Intertemporal MPC and Shock Size

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Abstract

We elicit the intertemporal Marginal Propensity to Consume (iMPC) based on hypothetical different size lottery winnings through questions in the 2023-24 Italian Survey of Consumer Expectations (ISCE). Survey respondents were asked to allocate three hypothetical lottery winning amounts (€1,000, €10,000. and €50,000) between consumption and saving in both the year following the survey and over the longer term. The iMPC for a €1,000 win declines from 26% in the first year to about 1% five years after the shock. Larger win amounts have a smaller impact in the first year and a larger impact in the long run. The iMPC for a €10,000 (€50,000) prize declines from 19% (15%) in the first year to 2.5% (4%) in year five. Regardless of the size of the shock, the iMPC shows a weak negative relation to the cash-on-hand amount and a negative relation to income risk. We show that calibrated simulations of incomplete market models with borrowing constraints, income risk, and household heterogeneity are broadly consistent with these empirical findings.

Keywords: Intertemporal Marginal Propensity to Consume; Income Shocks; Shock Size

JEL: D12, D14, D15, C8, C99

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1. Introduction

The response of consumption to income changes is a key statistic for evaluating the validity of modern consumption theories, and also, for estimating the effectiveness of fiscal policy. Recent literature uses a range of approaches from structural models, quasi-natural experiments, and direct survey evidence to study the short-run effect of different sized transitory income shocks with different signs, see Jappelli and Pistaferri (2010), Havranek and Sokolova (2020), Gelman (2021) and Crawley and Theloudis (2024) for recent surveys. The present paper builds on this body of work to analyze the intertemporal Marginal Propensity to Consume (iMPC) from a transitory income shock. We exploit the responses to a question in the Italian Survey of Consumer Expectations (ISCE) which surveys a quarterly panel of 5,000 individuals representative of the Italian resident population aged between 20 and 75.

The novelty of our approach is that for the same individual, we elicit the propensity to consume as the result of different sized hypothetical shocks over more than one period. The survey question asked respondents to allocate three different amounts of hypothetical lottery winnings (€1,000, €10,000, and €50,000) between consumption and saving in the year following the survey and over the long run. The responses provide data on planned consumption up to 20 years after the survey, and allow construction of an empirical impulse response function to positive, unexpected, and transitory income shocks of different sizes. The richness of the data enable us to determine whether the shape of the iMPC varies across socioeconomic groups, levels of income risk, cash-on-hand, and macroeconomic uncertainty.

Our examination provides several interesting findings. In the first year the iMPC from a hypothetical €1,000 prize is 26%, compared to 19% and 15% respectively for €10,000 and €50,000 wins. However, over the long run this pattern is reversed; the response to a small shock is weaker than the response to a larger shock which shows that shocks of different size induce different intertemporal consumption reallocations. Small shocks are likely to be consumed more immediately and result in a relatively small iMPC in later years. However, large shocks are smoothed over time, showing a lower short run impact but higher planned consumption in future years, assuming the absence of other shocks in later periods. The relation between the iMPC and the size of the shock adds an important and so far unexplored dimension of iMPC heterogeneity, and has implication for models with precautionary saving and liquidity constraints. A relatively small positive income shock generates a large short run consumption response for the fraction of the population that is liquidity constrained or myopic. A large shock is more likely to overcome these constraints, implying a lower iMPC in the current period but a higher iMPC in subsequent periods.

Based on subjective expectations of income growth, we find that higher expected income volatilityis associated with a lower short run iMPC and a slightly higher response in the long run.[4] We find also that the short run consumption response to a shock is correlated positively with age, and weakly negatively correlated with uncertainty about future GDP and cash-on-hand.

In the second step of our analysis, we compare our empirical results with simulations of the iMPC for different sized shocks with the predictions of intertemporal consumption models that include income risk, borrowing constraints, and heterogeneous agents. Our analysis attempts to select the model (or model class) that best fits the empirical iMPC. Although the simulated models are partial equilibrium models, our results should be informative for researchers studying the dynamic responses to fiscal policy using incomplete market models with household heterogeneity in a general equilibrium model. For example, Auclert et al.

