Journal of International Money and Finance 130 (2023) 102743

Contents lists available at ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

Fiscal multipliers, monetary efficacy, and hand-to-mouth households ☆

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ARTICLE INFO

Article history:
Available online 13 September 2022

JEL Classification:
E21
E62
H20
E51

Keywords:
Liquidity Constraint
Saving Constraint
Fiscal Multiplier
Monetary Efficacy
Hand-to-Mouth Households

ABSTRACT

The effectiveness of fiscal and monetary policy has been found to exhibit large heterogeneity across countries, and it hinges heavily on households' marginal propensity to consume (MPC) in response to the policy shocks. This paper examines the role of households' liquidity, saving, and credit constraints as microfactors that underpin households' MPC and hence affect the macro level fiscal and monetary policy effectiveness.

This paper presents a uniform framework to measure the degree of various constraints faced by consumers, and employs data from 20 European countries to examine their nexus with hand-to-mouth (HtM) households. Our findings demonstrate that (i) a higher ratio of HtM households generally enhances fiscal multipliers; in particular, the size of tax multipliers is enhanced by the wealthy-HtM ratio (HtM households that hold positive illiquid wealth), whereas the size of fiscal spending multipliers is enhanced by the poor-HtM ratio (households that hold no illiquid wealth); (ii) monetary efficacy is higher in countries with larger HtM ratios, especially those with higher wealthy-HtM ratios; (iii) sole liquidity-constrained HtM households (type-I HtM households) enhance the efficacy of fiscal and monetary policies, but triple constrained HtM households (type-II HtM households that are liquidity-, saving-, and credit-constrained) do not enhance the efficacy, or even do the opposite. The triple constrained case is true especially for the monetary efficacy due to the dampening effect of the credit constraint. This paper contributes to the literature by providing evidence for the heterogeneous impacts of liquidity vs. saving and credit constrained HtM households, and wealthy- vs. poor-HtM households on fiscal and monetary efficacy.

☆ We thank Prof. Greg Kaplan for sharing the codes in calculating the hand-to-mouth ratio. Fei Guo acknowledges financial supports of the Young Scientists Fund of National Natural Science Foundation of China (7220031137), the Start-up Research Grant for Introduced Talents (0000/030900002218) from Ningxia University, and financial supports of the Economics First-class Research Field Project of Ningxia (award number: NXYLXK2017B04). Tao Chen acknowledges financial supports of Multi-Year Research Grant (MYRG2020-00042-FBA) from the University of Macau. Kit-Ming Isabel Yan acknowledges support from the Strategic Research Grant (project no. 7004995), General Research Fund (project no. 9043088) and the Global Research Unit (GRU) of the City University of Hong Kong.

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https://doi.org/10.1016/j.jimonfin.2022.102743
0261-5606/

1. Introduction

Fiscal and monetary policies have been widely used to combat economic downturns, and very recently have been adopted during the pandemic-driven recessions. Nevertheless, the effectiveness of these macroeconomic policies hinges heavily on microfactors that underpin households' response to the policies, especially in terms of their marginal propensity to consume (MPC) which is impacted by households' liquidity constraints.

For **fiscal efficacy**, both theoretical models (Galí et al., 2007; Bilbiie et al., 2008; Oh and Reis, 2012) and empirical studies (Cloyne and Surico, 2017) indicate that liquidity constraints (proxied by rule-of-thumb consumers, market-participation rate or mortgagors) enhance government spending multipliers under certain conditions. One rationale is that households under liquidity constraints are more eager to circumvent the consumption constraints when receiving windfall income, and hence have a higher marginal propensity to consume (MPC) (Kaplan and Violante, 2014; Cloyne and Surico, 2017; Farhi and Werning, 2016). However, liquidity constraints are sometimes coupled with saving constraints which arise because of the motivation of households to save in order to fulfill the minimum level of consumption in the future.[1] Saving constraints dampen the MPC of households (Miranda-Pinto et al., 2020; Chetty and Szeidl, 2007) and thus have an opposite effect on the effectiveness of fiscal and monetary policies compared with liquidity constraints. In the existing literature, there is a lack of studies that incorporate both types of constraints when analyzing fiscal and monetary efficacy, and explore how their effects differ for fiscal and monetary efficacy.

Concerning **monetary efficacy**, empirical studies in the literature show mixed results of liquidity-constrained households on the output responses to monetary shocks. Whilst Cloyne et al. (2020) and Almgren et al. (2021) identify positive effects[2], Kaplan et al. (2018) find that HtM consumers have weaker consumption responses to small interest changes. On the theoretical side, Bilbiie (2008) proposes a nonlinear effect of non-asset holders on monetary efficacy. For the effect of saving-constrained households, it is relatively less explored in the literature on monetary efficacy. In view of the mixed findings and gaps in the literature, this study aims at developing a unified framework to study the different yet often coupling effects of the liquidity and saving constraints on the fiscal and monetary efficacy.

In our unified framework for examining the nexus between HtM households under different constraints and output responses to fiscal and monetary shocks, consumers under various constraints are classified separately using data from 20 European countries. In the empirical implementation, a number of instruments are constructed to address possible endogeneity issues. First, in estimating the fiscal multipliers, the variance decomposition method developed by Blanchard and Perotti (2002) is applied. This method uses a structural VAR (SVAR) approach in which institutional information about the tax and transfer systems is used to identify the response of taxes and spending to activity, and hence to infer fiscal shocks. Besides, to control for potential endogeneity when examining the nexus between HtM households and fiscal multipliers, we have a design of predetermined independent variables where the sample period of HtM is prior to that of the dependent variable, namely, the fiscal multiplier. Furthermore, to deal with the possible endogeneity issue when investigating the nexus between HtM households and monetary efficacy, we use the method of Altavilla et al. (2019) to identify high-frequency monetary shocks, and the method of Jarociński and Karadi (2020) to distinguish pure monetary shocks from information shocks.

Our results indicate that HtM households generally enhance fiscal multipliers, in particular, tax multipliers are enhanced more by wealthy HtM households, whereas fiscal spending multipliers are enhanced more by poor HtM households. For monetary efficacy, output responses to both conventional and unconventional monetary shocks are more notable in countries with higher shares of HtM households, particularly those with higher shares of wealthy HtM households. This is consistent with the findings of Cloyne et al. (2020) and Almgren et al. (2021). However, by categorizing HtM households into two types based on liquidity, saving, and credit constraints, our results indicate that type-I HtM (liquidity-constrained) households contribute to the efficacy of fiscal or monetary policies, whereas type-II HtM (liquidity-, saving-, and credit-constrained) households have insignificant or even negative effects on aggregate responses to fiscal or monetary shocks. The triple constrained result is true especially for monetary efficacy due to the dampening effect of the credit constraint. Compared to Cloyne and Surico (2017), Cloyne et al. (2020), and Almgren et al. (2021) in the literature, our framework enables us to identify the differential effects of saving and credit constraints compared with those of liquidity constraints on the efficacy of fiscal and monetary policies.

Our paper uses a broad measure of liquidity-constrained households, namely, the HtM consumers, à la Kaplan et al. (2014). Adding to the literature, our research presents evidence on the heterogeneous effects of different types of HtM households on monetary efficacy. Our empirical study is related to Bilbiie's (2008) theoretical work, which highlights the nonlinear effects of non-asset holders on monetary efficacy. In the study by Bilbiie (2008), an increase in the share of non-asset holders leads to an initial increase in monetary efficacy followed by a decrease. Their finding shows that non-asset holders dampen monetary efficacy when their share reaches a certain threshold. This is primarily because a contractionary monetary policy depresses the real wage of non-asset holders in a general equilibrium model. This reduces the marginal cost of firms and raises labor demand when the share of non-asset holders reaches the threshold, leading to an

[1] Minimum consumption is also referred to as "committed consumption" by Chetty and Szeidl (2007), indicating the consumption "that is determined by prior decisions and costly to adjust in the short term" (Miranda-Pinto et al., 2020); for instance, regular automobile maintenance.

[2] The mortgagors in Cloyne et al. (2020) have the property of the wealthy HtM households in Kaplan et al. (2014), i.e., holding sizable illiquid assets but minimal liquid wealth.

expansionary effect. In our setting, saving constraint reduces the MPC of HtM consumers, whereas liquidity constraint increases the MPC of HtM consumers, leading to opposite impacts.

The contribution of this paper to the extant literature is threefold. First, we present evidence on how fiscal multipliers depend on the share of HtM households located in 20 European countries. This provides empirical findings for validating the theoretical implications in the literature on the role of rule-of-thumb consumers or asset-market participation in influencing fiscal multipliers (e.g.: Galí et al., 2007; Bilbiie and Straub, 2004; Bilbiie et al., 2008; Giambattista and Pennings, 2017; Oh and Reis, 2012; Farhi and Werning, 2016). We also extend other empirical works in the literature (such as Cloyne and Surico, 2017) that examine the nexus between liquidity-constrained households and fiscal multipliers by measuring liquidity-constrained households from a wider perspective using HtM households. This allows us to cover a broader range of households facing different types of constraints.

Second, we identify heterogeneous impacts of poor and wealthy HtM (P-HtM and W-HtM henceforth) households on the aggregate responses to government spending and tax shocks, extending previous studies that assume identical impacts from the two types. Third, we distinguish liquidity constraints from saving and credit constraints using a method developed by Kaplan et al. (2014). Differential impacts from the two types of constraints on fiscal and monetary efficacy are found.

The remainder of this article is organized into five sections. Section 2 presents the conceptual framework. Section 3 describes the data and the measurement of HtM households. Section 4 examines the relationship between HtM households and fiscal multipliers, and Section 5 assesses the impact of HtM families on monetary efficacy. Section 6 concludes and summarizes the study.

2. Conceptual framework

In our study, the first and foremost step is to identify the HtM households empirically.

HtM households are conceptually close to *rule-of-thumb consumers* (consumers that follow the simple rule-of-thumb that they consume their current income each period) or *non-Ricardian consumers* (liquidity constrained or rule-of-thumb consumers) in the literature. Campbell and Gregory Mankiw (1989) identify rule-of-thumb consumers by estimating the Euler equation which holds under the condition that current consumption is an optimal forecast of consumption in the next period for forward-looking consumers, but it does not hold for rule-of-thumb consumers. Kaplan et al. (2014), on the other hand, identify HtM consumers using survey data, classifying those who consume all their disposable income in each pay period as HtM. The number of HtM consumers in Kaplan et al. (2014) gives a lower bound for the number of rule-of-thumb consumers, as other reasons can also cause consumers to be rule-of-thumb. Nevertheless, the method used by Kaplan et al. (2014) has two advantages. First, it offers a direct method to measure HtM consumers from data instead of relying on the model-based Euler equation. Second, it can be decomposed into subcategories of HtM consumers, such as P-HtM and W-HtM consumers, for subsequent analysis.

While both P-HtM and W-HtM households consume all their disposable income in each pay period, the former holds no illiquid assets but the latter holds some illiquid assets. As previously noted, considerable theoretical studies (Galí et al., 2007; Bilbiie et al., 2008; Oh and Reis, 2012; Kaplan and Violante, 2014; Farhi and Werning, 2016) and empirical studies (Cloyne and Surico, 2017) indicate that higher number of liquidity-constrained households enlarges the aggregate response to fiscal shocks. Nevertheless, there are heterogeneities across P-HtM and W-HtM households. P-HtM households matter more for spending multipliers, whereas W-HtM households matter more for tax multipliers. This difference could be explained by several reasons.

The finding that W-HtM households matter more for tax multipliers can be explained by two reasons. First, as Kaplan and Violante (2014) state, W-HtM families tend to have higher MPC than P-HtM families because W-HtM families have larger wealth and hence often a higher target level of desirable consumption. As such, given the same degree of liquidity constraints, W-HtM families are generally more eager to overcome the constraints to achieve their desirable level of consumption. Hence, lowering tax payment yields stronger consumption responses from W-HtM households. Second, W-HtM consumers usually have heavier relative tax liability because they fall into higher tax brackets. As a result, tax cuts are expected to be more impactful in easing the budget constraints of W-HtM consumers. In contrast, P-HtM households matter more for spending multipliers because fiscal expansion via increase in government transfers to households will redistribute resources from the rich to the poor (Ma, 2019), leading to greater consumption responses to fiscal shocks for P-HtM consumers than for W-HtM consumers.

Besides, the literature has indicated opposite impacts from saving vs. liquidity constraints on the size of fiscal multipliers. On one hand, liquidity constraints lead to a higher MPC of HtM households than non-HtM households (Kaplan and Violante, 2014; Cloyne and Surico, 2017; Farhi and Werning, 2016), while, on the other hand, saving constraints do the opposite (Miranda-Pinto et al., 2020; Chetty and Szeidl, 2007). As a result, the overall conceptual effect of HtM consumers on fiscal efficacy is ambiguous. To distinguish the effects of the two constraints, we start by examining the relationship between MPC and consumption levels, as shown in Fig. 1 below.

