate consumption and since then the subject of countless theoretical and empirical studies.

Relying on his intuition, Keynes states as a "fundamental psychological law" of any modern community that consumption expenditures only depend on current disposable income with a marginal propensity to consume (MPC) between zero and one. Furthermore, he argued that with higher absolute level of income the average propensity to consume (AVC) falls as higher proportions of income are being saved.

First empirical studies using cross-section household and short-term time series data (Ackley, 1961) were able to confirm Keynes' theory, showing that high-income households saved larger fractions than households with lower incomes. However, evidence based on long-run time-series suggested that aggregate consumption is instead roughly proportional to income and the MPC significantly higher than postulated by Keynes (Kuznets, 1942).

The most important theories which try to reconcile the cross-section and time-series aspects of the Kuznets paradox are the "life-cycle hypothesis" developed by Modigliani and Brumberg (1954) and the "permanent income hypothesis" associated with Michel Friedman (1957). The initially distinct approaches eventually merged into one framework which is the keystone of modern economic theory on consumption behaviour – the life-cycle permanent income hypothesis (LC-PIH).

While the model setups differ a little, the key assumption of both theories is that households wish to smooth their consumption when income fluctuates over time to maximize their intertemporal utility. The life-cycle hypothesis highlights the role of savings to transfer purchasing power from one period of life to another in order to balance consumption over a lifetime. The model is based on the observation that the level of labour income is usually low in early life, peaks in the second half of working life, before dropping after retirement. Consumption smoothing individuals would therefore prefer to borrow in early life (e.g. student loan), pay off the loans and accumulate wealth during high-income working life to use up the assets after retirement.

This approach implicitly states that households face an intertemporal budget constraint which links consumption at different periods of life (Fisher, 1930). The budget constraint restricts the present value of future consumption to be equal to the present value of lifetime income. The real interest rate at which households borrow and lend determines the trade-off between consuming in period t and period t+1. Furthermore, the consumption pattern is assumed to depend also on a fixed subjective discount factor measuring how much the agent cares about future consumption.

Instead of focusing on the life cycle, Friedman's "permanent income hypothesis" analysed more generally the problem of infinite-lived households that face fluctuating incomes. Most importantly, the model assumes that income consists of a permanent and a transitory component. A households permanent income is defined as its steady, expected long-term average income over life, whereas unexpected positive or negative deviations from this level are described as transitory income (i.e. the difference between current and permanent income). Consumption is driven by permanent income and not by transitory income, which has important implications for the pattern of savings. When current income is high, households will save more, whereas low current income might potentially lead agents to borrow in order to smooth their consumption.

The prediction about the consumption effect of permanent vs temporary changes in income according to the theory are straightforward. A temporary windfall gain or loss does not significantly affect permanent income, which drives current consumption. Consequently, the marginal propensity to consume out of a temporary change in income is small. However, permanent changes in income influence the expected average long-term income (permanent income) and therefore lead to large changes in consumption.

The lifecycle and the permanent income hypothesis manage to reconcile the different findings among household cross-sections and long-term time-series analysis, known as Kuznets

Paradox. It is plausible that a lot of the variation in the cross section comes from the fact that households are at different points of their life cycles, i.e. variation in temporary income is much bigger than the variation in permanent income which results in low MPCs. In the long run, most of the variation reflects long-term growth, thus variation comes from changes in permanent income. The marginal propensity to consume is close to one and aggregate consumption roughly proportional to income. Since the LCH and the PIH predict the same dynamic behaviour of consumers and only substantially differ with respect to the planning horizon (finite vs infinite lived households) most papers treat these theories as one unified framework, called the life-cycle permanent income hypothesis (LC-PIH).

2.2. The random walk of consumption

In 1976, Robert Lucas criticized that the evaluation of economic polices based on models using statistical relationships between historic data might be misleading. If the underlying decision rules (e. g. consumption function) are not structural, i.e. not policy-invariant, the relationship might break if policy changes and expectations changes as a result. Therefore, economic policy should be based on micro founded models rooted on deep policy-invariant parameters governing individual behaviour (preferences, technology, resource constraints) (Lucas, 1976).

Incorporating the implications of the Lucas critique, Hall (1978) formalised intertemporal dynamic optimization problems and introduced the concept of rational expectations into modelling consumption. Using the Euler equation approach, rational expectations and a quadratic utility function to characterize the consumer's optimal choice, Hall derived that consumption follows a random walk. Assuming households base consumption on their currently expected lifetime income (see LC-PIH), they change their consumption behaviour if news about their estimated permanent income are received (e. g. unexpected job promotion). Since changes in consumption reflect unpredicted surprises about the lifetime income, consumption growth should be unpredictable as well, i.e. following a random walk. This implies that lagged income should not have any predictive power for consumption growth ("excess sensitivity"). Consequently, a key prediction of the LC-PIH with certainty equivalence is that not the time pattern of income, but subjective time preference and real interest rate determine consumption growth. However, collective empirical evidence consistently shows that the correlation between lagged income and consumption growth is a robust feature of micro-level and aggregate data, which suggests a significant departure from the random walk hypothesis. Furthermore, it is common to estimate large sensitivity of consumption with respect to unexpected temporary income shocks which refutes the most salient prediction of the LC-PIH.

2.3 Precautionary saving motive and liquidity constraints

The standard life-cycle permanent income hypothesis with certainty equivalent preferences does not incorporate two important determinants of consumption behaviour, which current literature recognized as important to evaluate the consumption response to income changes: the precautionary saving motive and liquidity constraints.

The precautionary saving motive is induced by the presence of uncertainty regarding future income and has been widely researched as possible explanation for inconsistencies with the LC-PIH. If one removes Hall's (1978) assumption of a quadratic utility function, the combination of uncertainty about future income and convex marginal utility alters the consumption path. Households are incentivised to reduce current consumption and increase expected future consumption to self-insure against future income shocks. This "precautionary savings" motive provides an explanation for the observation that households with more volatile incomes tend to save more than consumers with more stable income patterns (Carroll and Samwick, 1998). Furthermore, Caroll (1997) shows that the precautionary saving motive decreases with household wealth: wealthy consumers have a higher ability to buffer their consumption against negative income shocks. As a result, they are more certain about future consumption and save less (and vice versa).

The other important determinant of consumption behaviour which has been emphasized by consumption models since the 1990s is the presence of liquidity constraints.

The LC-PIH proposed by Hall (1978) assumes that households have access to perfect capital markets in the sense that they can freely borrow/save in order to transfer resources over time to maintain a stable consumption profile. In reality, households pay higher interest rates than they receive and cannot take on loans at any rate. Thus, the existence of credit market frictions may be an important explanation for the observed excess sensitivity in the data.

The buffer stock models in tradition of Deaton (1991) and Caroll (1997) combine the precautionary saving motive with liquidity constraints and allow them to fully interact. In these models, buffer stock saving behaviour emerges if households are impatient in the sense that they want to spend down their assets (or even borrow against future income) to increase current consumption, but their precautionary saving motive to self-insure against future income shocks prevents them to draw down savings too far. Next to the presence of uncertainty regarding future income, households might face a borrowing constraint, which provides an additional incentive to accumulate a buffer stock of savings in order to prevent the constraint from becoming binding. For the classic buffer stock models, it is assumed that the optimal consumption function is concave, which means that the marginal propensity to consume is lower for wealthy households (Caroll and Kimball, 1996; Caroll 2001). Thus, the main determinant of household's MPC out of income shocks in these frameworks is their net wealth level.

Kaplan, Violante and Weidner (2014) criticise that most of these incomplete market models with idiosyncratic risk feature either a single asset or two assets with different risk profiles but no differentiation with respect to the degree of liquidity. Measuring hand-to-mouth behaviour only by the level of net worth might be misleading since this measurement does not pick up households which own sizeable amount of wealth, but still behave in a hand-to-mouth fashion because their assets are illiquid. The following review of literature on consumption responsiveness to income fluctuations underlines the importance to consider the liquidity of household's asset to analyse consumption behaviour in depth.

2.4 Consumption response to income changes

In order to evaluate the consumption response to fluctuations of income, it is important to differ between the nature of these income changes. The main distinction that can be drawn is between the consumption response to anticipated and unanticipated income changes.

One of the most salient prediction of the LC-PIH with certainty equivalent preferences is that anticipated income fluctuations should not have any predictive power for consumption growth. Despite that clear prediction, empirical results consistently show that consumption is excessively sensitive to expected income changes ("excess sensitivity").

For unanticipated income changes, the LC-PIH distinguishes whether income shocks alter the permanent component of income (expected value of lifetime resources) or if the income shock is of transitory character. Whereas permanent income shocks should lead to major revisions in consumption, transitory windfall gain or losses are expected to be smoothed by saving or borrowing. Additionally, more recent literature tries to gain further insights by distinguishing between the effect of positive and negative income shocks on consumption behaviour and examines the effect of different sizes of windfall gains. In the following, I review the most important empirical research on the distinct cases of income fluctuations and attempt to further highlight the importance of Kaplan, Violante and Weidner's new concept of approaching liquidity constraints and its implications.

2.4.1 Consumption response to anticipated income changes

First macroeconomic evidence refuting the LC-PIH with certainty equivalent preferences is provided by Flavin (1981). The author modelled an income process which decomposes income growth into a predictable and unpredictable component. Using U.S. time series data, Flavin estimated that consumption exhibits significant excess sensitivity to current income, which should not be the case if consumption follows a random walk. Another well cited approach testing Hall's random walk hypothesis was developed by Campbell and Mankiw (1989, 1990, 1991). Proposing a characterization of time series data in which aggregate consumption is generated by a share of "rule of thumb" households (consuming current income) and a fraction of forward-looking permanent income consumers, they estimate that with around half of households consuming their current income rather than the permanent component, the departure from the random walk LC-PIH is significant. Moreover, Campbell and Mankiw (1991) show in a cross-country setting that the fraction of "rule-of-thumb" consumers is negatively correlated with consumer debt. This result suggests that liquidity constraints are associated with excess sensitivity, since countries with low consumer debt might have less developed credit markets (Japelli and Pagano, 1989).

Starting in the 1990s, economists abandoned excess sensitivity test relying on macroeconomic data soon after empirical evidence pointed out that these tests are likely to be significant only due to aggregation bias in Euler equations for consumption (Attanasio and Weber, 1993). Even though estimating the consumption response to anticipated income changes using micro-level data is not less problematic, (i.e. due to measurement errors, finding truly exogenous instruments for income growth with predicative power, failure to control for non-separable preferences (Japelli and Pistaferri, 2010)), there is collective empirical evidence based on household data which suggests excess sensitivity of consumption.

Souleles (1999) examines the change of U.S. household expenditures after receiving a predicted income tax refund and finds significant excess sensitivity, which contradicts the standard LC-PIH. The paper compares the estimated MPC out of this anticipated income gain between households with little and substantial liquid wealth and finds significantly stronger consumption responses for constrained households. However, the study's determination of household liquidity is debatable, since only the sum of checking and savings accounts is defined as liquid wealth (often missing in HH data) without considering other liquid assets (e.g. directly held mutual funds, stocks and bonds). Acknowledging that this measure of liquid wealth might be insufficient to identify liquidity constrained households, Parker, Souleles and Johnson (2013) add age and net family income as proxies for liquidity constraints in a similar analysis of the U.S. stimulus payment of 2008. Exploiting the randomization in time of receipting the stimulus tax rebate, they estimate that the consumption responses to this well announced windfall gain are larger than implied by the LC-PIH for all households and significantly higher for older, lower-income, and home-owning households.