[4] A negative association between the short run propensity to consume and income risk is consistent with Savoia (2023).

(2024) show that in these models the iMPC is essential to evaluate the size of the fiscal multipliers.

We find that a one-asset model with precautionary saving and liquidity constraints is a good predictor of the decline over time in the iMPC, the negative relation between the iMPC and the shock size, and the relation between the iMPC and income risk. The accuracy of the predictions increases for larger shocks. In contrast to the empirical iMPC, the simulations show a clear negative relation between cash-on-hand and the propensity to consume, particularly for relatively small shocks.

We simulated other models and compared the empirical and theoretical iMPC using the Mean Squared Error (MSE) statistics. The data strongly reject the quadratic utility model which predicts a constant iMPC is over time and shock size. The model with a fraction of consumers who spend their entire income in each period is a good match for the iMPC for small shocks but does not account for the lower iMPC generated by larger shocks. A model with two assets as in Kaplan et al. (2014) and Auclert et al. (2021), is a good fit with the data for small shocks but for larger shocks underperforms compared to other models. Overall, our analysis suggests that liquidity, precautionary saving, and constraints are the main explanations of theiMPC that we observe in our data.

Our analysis complements recent empirical and theoretical work. Empirically, it is linked to the growing literature on economic expectations and survey experiments. Bachmann et al. (2022) provide a review of the design of survey experiments which ask respondents to make hypothetical decisions. The paper by Stantcheva (2023) examines a large body of work which shows that the approach has been used in several different fields such as education, labor, health, and macro-finance. In the stream of work on consumption, our paper adds to recent attempts to estimate the iMPC; for example, Fagereng et al. (2018), Golosov et al. (2021), and

Andersen et al. (2024) which use administrative data, Druedahl et al. (2022) which uses transaction data, and Colarieti et al. (2024) who use survey data. Our paper contributes to the literature by providing new estimates of the iMPC over a long time horizon for different sized shocks.

In terms of adding to the theory, our experiment adds to work evaluating the validity of intertemporal consumption models with incomplete markets; for example, see the surveys by Attanasio and Weber (2010), Jappelli and Pistaferri (2017), Kaplan and Violante (2022), and Violante (2024). Our calibrated partial equilibrium models complement two other papers that use quantitative models to estimate the iMPC as the result of income shock. Auclert et al. (2024) study the dynamic output and consumption response to government spending and taxes in a general equilibrium model. Bardoczy et al. (2024) show that in a HANK (Heterogeneous Agent New Keynesian) model the depletion of excess savings occurs within three years for households in the top income quartile.

The paper is organized as follows. Section 2 reviews the previous findings for the iMPC and presents our empirical framework. Section 3 describes the survey data and the format of the questions used to elicit the iMPC. Section 4 presents the empirical iMPC and how it varies with shock size and individual characteristics. Sections 5 and 6 compare our findings with the predictions of an incomplete market model with heterogeneous agents. Section 7 concludes.

2. Intertemporal MPC

In this paper, we define the short-run MPC or simply the MPC as the change in consumption induced by a transitory and unanticipated income shock of a given size which occurs in the first period. As in Auclert et al. (2024), we generalize the MPC by studying the consumption response to the same initial shock in future periods which we denote as the intertemporal or iMPC.

With a few exceptions, the empirical consumption literature focuses on estimating the short run MPC, and relies on structural methods, natural experiments, or survey questions which ask consumers to report how they responded to a previous shock, or how they would respond to a hypothetical income shock. Jappelli and Pistaferri (2010), Havranek and Sokolova (2020), Gelman (2021) and Crawley and Theloudis (2024) survey a large body of empirical evidence which indicates that in the U.S. the average MPC non-durable goods and services from a real windfall gain of $500-$1,000 is between 15% and 30%.