Theoretically, households can be classified into different tiers based on two consumption thresholds—the minimum level (subsistence level) and desired level of consumption. As in Fig. 1, in each of the consumption intervals, various constraints are loaded. More specifically, if a household can attain the desired consumption, we term this a *first-tier household*. These households are subject to no liquidity or saving constraints and they are non-HtM households. Similarly, individuals with

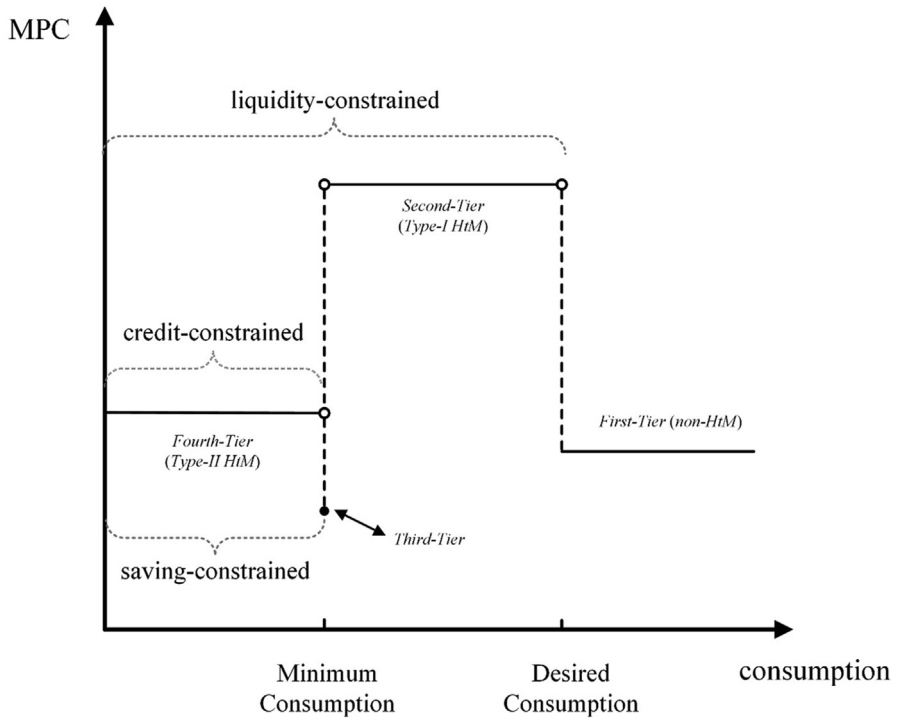


Fig. 1. Marginal propensity to consume (MPC) and various constraints under different consumption levels. Notes: For the convenience of comparison, we use constant MPC for each of the categories. In real cases, the MPC for each category may be more complicated. However, this does not alter the relative magnitude of the MPC for different categories and the conclusions of this paper are not affected.

consumption ranging from the minimum level to the desired level are classified as *second-tier households*. Second-tier households are subject to liquidity constraints in realizing the desired consumption and hence they have larger MPC than first-tier households that are not constrained.

When consumers are unable to attain the minimum level of consumption, they have no choice but to resort to the credit market. As long as borrowing can make up for the shortage, we assign them to *third-tier households*. These households are also subject to liquidity constraints. Moreover, saving constraint is likely to ensue, as they must save and pay down their existing debt (reducing their negative savings) to meet the minimum consumption in future periods. Comparing the priority in overcoming the various constraints to meet the different consumption levels, rational households generally prioritize allocating spending to meet the minimum consumption today, and next in priority to meet the minimum consumption tomorrow, followed by the priority to fulfill the desired consumption today. The additional saving constraint on third-tier households lowers their MPC compared to the second-tier and first-tier households. This is because even though third-tier households can achieve their minimum consumption today with the use of credit, they have to save to meet the minimum consumption tomorrow. In contrast, second-tier and first-tier households are not subject to this saving constraint.

Further to the three tiers of households discussed above, *fourth-tier households* are defined as those who fail to harness loans to sustain the minimum consumption due to credit limits. In other words, these households encounter liquidity, saving, and credit constraints. Compared to third-tier households, the extra credit constraints on fourth-tier households make them unable to achieve the current minimum consumption. As a result, fourth-tier households will eagerly consume if they receive windfall income, leading to a higher MPC than the third-tier households. However, the magnitude of MPC of fourth-tier households compared with those of second- or first-tier households is ambiguous. It depends on how far the consumption of fourth-tier households is from their minimum level of consumption.

In the empirical analysis of Kaplan and Violante (2014), they categorize HtM consumers into two groups in each pay period. The first group comprises of **type-I HtM households (at the zero-liquid-wealth kink)**, which consume all their disposable income but decide not to borrow. Instead, they choose to restrain their consumption desire because the wedge between the return on liquidity saving and the interest rate on unsecured credit generates a borrowing cost, and such a cost may surpass the utility benefit from meeting the desired consumption. The second group consists of **type-II HtM households (at the credit-limit kink)** which consume all their disposable income and possible borrowing subject to the credit limit. Households on the kinks are hand-to-mouth, meaning that they consume all their income. Under this categorization, second-tier households in the theoretical literature could be proxied empirically by type-I HtM households, fourth-tier households could be proxied by type-II HtM households, and first-tier households by non-HtM households. Table 1 describes the relationship

Table 1
Household categorizations, various constraints, and associated marginal propensity to consume (MPC).

Theoretical classifications per Fig. 1	Constraints loaded	Empirical classifications per Kaplan	MPC regarding additional income	MPC regarding additional credit (MPCC)
1st tier	–	non-HtM	mpc_{t1}(benchmark)	$mpcc_{t1}$(benchmark)
2nd tier	liquidity constraints	type-I HtM (at the zero-kink)	$mpc_{t2} > mpc_{t1}$	$mpc_{t2} \geq mpcc_{t2} > mpcc_{t1}$
3rd tier	liquidity & saving constraints	–	$mpc_{t3} < mpc_{t1}$	$mpcc_{t3} = mpcc_{t1}$
4th tier	liquidity, saving & credit constraints	type-II HtM (at the credit-limit kink)	mpc_{t4} is ambiguous compared to mpc_{t1}	$mpcc_{t4}$ is ambiguous compared to $mpcc_{t1}$, $mpcc_{t4} \leq mpc_{t4}$

Notes: (i) $mpc_{t1} - mpc_{t4}$ indicate the marginal propensity to consume regarding additional income, whereas $mpcc_{t1} - mpcc_{t4}$ indicate the marginal propensity to consume regarding additional credit; (ii) mpc_{t1} and $mpcc_{t1}$ are used as benchmarks for second-, third-, and fourth-tier households.

between the theoretical classification of households, various constraints loaded, the empirical classification per Kaplan et al. (2014), and their associated MPC.

As noted before, there is a lack of consensus in the empirical literature on whether HtM consumers would amplify or dampen the aggregate responses to monetary shocks. On one hand, Cloyne et al. (2020) and Almgren et al. (2021) suggest an amplifying effect, since HtM consumers have higher MPC and respond more strongly to additional credit. On the other hand, Kaplan et al. (2018) state that as HtM households are either at the zero-liquid-wealth kink or the credit-limit kink, they are constrained from borrowing to increase their consumption. For this reason, HtM households are less sensitive to additional credit from positive monetary shocks (Kaplan et al., 2018; Vissing-Jørgensen, 2002). Which of these two opposite views is more likely to prevail empirically hinges on whether the kinks will restrict the households from accessing the expanded credit under monetary expansion (à la Kaplan et al., 2018; Vissing-Jørgensen, 2002), or the expanded credit will help the households surmount the restrictions imposed by the kinks. With expanded credit, the real interest rate falls and hence the cost of accessing credit decreases. At least some of the prior constrained households will surpass the zero-liquid-wealth constraint and use the expanded credit to fulfill the previously constrained consumption desire. Additionally, expansionary credit also extends the credit limit for some households, which is equivalent to surmounting their credit-limit kink.

The household classification in Fig. 1 can be generalized to analyze the impacts of monetary shocks by relabeling the vertical axis as the "MPC to expanded credit (MPCC)" instead of "the MPC to income". As noted previously, the MPCC for *second-tier households* may be a little bit lower than their corresponding MPC in Fig. 1, since only a portion of these households are expected to surmount the zero-liquid-wealth kink when presented with expanded credit. In contrast, the MPCC for *third-tier households* may be very close to the MPCC of non-HtM households. This is because *third-tier households* already achieve the minimum level of consumption before they reach the credit limit. They thus already have excess credit prior to the credit expansion, and the expanded credit has little effect on their consumption or saving decisions. Similarly, the MPCC for *fourth-tier households* may be smaller than the corresponding MPC in Fig. 1. This is because the expanded credit is distributed unevenly across different groups, and previously credit-limited households may be less preferred by lenders.

Note that the argument here does not indicate that fiscal policies are more/less effective than monetary policies in the associated cases. While the MPC and MPCC here are the responses based on one unit of marginal income or marginal credit, the efficacy of fiscal and monetary policies is influenced by many factors during the policy transmission.

3. Data and measurement

3.1. Data

The data used in this study are collected from several sources. The *Eurosystem Household Finance and Consumption Survey (HFCS) (2nd wave)* is used to calculate the HtM ratio. This survey covers 84,665 households across 20 countries. To estimate the fiscal multipliers, we utilize quarterly GDP and government spending data from *Eurostat*, quarterly tax revenue data from *CEIC*, quarterly consumer price index from *the Federal Reserve Bank of St. Louis*, and population data from *World Development Indicators*. The data spans from the first quarter of 2002 to the fourth quarter of 2018, with minor variations for some countries. All macro-level variables are deflated to real terms and deseasonalized. Government spending, taxes, and output are detrended by dividing them by the trend of real output per Ramey and Zubairy (2018).

To measure monetary shocks, we use interest rate of the main refinancing operations taken from *CEIC*, total assets of central banks from the *European Central Bank (ECB)*, and real effective exchange rates from *Eurostat*. The quarterly data constructed spans from the first quarter of 1995 to the second quarter of 2019.

3.2. Measurement of HtM households

For HtM households, there are two kinks that constrain them, namely, the zero-liquid-wealth and credit-limit kinks (Kaplan et al., 2014). Households at the *zero-liquid-wealth kink* are identified as households with average liquid assets less

than half of their earnings per pay period. Similarly, households at the *credit-limit kink* are identified as households with their average liquid assets smaller than "half of their earnings per pay period subtracting the unsecured credit limit". We then partition HtM into *wealth-HtM households* (W-HtM households) that hold positive illiquid wealth and *poor-HtM households* (P-HtM households) that hold no illiquid wealth.

In the empirical framework, we let y_{it} denote the income of household i in pay period t; a_{it} denotes household i's net illiquid asset balance in pay period t, m_{it} denotes household i's net liquid asset balance in pay period t, and $\underline{m}_{it}$ denotes household i's unsecured credit limit in pay period t. Then, the following inequalities hold for *P-HtM households*.

$$a_{it} \leq 0,\ 0 \leq m_{it} \leq \frac{y_{it}}{2} \text{ for } m_{it} \geq 0 \text{ at the } zero - liquid - wealthkink \tag{1}$$

$$a_{it} \leq 0,\ m_{it} \leq \frac{y_{it}}{2} - \underline{m}_{it} \text{ for } m_{it} \leq 0 \text{ at the } credit - limitkink$$

The following inequalities hold for *W-HtM households*.

$$a_{it} > 0,\ 0 \leq m_{it} \leq \frac{y_{it}}{2} \text{ for } m_{it} \geq 0 \text{ at the } zero - liquid - wealthkink \tag{2}$$

$$a_{it} > 0,\ m_{it} \leq \frac{y_{it}}{2} - \underline{m}_{it} \text{ for } m_{it} \leq 0 \text{ at the } credit - limitkink$$

Similar to Kaplan et al. (2014), we winsorize the raw data from the HFCS by removing non-core households: (i) with members aged less than 20 or > 79, and (ii) with negative incomes or with all income originating from self-employment. We then construct four key variables—the pay period income, net liquid wealth, net illiquid wealth, and pay period unsecured credit limit.

Setting two weeks as a pay period, we compute *income* in a pay period by summing up the gross wages, salaries, self-employment incomes, and routine public and private transfers. *Net liquid wealth* is defined as the difference between liquid assets and liquid debt. *Liquid assets* include cash,[3] sight accounts, mutual fund holdings, publicly traded shares, and corporate as well as government bonds. *Liquid debts* include the credit card balance after the most recent payment and balance on credit lines or bank overdrafts. *Net illiquid wealth* aggregates the value of households' main residence and other properties (net of mortgages and unsecured loans), occupational and voluntary pension plans, and cash values of life insurance policies. The *unsecured credit limit* is measured by one month's income, same as Kaplan et al. (2014).

Table 2 tabulates the composition of household portfolios of 20 countries. Several stylized facts are noticed. First, illiquid assets account for the bulk of families' wealth. Second, we observe a substantial household-level gap between net liquid wealth and monthly incomes. In particular, the median of monthly incomes (1,892 euro) is triple that of net liquid wealth (633 euro), indicating that a large fraction of the population may be categorized as HtM consumers.

After deriving the data for W-HtM and P-HtM, we transform them into ratios by dividing them by the total number of households. The W-HtM and P-HtM ratios are calculated for each country and reported in **Appendix A** and **B**. The baseline case refers to the results obtained in strict conformity with our above identification strategy. For robustness check, we also compute the ratios based on alternative constructions of W-HtM (P-HtM).

4. Fiscal multipliers and HtM households

4.1. Baseline results using the local projection

We start by calibrating the tax and fiscal spending multipliers using the local projection model. As pointed out by Jorda (2005), this approach can mitigate several misspecifications of structural vector autoregressions (SVAR). In this paper, we specify the panel-local-projection model as follows:

$$x_{i,t+h} = \alpha_h + \psi_h(L) z_{i,t-1} + \beta_h shock_{i,t} + a_{i,h} + \tau_{t,h} + \varepsilon_{i,t+h} \tag{3}$$

where $x_{i,t+h}$ is country i's output at period $t+h$; h indicates the forecast horizon {0, 1, 2 ...}; $z_{i,t-1}$ is a vector of control variables in country i at period $t-1$, containing the first lag of government consumption, tax revenue, output, the exchange rate regime, trade openness, and the debt to GDP ratio. $\psi_h(L)$ is a polynomial of the lag operator. $Shock_{i,t}$ denotes country i's fiscal shock including increase in government spending or decrease in tax revenue at period t. Country ($a_{t,h}$) and time ($\tau_{t,h}$) fixed effects are incorporated in the equation. Heteroskedasticity and autocorrelation consistent (HAC) standard errors are used in the estimation.

Due to contemporaneous correlations, endogeneity may arise when estimating the fiscal multipliers. We construct an instrumental variable inspired by the SVAR model of Blanchard and Perotti (2002). In **Appendix D**, equation system (D2) captures the relationship between the reduced-form residuals (u_t^{tax}, u_t^{spend}, and u_t^{output}) and uncorrelated structural shocks (e_t^{tax},

[3] Except for Spain, we use the ratio of cash over sight accounts from the U.S. to estimate the cash balance for countries without available data following Kaplan et al. (2014).

Table 2
Household portfolios.