Expanding research on consumption behaviour following the U.S. fiscal stimulus payment, Misra and Surico (2013) showed that households which own real estate with substantial mortgage debt display the highest excess sensitivity to transitory income increases. Further empirical support for the theory that highly indebted consumers with illiquid assets are most likely to exhibit (wealthy) hand-to-mouth behaviour is provided by Cloyne and Surico, 2017, who investigate long-term expenditure data of British households and find that highly leveraged homeowners exhibit large consumption responses to transitory income fluctuations following tax changes. These last finding are particularly interesting for the topic of this thesis since most of Kaplan, Violante and Weidner's identified W-HtM households consume all their disposable income every period and experience high consumption responses to windfall gains because their wealth is bound in illiquid real estate.

2.4.2 Consumption response to unanticipated income changes

Many empirical studies attempt to estimate the marginal propensity to consume out of unpredicted income shocks in order to evaluate the effect of fiscal and monetary policy interventions. The greatest challenge researchers face is to isolate the exogenous income shocks necessary to be able to examine the consumption response following the shock. In order to do so, the literature considers three distinct approaches (Japelli and Pistaferri, 2010).

The first approach investigates consumption behaviour in a quasi-experimental setting by relying on episodes in which income fluctuates due to unpredicted exogenous events. These can be of transitory or permanent character (temporary unemployment vs occupational disability) and positive or negative shocks (lottery win vs illness). The second approach estimates MPCs by decomposing income shock in a temporary and permanent component and relying on covariance restrictions imposed by theory on the joint dynamics of consumption and income (e.g. no foresight). The third approach makes use of the relatively new feature of surveys to directly ask households how they would alter their consumption in response to hypothetical income shocks.

Following the first approach, Browning and Crossley (2001) exploit a legislative change of the Canadian unemployment income system to investigate the consumption response of households to a job loss with respect to the level of income replacement. The authors control for the shock to the permanent income component induced by the job loss by an IV approach and create separate subsets based on household characteristics to examine heterogeneity in consumption responses (liquid wealth, age, regular benefit user and family status). Consistent with the prediction of the LC-PIH, most households show small to zero reaction to the variation of the income replacement rate (transitory shock). However, with an elasticity of consumption expenditures to unemployment income of around 20%, households with no liquid assets at the job separation exhibit a significant consumption response to the transitory income shock. In contrast to most other papers, households expected to be liquidity constrained were not identified by zero net worth (total assets minus liabilities) but by a survey question which explicitly asked if the household possessed any liquid assets prior to the job loss. For that reason, it can be assumed that wealthy hand-to-mouth households are picked up as well, which strengthens the validity of the estimation.

Micro-level evidence of Fagereng, Holm and Natvik (2016) who analyse Norwegian administrative panel data to measure the consumption response to sizeable lottery prizes shows how relevant it is to distinguish liquid and illiquid assets. Classic buffer stock models assume that the optimal consumption function is concave, which means that the MPC is lower for wealthy households (Caroll and Kimball, 1996; Caroll 2001). Thus, the main determinant of household's MPC out of income shocks in these frameworks is their net wealth level.

Refuting classic incomplete markets models, the authors find that net wealth is not important to determine the MPC once liquidity is controlled for. Household's balance sheets in Norway are dominated by illiquid real estate. After controlling for liquidity, the authors find that households with greater net wealth do not exhibit lower MPCs since liquid assets matter. This result is in line with the wealthy HtM insight and further emphasizes the need to distinguish between liquid and illiquid assets.

Blundell, Pistaferri and Preston's (2008) approach examines consumption behaviour of households through the decomposition of income shocks in a temporary and permanent component and the use of covariance restrictions. For more details on the methodology please refer to section 4.1. Using the PSID with imputed data on consumption from the U.S. Consumer Expenditure Survey, the estimated MPC for the U.S.A. shows that consumption growth is nearly insensitive to transitory income shocks. An exception are low-wealth households which experience high responsiveness to transitory fluctuations. Furthermore, the marginal propensity to consume to permanent shocks was significantly lower than one, which suggests that households can partially insure themselves against permanent income shocks.

A weakness of the paper is that households are defined to be of low wealth if they belong to the bottom 20% of wealth distribution in the first year of observation. This definition of constrained households does not pick up wealthy hand-to-mouth households, which own little to zero liquid wealth, but substantial amount of locked-up illiquid assets. Consequently, the estimated responsiveness to income shocks might be imprecise, since a significant share of households facing constraints on spending are not examined separately.

The third approach exploits direct survey question on how households would allocate hypothetical windfall gains. Most recent research by Fuster, Kaplan and Zafar (2018) based on constructed survey questions emphasizes the role of liquid assets as crucial determinant for consumption behaviour regarding income fluctuations. Whereas the consumption response to positive unpredicted transitory income shocks is heterogenous (either zero or substantially positive and increasing in size), households are much more sensitive to unexpected windfall losses, while the spending response to losses is highly correlated with the level of liquid assets. Furthermore, only few households increase consumption in response to news about future gains, but most households cut down spending if they expect future losses. Interestingly, this does not seem to be related to credit constraints, since mostly all households turn down the offer of a one-year interest-free loan. This further highlights the explanatory power of liquid resources for the determination of household consumption behaviour.

3. Identifying hand-to-mouth households in the data

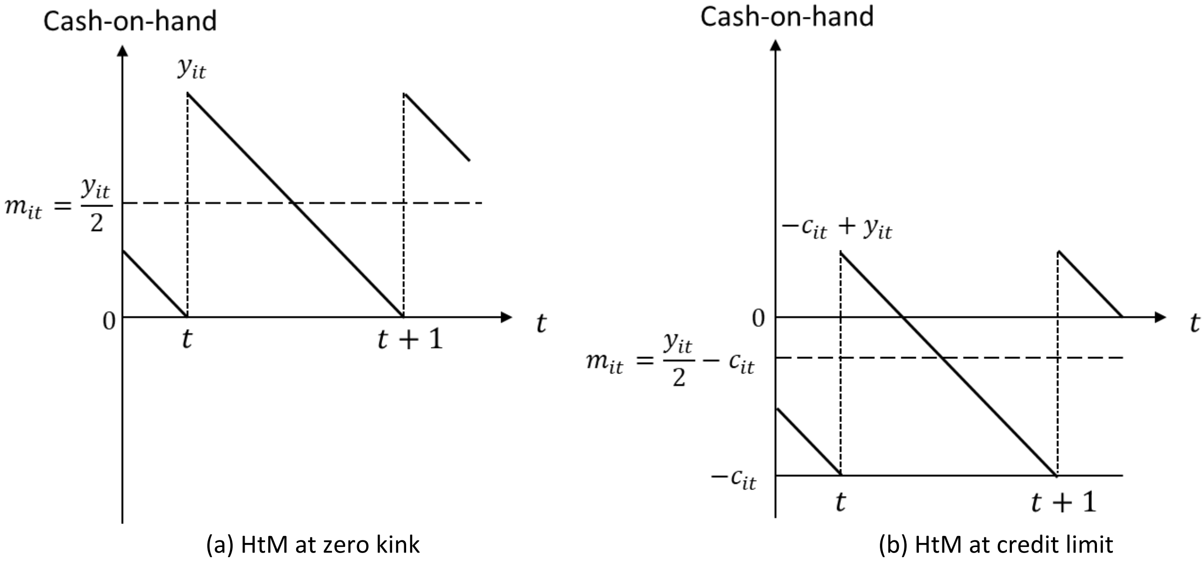
3.1 Methodology (I)

Kaplan, Violante and Weidner (2014)'s alternative approach to identify hand-to-mouth households in micro-level data uses a model featuring two assets with a different degree of liquidity (liquid and illiquid asset) as guiding framework. The authors argue that households face a trade-off between investing in an illiquid asset (housing, pension plan) or holding wealth in liquid assets (e.g. saving account). Whereas liquid wealth can easily be used to smooth consumption in response to a transitory income shock, illiquid assets are only accessible by paying high transaction costs. However, since illiquid assets usually yield a higher return in the long run, it generates a higher lifetime consumption. Therefore, being able to smooth consumption either means substantial opportunity costs of holding liquid wealth (e.g. in form of large cash balances) or in case wealth is stored in illiquid assets high access transaction costs. Additionally, households might need to take on credits at expensive rates to be able to smooth consumption. If households intuitively regard welfare losses from not smoothing as second order, they might prefer to live hand-to-mouth instead of using their wealth to adjust consumption to transitory income shocks.

Following KVW (2014)'s identification strategy, I will make use of the theory that for HtM households there exist two kinks in the intertemporal budget constraint at which the consumption response to transitory income shocks may be large: zero liquid wealth and the hard constraint of an unsecured credit limit. If a household ends its pay-period at one of these kinks, i.e. consumes all its disposable income and carries no liquid wealth to the next period, it is HtM. In contrary to P-HtM, W-HtM households do have positive net worth, however bounded in hard accessible illiquid assets.

The pay-period is defined as the interval from one steady income receipt to the next one. To keep up consistency with KVW's measurement, the baseline scenario assumes the pay-period to be bi-weekly. With regard to the theoretical definition of the hand-to-mouth status, it would be ideal to observe balances of liquid assets at the end of every pay-period. However, like most household surveys, the Italian "Survey on Household Income and Wealth" reports balances of liquid wealth at the interview date which is set randomly and differs between households. Sticking to the identification strategy, observed balances of liquid wealth/cash-on-hand are assumed to be an average over the period.

Let y_{it} denote total income, a_{it} the balance of illiquid assets, m_{it} the average holding of liquid assets and c_{it} the credit limit of household i over the pay-period t.



Graph 1: Illustration of HtM behaviour at the zero kink (a) and at the credit limit (b)

Households can exhibit hand-to-mouth consumption behaviour at two kinks of the intertemporal budget constraint – at zero liquid wealth and the borrowing limit. The dynamics of income and average cash-on-hand/liquid wealth for HtM households of the first case (pay-period starts and ends at the zero kink) is illustrated in panel (a) of Graph 1. Household's balance of liquid wealth is highest at the beginning of pay-period t after receiving income y_{it}. During the following period, the liquid resources are spent at a constant rate until they reach zero at $t+1$. Due to the assumption of consuming resources at a constant rate the average balance over the pay-period is equal to half of income.

The way to identify HtM households at the zero kink in every cross-section is then to count agents which hold average liquid wealth balances that are positive (to exclusively capture non-borrowing households) but equal or less than half their income per pay-period. Whether the identified hand-to-mouth households are classified as poor or wealthy depends on whether they hold any illiquid wealth.