This average value hides substantial heterogeneity since for many households the MPC is close to zero and for some it is close to 1, with considerable variation in between these two values. Previous studies show that the short-run MPC varies with the direction and size of the income shocks. In particular, the MPC produced by a negative income shock tends to be higher than the MPC for a positive shock, and the MPC from a small shock tends to be higher than for a large shock (Fuster et al., 2021; Christelis et al. 2019). Some papers show that the MPC tends to be higher for low-wealth individuals or individuals with illiquid assets while other studies show that the wealth-MPC relation is rather flat.[5]

[5] Chetty et al. (2024) is a very recent paper which uses high quality data to estimate the MPC. The authors focus on the response to a stimulus payment the first month after receipt, and find that stimulus payments increase spending for low-income households but have little impact on high-income households' spending.

While most studies focus on the short run (1-12 months) impact of income shocks on consumption, there are a few recent studies that use lottery data and examine the impact in later periods. To our knowledge, Colarieti et al. (2024) is the only survey that includes direct questions on the MPC in more than one period. They rely on a hypothetical lottery and focus on the quarter-by-quarter dynamics of how the household would allocate $1,000 (or 10% of its income) to spending, debt repayments, and saving over the following four quarters. They find that the MPC is 0.16 in the first quarter, and 0.42 cumulated over a year. Initially, the MPC seems to vary little among households over the whole year heterogeneity increases, with liquid households reporting a larger MPC. However, the iMPC horizon in this study is only one year.

Golosov et al. (2024) analyzed the consumption responses of U.S. lottery winners of prizes over $30,000 and found that $1 extra unearned income increased consumption expenditure by 60 cents over the prize-winner's remaining life. Fagereng et al. (2021) used administrative data for Norway and fund that households spent about half of their lottery winnings in the first year, and about 90% over the first five years. They found also that the short run MPC shows a negative correlation with liquid assets and size of the lottery win. Their evidence suggests that spending is tilted more to the present (higher MPC) than standard models would predict. Andersen et al. (2024) used customer records from a large retail bank in Denmark to track investors' consumption responses to stock market wealth shocks. They found that the accumulated MPC over one year was around 4%, and 16.4% over three years.[6]

[6] Druedahl et al. (2022) study the consumption response of Danish borrowers with adjustable-rate mortgages, and exploit the fact that the bank sends a letter in advance of the annual interest rate reset advising borrowers about the expected change to their mortgage payments. They find that unconstrained households adjust consumption immediately, while liquidity-constrained households adjust closer to the arrival of the cash flow.

Based on our survey data we define $iMPC_{i,j,t} = \frac{\partial c_{i,j,t}}{\partial L_j}$, where L_j is a lottery win of size j and $iMPC_{i,j,t}$ is the change in consumption of individual i in period t induced by lottery win L_j. In practice, we estimate the regressions based on the following simple specification:

$$iMPC_{i,j,t} = \sum_{t=1}^{T} \beta_{j,t} + \delta_{i,j} + \varepsilon_{i,j,t} \tag{1}$$

where the main coefficients of interests are $\beta_{j,t}$, that is, the average of the iMPC in response to shock j in period t. The $\beta_{j,t}$ coefficients are comparable to how the MPC is calculated in the literature, and have a direct counterpart in our calibrated model. The $\delta_{i,j}$ are individual fixed effects and capture all the sources of heterogeneity in consumption except the shock. We assume that the error term $\varepsilon_{i,j,t}$ is the classical measurement error in reported iMPC. We estimate separate regressions for each of three shocks as described in Section 4. In some variants of equation (1) we estimate the year-by-year consumption response to the shock, replacing the fixed effects with a set of socioeconomic variables.

In a frictionless permanent income model with quadratic utility the iMPC is constant overtime, regardless of the size of shock. Therefore, testing whether the $\beta_{j,t}$ parameters are constant over time and identical for different shock sizes is a joint test of the validity of the quadratic utility model.[7] Models with precautionary saving, borrowing constraints, liquidity, and myopia introduce non-linearities in the iMPC over time and over the shock size, possibly inducing higher responses in the short-run and a weaker impact in future periods.