	One-Step Statistics		Two-Step Statistics		
	Median	Mean	Mean	Maximum	Minimum
Annual Income (age 20–65)	22,709	36,486	30,118	60,199	2,777
Monthly Income (age 20–65)	1,892	3,041	2,510	5,017	231
Net Wealth	71,213	245,497	230,941	802,483	35,956
Net Liquid Wealth	633	30,812	22,835	155,314	95
Cash, Checking & Saving	425	6,467	4,954	26,606	450
Mutual Funds, Stocks & Bonds	0	24,897	18,490	131,983	196
Credit Card Debt & Credit Line debt	0	551	609	3,275	57
Net Illiquid Wealth	65,527	214,633	208,054	731,265	32,958
Housing Net of Mortgages	42,647	169,477	173,906	646,917	28,496
Vehicles	4,005	11,151	9,048	27,767	1,593
Retirement Accounts	0	1,908	1,828	11,591	0
Life Insurance	0	18,320	9,488	97,455	37
Certificates of Deposit	0	14,061	13,812	40,645	0

Notes: This table presents the components of household portfolios. One-Step Statistics indicate deriving the statistics directly, whereas Two-Step Statistics indicate deriving the mean, maximum, and minimum values in each country first and then taking crosscountry averages. All values are expressed in EUR.

e_t^{spend}, and e_t^{output}) of the SVAR in Blanchard and Perotti (2002). This system of equations is used to solve for the uncorrelated structural shocks, and it yields two useful relationships below:

$$E\left[(Tax_t - a_1 Output_t)u_t^{output}\right] = 0 \tag{4}$$

$$E\left[(Spend_t - b_1 Output_t)u_t^{output}\right] = 0$$

Here a_1 is the tax-output elasticity taken from Price et al. (2015), and b_1 is 0 for discretionary fiscal spending[4]; $Spend_t$, Tax_t, and $Output_t$ denote government spending, tax revenue, and output at time *t*, respectively; *E* indicates the expectation operator. Eq. (4) states the orthogonality condition when $Tax_t - a_1 Output_t$ and $Spend_t - b_1 Output_t$ are uncorrelated with u_t^{output} (the reduced-form residual in the output equation). These two terms are associated with Tax_t and $Spend_t$ and could be used as instruments for Tax_t and $Spend_t$, respectively, when estimating Eq. (3).

Given the above settings, we contrast the response to fiscal shocks of countries that have high-HtM ratios and low-HtM ratios (relative to the median). We estimate Eq. (3) for the two groups and the results are plotted in Fig. 2. The dark solid line denotes the response of the high-HtM group to fiscal shocks, and the dashed lines indicate the 90% confidence interval. The gray line with white squares denotes the response of the low-HtM group to fiscal shocks, and the gray boundaries indicate the corresponding 90% confidence interval.

Fig. 2 indicates several salient patterns. First, the magnitude of the initial fiscal and tax multipliers is comparable to previous studies that also employ the local projection method (Romer and Romer, 2010; Nakamura and Steinsson, 2014; Ramey and Zubairy, 2018). Second and more importantly, countries with high HtM ratios (high-W-HtM or P-HtM ratios) exhibit larger magnitude of fiscal spending multipliers and tax multipliers than the low-HtM counterparts. Such results confirm the theoretical prediction in Section 2 that the higher MPC of HtM households induced by the liquidity constraint will lead to larger magnitude of fiscal spending and tax multipliers.[5]

4.2. Impact of type-I and type-II HtM

As demonstrated in Fig. 1, varying household tiers may respond differently to fiscal shocks due to deviations in MPC. In particular, while second-tier (liquidity-constrained) and fourth-tier (liquidity-, saving-, and credit-constrained) households belong to HtM households, empirical measurement is possible using type-I (at the zero-liquid-wealth kink) and type-II HtM households (at the credit-limit kink) according to Kaplan et al. (2014). To examine heterogeneities of type-I and type-II HtM households regarding output responses to fiscal shocks, we replicate the local projection regression by grouping households according to the medians of type-I and type-II P-HtM (W-HtM) ratios. The results are presented in Fig. 3.

Regardless of being W-HtM or P-HtM, low- and high-type-I HtM groups have divergent influences on fiscal multipliers, wherein countries with high type-I HtM ratios have larger fiscal multipliers, and high- and low- type-II-HtM groups show no difference in affecting fiscal multipliers. This evidence further validates our theoretical prediction in Section 2 that saving

[4] The assumption of discretionary government spending is widely used in literature estimating fiscal multipliers using VARs, for instance, Ilzetzki et al. (2013), Ramey (2011), and Blanchard and Perotti (2002), especially when quarterly data are employed. These works assume that it takes time for government spending to respond to economic conditions.

[5] These results also align with the implications from theoretical models such as Galí et al. (2007), Bilbiie et al. (2008), Oh and Reis (2012), and the empirical work of Cloyne and Surico (2017).

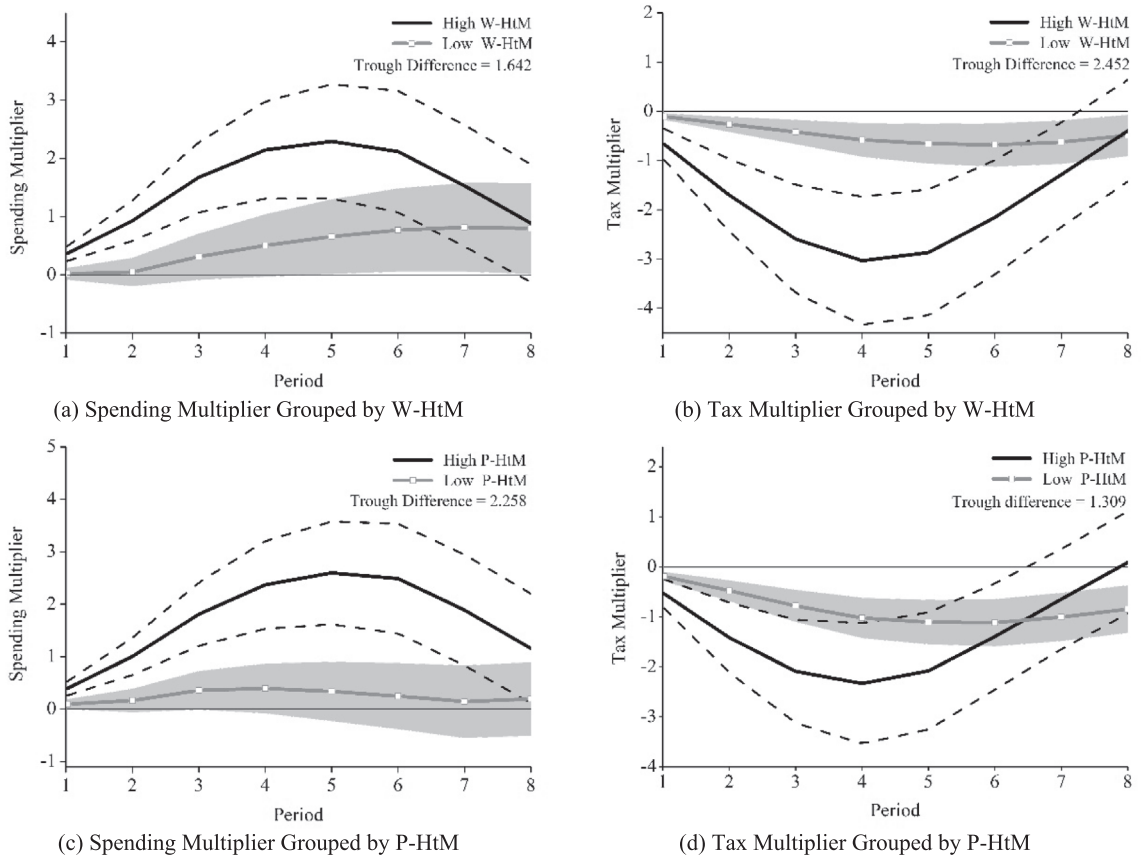


Fig. 2. Fiscal multipliers grouped by the median of the W-HtM/P-HtM ratios.

constraints on type-II HtM households dampen their MPC, as liquidity and saving constraints jointly lead to insignificant responses of their output to fiscal shocks.

4.3. Robustness checks using OLS regressions

To further verify the effect of HtM ratios on fiscal spending and tax multipliers, we perform the following OLS regression in addition to grouping local projections. The model is as follows:

$$FM_i = \beta_0 + \beta_1 HtM_i + \beta_2 TradeOpen_i + \beta_3 Exchange_i + \beta_4 Debt_i + u_i \quad (5)$$

where FM_i denotes country i's fiscal multipliers, including the fiscal spending and tax multipliers. HtM_i is the ratio of W-HtM (or P-HtM) in country i. Following prior literature (Ilzetzki et al., 2013; Ilzetzki et al., 2019), we introduce three control variables in Eq. (5) – trade openness (*TradeOpen*), exchange rate regime (*Exchange*), and government debt to GDP ratio (*Debt*). Trade openness is calculated as the total import and export over GDP, whereas the exchange rate regime is based on the index constructed by Ilzetzki et al. (2019).

Before estimating regression (5), we use the framework of Blanchard and Perotti (2002) to estimate the fiscal spending and tax multipliers, as described in Appendix D. Depending on whether the tax or government spending decisions come first in the SVAR system ($a_2 = 0$ or $b_2 = 0$ in equation (D2) of Appendix D), two values are obtained for each of the government spending and tax multiplier. When the tax (government spending) decision comes first, we label the estimated multiplier "Multiplier 1 (2)", respectively. Furthermore, we report the *impact multiplier* – the multiplier at the moment the impulse occurs (Ilzetzki et al., 2013) and the *peak multiplier* – the maximal output response over the first four quarters upon the arrival of a shock (Blanchard and Perotti, 2002). The multipliers reported in the tables are labeled as *impact multiplier 1*, *peak multiplier 1*, *impact multiplier 2*, and *peak multiplier 2* for the fiscal spending and tax multipliers.

In **Panel A and B of** Table 3, we apply cross-country regressions to eq. (5) to examine whether the presence of W-HtM households and P-HtM households affect the size of fiscal multipliers. In view of the small sample size (20 observations), we report significance levels at the 15% and 20%, similar to the procedure of Mishra et al. (2014).

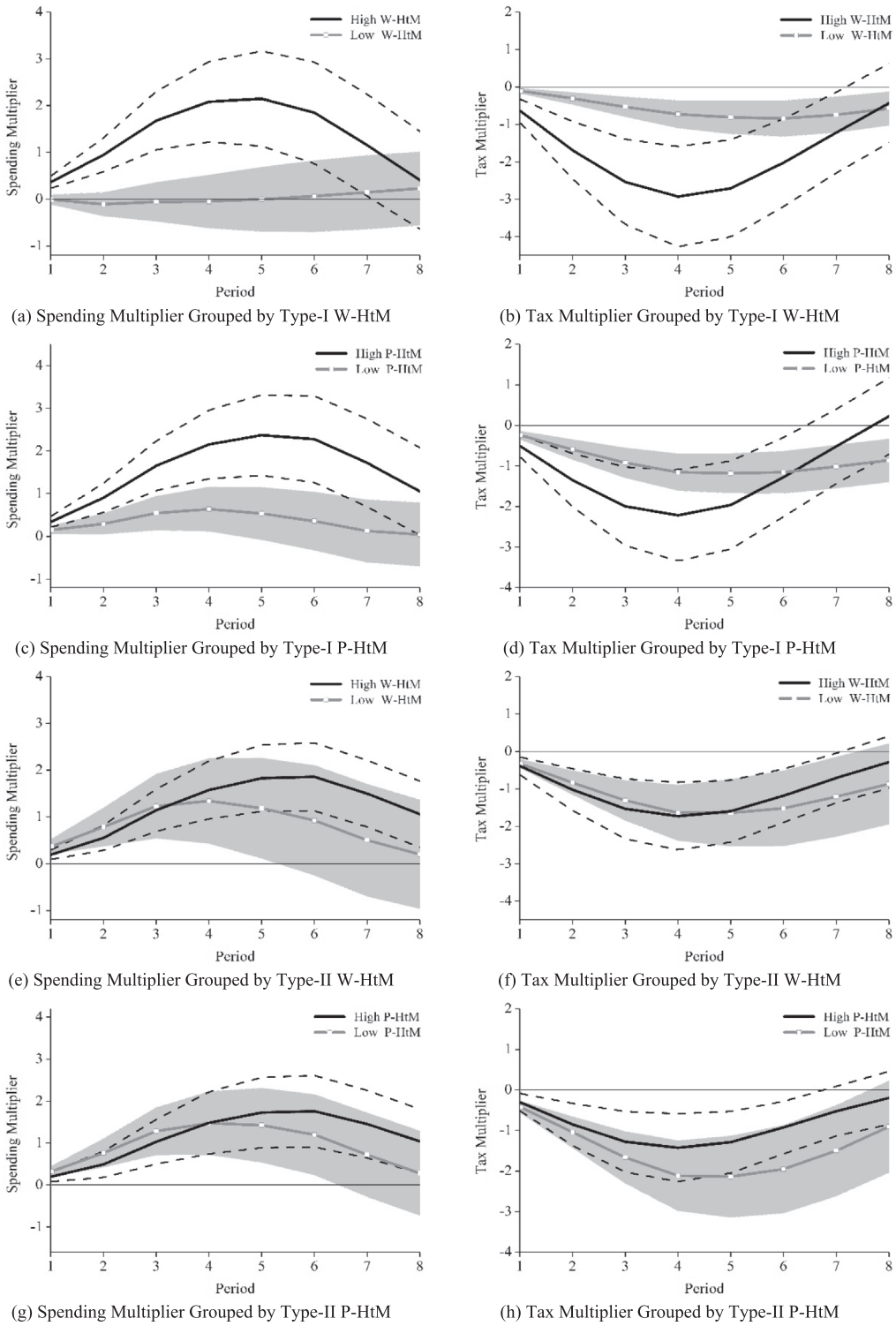


Fig. 3. Fiscal multipliers grouped by the median of type-I/type-II W-HtM/P-HtM ratios.

Three major findings emerge from the results in Table 3. First, we observe negative (positive) effects of HtM households on tax (fiscal spending) multipliers, confirming that HtM households amplify the size of fiscal multipliers. Second, the presence of W-HtM households yields a significant, albeit weak, effect on tax multipliers, whereas P-HtM households have

Table 3
Impact of HtM households on fiscal multipliers.