More precisely, a household is considered poor HtM at the **zero kink** if

$$a_{it} \leq 0 \quad and \quad 0 \leq m_{it} \leq \frac{y_{it}}{2}$$

and wealthy HtM at the **zero kink** if

$$a_{it} > 0 \quad and \quad 0 \leq m_{it} \leq \frac{y_{it}}{2}$$

For the second scenario, all households which show hand-to-mouth behaviour at the **credit limit** ($-c_{it} < 0$) are counted. Panel (b) of Graph 1 illustrates the dynamics of income and liquid wealth/cash-on-hand for HtM households at the credit limit. These HtM households consume all liquid wealth as well as all its available credit each period. The differentiation between poor and wealthy HtM is determined again by the possession of illiquid wealth. Specifically, a household is counted as poor HtM at the **credit limit** if

$$a_{it} \leq 0, \quad m_{it} \leq 0 \quad and \quad m_{it} \leq \frac{y_{it}}{2} - c_{it}$$

and wealthy HtM at the **credit limit** if

$$a_{it} > 0, \quad m_{it} \leq 0 \quad and \quad m_{it} \leq \frac{y_{it}}{2} - c_{it}$$

To differentiate HtM households identified by the method above to unconstrained households with significant liquid and illiquid wealth, the latter are referred to as non hand-to-mouth households, or N-HtM.

Since illiquid wealth a_{it} is defined net of debt, i.e. for example housing prices net the amount of outstanding mortgage debt, it is possible that the balance of illiquid assets a_{it} is below zero. This situation occurs when the market value of housing property falls below the residual value of the outstanding mortgage. In this very rare event, households are counted as P-HtM despite owning real estate because they are not able to use the illiquid resources to smooth consumption even if they would be willing to pay the transaction costs.

In order to be able to compare consumption behaviour of the three household types (P-HtM, W-HtM and N-HtM) based on this new identification strategy to the traditional measurement, the share of HtM households based on net-worth is computed as well (i.e. HtM-NW). With net worth being the sum of average net illiquid and liquid wealth for household i over the pay-period t ($n_{it} = a_{it} + m_{it}$), a household is hand-to-mouth in terms of net worth if

$$0 \leq n_{it} \leq \frac{y_{it}}{2} \quad or \quad n_{it} \leq 0 \quad and \quad n_{it} \leq \frac{y_{it}}{2} - c_{it}$$

For the third and last approach to estimate the fraction of HtM households in the population I make use of a direct question in the SHIW, asking households if their income is sufficient to see them through to the end of the month (answers ranging from “with great difficulties” to “very easily”). The benefit of this approach is that it does not rely on reported balances of liquid assets and earnings and provides a valuable check on how reliable the other two measurements identify hand-to-mouth households.

3.2 Description of survey data

The “Survey on Household Income and Wealth (SHIW)” was first conducted by the Banca d’Italia in the 1960s and compromises in the more recent years data of around 8000 households distributed in over 300 Italian municipalities. Each wave roughly half of households have been interviewed in previous surveys (panel households). The SHIW dataset is subject of the empirical research of the thesis since it is one of the only existing micro-level longitudinal surveys, which gathers bi-yearly data on income, consumption <u>and</u> wealth, next to a set of household characteristics. Furthermore, the detailed data collection on various assets of a household’s portfolio makes it possible to divide wealth into two classes of assets based on their degree of liquidity. In order to be consistent in identifying HtM households, the definitions of liquid and illiquid wealth as well as income follow (if possible) the ones of Kaplan, Violante and Weidner (2014).

Income The definition of income used to identify HtM households in the data consist of all sources of family income that can be considered as steady inflows of liquid wealth. This includes labour income from salaries and wages of payroll employees and self-employment as well as regular government transfers like pension and arrears or public financial assistance (unemployment benefits, wage supplements, social security payments etc.). Furthermore, the definition of income compromises private transfers like alimony and child support plus other payments (e.g. scholarships) as long as they enter the household’s balance sheet regularly. In contrast to the income definition of KVW, the SHIW dataset used for this paper reports total earned and received income net of taxes. Since tax systems are usually designed to withhold taxes at the source, most households income disposable for consumption is net of taxes. Computing the share of HtM households with gross total income following section 3.1 would inflate the liquid asset threshold and lead to an overestimation of HtM households in the population. The measure of income excludes earnings from financial assets because capital income like dividends or interest are realized less frequently.

Consumption Consumption is defined as all non-durables expenditure of a household, including food eaten outside or at home, utilities of main dwelling (heating, electricity, water and gas) as well as expenses for services like health and education.

Liquid wealth The identification strategy described in section 3.1 follows a measure of net liquid wealth that results from subtracting liquid debt from liquid assets. Here liquid assets are defined as the sum of current and savings bank accounts plus directly held government securities, corporate bonds, investment funds and shares of listed and unlisted companies. Like most household wealth surveys, the Italian SHIW lacks information on the amount of cash stored physically in households. To make up for the shortcoming, I impute cash holdings by assuming that the median ratio of cash to the balance of checking and saving accounts is five percent for each household. This ratio is suggested by KVW after investigating the ratio of cash to sight accounts for two independent surveys in which cash holdings are reported (SCPC 2010 for the U.S. and the HFCS 2010 for Spain). Liquid debt is defined as total debt on all credit cards owned by the household and overdrafts on bank and post office accounts which accrue interest excluding business or company accounts.

Illiquid wealth Analogue to liquid wealth, the definition of illiquid wealth used for the identification of HtM households is computed net of debt. The most important component of net illiquid wealth is the current value of real estate (both residential and non-residential) less the amount of outstanding debt which must be repaid to extinguish the mortgage. Furthermore, it includes the value of life insurance policies and (private) pension plans as well as a list of illiquid investments like equity in partnerships, loans to cooperatives or options, futures, royalties etc.

3.3 Baseline sample selection

Following Kaplan, Violante and Weidner (2014), I exclude households with negative or zero reported total income. Furthermore, the sample is restricted to households in which the head is between 20 and 75 years old in order to concentrate the analysis on agents in their active (working) life. The baseline sample for identifying HtM households compromises eight sample years over the period from 2002 to 2016 and includes 51,901 observations. For a summary of the final data used please refer to Table 1.

Years	2002	2004	2006	2008	2010	2012	2014	2016
Initial sample size	8011	8012	7768	7977	7952	8151	8156	7421
Not age 20 - 75	1072	1123	1208	1306	1299	1430	1672	1701
Total income ≤ 0	105	37	51	63	83	61	190	200
Final sample size	6,848	6,855	6,513	6,612	6,571	6,665	6,305	5,532

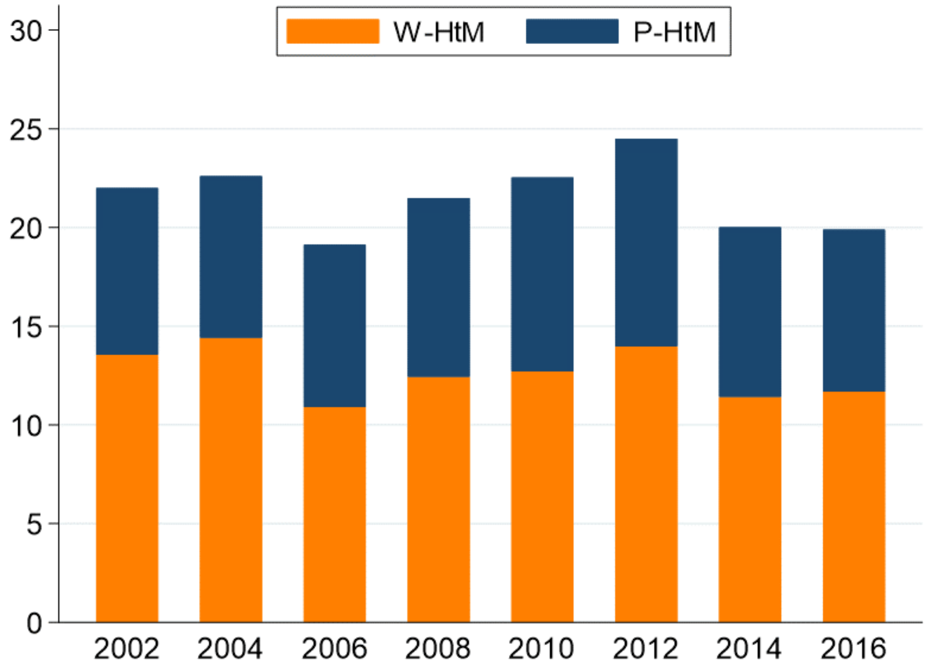
Table 1: Summary of final sample used for analysis

An overview of the composition of Italian household portfolios over the last periods is provided by Table A1 in the appendix. The values are adjusted for inflation using the World Bank's consumer price index for Italy retrieved from the Federal Reserve Bank of St. Louis (Index 2010 = 100).

The typical Italian household portfolio is based on some liquid wealth stored in savings accounts and cash and a significantly higher amount of illiquid wealth of which net real estate forms by far the most valuable asset. Whereas only a low proportion hold illiquid wealth in private retirement accounts or life insurances (between 3% and 6%), a majority of three quarters of households own some sort of housing. The homeownership rate remains steady, while housing's net value and with it the median of real holdings of illiquid wealth substantially decrease after 2010, possibly due to the plummeting real estate prices following the global economic prices (ECB, 2019). The low share of private retirement accounts of Italian households can be explained by a rather effective and generous public pension system. This view is supported by the gross pension replacement rate of 83% of income in Italy, i.e. gross pension entitlement divided by gross pre-retirement median income, which is significantly higher than the OECD average of 53% (OECD, 2019).

3.4 Distribution of hand-to-mouth households

The identification of the three different household types – poor, wealthy and non HtM – follows the method described in section 3.1. To keep up consistency with KVW, I assume a bi-weekly pay period and a credit limit of one month of income for each household as a benchmark.



Graph 2: Distribution of poor and wealthy HtM households

The distribution of hand-to-mouth households over the years from 2002 to 2016 is illustrated in Graph 2. Pooled over the entire sample period, it shows that every fifth Italian household is classified as hand-to-mouth (22%). Furthermore, the estimation reveals that there are more W-HtM (12.3%) than P-HtM households (9.3%) in the population. This result is remarkable, since it shows that more than half of HtM households own substantial wealth, however locked up in illiquid assets.

The significance of identifying HtM behaviour with this alternative measurement by Kaplan, Violante and Weidner becomes obvious when compared to the traditional approach based on net worth (see section 3.1). Instead of 22% of Italian households identified as (poor and wealthy) HtM, the traditional measure in terms on net worth characterizes only 9.6% as hand-to-mouth. In other words, it might be conceivable that this narrow approach which only considers families with extreme financial positions potentially misses out a significant fraction of HtM households. If the analysis of consumption response to transitory income shocks provides evidence that indeed both poor and wealthy HtM households exhibit higher MPCs, the implications for designing fiscal or monetary are substantial.

It shows that over the observed period from 2002–2016, the share of HtM households is a robust and steady feature of the Italian population as is the relative split between wealthy and poor HtM households. I test the results on its robustness by calculating the fraction of HtM households with modifications of the identification strategy concerning the definition of the pay-period of income (monthly instead of bi-weekly) and the credit limit (one year of annual total income instead of a month). Looking at the formulas for the identification of HtM households at section 3.1, it is expected that extending the pay-period of income from bi-weekly to a month leads to more households being identified as HtM due to a higher liquid wealth threshold. Conversely, assuming the credit limit to be one year of total income instead of one month supposedly results in less households being counted as HtM.