For instance, if consumers are liquidity constrained in the period in which the shock occurs, the iMPC will be 1 in the initial period and zero in all subsequent periods. If the shock is large enough to overcome the liquidity constraint, the iMPC will be less than 1 in the initial

[7] If the regression has a constant term, the hypothesis is that the parameters are jointly equal to zero.

period, and positive afterwards. Precautionary saving and expectations of future borrowing constraints have opposing effects, in the short run reducing the iMPC, and in future periods increasing it. The survey allows us to test some of these important and so far unexplored implications of the iMPC statistics.

3. The survey

Our data on iMPC come from the responses to the Italian Survey of Consumer Expectations (ISCE), a rotating panel, representative of the Italian resident population aged between 18 and 75 years. It is administered quarterly and collects data on demographic variables, income, wealth, consumption, expectations of microeconomic (e.g. income growth, energy costs, health expenditure) and macroeconomic variables (e.g. inflation, unemployment, GDP growth). These variables refer to October 2023 (wave 1), January 2024 (wave 2), and April 2024 (wave 3). In each wave, the sample size is approximately 5,000 individual observations.

The survey builds on two international experiences of online, high-frequency surveys that collect both realized variables and also expectations, preferences, and perceptions. The New York Fed Survey of Consumer Expectations collects information on consumers' views and expectations regarding inflation, employment, income, and household finances, while the European Central Bank Consumer Expectation Survey collects monthly data on households' expectations from about 20,000 individuals from 11 euro-area economies.

The ISCE sampling scheme is similar to that employed for the Bank of Italy Survey of Household Income and Wealth (SHIW). The sample stratifies the Italian resident population along: area of residence in Italy (North-East, North-West, Central, South), age group (18-34, 35-44, 45-54, 55-64, over 65), gender, education (college degree, high school degree, less than high school), and occupation (working, not working). All interviews are enabled by a Computer Assisted Web Interviewing (CAWI) method. The average response rate (ratio of completed interviews to invitations) across waves is 33%. We use sample weights to make the descriptive statistics population-representative. The ISCE Statistical Bulletin presents detailed information on the survey design and the sample structure, and compares the main variables with the SHIW (see Guiso and Jappelli, 2024).

The questionnaire includes a section that is the same for every quarter, and special sections which change. For our study, we rely on the background demographic and economic variables and the January 2024 (wave 2) special section which asks about the iMPC.

Table 1 reports the sample means and medians for the main variables used in the estimations, and compares them with their SHIW counterparts. Means and medians are computed using sample weights. The demographic variable sample means are similar in the ISCE and SHIW samples and the weighted median values of income, consumption, and financial wealth are also closely aligned. However, we observe also some notable differences. For instance, the proportion of respondents with college education is higher in the ISCE (24%) compared to the SHIW (15%). This is because the ISCE oversamples the population segment more likely to have internet access and able to respond to online questionnaires.

The ISCE also asks respondents about intentions and expectations. In our study context, the most useful is expectations about the distribution of income growth in the 12 months following the interview.[8] The question about expectations is presented in a probabilistic format, with respondents asked to allocate 100 probability points to given intervals of future income growth ranging from "less than -8%" to "more than 8%". This allows us to estimate the entire distribution of expected income growth for each individual in the sample, and to calculate the standard deviation of the distribution to measure subjective income risk.

The special section of the second wave from the ISCE includes questions about the iMPC for a transitory and positive income shock. The first three questions ask respondents how they would spend three hypothetical lottery winnings over time:

Imagine winning a lottery prize of €1,000 / €10,000 / €50,000 today. Think about how you would spend this sum in the coming years. You are free to choose how to distribute the sum over the next 10 years and beyond.

Respondents can choose how much to consume in each of the five years following the win. After the fifth year, the periods are presented in three intervals of five years, although respondents can also choose to use the prize beyond the 20th year ("*use in subsequent years*"). The order in which the three hypothetical wins are presented could introduce some framing effects in the iMPC estimates. Therefore, we created six randomized groups, and for each group presented different permutations of the three prizes. In the regression analysis, we control for the six randomized groups which are well balanced in terms of the demographic and economic variables.