	Tax Multiplier 1		Tax Multiplier 2		Spending Multiplier 1		Spending Multiplier 2	
	Impact	Peak	Impact	Peak	Impact	Peak	Impact	Peak
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Impact of W-HtM								
W-HtM	0.003	**−0.291**$^{\wedge}$	−0.128	**−0.354***	**0.606*****	**0.297***	**1.070**$^{\wedge}$	0.87
	[0.192]	**[0.193]**	[0.137]	**[0.169]**	**[0.165]**	**[0.162]**	**[0.733]**	[0.751]
Trade Openness	0.005	0.033	0.021	0.041$^{\wedge}$	0.010	−0.008	−0.119	−0.128
	[0.027]	[0.027]	[0.022]	[0.028]	[0.047]	[0.036]	[0.105]	[0.105]
Exchange Regime	−0.012	−0.005	−0.005	−0.002	−0.021**	−0.012$^{\wedge}$	−0.050$^{\wedge}$	−0.044
	[0.009]	[0.009]	[0.006]	[0.008]	[0.007]	[0.008]	[0.034]	[0.035]
Debt to GDP	−0.001	0.002*	−0.000	0.002**	−0.003***	−0.003**	−0.008$^{\wedge\wedge}$	−0.008$^{\wedge}$
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.005]	[0.005]
Constant	−0.894***	−1.059***	−0.964***	−1.081***	0.174$^{\wedge}$	0.267**	0.699$^{\wedge\wedge}$	0.763$^{\wedge\wedge}$
	[0.129]	[0.103]	[0.099]	[0.100]	[0.126]	[0.106]	[0.430]	[0.443]
Observation	20	20	20	20	20	20	20	20
R^2	0.142	0.257	0.167	0.297	0.523	0.477	0.429	0.38
Panel B: Impact of P-HtM								
P-HtM	0.387	0.028	0.047	−0.109	**1.649*****	**1.111****	**3.629***	**3.194**$^{\wedge\wedge}$
	[0.477]	[0.420]	[0.334]	[0.430]	**[0.497]**	**[0.467]**	**[1.963]**	**[2.005]**
Trade Openness	0.004	0.033	0.021	0.041	0.008	−0.009	−0.124$^{\wedge\wedge}$	−0.133$^{\wedge\wedge}$
	[0.027]	[0.032]	[0.022]	[0.032]	[0.030]	[0.023]	[0.081]	[0.086]
Exchange Regime	−0.013$^{\wedge}$	−0.009	−0.007	−0.006	−0.017**	−0.010$^{\wedge\wedge}$	−0.045$^{\wedge\wedge}$	−0.040$^{\wedge}$
	[0.009]	[0.011]	[0.006]	[0.011]	[0.007]	[0.006]	[0.026]	[0.028]
Debt to GDP	−0.001	0.001*	−0.000	0.001*	−0.003***	−0.003**	−0.009*	−0.008$^{\wedge\wedge}$
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.005]	[0.005]
Constant	−0.933***	−1.130***	−0.999***	−1.152***	0.145	0.221**	0.573$^{\wedge\wedge}$	0.636*
	[0.117]	[0.113]	[0.098]	[0.115]	[0.110]	[0.081]	[0.347]	[0.362]
Observation	20	20	20	20	20	20	20	20
R^2	0.186	0.173	0.114	0.159	0.555	0.602	0.528	0.478

Notes: This table examines the impact of W-HtM (P-HtM) households on fiscal multipliers in Panel A (B). The empirical model is the OLS. The multipliers are estimated using the Blanchard and Perotti (2002) SVAR approach. Tax (Spending) Multiplier 1 indicates the results estimated under the setting $a_2 = 0$, while Tax (Spending) Multiplier 2 indicates the results estimated under the setting $b_2 = 0$. Heteroskedasticity robust standard errors are reported in brackets underneath each coefficient. ***, **, *, $^{\wedge\wedge}$, and $^{\wedge}$ indicate significance at 1%, 5%, 10%, 15%, and 20% levels, respectively.

insignificant effects on tax multipliers. These findings can be explained by two reasons. The first is that, due to the higher level of desirable consumption for W-HtM households, they have a higher marginal propensity to consume (MPC) when there are tax cuts than P-HtM households (Kaplan and Violante, 2014). The second reason is that, W-HtM households generally faced a heavier tax levy so that any cuts in tax burden tend to benefit them more, leading to a stronger effect of W-HtM ratios on tax multipliers. The significant coefficients of W-HtM on tax multipliers range from − 0.354 to − 0.291, meaning that a one-unit increase of the W-HtM ratio increases the size of the tax multiplier by 0.291 to 0.354 units.

The third finding is that, regardless of being wealthy or poor, high HtM ratios exert significantly positive impact on the fiscal spending multipliers. In terms of the magnitude, the effect of P-HtM households appears to be more prominent, implying that P-HtM households contribute more to raising the fiscal spending multipliers. These results are consistent with Ma (2009) who asserts that poor households benefit more from government expenditures due to income-redistribution effects. With greater fiscal support, P-HtM households tend to respond more strongly to fiscal spending shocks and thus contribute more to enlarging the fiscal spending multiplier than W-HtM households. The significant coefficients of P-HtM on fiscal spending multipliers range from 1.111 to 3.629, indicating that a one-unit increase of the P-HtM ratio increases the fiscal spending multiplier by 1.111 to 3.629. The significant coefficients of W-HtM on fiscal spending multipliers range from 0.297 to 1.070, indicating that a one-unit increase of the W-HtM ratio increases the fiscal spending multiplier by 0.297 to 1.070.

Notably, the coefficients of ***W-HtM*** on the *peak multiplier* of ***tax multiplier 1 and 2*** are significant (column 2 and 4), while the coefficients of ***W-HtM*** on the *impact multiplier* of ***tax multiplier 1 and 2*** are insignificant (column 1 and 3).[6] We ascribe the insignificant effect on the *impact multiplier* to the lag effect of households' responses to tax cuts. To further investigate this, we repeat the same regression but use tax and fiscal spending multipliers measured by output responses at the second, third, and fourth quarters (i.e. with 1–3 period lags).[7] The results are presented in Table 4. As indicated, the significant impact of W-HtM households on tax multipliers is delayed to the third and fourth quarters. In contrast, the W-HtM households have a more instantaneous influence on the fiscal spending multipliers in the first and second quarters. Overall, we find that W-HtM households take a longer time to enhance tax multipliers relative to fiscal spending multipliers.

[6] As discussed in Section 4.3 and Apppendix D, we use the framework of Blanchard and Perotti (2002) to estimate the fiscal spending and tax multipliers. When the tax (government spending) decision comes first in the SVAR system, we label the estimated multiplier "Multiplier 1 (2)", respectively. The impact multiplier refers to the multiplier at the moment the impulse occurs (Ilzetzki et al., 2013) and peak multiplier refers to the maximal output response over the first four quarters upon the arrival of a shock (Blanchard and Perotti, 2002).

[7] The shocking quarter is recorded as the 1st quarter.

Table 4
Impact of W-HtM households on fiscal multipliers: dynamic analyses.

	Tax Multiplier 1			Tax Multiplier 2			Spending Multiplier 1			Spending Multiplier 2		
	2nd Quarter	3rd Quarter	4th Quarter	2nd Quarter	3rd Quarter	4th Quarter	2nd Quarter	3rd Quarter	4th Quarter	2nd Quarter	3rd Quarter	4th Quarter
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
W-HtM	−0.243	**−0.774**$^{\wedge\wedge}$	**−0.840**$^{\wedge\wedge}$	−0.348	**−0.865***	**−0.913**$^{\wedge\wedge}$	**1.039****	0.186	−0.296	**2.861**$^{\wedge\wedge}$	2.661	2.288
	[0.390]	**[0.497]**	**[0.539]**	[0.365]	**[0.493]**	**[0.539]**	**[0.430]**	[0.418]	[0.615]	**[1.816]**	[2.252]	[2.369]
Trade Openness	0.010	0.116$^{\wedge}$	0.290***	0.019	0.121*	0.293***	−0.02	0.019	0.041	−0.128$^{\wedge\wedge}$	−0.104	−0.075
	[0.049]	[0.067]	[0.057]	[0.050]	[0.067]	[0.056]	[0.025]	[0.042]	[0.060]	[0.083]	[0.111]	[0.129]
Exchange Regime	0.017	0.012	0.011	0.023$^{\wedge}$	0.017	0.014	0.000	−0.004	−0.010	−0.027	−0.039	−0.046
	[0.019]	[0.021]	[0.017]	[0.017]	[0.020]	[0.017]	[0.006]	[0.011]	[0.017]	[0.026]	[0.037]	[0.043]
Debt to GDP	−0.000	0.004**	0.007***	0.000	0.004**	0.007***	−0.002$^{\wedge}$	−0.000	0.001	−0.006$^{\wedge}$	−0.007	−0.006
	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]	[0.005]	[0.006]	[0.006]
Constant	−0.726***	−0.872***	−1.151***	−0.763***	−0.884***	−1.148***	0.056	0.021	−0.061	0.426	0.496	0.413
	[0.156]	[0.193]	[0.246]	[0.139]	[0.189]	[0.242]	[0.095]	[0.117]	[0.171]	[0.341]	[0.446]	[0.483]
Observation	20	20	20	20	20	20	20	20	20	20	20	20
R^2	0.064	0.234	0.449	0.112	0.265	0.463	0.466	0.068	0.11	0.418	0.311	0.235

Notes: This table examines the dynamic impact of W-HtM households on fiscal multipliers measured at various response periods. The empirical model is the OLS. The multipliers are estimated using the Blanchard and Perotti (2002) SVAR approach. Tax (Spending) Multiplier 1 indicates the results estimated under the setting $a_2 = 0$, while Tax (Spending) Multiplier 2 indicates the results estimated under the setting $b_2 = 0$. 2nd (3rd, 4th) Quarter refers to the output response in the second, third, or fourth quarter after a shock in the first quarter. Heteroskedasticity robust standard errors are reported in brackets underneath each coefficient. ***, **, *, $^{\wedge\wedge}$, and $^{\wedge}$ indicate significance at 1%, 5%, 10%, 15%, and 20% levels, respectively.

To examine whether there are heterogeneous effects from liquidity and saving constraints, we rerun Eq. (5) by separating the HtM ratio into the **type-I (liquidity-constrained only)** and **type-II (liquidity-, saving-, and credit-constrained) HtM ratios.** These ratios are used as independent variables in the regressions in Table 5. Two inferences are drawn from the results. First, for ***type-I households*** (**Panel A and B of** Table 5), both P-HtM and W-HtM households have significant enhancing impacts on the fiscal spending multipliers, with a larger impact from the former. However, *type-I W-HtM households* have weak significant enhancing effects on the size of tax multipliers, whereas *type-I P-HtM households* have insignificant effects on tax multipliers. These results are consistent with those reported in Table 3, wherein we do not separate type-I and type-II HtM households. Second, for ***type-II households*** **(Panel C and D of** Table 5**)**, both W-HtM or P-HtM households under the type-II category lose their strengthening effect on fiscal multipliers, as indicated by their insignificant coefficients. This aligns with our theories in Section 2 that the positive effect on MPC from liquidity constraint is offset by the dampening effect on MPC from saving constraint, leading to an overall insignificant effect.

4.4. Robustness checks using alternative proxies for HtM

As one of the robustness checks, 11 alternative proxies for W-HtM and P-HtM households are constructed based on Kaplan et al. (2014). These alternative proxies consider different identification methodologies and definitions of HtM households (based on alternative measures of payment periods, credit limit, illiquid assets, etc.) Further details are provided in the footnotes of Table 6. We then revisit Eq. (5) by using these new measures of HtM ratios, the results are presented in Table 6. The results generally reveal significant enhancing effects of W-HtM on the size of the tax multipliers, and P-HtM on the fiscal spending multipliers, further reinforcing our previous results.

4.5. The possible endogeneity issue

As the effectiveness of fiscal policies (dependent variable) can affect households' budget constraints and hence the share of HtM households in a country (independent variable), this feedback effect may lead to endogeneity issues. To manage such issues, we perform a robustness check by measuring the HtM ratios (the independent variables) using the first wave (instead of the second wave) of HFCS survey data from fieldwork periods prior to the periods for computing the fiscal multipliers (the dependent variable). This way the HtM ratios are predetermined in the regressions. More specifically, we use the first wave of HFCS data from the fieldwork period 2009 to 2011. The fiscal multipliers are estimated using data from the fourth quarter of 2011 to the fourth quarter of 2018. Fig. 4 below presents the results.

In Fig. 4, the results for fiscal spending multipliers are consistent with those presented in Fig. 2 that use the second-wave HFCS data; particularly, the high-HtM group shows stronger output responses to fiscal spending shocks. However, for tax multipliers, the dynamic responses of output to tax cuts are stronger in the cases with lower HtM ratios. This seemingly contradictory result can be explained by the stronger effect of saving constraints in the tax-cut case during the associated period, leading to weaker responses of the HtM households. The fieldwork period of the first-wave HFCS data is June 2009 to August 2011, while that of the second wave is October 2011 to March 2015. The period of the first wave contains years shortly after the 2007–2008 financial crisis during which many households went bankrupt. Households faced stronger saving-constraint

Table 5
Impact of type-I and type-II HtM households.