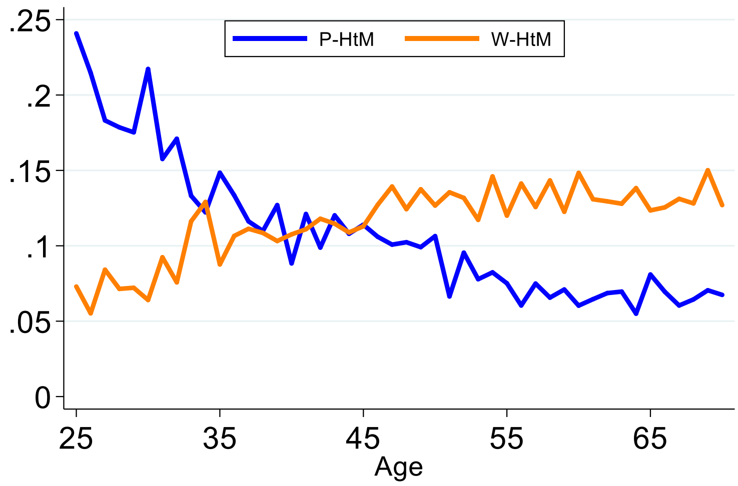
As expected, the assumption of a less frequent pay period increases the share of HtM households pooled over the period 2002-2016 by six percentage points (11.2% P-HtM and 16.4% W-HtM) compared to the baseline estimation (9.3% P-HtM and 12.3% W-HtM). Surprisingly, modifying the identification strategy regarding the credit limit has almost no effect on the fraction of HtM households (9.2% P-HtM and 11.6% W-HtM). The definition of HtM behaviour at the credit limit (section 3.1) states that only households with negative net liquid wealth are affected by changes of the credit limit. Since there are only very little Italian households with substantial negative net liquid wealth, extending the credit limit hardly affects the distribution of (HtM) household types.

Additionally, I make use of a direct question of the SHIW, asking households to which degree their income is sufficient to see them through to the end of the month. P-HtM households with neither liquid nor illiquid assets are likely to report difficulties in balancing their consumption and spending. Less obvious is that also households with a significant amount of illiquid wealth, but little to zero liquid wealth (W-HtM) can have difficulties to cover expenses if their illiquid assets are only accessible after paying high transactions costs. Pooled over 2002–2016, ca. 29% of Italian households report that they are only able to cover consumption with their income with “great difficulties” or “difficulties” and can therefore be classified as hand-to-mouth. Even though the share might be overestimated due to the subjective nature of the direct survey question, this alternative identification provides a useful check that the estimated 22% of (poor and wealthy) HtM households based on reported liquid/illiquid wealth, income and consumption is plausible in its magnitude.

These results also seem to be valid when comparing it to the single year cross-country estimation of KVW for Italy. In their analysis for the year 2010, KVW used data from the HFCS to identify HtM households in Italy and estimate that roughly 8% are classified as poor and 15% as W-HtM households. It is not surprising that the exact values of this analysis and KVW's paper are slightly different, considering that the income measurement of the SHIW survey used in this thesis is net of taxes whereas the HFCS reports gross income (i.e. likely overestimates the share of HtM households by inflating the thresholds of liquid assets).

3.5 Description of hand-to-mouth households

The analysis of demographic characteristics and portfolio composition shows that W-HtM households share more similarities with N-HtM than with P-HtM households despite the expected heterogenous consumption behaviour (see panel A1-A8 in appendix).



Graph 3: Age profile of HtM households (pooled 2002–2016)

Graph 3 depicts the fraction of poor and wealthy Italian HtM households by age. Whereas the share of P-HtM household is highest during young age and sharply falls until retirement, the fraction of W-HtM increases gradually to the age of 50 and stays constant in the second half of the life-cycle. Non and W-HtM households are on average around the same age (ca. 54), while P-HtM households are significantly younger (47).

Also, when it comes to other demographic characteristics like education, family or employment status, W-HtM households are more comparable to N-HtM households than to P-HtM households (see appendix A1-A4). It is especially true for the education level of the household head (here measured as fraction of households with secondary education or higher) and family status (stable marriage). Regarding the income path over the life-cycle, for W-HtM and N-HtM households the median income is hump-shaped with a distinct peak in their mid-50s. In contrast, the net income of P-HtM households remains relatively constant during the entire working-life, however on a significantly lower level (see appendix A5). The relatively smoother profiles of N-HtM households compared to poor and wealthy HtM households in panel A1-A8 can be explained by the significantly higher share of unconstrained N-HtM households in the Italian population.

Panel A6-A8 illustrate the differences and common features of the portfolio composition for the three household types. Unsurprisingly, poor and wealthy HtM households do not hold notable liquid assets, whereas for N-HtM households the amount nearly triples during the entire lifetime. Per definition, unlike non and W-HtM households, households classified as P-HtM also do not own any illiquid assets. Investigating the panel A6-A8, it is important to notice that W-HtM households are in possession of substantial amounts of capital bounded in illiquid assets comparable to the level of N-HtM households. This observation is valuable since it refutes the possibility that W-HtM households are essentially the same as P-HtM households, just with an insignificant amount of non-accessible savings. Furthermore, it is plausible that the consumption sensitivity to transitory income shocks of W-HtM households is larger to changes of moderate magnitude since for severe negative shocks they might prefer to pay transaction costs and dip into illiquid assets to hold consumption on a constant level.

Looking at panel A8 shows that this significant amount of illiquid wealth consists to the greatest part of housing property. The graph also reveals the striking similarities between the portfolio allocation of N-HtM and W-HtM households which both mainly hold illiquid assets in the form of real estate. That there is only a little share of wealth invested in other illiquid assets like life insurances or private pension plans can be explained by the rather effective and generous Italian public pension system (OECD, 2019).

The three different households types also vary with respect to the persistence of their hand-to-mouth status. As expected, the status of N-HtM households is clearly the most persistent, while the W-HtM status is most transient with an expected length of around 2.7 years. An explanation for the transitory nature of the household's status might be that HtM behaviour occurs at certain phases of the life-cycle and depends on socioeconomic factors and income dynamics and should not be regarded as an innate feature of the individual which determines consumption behaviour.

Concluding, the analysis of the demographic characteristics and portfolio composition of HtM households for longitudinal Italian households data shows that W-HtM households share more similarities with N-HtM than with P-HtM households which is consistent with KVW's observation for U.S. data.

4. Consumption response to transitory income shocks

4.1 Methodology (II)

The major result of the previous analysis is that over the observed period from 2002–2016, a constant fraction of Italian households can be identified as poor and wealthy HtM households. In theory, P-HtM households do not own neither liquid nor illiquid assets and cannot take on a loan easily to smooth temporary income shocks. W-HtM households also hold little liquid wealth, but a substantial amount of illiquid wealth. Since these assets are only accessible with high transactions costs, W-HtM households are assumed to exhibit a high consumption sensitivity to transitory income shocks as P-HtM households. In order to investigate the consumption behaviour of the different household types, I follow KVW (2014) and use the methodology proposed by Blundell, Pistaferri, and Preston (2008) to estimate the marginal propensity to consume out of a transitory income shock.

Blundell, Pistaferri and Preston's (2008) approach examines consumption behaviour of households through the decomposition of income shocks in a temporary and permanent component and the use of covariance restrictions.

The statistical decomposition approach measures income shocks as deviation from observable income determinants of households. Suppose that (log) income $\log Y$ can be decomposed into three different components: a set of socioeconomic characteristics Z which are known to household i at time t and affect its income, a permanent component P and a mean-reverting transitory component v. The income process for every household i can be written as:

$$\log Y_{it} = Z'_{it}\,\varphi_t + P_{it} + v_{it}$$

Consistent with several empirical studies (Abowed and Card, 1989; Mofitt and Gottschalk, 1995; Meghir and Pistaferri 2004), it is assumed that the permanent income component P_{it} follows a random walk of the form:

$$P_{it} = P_{it-1} + \varsigma_{it}$$

where ς_{it} is serially uncorrelated. The transitory component v_{it} follows a MA(q) process

$$v_{it} = \sum_{j=0}^{q} \theta_j \varepsilon_{qt}$$

with the order q of the process to be determined empirically and $\theta_0 = 1$.

In order to isolate (log) income net of its predictable individual components y_{it}, the effect of socioeconomic characteristics on income are deducted, i.e. $y_{it} = \log Y_{it} - Z'_{it}\, \varphi_t$. Thus, (unexplained) income growth can be presented as

$$\Delta y_{it} = \varsigma_{it} + \Delta v_{it}$$

The income process y_{it} is therefore specified as an error component model which consists of orthogonal permanent and i.i.d components with ς_{it} being the permanent shock and v_{it} the transitory shock (see Appendix A. for derivation).

To construct the residual y_{it} and the first-differenced residual Δy_{it} of log income, I regress the log of total income $\log Y_{it}$ on the following household characteristics: education and working status of the household head, family size, marital status, number of children, regional dummies, town size, cohort and year dummies and interaction of year dummies with education, working status and region. Analogue to the previous step, the log of total consumption expenditures is regressed on the mentioned household characteristics to construct the first-differenced residual of log consumption Δc_{it}. Appendix B. provides a detailed overview of the used regressors and the regression output.

The true coefficient which measures the transmission of a transitory income shock on consumption, the marginal propensity to consume (MPC), is defined as

$$MPC = \frac{cov(\Delta c_{it}, v_{it})}{var(v_{it})}$$

Under the assumption that households do not have advanced information or foresight about future transitory or permanent income shocks,

$$cov(\Delta c_{it}, \varsigma_{it+1}) = cov(\Delta c_{it}, v_{it+1}) = 0$$

and considering that (unexplained) income growth at t+1 is correlated with the transitory shock at t, but not with the permanent one, i.e. $cov(\Delta y_{it+1}, \varsigma_{it}) = 0$, then the proposed estimator

$$\widehat{MPC} = \frac{cov(\Delta c_{it}, \Delta y_{it+1})}{cov(\Delta y_{it}, \Delta y_{it+1})}$$

is a consistent estimator of the true marginal propensity to consume (MPC). To estimate the consumption response to a transitory income shock for the different household types, I implement the estimator by an IV regression of Δc_{it} on Δy_{it}, using Δy_{it+1} as an instrument (for the derivation of the proposed estimator, please refer to Appendix C.).

Since the described methodology to identify the transmission coefficient requires panel data with at least three periods, I limit the empirical analysis on households which appear in the survey more than two consecutive times. Following Blundell, Pistaferri and Preston (2008), I drop income outliers defined as households with an income growth of more than 500%, a reduction of above 80% or a total income of less than €100 a year. Similarly, I remove households which exhibit the same extreme positive or negative growth rates for consumption expenditures without changes in the number of family members plus households of which all consumption expenditures result from food spending. To be able to accurately estimate the income growth component determined by socioeconomic characteristics, households are dropped with missing information on education level or their region of residence. Over the pooled years 2002–2016, the final sample consists of 24,739 observations gathered from 5,315 surveyed households.