There might be concern that a hypothetical shock might not reproduce real behavioral response to an actual shock. For instance, respondents might be tempted to offer socially desirable responses, or might be influenced by perceived societal norms (e.g. reporting high saving rates) while their responses might not reflect their actual behavior. To mitigate these concerns, for the same individual we compare the responses to the same shock over time, and the responses to different shocks in the same periods which should account for the influence of individual fixed effects. On the assumption that these potential biases are randomly distributed within the population, we can still make causal inferences about the time and size dimensions of the consumption response.[9]

Since we consider some respondents might find these questions quite challenging, we do not distinguish between durables and non-durables consumption. In the first step of the analysis, we estimate three intertemporal marginal propensities to spend (iMPX) by dividing the consumption reported in each year by the lottery win value. We organized the data in a panel with each individual observed for nine periods. As already mentioned, the first five periods are the yearly iMPX, the next three are five-year intervals, and the last period is an open interval. Background variables such as age, gender, education, and cash-on-hand do not change in the panel and are fixed at the baseline that is, at the time that individuals received their hypothetical lottery win and were asked to plan their future (hypothetical) expenditure.

The second step in the analysis was estimating the iMPC from the distribution of iMPX, relying on a rough estimate of the overall amount likely to be spent on durable goods (without asking for the period break-down). We asked the respondents how much of the total prize they would allocate to durable consumption (cars, appliances, computer/electronic equipment, furniture). We converted this qualitative indicator into a quantitative variable that is coded 0 ("I don't plan to spend anything on durables"), 0.25 ("less than half"), 0.5 ("half the amount"), 0.75 ("more than half") and 1 ("spend all of it on durables"). Table 2 shows that the proportion of total consumption spent on durable goods is higher for small shocks. For instance, the fraction of those who would spend the entire prize on durables purchases is 45% for the smallest prize, 26% for the intermediate amount, and 17% for the largest prize. To estimate the

[9] The questionnaire was administered in early February 2024, one year after the post-pandemic recovery. In 2023, real GDP growth in Italy was 0.9%, slowing from the 4% growth rate in the previous year, and was projected to grow at 0.7% in 2024. Although we cannot rule out business cycle effects, the period in which the survey was administered should have weakened their impact.

iMPC, we assume that the amount that people allocate between non-durables and durables is the same over time, and multiply the iMPX by 1 minus the share of durable consumption reported in table 2.[10]

4. The empirical propensity to consume

In this section we present the main results of the iMPX and iMPC analyses for each of the three lottery win values. We also show that the propensity to consume varies with age, cash-on-hand, income risk, and other demographic variables.

4.1. iMPX

We compute the cross-sectional average of the propensity to spend for each of the nine periods following the shock; Figure 1 plots the three resulting iMPX. Recall that each individual reports the iMPX for each of the three prize values, and that the amounts reported are standardized by the lottery win. Figure 1 shows high propensity to spend in the first year for the €1,000 prize (77%), intermediate spending for the €10,000 prize (50%), and lower spending for the €50,000 prize (35%).

These high spending propensities are broadly consistent with previous findings. Fagereng et al. (2021) found that in the case of Norway households spent about 50% of their lottery winnings in the first year. Jappelli and Pistaferri (2014) studied the case of Italy and the propensity to spend a hypothetical and unanticipated bonus equivalent to one month's income was 48% while Christelis et al. (2019) reported that following a one-month income increase the average Dutch respondent allocated 48.8% of this additional income to total consumption.

[10] Another concern is that the question does not include debt repayment as a possible use of a lottery win. Since not everyone equates debt repayment with saving, in the robustness checks we test whether the results change if we exclude individuals with debts.