	Tax Multiplier 1		Tax Multiplier 2		Spending Multiplier 1		Spending Multiplier 2	
	Impact	Peak	Impact	Peak	Impact	Peak	Impact	Peak
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Impact of Type-I W-HtM								
Type-I W-HtM	0.035	−0.311	−0.116	**−0.381***	**0.663*****	**0.328***	**1.292^^**	1.065
	[0.222]	[0.235]	[0.149]	**[0.206]**	**[0.173]**	**[0.182]**	**[0.804]**	[0.829]
Trade Openness	0.005	0.031	0.020	0.038	0.015	−0.006	−0.110	−0.121
	[0.026]	[0.028]	[0.022]	[0.029]	[0.047]	[0.035]	[0.100]	[0.101]
Exchange Regime	−0.013	−0.005	−0.005	−0.002	−0.022***	−0.012^	−0.053^^	−0.047
	[0.009]	[0.008]	[0.006]	[0.008]	[0.007]	[0.009]	[0.035]	[0.036]
Debt to GDP	−0.001	0.001*	−0.000	0.001**	−0.003***	−0.003**	−0.008^^	−0.008^
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.005]	[0.005]
Constant	−0.900***	−1.059***	−0.968***	−1.080***	0.170^	0.264**	0.665^^	0.732*
	[0.125]	[0.110]	[0.097]	[0.107]	[0.117]	[0.101]	[0.394]	[0.411]
Observation	20	20	20	20	20	20	20	20
R^2	0.144	0.259	0.153	0.302	0.537	0.486	0.466	0.410
Panel B: Impact of Type-I P-HtM								
Type-I P-HtM	0.472	−0.001	0.095	−0.147	**1.827*****	**1.210****	**4.265****	**3.741***
	[0.525]	[0.476]	[0.356]	[0.468]	**[0.438]**	**[0.426]**	**[1.923]**	**[2.015]**
Trade Openness	0.006	0.033	0.021	0.040	0.015	−0.005	−0.108^	−0.118^
	[0.026]	[0.032]	[0.023]	[0.033]	[0.030]	[0.023]	[0.074]	[0.079]
Exchange Regime	−0.013^	−0.009	−0.007	−0.006	−0.017**	−0.010^	−0.044^^	−0.039^
	[0.009]	[0.011]	[0.006]	[0.011]	[0.006]	[0.007]	[0.026]	[0.028]
Debt to GDP	−0.001	0.002*	−0.000	0.001*	−0.003***	−0.003**	−0.008*	−0.008^^
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.004]	[0.005]
Constant	−0.941***	−1.127***	−1.004***	−1.149***	0.127	0.211**	0.509^^	0.580*
	[0.112]	[0.116]	[0.099]	[0.117]	[0.105]	[0.076]	[0.301]	[0.322]
Observation	20	20	20	20	20	20	20	20
R^2	0.199	0.173	0.117	0.161	0.569	0.607	0.571	0.513
Panel C: Impact of Type-II W-HtM								
Type-II W-HtM	−0.468	−0.230	−0.401	−0.223	0.247	0.071	−1.434	−1.380
	[0.450]	[0.675]	[0.516]	[0.711]	[0.774]	[0.397]	[1.523]	[1.196]
Trade Openness	0.008	0.035	0.024	0.042	0.009	−0.008	−0.109	−0.119
	[0.026]	[0.031]	[0.021]	[0.033]	[0.050]	[0.039]	[0.114]	[0.114]
Exchange Regime	−0.012^	−0.009	−0.007	−0.006	−0.014	−0.008	−0.036	−0.033
	[0.008]	[0.011]	[0.006]	[0.011]	[0.012]	[0.007]	[0.030]	[0.029]
Debt to GDP	−0.001	0.002*	−0.000	0.001**	−0.003*	−0.003*	−0.008^	−0.008
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.006]	[0.006]
Constant	−0.886***	−1.123***	−0.988***	−1.160***	0.311*	0.335**	0.967	0.984^^
	[0.143]	[0.085]	[0.089]	[0.086]	[0.172]	[0.150]	[0.652]	[0.649]
Observation	20	20	20	20	20	20	20	20
R^2	0.167	0.176	0.145	0.161	0.326	0.373	0.318	0.305
Panel D: Impact of Type-II P-HtM								
Type-II P-HtM	−0.420	0.701	−0.731	0.467	1.528	1.440	−1.146	−0.780
	[1.293]	[2.380]	[1.354]	[2.324]	[1.782]	[1.534]	[3.233]	[3.097]
Trade Openness	0.006	0.031	0.024	0.039	0.004	−0.014	−0.114	−0.125
	[0.027]	[0.035]	[0.021]	[0.037]	[0.049]	[0.037]	[0.120]	[0.119]
Exchange Regime	−0.012^	−0.010	−0.006	−0.007	−0.014	−0.008	−0.036	−0.033
	[0.009]	[0.012]	[0.006]	[0.011]	[0.012]	[0.007]	[0.031]	[0.030]
Debt to GDP	−0.001	0.001*	−0.000	0.001*	−0.003*	−0.003*	−0.008	−0.008
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.006]	[0.006]
Constant	−0.893***	−1.127***	−0.993***	−1.164***	0.314*	0.335**	0.948^	0.965^
	[0.143]	[0.085]	[0.089]	[0.087]	[0.167]	[0.145]	[0.650]	[0.645]
Observation	20	20	20	20	20	20	20	20
R^2	0.145	0.177	0.126	0.159	0.333	0.390	0.306	0.292

Notes: This table examines the impact of type-I W-HtM (type-I P-HtM, type-II W-HtM, type-II P-HtM) households on fiscal multipliers in Panel A (B, C, D). The empirical model is the OLS. The multipliers are estimated using the Blanchard and Perotti (2002) SVAR approach. Tax (Spending) Multiplier 1 indicates the results estimated under the setting $a_2 = 0$, while Tax (Spending) Multiplier 2 indicates the results estimated under the setting $b_2 = 0$. Heteroskedasticity robust standard errors are reported in brackets underneath each coefficient. ***, **, *, ^^, and ^ indicate significance at 1%, 5%, 10%, 15%, and 20% levels, respectively.

to meet their minimum consumption in the subsequent few years. In fact, the estimated HtM ratios indicate that the type-II HtM ratios (for saving-constrained households) in the first-wave data are much larger than that in the second-wave data.

To further verify the conjecture that the dominating role of the saving constraint during the first-wave period leads to the smaller effect of the overall HtM households on fiscal efficacy than non-HtM households, we replicate the results for low/high type-I and type-II HtM groups using the first-wave HFCS and the predetermined setting above. The results are shown in Fig. 5 below.

Table 6
Robustness checks: alternative constructions of HtM households.

	Panel A: Impact of W-HtM				*Panel B: Impact of P-HtM*			
	Tax Multiplier 1 (1)	Tax Multiplier 2 (2)	Spending Multiplier 1 (3)	Spending Multiplier 2 (4)	Tax Multiplier 1 (5)	Tax Multiplier 2 (6)	Spending Multiplier 1 (7)	Spending Multiplier 2 (8)
Measure 1	−0.651	−0.147	0.496	−0.390	−0.104	0.312	**2.826****	5.637
	[0.966]	[0.957]	[0.679]	[1.746]	[1.070]	[0.906]	**[0.982]**	[4.517]
Measure 2	**−0.412**$^{\wedge\wedge}$	**−0.471****	0.245	0.844	0.416	0.285	**0.675****	**2.080**$^{\wedge\wedge}$
	[0.235]	**[0.207]**	[0.184]	[0.738]	[0.401]	[0.395]	**[0.291]**	**[1.269]**
Measure 3	**−0.326**$^{\wedge}$	**−0.396***	**0.337***	1.106	0.012	−0.127	**1.228****	**3.755***
	[0.225]	**[0.196]**	**[0.182]**	[0.851]	[0.458]	[0.460]	**[0.451]**	**[2.087]**
Measure 4	**−0.268**$^{\wedge}$	**−0.333***	**0.304***	0.982	0.004	−0.146	**1.138****	**3.545**$^{\wedge\wedge}$
	[0.189]	**[0.164]**	**[0.165]**	[0.797]	[0.415]	[0.428]	**[0.493]**	**[2.207]**
Measure 5	**−0.360**$^{\wedge\wedge}$	**−0.412***	**0.279**$^{\wedge\wedge}$	0.692	0.016	−0.068	**1.015****	**2.669**$^{\wedge\wedge}$
	[0.217]	**[0.194]**	**[0.166]**	[0.664]	[0.395]	[0.408]	**[0.391]**	**[1.601]**
Measure 6	−0.218	**−0.281***	**0.283***	0.799	−0.262	−0.367	**1.671****	**5.251**$^{\wedge\wedge}$
	[0.177]	**[0.157]**	**[0.141]**	[0.669]	[0.595]	[0.568]	**[0.589]**	**[3.005]**
Measure 7	**−0.291**$^{\wedge}$	**−0.354***	**0.297***	0.870	0.029	−0.109	**1.109****	**3.189**$^{\wedge\wedge}$
	[0.193]	**[0.169]**	**[0.162]**	[0.751]	[0.420]	[0.430]	**[0.466]**	**[2.002]**
Measure 8	**−0.281**$^{\wedge}$	**−0.343***	**0.302***	0.888	0.008	−0.136	**1.149****	**3.294**$^{\wedge\wedge}$
	[0.191]	**[0.167]**	**[0.160]**	[0.752]	[0.442]	[0.449]	**[0.486]**	**[2.093]**
Measure 9	**−0.273**$^{\wedge}$	**−0.341***	**0.312***	0.838	0.055	−0.051	**1.070****	**3.005**$^{\wedge\wedge}$
	[0.194]	**[0.165]**	**[0.161]**	[0.757]	[0.400]	[0.408]	**[0.414]**	**[1.784]**
Measure 10	−0.264	**−0.337***	**0.297***	0.876	−0.080	−0.132	**1.052****	**2.963**$^{\wedge}$
	[0.198]	**[0.173]**	**[0.164]**	[0.728]	[0.436]	[0.430]	**[0.471]**	**[2.045]**
Measure 11	**−0.290**$^{\wedge}$	**−0.353***	**0.298***	0.870	0.030	−0.109	**1.119****	**3.229**$^{\wedge\wedge}$
	[0.192]	**[0.168]**	**[0.163]**	[0.753]	[0.421]	[0.431]	**[0.465]**	**[2.009]**

Notes: This table examines the impact of W-HtM (P-HtM) on fiscal multipliers in Panel A (B) using alternative constructions of HtM households. For simplicity, only coefficients of HtM ratios are reported. The empirical model is the OLS. The multipliers are estimated using the Blanchard and Perotti (2002) SVAR approach. Tax (Spending) Multiplier 1 indicates the results estimated under the setting $a_2 = 0$, while Tax (Spending) Multiplier 2 indicates the results estimated under the setting $b_2 = 0$. W-HtM (P-HtM) is identified by alternative methods: Measure 1 = Consumption is larger than income in last year; Measure 2 = Households with liquid assets less than 2000 local currency units; Measure 3 = One year's income as the credit limit; Measure 4 = Weekly pay period; Measure 5 = Monthly pay period; Measure 6 = Vehicles as illiquid assets; Measure 7 = Retirement account as liquid assets for households with 60-year-old-above members; Measure 8 = Business assets are counted as illiquid assets and self-employment income is counted as income; Measure 9 = Direct investment (mutual funds, bonds, and stocks) is counted as illiquid assets; Measure 10 = Other valuables are counted as illiquid assets; Measure 11 = HELOCs (home equity lines of credit) are counted as liquid debt. Heteroskedasticity robust standard errors are reported in brackets underneath each coefficient. ***, **, *, $^{\wedge\wedge}$, and $^{\wedge}$ indicates significance at 1%, 5%, 10%, 15%, and 20% levels, respectively.

Fig. 5 reveals that, for type-I HtM households (sole liquidity-constrained HtM households), the high-HtM groups have larger tax multipliers than the low-HtM groups. For type-II HtM households (HtM households that are liquidity-, saving-, and credit-constrained), the high-HtM groups have smaller tax multipliers than the low-HtM groups. This is because type-I HtM households are not subject to the saving constraint, and hence the liquidity constraint leads to stronger output responses to fiscal shocks than the non-HtM households. In contrast, the saving constraint dominates the behavior of type-II HtM households, leading to weaker responses to tax shocks than non-HtM households.

Note that the spending multiplier gap between the low and high HtM groups using the first wave HFCS data (Fig. 4(a) and 4(c)) is less remarkable than that using the second wave HFCS data (Fig. 2(a) and 2(c)). This is also attributed to the stronger saving constraint during the period of the first wave data. However, unlike the tax multiplier case, the effect of the stronger saving constraint does not dominate in the fiscal spending case. This may be because the financial condition of wealthy HtM households worsened more drastically than the poor HtM households in the financial crisis since the former held more financial assets. As is documented in Section 4.3, the tax multiplier is mainly affected by the wealthy HtM since they are the main taxpayers under the current progressive tax system, while the fiscal spending multiplier is mainly affected by the poor HtM households who benefit more from government spending policies. As a result, using the first wave data which is in a period that closely follows the financial crisis, the repressive effect of the stronger saving constraint on fiscal multipliers is further strengthened in the tax reduction case than in the fiscal expansion case due to the dominating role of the wealthy HtM in affecting the tax multiplier and the more drastic decline of the financial condition of the wealthy HtM induced by the financial crisis.

5. Monetary efficacy and HtM households

5.1. The impact of HtM on monetary efficacy

We extend our analysis to the examination of output responses to monetary shocks by applying the panel local projection method to the framework of Burriel and Galesi (2018). The model is stated below.

$$Y_{i,t+h} = \alpha_h + \psi_h(L)z_{i,t-1} + \phi_h(L)z^*_{i,t-1} + \beta_h shock_{i,t} + a_{i,h} + \tau_{t,h} + \varepsilon_{i,t+h} \quad (6)$$

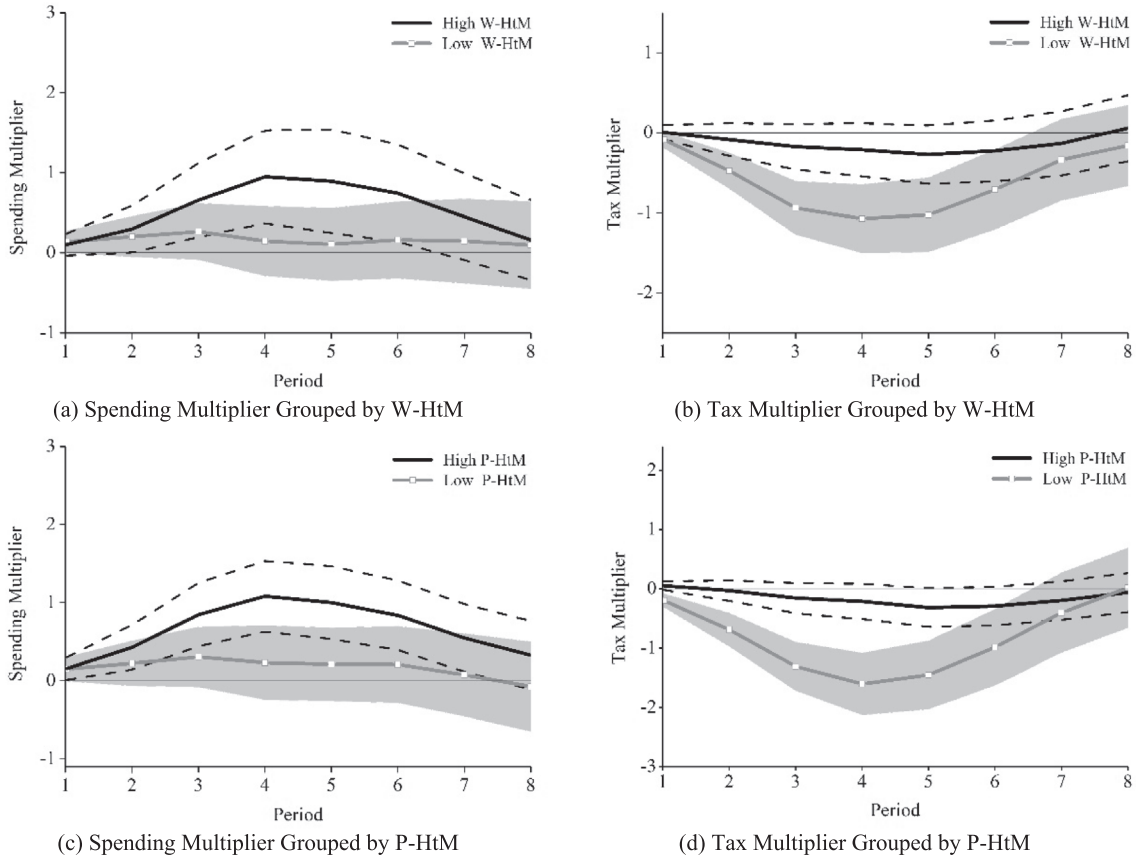


Fig. 4. Fiscal multipliers grouped by the median of the W-HtM/P-HtM ratios (first wave *HFCS* results).