4.2 Results

Table 1 summarizes the estimated marginal propensities to consume (MPCs) out of a transitory income shock for each group of household type following (I) the identification strategy of Kaplan, Violante and Weidner and (II) the traditional approach based on net worth.

	(I)			(II)	
	W-HtM	**P-HtM**	**N-HtM**	**HtM-NW**	**N-HtM-NW**
Baseline	. 391***	.345***	. 316***	.348***	.329***
	(.0337)	(.0467)	(.0165)	(.0460)	(.0151)
Stable marital status	.390***	.361***	.316***	.356***	.330***
	(.0363)	(.0493)	(.0169)	(.0488)	(.0157)
Pay-period (monthly)	.376***	.343***	.316***	-	-
	(.0326)	(. 0429)	(.0167)		
Credit limit of one year	.400***	.352***	.315***	-	-
	(.0358)	(.0472)	(.0163)		

Table 2: MPCs out of transitory shock for different household types. Wealthy (W-), poor (P-), non (N-) and net worth (NW) hand-to-mouth (HtM) households. Robust standard errors in parentheses; level of significance: *** = 0.01, **=0.05, *=0.1.

As predicted by theory, the point estimates of the MPCs out of an unexpected transitory income shock are higher for poor and wealthy HtM households compared to the group of N-HtM households. Whereas poor and wealthy HtM households consume 39% and 35% of an unpredicted temporary change in income, N-HtM households consume only 31% within the period of two years.

In order to test the coefficients of the baseline estimation on its robustness, I compute the MPCs of non, poor and wealthy HtM households when modifying the assumptions of the definition of the credit limit (assumed to be one year of annual total income instead of a month) and pay-period of income (monthly instead of bi-weekly). Furthermore, I analyse the MPCs of the different consumption types if the sample is restricted to households with stable marital status over the entire period. Generally, the transmission coefficient for the group of W-HtM and P-HtM is higher than the MPC of N-HtM households which is in line with the prediction of the theory.

Comparing the transmission coefficients resulting from KVW's method to the traditional approach when households are divided into HtM households (HtM-NW) and non-HtM (N-HtM-NW) on basis of their net worth, it shows that the difference between the estimated MPCs, 33% and 35% for the baseline scenario, is smaller.

To test if the difference of MPCs between the household types is statistically significant, I include an interaction between the HtM-indicator and the predictor of the IV regression (Δc_{it} on Δy_{it}, using Δy_{it+1} as an instrument, i.e. $\Delta y_{it} \# i.HtM$, see Appendix AA) taking W-HtM households as base level for (I) KVW's identification strategy and HtM-NW households for the (II) traditional approach.

	(I)			(II)	
	W-HtM	**P-HtM**	**N-HtM**	**HtM-NW**	**N-HtM-NW**
Baseline	.393***	-.045	-.077**	.349***	-.020
	(.0337)	(.0575)	(.0368)	(.0464)	(.0485)
Stable marital	.391***	-.029	-.074**	.329***	+.027
status	(.0364)	(.0614)	(.0394)	(.0156)	(.0511)
Pay-period	.377***	-.033	-.060*	-	-
(monthly)	(.0326)	(.0536)	(.0357)		
Credit limit of	.402***	-.047	-.086**	-	-
one year	(.0359)	(.0591)	(.0388)		

Table 3: Testing significance of difference between MPCs. Wealthy (W-), poor (P-), non (N-) and net worth (NW) hand-to-mouth (HtM) households. Robust standard errors in parentheses; level of significance: *** = 0.01, **=0.05, *=0.1.

Even though the estimations might be somewhat imprecise due to the possible presence of measurement errors in the survey data, Table 3 shows that there is a statistically significant difference between the MPCs of W-HtM and N-HtM households in all investigated scenarios (ca. 8% lower in the baseline scenario). Conversely, the transmission coefficient of a transitory income shock on consumption is not significantly higher for HtM-NW households compared to N-HtM-NW households identified by the traditional approach based on net-worth.

To explain this result, it is helpful to investigate the composition of the two groups identified by the latter approach. While the group of HtM households identified on basis of (close to zero) net worth are nearly identical with the group of KVW's P-HtM households, the traditional measurement mistakes most of W-HtM households for N-HtM households which inflates the MPC of N-HtM-NW households. This comparison provides further evidence on the importance of differentiating household assets into two classes based on their liquidity instead of only taking into account net worth when examining HtM consumption behaviour.

Kaplan, Violante and Weidner's analysis does not investigate an interesting method to test the validity of their theory that emphasizes the role of liquid wealth of households to determine whether they exhibit hand-to-mouth behaviour.

Direct survey questions asking households to which degree their income is sufficient to see them through to the end of the month identify households which experience difficulties to cover their expenses. It is plausible that this group consist of households with neither liquid nor illiquid assets (P-HtM) but also of households with little to zero liquid wealth, but substantial non-accessible illiquid assets (W-HtM).

To test this alternative approach of identifying HtM behaviour and to investigate the significance of the liquidity of a household's portfolio, I start with splitting the sample into a group which reports having difficulties to cover expenses and the remaining households with no difficulties to see them through the month. The estimated transmission coefficient for the first group which is likely to have liquidity issues and exhibit HtM behaviour is with over 37% more than 11 percentage points higher than the other group with sufficient income and/or liquid means to cover consumption (MPC: 26%). The difference between the MPCs is statistically significant (p-value < 0.001).

Additionally, I analyse how poor and wealthy HtM households identified by KVW's approach answered the survey question and it shows that 94% of P-HtM households and 84% of W-HtM households reported that they usually have difficulties to see them through the month, whereas the majority of N-HtM households does not report such an issue.

This investigation emphasizes the valuable new insight of KVW's identification strategy: households are constrained and exhibit HtM behaviour, i.e. high consumption responses to unexpected income changes if they lack liquid assets to smooth consumption.

5. Discussion

My results provide further evidence for the association between the degree of liquidity of household's portfolios and their consumption sensitivity to transitory income shocks.

Admittedly, as in KVW (2014) the estimations might be imprecise due to the nature of the used methodology of statistically decomposing shocks into a permanent and transitory component and using covariance restrictions to estimate MPCs out of windfall income changes. A drawback of measuring income shocks as deviation from observable income determinants of households is that it builds on the strong assumption that each individual forms expectations on the same variables which might not reflect reality. Furthermore, assuming that income and consumption follow a particular process always bears the risk of a structural bias for the consumption rule, although the used processes in this thesis have been shown to fit data well by the empirical literature.

Even though the estimated transmission coefficients might be somewhat imprecise due to the drawbacks of the methodological approach explained above, the (statistically and economically) higher estimated MPCs for P-HtM and W-HtM households compared to N-HtM households are in line with research conducted after the release of KVW (2014).

Most recently Fagereng, Holm and Natvik (2019) analysed consumption behaviour after a transitory income shock in form of sizeable lottery prizes. Using the same assumption for the identification of household types as the baseline analysis of this thesis as described in section 3.1, the authors confirm that P-HtM as well as W-HtM households exhibit higher MPCs than unconstrained consumption-smoothing households (N-HtM).

The importance of providing estimates for MPCs out of income shocks also in contexts other than the USA becomes obvious if recalling that the latter are crucial to accurately design and evaluate fiscal and monetary policy. Since empirical research as well as the results above suggest the presence of a substantial share of W-HtM household in the population, this household type should be modelled separately to avoid a distorted view of the effects of economic policies on (aggregate) consumption. An example for this is provided by Ampudia, Georgarakos, Slacalek et al. (2018) who consider the heterogeneity of MPCs for different household types in their assessment of the distributional implications of ECB monetary policy on income and wealth and its propagation to consumption.

To fully understand consumption behaviour following income changes, it is also necessary to investigate the consumption response to income shocks of different sizes and signs. Kaplan, Violante and Weidner's (2014) simulation of their two-asset incomplete markets model featuring W-HtM households shows that the magnitude of the income shock matters for the consumption response (increasing windfall gains are associated with lower transmission coefficients). Furthermore, the consumption response to an unexpected transitory income loss is significantly larger than the MPC out of a positive lump sum income transfer. Besides recently published papers with partly inconsistent results (Christelis et al., 2017, Fusters et al., 2018 and Fagereng et al., 2019), the analysis of potentially asymmetric consumption responses to different shocks in magnitudes and signs should be intensified by empirical research.

6. Conclusion

The life-cycle permanent income hypothesis associated with Franco Modigliani (1954) and Milton Friedman (1957) provides a valuable framework to investigate the joint dynamics of income and consumption but fails to explain the observed large sensitivity of consumption to windfall changes in income which contradicts its main prediction that temporary fluctuations of income are balanced by saving or borrowing in order to smooth consumption.

A natural explanation for the puzzle is that there exists liquidity constrained "hand-to-mouth" households in the population which would prefer to consume more than they currently do if they could draw on additional resources in form of savings or cheaply accessible credit. However, the traditional approach to estimate the fraction of HtM households, i.e. to count financially fragile families with little to zero net worth (total assets minus liabilities) identifies not enough constrained HtM households to reconcile the observed large consumption responses.

Kaplan, Violante and Weidner (2014) argue that the traditional approach overlooks households with substantial amounts of illiquid wealth, but little to zero liquid assets. The authors suggest that W-HtM households are liquidity constrained due to their portfolio composition and exhibit large consumption sensitivity for which they find evidence for the U.S. by estimating the MPC out of a transitory income shock.

With the objective to provide more empirical support for the theory, I revisit the W-HtM insight in a context other than the U.S. and apply the author's alternative identification strategy on the Italian SHIW from 2002–2016.

The first main result of the analysis is that also for Italy, the prevalence of hand-to-mouth households is a stable feature of the wealth distribution. Pooled over the observed period, every fifth Italian household is classified as hand-to-mouth (22%) of which 9.3% are identified as P-HtM and 12.3% as W-HtM. In contrast, the traditional approach identifies only 9.6% of the population as HtM households. This shows that by not differentiating between liquid and illiquid wealth, a majority of W-HtM are overlooked due to their significant illiquid assets.

The severe consequences of the traditional method to overlook W-HtM households becomes obvious when the second main result is considered. I provide evidence that the estimated marginal propensity to consume out of a transitory income shock is higher for W-HtM and P-HtM than for N-HtM households. Even though the difference between the MPCs is relatively small, it is crucial to regard households with little liquid wealth as hand-to-mouth even if they hold substantial illiquid assets, since they behave in the same fashion as P-HtM households by letting consumption track swings in disposable income. Treating W-HtM as unconstrained households would significantly bias the predicted consumption response to unexpected income changes of the analysed population.

The third result further highlights the importance of treating W-HtM households as an independent type of household. The analysis of demographic characteristics and portfolio composition reveals that W-HtM households share more similarities with N-HtM than with P-HtM households. Whereas the latter type mainly consists of relatively young households with low income, W-HtM households are around the same age as N-HtM with a similar income profile. Furthermore, investigating the portfolio composition shows that W-HtM hold almost the same level of net illiquid wealth as N-HtM households (largely bound in real estate). This observation is valuable since it emphasizes that W-HtM are not essentially P-HtM with an insignificant amount of non-accessible savings. Consequently, it is plausible that the consumption sensitivity to transitory income shocks of W-HtM households is larger to changes of moderate magnitude since in case of severe negative shocks they might prefer to pay transaction costs and dip into illiquid assets to hold consumption on a constant level.

Concluding, this thesis provides further evidence that W-HtM households are liquidity constrained and exhibit similar large consumption sensitivity in response to transitory income shocks as P-HtM households but are closer to N-HtM households in terms of demographic characteristics and portfolio composition. To evaluate and predict the effects of fiscal and monetary policies, it is therefore crucial to include wealthy hand-to-mouth households as independent additional type in economic models.

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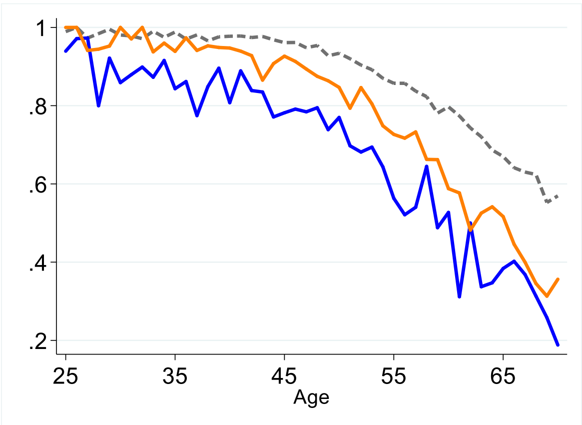
Appendix

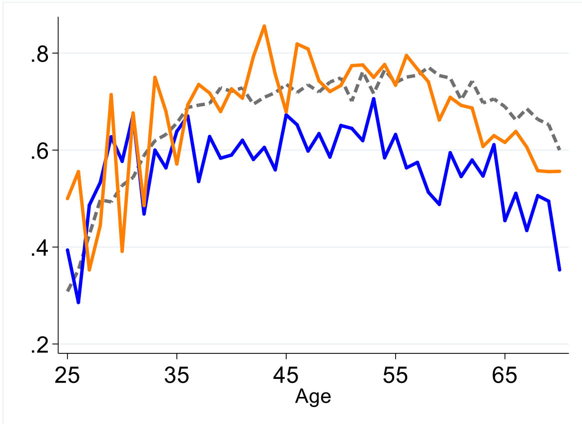
Table A1: Composition of Italian household portfolios

	2008		***2010***		***2012***		***2014***		***2016***	
	Median	Frac. > 0	Median	Frac. > 0	Median	Frac. > 0	Median	Frac. > 0	Median	Frac. > 0
Total income	24601	1	24355	1	21292	1	21763	1	20485	1
Net worth	169071	0.916	178094	0.911	152019	0.898	144407	0.915	132777	0.924
Net liquid wealth	6914	0.832	6957	0.815	4957	0.789	5439	0.826	5150	0.840
Savings account & cash	5371	0.835	5250	0.819	4708	0.788	4886	0.828	4888	0.842
Directly held stocks	0	0.040	0	0.039	0	0.054	0	0.053	0	0.037
Directly held bonds	0	0.163	0	0.168	0	0.178	0	0.193	0	0.152
Credit card debt	0	0.038	0	0.040	0	0.031	0	0.027	0	0.026
Net illiquid wealth	153468	0.745	160000	0.752	141634	0.756	137730	0.760	121045	0.757
Net real estate	153468	0.725	158000	0.729	141634	0.737	130285	0.736	111734	0.721
Retirement accounts	0	0.029	0	0.060	0	0.064	0	0.058	0	0.143
Life insurance	0	0.055	0	0.046	0	0.039	0	0.033	0	0.039

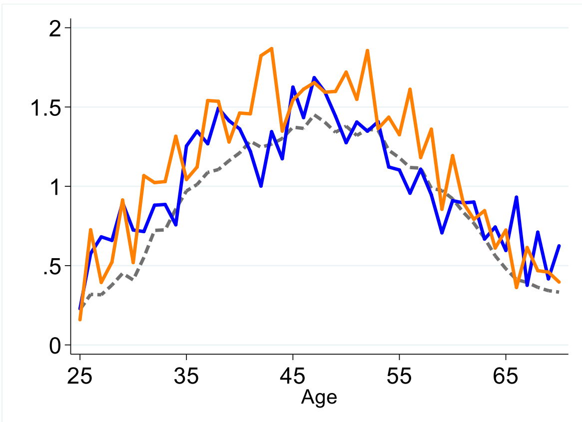
Panel A1-A4: Demographic characteristics of HtM households



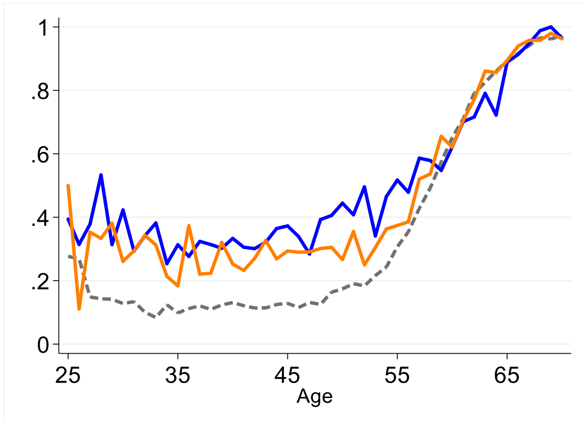
(A1) % HH with secondary education or higher



(A2) % married HH



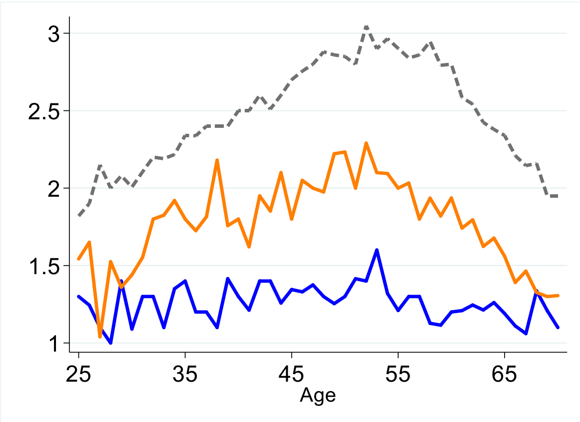
(A3) number of children



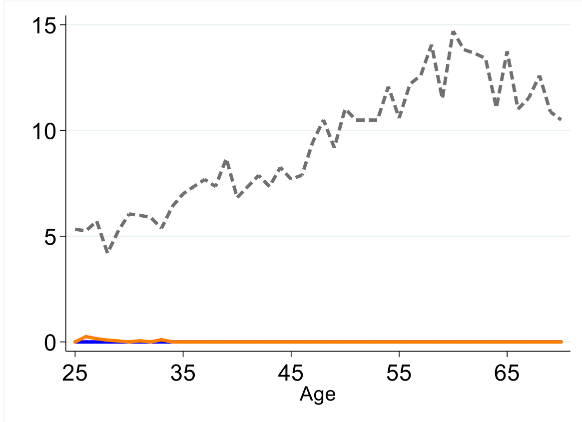
(A4) % unemployed HH

N-HtM P-HtM W-HtM

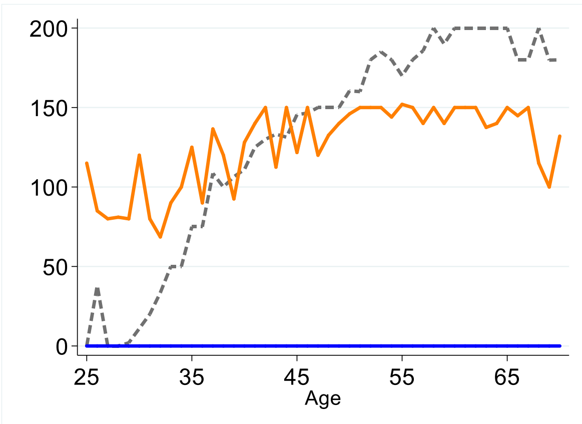
Panel A5-A8: Income and portfolio composition of HtM households



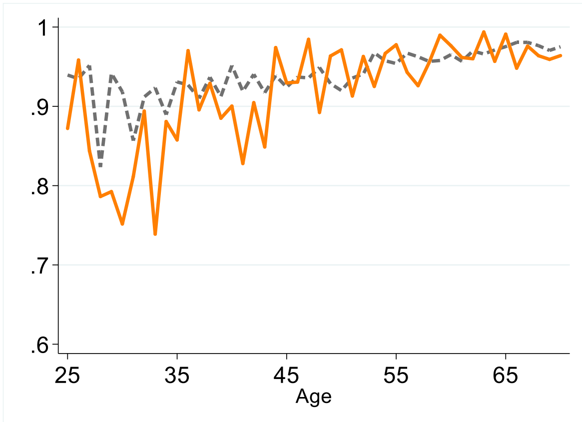
(A5) Median household income



(A6) Median net liquid wealth



(A7) Median net illiquid wealth



(A8) % housing of net illiquid wealth

Appendix A. Unexplained income process:

The income process for each household i at time t can be written as:

$$\log Y_{it} = Z'_{it}\,\varphi_t + P_{it} + v_{it}$$

with P being the permanent component, v the transitory component and Z a set of socioeconomic characteristics affecting household income.

It is assumed that the permanent income component P_{it} follows a random walk of the form:

$$P_{it} = P_{it-1} + \varsigma_{it}$$

where ς_{it} is serially uncorrelated. The transitory component v_{it} follows a MA(q) process

$$v_{it} = \sum_{j=0}^{q} \theta_j \varepsilon_{qt}$$

with $\theta_0 = 1$ and the order q of the process to be determined empirically.

With $y_{it} = \log Y_{it} - Z'_{it}\,\varphi_t$ being (log) income net of its predictable individual components, unexplained income growth can be presented as

$$\begin{aligned}
\Delta y_{it} &= y_{it} - y_{it-1} \\
\Delta y_{it} &= P_{it} + v_{it} - P_{it-1} + v_{it-1} \\
\Delta y_{it} &= P_{it-1} + \varsigma_{it} + v_{it} - P_{it-1} + v_{it-1} \\
\Delta y_{it} &= \varsigma_{it} + \Delta v_{it}
\end{aligned}$$

with the permanent shock ς_{it} and transitory shock v_{it}.