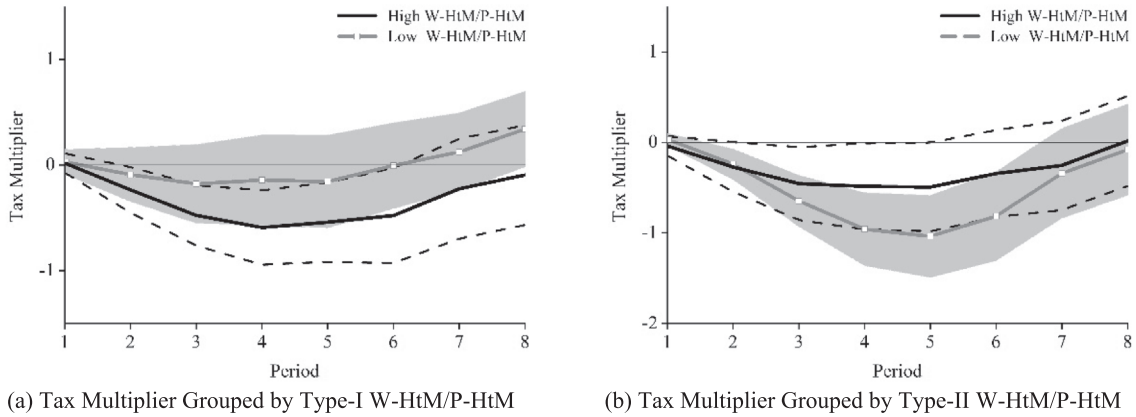


Fig. 5. Tax multipliers grouped by the median of type-I/type-II W-HtM/P-HtM ratios (first wave *HFCS* results)*. *Since the medians of type-I/type-II W-HtM ratios and the median of type-I/type-II P-HtM ratios are the same in the sample here, the results grouped by the median of P-HtM ratios and those grouped by the median of W-HtM ratios are the same. As such, we consolidate figures with same results to save space.

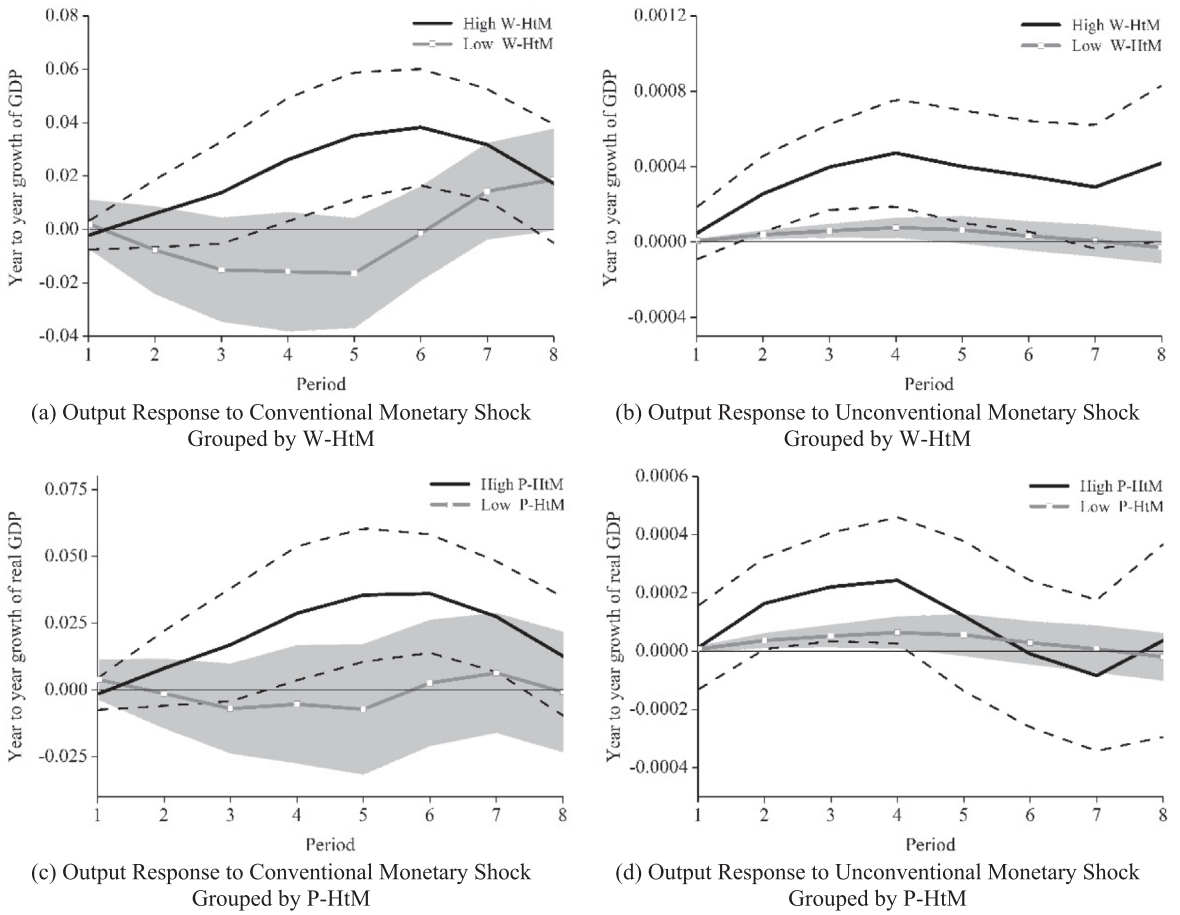
where $Y_{i,t+h}$ is country i's annual growth rate of output at period $t+h$; h is the forecast horizon, which equals 0, 1, 2 …; $z_{i,t-1}$ is a vector for controlling the domestic conditions at period $t-1$, it encompasses the output, inflation rate, and real effective exchange rate. $z^{*}_{i,t-1}$ captures the condition of country i's trading partners at period $t-1$, measured by the output

and inflation rates of different partners in a weighted average. The weight adopted here is the bilateral trade value between country i and each partner over country i's total trade volume. $Shock_{i,t}$ is country i's conventional (and unconventional) expansionary monetary policy at period t. The conventional monetary policy refers to interest rates in main refinancing operations (policy rates), while the unconventional monetary policy is proxied by the total assets of central banks as adopted in Burriel and Galesi (2018). $a_{i,h}$ ($\tau_{t,h}$) is the country (time) fixed effect. The HAC standard errors are reported. Monetary efficacy is measured as the output response to a one-unit decrease in policy rates or a one-unit increase in the total assets of central banks. We regress eq. (6) on the high- and low-HtM subsamples (divided by the median of the HtM ratio for each of the W-HtM and P-HtM groups). The results are presented in Fig. 6.

As shown in the figure, high-HtM households exhibit larger output responses to conventional expansionary monetary shocks (decreases in policy rates) and unconventional expansionary monetary shocks (increases in asset sizes) than the low-HtM households. This provides empirical support to Cloyne et al. (2020) and Almgren et al. (2021) which theorize that expansionary credit can override the kinks that previously constrain the HtM households. The higher MPC of HtM households will induce them to use the additional credit from expansionary monetary shocks to consume more than the non-HtM households. Notably, the response to conventional policies is negative but insignificant for the low HtM group. The negative sign may be attributed to the decreasing interest rates that hurt low-HtM consumers who are more likely to be lenders.

5.2. Separation between type-I and type-II HtM households

As described in Section 2, the zero-liquid-wealth kink and credit-limit kink hamper HtM consumers' access to excess credit, diminishing the potential enhancing effect of HtM households on monetary efficacy (Kaplan et al., 2018; Vissing-Jørgensen, 2002; Burriel and Galesi, 2018; Alpanda and Zubairy, 2019). This consideration complicates the impact of type-II HtM households on fiscal multipliers. To evaluate the difference, we separate the 20 countries in our sample into the type-I and type-II groups and contrast the



(a) Output Response to Conventional Monetary Shock Grouped by W-HtM

(b) Output Response to Unconventional Monetary Shock Grouped by W-HtM

(c) Output Response to Conventional Monetary Shock Grouped by P-HtM

(d) Output Response to Unconventional Monetary Shock Grouped by P-HtM

Fig. 6. Monetary shocks grouped by the median of the W-HtM/P-HtM ratios.

monetary efficacy of countries with high and low type-I and type-II HtM ratios (high and low are defined related to the medians of the type-I and type-II HtM ratios). We re-estimate Eq. (6) for the subsamples, and the results are presented in Fig. 7.

The results for the **high and low type-I HtM groups** are shown in **subfigures a, b, c, and d of** Fig. 7. Overall, the monetary efficacy is larger for the high type-I HtM group than the low type-I HtM group. The results align with the theory in Section 2 that high type-I HtM households have a more unambiguous positive impact on monetary efficacy.

Similarly, the results for the **high and low type-II HtM groups** are presented in **subfigures e, f, g, and h of** Fig. 7. It is found that the output responses to monetary shocks in some cases are larger for the low type-II HtM subsample. As analyzed in Section 2, *the MPC to credit (MPCC) in response to monetary shocks* can be smaller than *the MPC to income (MPC) in response to fiscal spending shocks* for type-II HtM households, since the credit-limit kink can restrain type-II HtM households from accessing the expanded credit under positive monetary shocks. Coupling with the saving constraints, such a driving force can lead to weaker responses to monetary shocks for the high type-II HtM group. These findings are congruent with those of Burriel and Galesi (2018) and Alpanda and Zubairy (2019).

From the results, we discern an insignificant output response to unconventional monetary measures for countries with high type-II HtM ratios. This concurs with Guerello (2018)'s view that unconventional monetary shocks exacerbate income inequalities in the sense that when bond-purchase programs are underway, low-income households with minimal financial assets fail to benefit from the market rally. In addition, they have to bear the potential costs of inflation, which erodes their purchasing power and discounts the effectiveness of unconventional monetary policies.

5.3. Exogenous monetary shocks

Altavilla et al. (2019) constructed a measure of exogenous monetary shocks using **changes in the overnight indexed swap rates reported in the press release and the conference windows of the ECB**. More specifically, at 13:45 of the Central European Time (CET) on the release day, a press release on the monetary policy decisions (with no explanation of the rationale) is issued. Then, at 14:30 CET, the president of ECB reports the rationale behind the policy decision with about 15 min, followed by a question and answer session of about 45 min. This measure is believed to be exogenous because in such a short period, the monetary policy is less likely to respond to asset price shocks; therefore, the one-way causality effect from the monetary policy to the financial market can be identified. Building on this **exogenous** dataset of Altavilla et al. (2019), we segregate the effects of information shock from monetary shock by adopting the methodology of Jarociński and Karadi (2020). Information shocks often occur simultaneously with monetary shocks as people may infer information about the economic outlook from the monetary policy announcements of the central banks. Monetary expansion is commonly interpreted as a signal of pessimistic economic outlook, and vice versa. The effect of the information shocks on consumption and output can be opposite to that of pure monetary shocks.

The key to disentangle the information and monetary shocks is that these two types of shocks lead to different comovement between interest rate and stock price. As pointed out by Jarociński and Karadi (2020), a shock that results in a negative comovement between interest rate and stock price is identified as a pure monetary policy shock, while a shock that results in a positive comovement between interest rate and stock price is identified as an information shock. Taking interest rate cuts as an example, the rationale for the negative comovement scenario is that a decrease in discount rate increases the present value of future dividends, which in turn raises the stock price, whereas the rationale for the positive comovement scenario is that households interpret cuts in discount rate (monetary expansions) as a signal of pessimistic economic outlook and such expectation depresses the stock price.