Appendix: B. Regression of (log) income and consumption on household characteristics

$$\log Y_{it} = \alpha_0 + \beta_1 studio2_{it} + \beta_2 q_{it} + \beta_3 ncomp_{it} + \beta_4 nperc_{it} + \beta_5 children_{it} + \beta_6 staciv_{it} + \beta_7 area5_{it} + acom4c_{it} + \beta_8 cohort_{it} + \beta_9 year_{it} + \beta_{10} area5_{it} \times year_{it} + \beta_{11} q_{it} \times year_{it} + e_{it}$$

$$\log C_{it} = \alpha_0 + \beta_1 studio2_{it} + \beta_2 q_{it} + \beta_3 ncomp_{it} + \beta_4 nperc_{it} + \beta_5 children_{it} + \beta_6 staciv_{it} + \beta_7 area5_{it} + \beta_8 cohort_{it} + \beta_9 year_{it} + \beta_{10} area5_{it} \times year_{it} + e_{it}$$

Variable	Description
$studio2_{it}$	education level (1=no education, 2=primary, 3=secondary, 4=tertiary)
q_{it}	working status (1=employee, 2=self-employed, 3=not-employed)
$ncomp_{it}$	N° of household members
$nperc_{it}$	N° of household income earners
$children_{it}$	N° of children
$staciv_{it}$	marital status (1=married/civil partnership, 2=single, 3=divorced, 4=widowed)
$area5_{it}$	geographical area (1=North-east, 2= North-west, 3=Centre, 4=South, 5=Islands)
$acom4c_{it}$	town size (0=0-20.000 inhabitants, 1=20.000-40.000, 2=40.000-500.000, 3= more than 500.000 inhabitants).
$cohort_{it}$	birthdate (1=1920-1930, 2=1930-1940, 3=1940-1950, …. 8=1990-2000)
$year_{it}$	year dummies

$$\log Y_{it} = \alpha_0 + \beta_1 studio2_{it} + \beta_2 q_{it} + \beta_3 ncomp_{it} + \beta_4 nperc_{it} + \beta_5 children_{it} + \beta_6 staciv_{it} + \beta_7 area5_{it} + acom4c_{it} + \beta_8 cohort_{it} + \beta_9 year_{it} + \beta_{10} area5_{it} \times year_{it} + \beta_{11} q_{it} \times year_{it} + e_{it}$$

```
Random-effects GLS regression                   Number of obs     =     24,001
Group variable: nquest                          Number of groups  =      5,315

R-sq:                                           Obs per group:
     within  = 0.2939                                         min =          2
     between = 0.6117                                         avg =        4.5
     overall = 0.5503                                         max =          8

                                                Wald chi2(74)     =   10203.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

                           (Std. Err. adjusted for 5,315 clusters in nquest)
```

logtotali~me	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
studio2						
2	.1068249	.0267188	4.00	0.000	.0544569	.1591928
3	.2756084	.0272591	10.11	0.000	.2221816	.3290351
4	.5454485	.0310174	17.59	0.000	.4846555	.6062415
q						
2	.0567181	.0388297	1.46	0.144	-.0193867	.1328229
3	-.0732746	.0193381	-3.79	0.000	-.1111765	-.0353727
ncomp	.100137	.0095214	10.52	0.000	.0814754	.1187986
nperc	.2995501	.0057787	51.84	0.000	.2882241	.3108761
children	-.0426229	.0101342	-4.21	0.000	-.0624855	-.0227603
staciv						
2	-.1405667	.0156233	-9.00	0.000	-.1711877	-.1099457
3	-.1656066	.0166291	-9.96	0.000	-.1981992	-.1330141
4	-.1381717	.0158052	-8.74	0.000	-.1691493	-.107194
area5						
2	-.0164321	.0291631	-0.56	0.573	-.0735907	.0407266
3	-.1049162	.0282008	-3.72	0.000	-.1601888	-.0496437
4	-.3436514	.0307679	-11.17	0.000	-.4039554	-.2833474
5	-.3111326	.0342127	-9.09	0.000	-.3781882	-.2440769
acom4c						
1	.0509491	.0128075	3.98	0.000	.0258469	.0760513
2	.0370837	.010833	3.42	0.001	.0158514	.058316
3	.0664456	.0208682	3.18	0.001	.0255446	.1073466
cohort						
3	-.3210105	.1253352	-2.56	0.010	-.5666629	-.075358
4	-.2850148	.1257339	-2.27	0.023	-.5314488	-.0385809
5	-.3254435	.1266386	-2.57	0.010	-.5736507	-.0772363
6	-.3962283	.125765	-3.15	0.002	-.6427232	-.1497335
7	-.4719321	.1260233	-3.74	0.000	-.7189333	-.224931
8	-.5167698	.1285922	-4.02	0.000	-.7688058	-.2647338
10	-.4515587	.1675052	-2.70	0.007	-.7798628	-.1232546

year						
2004	.072621	.0198111	3.67	0.000	.0337921	.11145
2006	.1237613	.0204702	6.05	0.000	.0836404	.1638822
2008	.1760812	.0208927	8.43	0.000	.1351323	.2170302
2010	.1927186	.0219773	8.77	0.000	.1496439	.2357933
2012	.176696	.0237347	7.44	0.000	.1301769	.2232152
2014	.2272466	.024397	9.31	0.000	.1794293	.2750638
2016	.2330956	.0283166	8.23	0.000	.1775961	.2885951
area5#year						
2 2004	-.0053215	.0282667	-0.19	0.851	-.0607233	.0500802
2 2006	.0183562	.0292195	0.63	0.530	-.038913	.0756254
2 2008	.0192352	.0289589	0.66	0.507	-.0375232	.0759936
2 2010	.0233669	.0304135	0.77	0.442	-.0362425	.0829763
2 2012	.0298786	.0317395	0.94	0.347	-.0323296	.0920868
2 2014	-.0138381	.0327291	-0.42	0.672	-.0779859	.0503098
2 2016	.0042636	.0368283	0.12	0.908	-.0679185	.0764458
3 2004	.0263592	.0273318	0.96	0.335	-.0272102	.0799286
3 2006	.0585546	.0286055	2.05	0.041	.0024889	.1146204
3 2008	.0579569	.0288677	2.01	0.045	.0013772	.1145366
3 2010	.0660032	.0299892	2.20	0.028	.0072254	.124781
3 2012	.0603723	.0311008	1.94	0.052	-.0005841	.1213287
3 2014	.051875	.0322404	1.61	0.108	-.0113151	.1150651
3 2016	.0966802	.035345	2.74	0.006	.0274054	.165955
4 2004	.0245829	.0296075	0.83	0.406	-.0334467	.0826126
4 2006	.0670516	.0303089	2.21	0.027	.0076472	.1264559
4 2008	.0615071	.0301638	2.04	0.041	.0023872	.120627
4 2010	.0689246	.0315384	2.19	0.029	.0071104	.1307388
4 2012	.076903	.0328234	2.34	0.019	.0125703	.1412357
4 2014	.0663257	.0339901	1.95	0.051	-.0002937	.1329451
4 2016	.0778747	.0373879	2.08	0.037	.0045957	.1511537
5 2004	.0018689	.0324378	0.06	0.954	-.061708	.0654458
5 2006	.0295594	.0334051	0.88	0.376	-.0359134	.0950323
5 2008	.0335378	.0341414	0.98	0.326	-.0333781	.1004538
5 2010	.0218855	.0359322	0.61	0.542	-.0485405	.0923114
5 2012	.0355858	.0369656	0.96	0.336	-.0368655	.108037
5 2014	.0163141	.0384344	0.42	0.671	-.0590159	.0916441
5 2016	.0153896	.0438181	0.35	0.725	-.0704923	.1012714
q#year						
2 2004	.0501669	.0415824	1.21	0.228	-.0313332	.1316669
2 2006	.0182407	.0417702	0.44	0.662	-.0636274	.1001087
2 2008	.0284406	.0421427	0.67	0.500	-.0541576	.1110388
2 2010	-.0241133	.0427373	-0.56	0.573	-.1078768	.0596502
2 2012	-.0353487	.0436446	-0.81	0.418	-.1208905	.0501931
2 2014	-.0255699	.0470044	-0.54	0.586	-.1176969	.0665571
2 2016	-.0370955	.0537385	-0.69	0.490	-.142421	.0682299
3 2004	-.0392689	.0188433	-2.08	0.037	-.0762011	-.0023366
3 2006	-.0485134	.0194496	-2.49	0.013	-.086634	-.0103928
3 2008	-.0695302	.0195823	-3.55	0.000	-.1079108	-.0311496
3 2010	-.0687535	.0203978	-3.37	0.001	-.1087324	-.0287745
3 2012	-.0602042	.0209332	-2.88	0.004	-.1012325	-.0191759
3 2014	-.0815755	.0213284	-3.82	0.000	-.1233783	-.0397727
3 2016	-.0807368	.0230091	-3.51	0.000	-.1258339	-.0356397
_cons	9.381113	.1326107	70.74	0.000	9.121201	9.641025
sigma_u	.30805601					
sigma_e	.25466491					
rho	.59403373	(fraction of variance due to u_i)				

$$\log C_{it} = \alpha_0 + \beta_1 studio2_{it} + \beta_2 q_{it} + \beta_3 ncomp_{it} + \beta_4 nperc_{it} + \beta_5 children_{it} + \beta_6 staciv_{it} + \beta_7 area5_{it} + \beta_8 cohort_{it} + \beta_9 year_{it} + \beta_{10} area5_{it} \times year_{it} + e_{it}$$

```
Random-effects GLS regression                   Number of obs      =     23,918
Group variable: nquest                          Number of groups   =      5,315

R-sq:                                           Obs per group:
     within  = 0.1009                                         min =          1
     between = 0.4864                                         avg =        4.5
     overall = 0.3612                                         max =          8

                                                Wald chi2(57)      =    6217.69
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =     0.0000

                           (Std. Err. adjusted for 5,315 clusters in nquest)
```

logcn_KVW	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
studio2						
2	.0675142	.0227378	2.97	0.003	.022949	.1120794
3	.2297594	.0228555	10.05	0.000	.1849635	.2745553
4	.4642376	.0270492	17.16	0.000	.4112222	.5172531
q						
2	.0177883	.0135382	1.31	0.189	-.0087461	.0443228
3	-.0780489	.0095666	-8.16	0.000	-.0967991	-.0592987
ncomp	.119325	.0100053	11.93	0.000	.099715	.1389349
nperc	.1195498	.005528	21.63	0.000	.1087152	.1303844
children	-.0329032	.0106473	-3.09	0.002	-.0537716	-.0120348
staciv						
2	-.1508317	.0154657	-9.75	0.000	-.1811438	-.1205195
3	-.1596367	.0174131	-9.17	0.000	-.1937658	-.1255076
4	-.1473258	.0153647	-9.59	0.000	-.17744	-.1172115
area5						
2	-.0040288	.0325126	-0.12	0.901	-.0677524	.0596948
3	-.0417937	.0329867	-1.27	0.205	-.1064465	.022859
4	-.323209	.0365737	-8.84	0.000	-.3948921	-.2515258
5	-.2772067	.0394878	-7.02	0.000	-.3546013	-.1998121
cohort						
3	-.0419574	.1281812	-0.33	0.743	-.2931879	.2092731
4	-.0314059	.1279445	-0.25	0.806	-.2821725	.2193606
5	-.0674408	.1282396	-0.53	0.599	-.3187857	.1839042
6	-.1565363	.1284505	-1.22	0.223	-.4082947	.095222
7	-.2365861	.1288759	-1.84	0.066	-.4891782	.0160061
8	-.2934762	.1316016	-2.23	0.026	-.5514107	-.0355417
10	-.2726519	.1495337	-1.82	0.068	-.5657325	.0204287