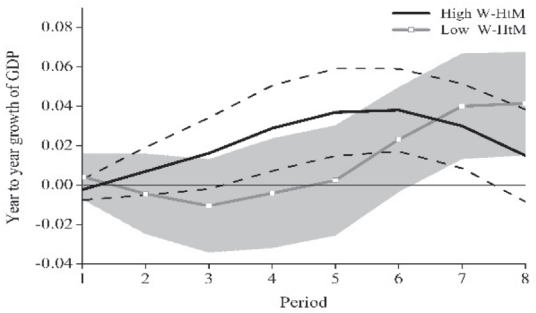
Here, we use the methodology of Jarociński and Karadi (2020) to identify the effect of pure monetary shocks by exerting sign restrictions on the high-frequency interest rate surprises and stock market surprises in the following vector autoregression model.

$$\begin{pmatrix} m_t \\ y_t \end{pmatrix} = \sum_{p=1}^{P} \begin{pmatrix} B_{MM}^{p} & 0 \\ B_{YM}^{p} & B_{YY}^{p} \end{pmatrix} \begin{pmatrix} m_{t-p} \\ y_{t-p} \end{pmatrix} + \begin{pmatrix} c_M \\ c_Y \end{pmatrix} + \begin{pmatrix} u_t^m \\ u_t^y \end{pmatrix}, \begin{pmatrix} u_t^m \\ u_t^y \end{pmatrix} \mathrm{N}(0, \Sigma) \tag{7}$$

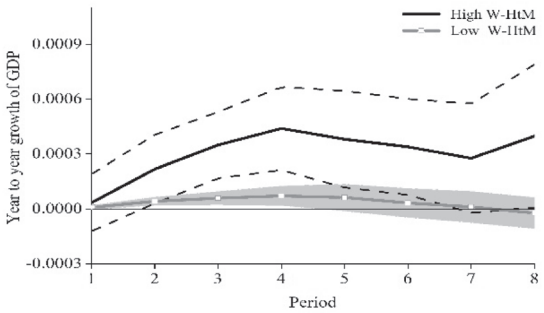
[8]Here m_t is a vector of two types of high-frequency surprises, comprising the *interest rate surprises* measured by changes in the three-month Euro Overnight Indexed Average interest rate swaps across the monetary window (including press release and conference windows) and the *stock price surprises* measured by changes in the EURO STOXX 50 across the monetary window. Shocks in m_t are interday high-frequency variables and we add each of them up to monthly frequency to be consistent with other variables. y_t is a vector of macroeconomic variables in month t, including the one-year bond yield of Germany as a measure of the risk-free rate, the BBB bond spread as a measure of financial conditions, the STOXX 50 index, and the interpolated GDP and GDP deflators. Variables in y_t are in monthly frequency. $\mathrm{N}(0, \Sigma)$ indicates the normal distribution. Other settings of model (7) and the identification method of pure monetary shocks are described in Appendix E.

The Eurozone countries used in our sample share the same variables in m_t and y_t, except for GDP. The data of the Eurozone variables is taken from Jarociński and Karadi (2020), whereas the data on GDP is from CEIC. The monthly data covers March 1999 to October 2017, starting from the launch of euro to the most recent period dur-

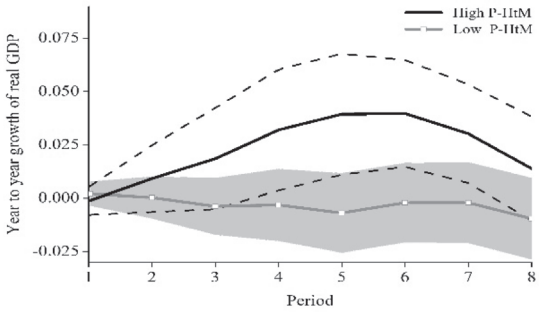
[8] In Jarociński and Karadi's (2020) baseline regression, B_{MM}^{p} and c_M are restricted to be 0, while they also bear out that the results are not affected without such restrictions.



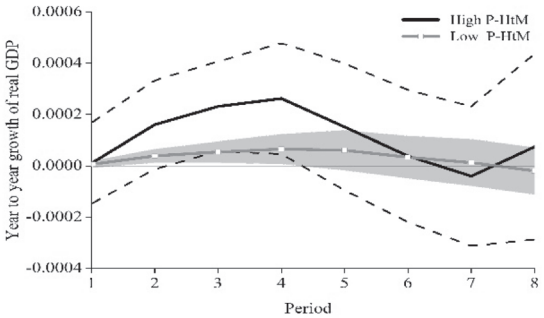
(a) Output Response to Conventional Monetary Shock Grouped by Type-I W-HtM



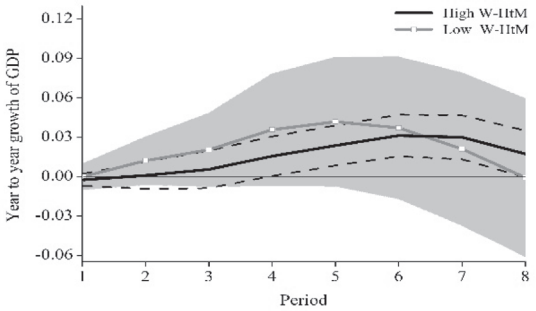
(b) Output Response to Unconventional Monetary Shock Grouped by Type-I W-HtM



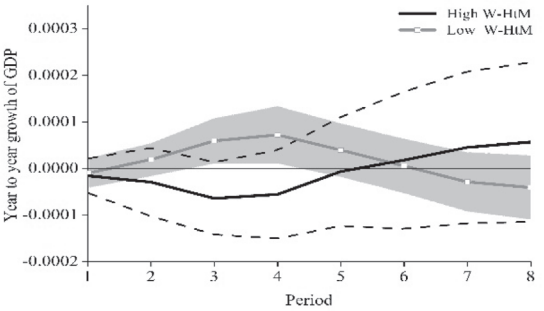
(c) Output Response to Conventional Monetary Shock Grouped by Type-I P-HtM



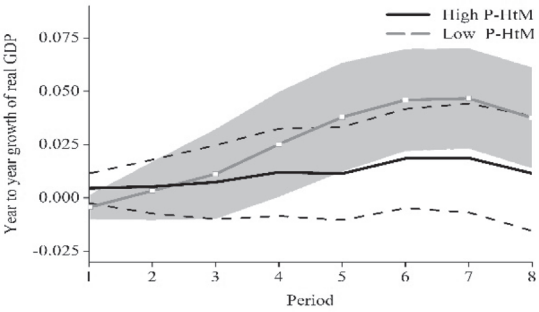
(d) Output Response to Unconventional Monetary Shock Grouped by Type-I P-HtM



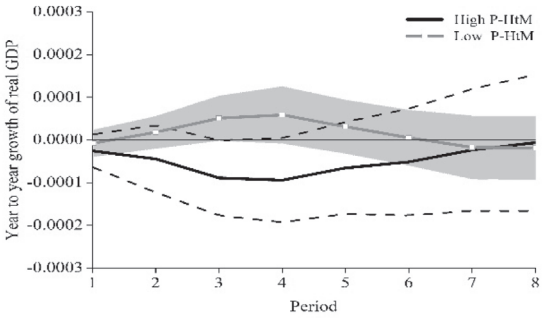
(e) Output Response to Conventional Monetary Shock Grouped by Type-II W-HtM



(f) Output Response to Unconventional Monetary Shock Grouped by Type-II W-HtM



(g) Output Response to Conventional Monetary Shock Grouped by Type-II P-HtM



(h) Output Response to Unconventional Monetary Shock Grouped by Type-II P-HtM

Fig. 7. Monetary shocks grouped by the median of type-I/type-II W-HtM/P-HtM ratios.

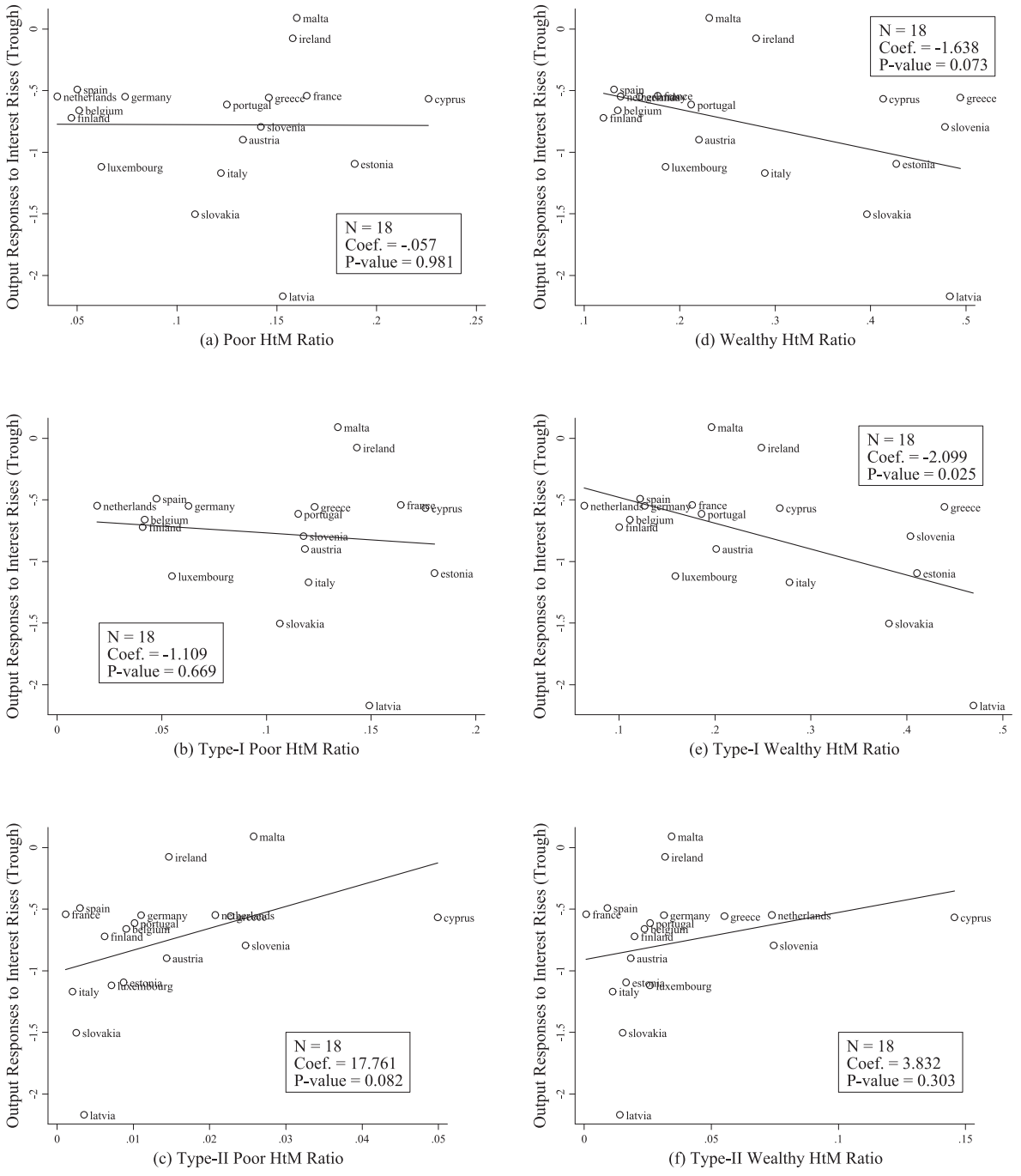


Fig. 8. HtM ratios and trough values of output responses to interest rate rises.

ing which a unified time series can be constructed. There are 18 countries in our sample. The sign restrictions imposed on the VAR system are a positive restriction on the high-frequency interest rate surprise and a negative restriction on the high-frequency stock-price surprise. These restrictions enable us to disentangle pure monetary shocks from information shocks. In the VAR system, a shock is assumed to last for two periods and there are six lags.

We take the trough values of the responses of output to interest rises as the measure of monetary efficacy and then examine the relationship between monetary efficacy and HtM ratios. As the output response to interest rate rises is negative;

hence, the more negative is the response, the higher is the monetary efficacy. The relationship between monetary efficacy and HtM ratios is depicted in Fig. 8.

The left panel of Fig. 8 shows the effects of P-HtM ratios (including type-I and type-II P-HtM ratios) on monetary efficacy. The right panel shows the corresponding effects of W-HtM ratios on monetary efficacy. The vertical axis indicates the output responses to interest rate rises, and a more negative value indicates higher monetary efficacy. The slopes of fitted curves and associated p-values are reported in the legends.

The left panel of Fig. 8 indicates that the poor HtM ratio and the type-I P-HtM ratio do not affect the monetary efficacy, whereas the right panel shows that the W-HtM ratio and the type-I W-HtM ratio significantly enhance monetary efficacy (significantly negative slopes). The results for W-HtM households are consistent with the baseline results, whereas the results for P-HtM households are not. This may be because credit expansion is difficult to be accessed by the poor; hence, the high MPC of P-HtM households has a less significant effect on consumption. These results reaffirm the viewpoints of Almgren et al. (2021).

6. Conclusions

The ***liquidity-constraint theory*** (Kaplan and Violante, 2014; Farhi and Werning, 2016) and the ***saving-constraint theory*** (Miranda-Pinto et al., 2020; Chetty and Szeidl, 2007) assert opposite effects of these constraints on the MPC of households. The liquidity-constraint theory suggests that **liquidity-constrained households** (proxied by rule-of-thumb consumers or mortgagors) have stronger consumption responses to *fiscal shocks* than non-constrained households and has received empirical support (Galí et al., 2007; Bilbiie et al., 2008; Oh and Reis, 2012; Cloyne and Surico, 2017). Nevertheless, there is a lack of consensus on the empirical effect of liquidity-constrained households on *monetary efficacy*. (Kaplan et al., 2018; Cloyne et al., 2020; Almgren et al., 2021). Further to that, the impact of **saving constraint** has been under-researched in empirical works even though it is also an important constraint faced by many households.

This study bridges the gap by providing a unified framework to study the impacts of both constraints on the MPC of households and hence how they affect the fiscal spending and monetary efficacy. To differentiate between the two constraints, we first construct a framework to analyze the dynamic relationship between the consumption level of households and their MPC. Based on this, two thresholds related to the minimum and desired consumption levels are used to categorize households that faced different constraints.

Using data from 20 European countries, we find that HtM households generally enhance **fiscal multipliers**. In particular, the magnitude of *tax multipliers* is enhanced more by *wealth-HtM households (W-HtM households),* whereas the magnitude of *fiscal spending multipliers* is enhanced more by *poor HtM households (P-HtM households).* For **monetary efficacy**, output responses to both conventional and unconventional monetary shocks are more salient for countries with larger HtM ratios, particularly larger *wealthy HtM ratios*. However, when we further categorize HtM households into two types on the basis of liquidity, saving, and credit constraints, we find that type-I HtM (liquidity-constrained only) households contribute to the efficacy of fiscal and monetary policies, whereas type-II HtM (liquidity-, saving-, and credit-constrained) households have insignificant or even negative effects on fiscal and monetary efficacy.

Our findings provide two practical implications for policymakers. First, for countries that have more P-HtM (less W-HtM) households, *fiscal spending expansion* is more effective in bolstering the economy. In contrast, for countries with fewer P-HtM (more W-HtM) households, *tax cuts* are more effective. Second, HtM households that are subject to saving constraints (type-II HtM households) have much lower MPC than households otherwise. Thus, countries with high ratios of type-II HtM households tend to have lower efficacy of fiscal and monetary policies. For this reason, policies that promote saving mechanisms such as fixed regular savings deposits and regular-instalment commitment products (as advocated in studies like John, 2017) can mitigate the saving constraint and hence improve the fiscal and monetary efficacy.