year						
2004	.0540338	.0255293	2.12	0.034	.0039972	.1040704
2006	.1507562	.025319	5.95	0.000	.101132	.2003805
2008	.242943	.025736	9.44	0.000	.1925012	.2933847
2010	.2558052	.0260884	9.81	0.000	.2046728	.3069376
2012	.2566781	.02785	9.22	0.000	.202093	.3112632
2014	.2179494	.0288391	7.56	0.000	.1614258	.2744729
2016	.2894221	.0373979	7.74	0.000	.2161236	.3627207
area5#year						
2 2004	.0132164	.0342186	0.39	0.699	-.0538507	.0802836
2 2006	-.0391053	.0336659	-1.16	0.245	-.1050893	.0268787
2 2008	-.0949037	.0339704	-2.79	0.005	-.1614845	-.0283229
2 2010	-.1137722	.0346161	-3.29	0.001	-.1816186	-.0459259
2 2012	.0319661	.0362177	0.88	0.377	-.0390193	.1029514
2 2014	-.0975232	.0382397	-2.55	0.011	-.1724715	-.0225748
2 2016	.0085766	.0487012	0.18	0.860	-.0868761	.1040293
3 2004	.1025313	.0342924	2.99	0.003	.0353195	.1697431
3 2006	.0187883	.0345614	0.54	0.587	-.0489509	.0865275
3 2008	.0027862	.0352411	0.08	0.937	-.066285	.0718574
3 2010	-.0377675	.0353232	-1.07	0.285	-.1069997	.0314648
3 2012	.0464494	.0367904	1.26	0.207	-.0256586	.1185573
3 2014	-.0387789	.0385415	-1.01	0.314	-.1143189	.036761
3 2016	.1159021	.0481128	2.41	0.016	.0216028	.2102014
4 2004	.119248	.0386611	3.08	0.002	.0434736	.1950225
4 2006	.0917011	.0382208	2.40	0.016	.0167897	.1666126
4 2008	.0904071	.0376455	2.40	0.016	.0166233	.164191
4 2010	.0780943	.0388088	2.01	0.044	.0020306	.1541581
4 2012	.1840246	.0399912	4.60	0.000	.1056432	.2624059
4 2014	.106876	.0415499	2.57	0.010	.0254396	.1883124
4 2016	.104057	.0510106	2.04	0.041	.004078	.204036
5 2004	.1068823	.0414572	2.58	0.010	.0256278	.1881369
5 2006	.0882196	.0413977	2.13	0.033	.0070815	.1693577
5 2008	.0339149	.0415871	0.82	0.415	-.0475944	.1154241
5 2010	.0167769	.0421109	0.40	0.690	-.065759	.0993128
5 2012	.1553735	.0434427	3.58	0.000	.0702275	.2405196
5 2014	.076675	.0458199	1.67	0.094	-.0131305	.1664804
5 2016	.1109006	.0567286	1.95	0.051	-.0002854	.2220867
_cons	8.929953	.1334108	66.94	0.000	8.668473	9.191433
sigma_u	.26304854					
sigma_e	.32500772					
rho	.39579414	(fraction of variance due to u_i)				

Appendix C. Derivation of MPC estimator

The true marginal propensity to consume (MPC) out of a transitory income shock is defined as

$$MPC = \frac{cov(\Delta c_{it}, v_{it})}{var(v_{it})}$$

Assuming that households do not have advanced information or foresight about future transitory or permanent income shocks,

$$cov(\Delta c_{it}, \varsigma_{it+1}) = cov(\Delta c_{it}, v_{it+1}) = 0$$

and considering that (unexplained) income growth at t+1 is correlated with the transitory shock at t, but not with the permanent one, i.e. $cov(\Delta y_{it+1}, \varsigma_{it}) = 0$, then the proposed estimator

$$\widehat{MPC} = \frac{cov(\Delta c_{it}, \Delta y_{it+1})}{cov(\Delta y_{it}, \Delta y_{it+1})}$$

is a consistent estimator of the true marginal propensity to consume (MPC).

Nominator

See (unexplained) income growth (Appendix A):

$$\begin{aligned}
\Delta y_{it} &= \varsigma_{it} + \Delta v_{it} \\
\Delta y_{it+1} &= \varsigma_{it+1} + \Delta v_{it+1} \\
\Delta y_{it+1} &= \varsigma_{it+1} + v_{it+1} - v_{it} \\
v_{it} &= \varsigma_{it+1} + v_{it+1} - \Delta y_{it+1}
\end{aligned}$$

With

$$cov(\Delta c_{it}, \varsigma_{it+1}) = cov(\Delta c_{it}, v_{it+1}) = 0$$

Then:

$$\boldsymbol{cov}(\Delta \boldsymbol{c_{it}}, \boldsymbol{v_{it}})$$

$$\begin{aligned}
&= cov(\Delta c_{it}, \varsigma_{it+1} + v_{it+1} - \Delta y_{it+1}) \\
&= cov(\Delta c_{it}, \varsigma_{it+1}) + cov(\Delta c_{it}, v_{it+1}) - cov(\Delta c_{it}, \Delta y_{it+1}) \\
&= -\, cov(\Delta c_{it}, \Delta y_{it+1})
\end{aligned}$$

Denominator

See (unexplained) income growth:

$$\begin{aligned}
\Delta y_{it} &= \varsigma_{it} + \Delta v_{it} \\
\Delta y_{it+1} &= \varsigma_{it+1} + \Delta v_{it+1} \\
\Delta y_{it+1} &= \varsigma_{it+1} + v_{it+1} - v_{it} \\
v_{it} &= \varsigma_{it+1} + v_{it+1} - \Delta y_{it+1}
\end{aligned}$$

&

$$\begin{aligned}
\Delta y_{it} &= \varsigma_{it} + \Delta v_{it} \\
\Delta y_{it} &= \varsigma_{it} + \Delta v_{it+1} \\
\Delta y_{it} &= \varsigma_{it} + v_{it} - v_{it-1} \\
v_{it} &= \Delta y_{it} - \varsigma_{it} + v_{it-1}
\end{aligned}$$

With assumptions that:

1) ς_{it} is serially uncorrelated
2) ς_{it} and v_{it} are mutually uncorrelated processes
3) $cov(\Delta y_{it+1}, \varsigma_{it}) = 0$

Then:

$$\boldsymbol{var(v_{it})}$$

$$\begin{aligned}
&= cov(v_{it}, v_{it}) \\
&= cov(\varsigma_{it+1} + v_{it+1} - \Delta y_{it+1}, \Delta y_{it} - \varsigma_{it} + v_{it-1}) \\
&= cov(\varsigma_{it+1}, \Delta y_{it}) - cov(\varsigma_{it+1}, \varsigma_{it}) + cov(\varsigma_{it+1}, v_{it-1}) \\
&+ cov(v_{it+1}, \Delta y_{it}) - cov(v_{it+1}, \varsigma_{it}) + cov(v_{it+1}, v_{it-1}) \\
&- cov(\Delta y_{it+1}, \Delta y_{it}) + cov(\Delta y_{it+1}, \varsigma_{it}) - cov(\Delta y_{it+1}, v_{it-1}) \\
\\
&= - cov(\Delta y_{it+1}, \Delta y_{it})
\end{aligned}$$

Appendix D: Baseline scenario – IV regression (see Appendix C)

Estimating MPCs of HtM households (W-HtM as base):

```
G2SLS random-effects IV regression              Number of obs     =     13,290
Group variable: nquest                          Number of groups  =      5,130

R-sq:                                           Obs per group:
     within  = 0.0660                                         min =          1
     between = 0.0784                                         avg =        2.6
     overall = 0.0708                                         max =          6

                                                Wald chi2(3)      =     530.98
corr(u_i, X)       = 0 (assumed)                Prob > chi2       =     0.0000

                             (Std. Err. adjusted for 5,130 clusters in nquest)
```

diff_c_KVW	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
diff_i	.392984	.033735	11.65	0.000	.3268646	.4591035
HtM9#c.diff_i						
0	-.0765706	.0368195	-2.08	0.038	-.1487355	-.0044057
1	-.0452417	.0575031	-0.79	0.431	-.1579457	.0674624
2	0	(omitted)				
_cons	.0016008	.0023529	0.68	0.496	-.0030107	.0062124
sigma_u	0					
sigma_e	.42871657					
rho	0	(fraction of variance due to u_i)				

```
Instrumented:   diff_i
Instruments:    0b.HtM9#c.diff_i 1.HtM9#c.diff_i 2.HtM9#c.diff_i diff_i_lead
```

N-HtM households:

```
-> HtM9 = 0

G2SLS random-effects IV regression              Number of obs     =     10,853
Group variable: nquest                          Number of groups  =      4,506

R-sq:                                           Obs per group:
     within  = 0.0491                                         min =          1
     between = 0.0883                                         avg =        2.4
     overall = 0.0604                                         max =          6

                                                Wald chi2(1)      =     368.47
corr(u_i, X)       = 0 (assumed)                Prob > chi2       =     0.0000

                             (Std. Err. adjusted for 4,506 clusters in nquest)
```

diff_c_KVW	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
diff_i	.3161477	.0164699	19.20	0.000	.2838673	.348428
diff_i	0	(omitted)				
_cons	.0049544	.0026714	1.85	0.064	-.0002816	.0101903
sigma_u	0					
sigma_e	.42490495					
rho	0	(fraction of variance due to u_i)				

```
Instrumented:   diff_i
Instruments:    diff_i diff_i_lead
```

P-HtM households:

```
-> HtM9 = 1

G2SLS random-effects IV regression              Number of obs     =        910
Group variable: nquest                          Number of groups  =        576

R-sq:                                           Obs per group:
     within  = 0.1026                                         min =          1
     between = 0.0671                                         avg =        1.6
     overall = 0.0939                                         max =          6


                                                Wald chi2(1)      =      54.64
corr(u_i, X)       = 0 (assumed)                Prob > chi2       =     0.0000

                               (Std. Err. adjusted for 576 clusters in nquest)

------------------------------------------------------------------------------
             |               Robust
  diff_c_KVW |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      diff_i |   .3453654   .0467224     7.39   0.000     .2537912    .4369396
      diff_i |          0  (omitted)
       _cons |  -.0118303   .0121214    -0.98   0.329    -.0355878    .0119271
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .49054161
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
Instrumented:   diff_i
Instruments:    diff_i diff_i_lead
------------------------------------------------------------------------------
```

W-HtM households:

```
-> HtM9 = 2

G2SLS random-effects IV regression              Number of obs     =      1,527
Group variable: nquest                          Number of groups  =      1,025

R-sq:                                           Obs per group:
     within  = 0.1649                                         min =          1
     between = 0.0854                                         avg =        1.5
     overall = 0.1176                                         max =          6


                                                Wald chi2(1)      =     134.78
corr(u_i, X)       = 0 (assumed)                Prob > chi2       =     0.0000

                             (Std. Err. adjusted for 1,025 clusters in nquest)

------------------------------------------------------------------------------
             |               Robust
  diff_c_KVW |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      diff_i |    .391338   .0337086    11.61   0.000     .3252704    .4574056
      diff_i |          0  (omitted)
       _cons |  -.0142812   .0090479    -1.58   0.114    -.0320147    .0034523
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .42753127
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
Instrumented:   diff_i
Instruments:    diff_i diff_i_lead
------------------------------------------------------------------------------
```