Author Statement.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. W-HtM across various countries

Rules of measurements	Measure	Austria	Belgium	Cyprus	Germany	Estonia	Spain	Finland	France	Greece	Hungary
Baseline		22.0	13.5	41.3	15.8	42.7	13.1	12.0	17.7	49.4	41.0
c > y in the past year [a]	Measure 1	8.9	8.0	16.6	9.5	8.5	15.6	NA	10.5	18.0	8.7
Financially fragile households [b]	Measure 2	41.6	34.1	53.8	31.5	59.3	25.2	22.0	31.9	69.2	64.8
One-year income as credit limit	Measure 3	20.6	12.5	29.1	13.2	41.9	12.5	10.3	17.7	46.4	39.0
Weekly pay period [c]	Measure 4	15.7	10.8	39.4	11.2	41.2	10.8	8.7	13.7	48.8	38.2
Monthly pay period [d]	Measure 5	31.6	19.0	45.1	25.7	45.5	18.3	19.2	27.3	50.9	44.3
Vehicles as illiquid assets	Measure 6	28.4	15.9	51.2	18.5	47.3	15.4	14.6	28.1	56.7	43.0
Retirement account as liquid assets for 60+ [e]	Measure 7	22.0	13.5	41.3	15.8	42.7	13.1	12.0	17.7	49.4	41.0
Business as illiquid assets [f]	Measure 8	21.9	13.4	42.1	15.7	43.2	13.3	12.1	19.2	49.8	41.5
Direct as illiquid assets [g]	Measure 9	23.7	17.1	43.6	20.2	43.6	15.8	17.9	24.5	49.9	45.5
Other valuables as illiquid assets	Measure 10	22.4	13.7	41.9	16.2	43.0	13.5	12.0	21.2	49.6	41.3
HELOCs as liquid debt [h]	Measure 11	22.0	13.5	41.7	16.0	42.7	13.4	12.0	17.8	49.5	41.4
S.D. of different constructions		7.7	6.2	9.3	5.8	11.1	3.6	3.9	6.0	11.0	11.8
S.D. except for the second and third cases [i]		4.1	2.3	5.2	3.8	1.7	2.0	3.1	4.5	2.5	2.1

Rules of measurements	Measure	Ireland	Italy	Luxembourg	Latvia	Malta	Netherlands	Poland	Portugal	Slovenia	Slovakia
Baseline		28.0	28.9	18.5	48.3	23.1	13.8	12.5	21.2	47.8	39.6
c > y in the past year [a]	Measure 1	13.6	7.1	6.4	7.1	10.0	11.2	8.0	9.4	6.3	10.9
Financially fragile households [b]	Measure 2	42.7	40.6	34.2	67.3	38.3	43.3	48.3	49.3	68.0	68.7
One-year income as credit limit	Measure 3	25.0	28.2	17.2	47.1	21.1	10.0	12.3	19.9	41.4	38.5
Weekly pay period [c]	Measure 4	22.3	28.5	15.0	42.1	22.0	10.8	12.0	18.8	45.1	35.7
Monthly pay period [d]	Measure 5	36.7	30.3	23.6	54.6	24.2	20.6	13.7	26.7	52.1	47.3
Vehicles as illiquid assets	Measure 6	35.1	37.0	22.7	50.4	27.8	15.5	15.1	25.9	56.6	42.6
Retirement account as liquid assets for 60+ [e]	Measure 7	28.0	28.8	18.5	48.3	23.1	13.8	12.5	21.2	47.8	39.6
Business as illiquid assets [f]	Measure 8	28.2	29.6	18.4	48.3	23.4	13.8	13.0	21.4	48.4	39.5
Direct as illiquid	Measure	32.0	33.2	21.8	49.0	31.1	16.1	12.9	22.3	53.5	40.3

Appendix A. (*continued*)

Rules of measurements	Measure	Ireland	Italy	Luxembourg	Latvia	Malta	Netherlands	Poland	Portugal	Slovenia	Slovakia
assets [g]	9										
Other valuables as illiquid assets	Measure 10	33.9	37.4	18.7	48.5	23.2	13.8	13.0	21.3	47.9	40.8
HELOCs as liquid debt [h]	Measure 11	28.2	28.9	18.5	48.2	23.1	14.2	12.7	21.4	47.8	39.6
S.D. of different constructions		7.2	8.0	6.1	13.3	6.3	8.5	10.0	8.9	13.8	12.1
S.D. except for the second and third cases [i]		4.3	3.3	2.5	2.9	2.8	2.8	0.8	2.3	4.1	2.8

Notes: a. c > y indicates consumption is larger than income in last year; b. Households with liquid balances lower than 2,000 local currency units; c. The pay period is set to one week; d. The pay period is set to one month; e. Retirement account as liquid assets for households with heads older than 60 years old; f. Business assets are counted as illiquid assets and self-employment income is counted as income; g. Direct investment (mutual funds, bonds, and stocks) is counted as illiquid assets; h. HELOCs (home equity lines of credit) are counted as liquid debt; i. Except for the case "c > y in the last year" and the case "financially fragile households."

Appendix B. P-HtM across different countries

Rules of measurements	Measure	Austria	Belgium	Cyprus	Germany	Estonia	Spain	Finland	France	Greece	Hungary
Baseline		13.3	5.1	22.6	7.4	18.9	5.0	4.7	16.5	14.6	13.3
c > y in the past year [a]	Measure 1	4.2	2.7	7.3	2.1	4.5	3.6	NA	5.8	8.0	4.2
Financially fragile households [b]	Measure 2	25.6	13.0	29.7	12.1	25.6	8.7	9.0	23.3	24.3	22.2
One-year income as credit limit	Measure 3	12.3	4.8	19.5	6.5	18.2	4.8	4.2	16.4	13.9	12.7
Weekly pay period [c]	Measure 4	11.1	4.5	21.8	6.2	18.6	4.4	3.6	13.9	14.5	12.3
Monthly pay period [d]	Measure 5	16.0	6.2	24.0	9.1	19.7	6.1	6.5	22.2	15.2	14.7
Vehicles as illiquid assets	Measure 6	6.9	2.7	12.7	4.7	14.3	2.8	2.1	6.1	7.3	11.3
Retirement account as liquid assets for 60+ [e]	Measure 7	13.3	5.1	22.6	7.4	18.9	5.0	4.7	16.5	14.6	13.3
Business as illiquid assets [f]	Measure 8	13.3	5.1	21.8	7.2	18.4	4.9	4.6	15.0	14.2	12.8
Direct as illiquid assets [g]	Measure 9	13.5	5.2	22.7	7.5	19.0	5.2	5.0	19.8	14.6	14.0
Other valuables as illiquid assets	Measure 10	12.8	4.8	22.0	6.9	18.6	4.6	4.7	13.1	14.4	13.0
HELOCs as liquid debt [h]	Measure 11	13.3	5.1	22.4	7.3	18.9	5.0	4.7	16.5	14.6	13.3
S.D. of different constructions		4.9	2.5	5.4	2.3	4.7	1.4	1.6	5.2	4.0	3.8
S.D. except for the second and third cases [i]		2.2	0.8	3.0	1.1	1.4	0.8	1.1	4.0	2.2	0.9

Rules of measurements	Measure	Ireland	Italy	Luxembourg	Latvia	Malta	Netherlands	Poland	Portugal	Slovenia	Slovakia
Baseline		15.8	12.2	6.2	15.3	16.0	4.0	7.7	12.5	14.2	10.9
c > y in the past year [a]	Measure 1	7.5	2.0	1.6	3.4	4.5	2.9	5.6	5.1	2.7	4.0
Financially fragile households [b]	Measure 2	22.0	17.2	14.3	20.1	40.2	9.6	36.8	27.2	21.8	16.2
One-year income as credit limit	Measure 3	14.4	12.1	5.9	15.0	14.7	3.0	7.4	12.0	12.3	10.6
Weekly pay period [c]	Measure 4	13.3	12.0	5.7	14.0	15.7	3.1	7.5	11.7	13.1	10.3
Monthly pay period [d]	Measure 5	18.6	12.5	6.8	17.0	16.3	5.6	8.3	14.1	15.9	12.1
Vehicles as illiquid assets	Measure 6	8.7	4.1	2.0	13.2	11.3	2.2	5.1	7.9	5.4	7.9
Retirement account as liquid assets for 60+ [e]	Measure 7	15.8	12.3	6.2	15.3	16.0	4.0	7.7	12.5	14.3	10.9
Business as illiquid assets [f]	Measure 8	15.4	11.4	6.2	15.3	15.7	3.9	7.2	12.2	13.4	10.7
Direct as illiquid assets [g]	Measure 9	16.4	12.5	6.3	15.4	16.8	4.0	7.8	12.7	14.8	10.9
Other valuables as illiquid assets	Measure 10	10.0	3.6	5.9	15.1	15.9	3.9	7.2	12.4	14.2	9.7
HELOCs as liquid debt [h]	Measure 11	15.8	12.2	6.2	15.2	16.0	4.0	7.7	12.5	14.2	10.9
S.D. of different constructions		3.9	4.4	3.0	3.7	7.8	1.8	8.2	5.0	4.7	2.7
S.D. except for the second and third cases [i]		2.9	3.3	1.3	0.9	1.5	0.8	0.8	1.5	2.8	1.0

Notes: a. c > y indicates consumption is larger than income in last year; b. Households with liquid balances lower than 2,000 local currency units; c. The pay period is set to one week; d. The pay period is set to one month; e. Retirement account as liquid assets for households with heads older than 60 years old; f. Business assets are counted as illiquid assets and self-employment income is counted as income; g. Direct investment (mutual funds, bonds, and stocks) is counted as illiquid assets; h. HELOCs (home equity lines of credit) are counted as liquid debt; i. Except for the case "c > y in the last year" and the case "financially fragile households".

Appendix C. Tax-output elasticity

Country	Elasticity	Country	Elasticity	Country	Elasticity
Austria	1.06	Greece	0.93	Netherlands	0.99
Belgium	1.04	Hungary	1.03	Poland	0.98
Cyprus	1.00	Ireland	1.02	Portugal	1.03
Estonia	1.14	Italy	1.01	Slovakia	0.89
Finland	0.93	Latvia	0.92	Slovenia	0.90
France	1.00	Luxembourg	1.09	Spain	1.16
Germany	0.92	Malta	1.00		

Notes: Data is obtained from Price et al. (2015).

Appendix D. Estimating the fiscal multipliers using SVAR

Building on Blanchard and Perotti (2002), we develop an SVAR model to capture the dynamic interaction among tax revenue, government spending, and output. The general model is specified as follows:

$$Y_t = A(L)Y_{t-1} + U_t \tag{D1}$$

where $Y_t \equiv [Tax_t, Spend_t, Output_t]'$ is a three-dimensional vector, including the logarithms of tax revenue, government spending, and GDP, $U_t \equiv [u_t^{tax}, u_t^{spend}, u_t^{output}]'$ is the vector of reduced-form residuals, and $A(L)$ is the polynomials in the lag operator. To get orthogonal impulse responses, the reduced-form residuals are specified as:

$$\begin{aligned} u_t^{tax} &= a_1 u_t^{output} + a_2 e_t^{spend} + e_t^{tax} \\ u_t^{spend} &= b_1 u_t^{output} + b_2 e_t^{tax} + e_t^{spend} \\ u_t^{output} &= c_1 u_t^{tax} + c_2 u_t^{spend} + e_t^{output} \end{aligned} \tag{D2}$$

We then determine three conditions that are used to recover the mutually uncorrelated structural shocks (e_t^{tax}, e_t^{spend}, and e_t^{output}). First, b_1 is set to 0 under the assumption that there are no contemporary responses of fiscal spending to the economic condition. Second, either a_2 or b_2 equals 0, which is in line with the assumption that mutual responses are forbidden between tax policies and fiscal spending. In other words, $a_2 = 0$ ($b_2 = 0$) indicates that tax (government spending) decisions come first. Third, a_1 is directly extracted from Price et al. (2015) who provide the tax-output elasticity for separate OECD countries.[9] This impulse response analysis enables us to estimate the fiscal spending (tax) multiplier by the output response to one unit of government spending increase (tax revenue reduction).

Appendix E. Detailed settings of model (7) and the identification method

The matrix $\begin{pmatrix} B_{MM}^p & 0 \\ B_{YM}^p & B_{YY}^p \end{pmatrix}$ contains the coefficients of the lag terms (m_{t-p} and y_{t-p}) in the model. Specifically, B_{MM}^p contains the coefficients of m_{t-p} in the m_t equation, B_{YM}^p contains the coefficients of m_{t-p} in the y_t equation, B_{YY}^p contains the coefficients of y_{t-p} in the y_t equation. c_M and c_Y are the constant terms in the m_t and y_t equations; u_t^m and u_t^y are the error terms. Since the financial surprises are unpredictable, the original model in Jarociński and Karadi (2020) assumes that B_{MM}^p and c_M are zeros. Nevertheless, the results do not change even when these zero restrictions are not imposed, as is indicated by Jarociński and Karadi (2020). This is because the estimation results automatically uncover the fact that financial surprises are unpredictable without any restrictions. In view of this, here we relax the original assumptions but only keep the zero restrictions to the coefficients of y_{t-p} in the m_t equation, giving larger degree of freedom to the estimation.

m_t contains two high-frequency variables, the high-frequency interest rate (*hf_interest*) and high-frequency stock prices (*hf_stock*); y_t contains five variables, the risk-free interest rate (*interest*), the BBB bond rate (*BBB*), the STOXX 50 index (*STOXX*), GDP, and GDP deflators. The sign restrictions are listed in the following table.

Shock\Variable	*hf_interest*	*hf_stock*	*interest*	*BBB*	*STOXX*	*GDP*	*GDP deflator*
hf_interest	> 0	< 0	?	?	?	?	?

In the above table, $>$ indicates positive restrictions, $<$ indicates negative restrictions, and the question mark indicates that it is unrestricted. Sign restrictions last for two periods since the impact, and six lags ($p = 6$) are used in model (7).

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[9] The values of tax-output elasticity for various countries are given in Appendix C. Since Price et al. (2015) only reported the tax-output elasticities for 18 countries, we used the average elasticity for the European Union (EU) members to proxy for the elasticity of the remainder countries Malta and Cyprus.

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