In the second period, the ranking is reversed, with the iMPX 9% for the smallest prize and about 19% for the two larger prizes. Most of the consumption impact of the shock vanishes after a few years: adding up the propensities to consume in the first five years results in a cumulative iMPX of 92.3% for the smallest prize, 87.6% for the intermediate prize, and 80% for the largest win. On average, the spending horizon spans the entire range of the periods presented to the respondents although the average respondent planned to spend 5% of the largest prize 20 years after the shock.

4.2. iMPC

Figure 2 plots our estimates for the three iMPC, that is, planned non-durable consumption standardized by the lottery prize value. The shape of each of the three curves is a scaled down version of those in Figure 1. In the first year, the iMPC is 26.5% for the smallest shock, 18.9% for the intermediate shock, and 15.5% for the largest shock. In the short run, the magnitude of the MPC is comparable with the findings of the literature. The surveys by Jappelli and Pistaferri (2010), Havranek and Sokolova (2020), Gelman (2021), and Crawley and Theloudis (2024) indicate that in the U.S. the average MPC non-durable goods and services from a windfall gain of $500-$1,000 was of the order of 15% to 25%. Christelis et al. (2019) found that in the Netherlands the average MPC nondurables is 19%.

The iMPC distributions include two features that are worth noticing. First, similar to the iMPX, in the second year the consumption response to a small shock is weaker (4%) than the response to a large shock (9%). In other words, small prizes tilt the consumption profile towards the present, while large prizes are more likely to be spent in future periods. Second, after five years spending on non-durable consumption is limited (between 5% for the €1,000 prize and

12% for the €50,000 prize). Therefore, in the theory section we consider the five-year iMPC as a sufficient statistic to characterize the dynamics of consumption.

Figure 3 shows another interesting dimension of the iMPC distributions. The proportion of respondents that consume the entire €1,000 prize in the first year (MPC=100%) is 15%, and is much lower for the two larger prizes (5% maximum). This suggests that shock size is an important dimension of heterogeneity in the empirical iMPC. A natural explanation of this is that myopia or liquidity constraints have the greatest effect on winners of the smallest value prize and vanish or are less important for larger shocks which are more significant and are more likely to overcome liquidity constraints.

Figures 4, 5, and 6 explore sources of heterogeneity associated with age, liquid resources (the sum of monthly income plus liquid financial assets), and income risk. Splitting the sample by age (below or above 40 years) Figure 4 shows that in the first period the iMPC is about 5% higher for the older group, regardless of the size of the shock. In the later periods, the iMPC is similar for the two groups, with a tendency for the younger group to report a slightly higher propensity to consume in the last period, and especially for the largest prize (about 2%). Figure 5 shows that cash-on-hand makes little different to the iMPC in any of the periods considered.

The ISCE also asks about the subjective probability distribution of expected earnings and retirement income growth 12 months ahead. Respondents are asked to indicate probabilities over 11 intervals of possible income growth values, ranging from less than 8% to more than 8%. We use the mid point of the intervals chosen by the respondent to construct the subjective distribution of income growth moments. For the lowest and highest open intervals we assume the respective values -10% and 10%. The standard deviations of the individual distributions are the income risk measures used in our iMPC analysis.

Figure 6 plots the iMPC splitting the sample between high and low-income risk respondents (standard deviation of expected income growth below or above 0.5%). In the short run, higher income risk is associated with a lower iMPC, while in later periods the relation is reversed. For instance, for a €10,000 win, in the first year the average iMPC of the low-risk group is 28% and of the high-risk group is 23%. This empirical regularity is in line with the predictions of models with precautionary saving and a concave consumption function. In the short run, prudent individuals save a larger fraction of their prize compared to individuals with the same preferences but lower risk. Section 5 analyzes the effect of income risk on the simulated iMPC and compares it to the empirical iMPC.

4.3. Regression analysis

Table 3 presents the regression results for the three iMPC distributions. Due to missing observations for iMPC, the ISCE sample size drops by about 10% to 4,137 respondents. We organized the cross-sectional data into a panel; for each individual we have a time series of the propensity to consume in nine periods following the interview, resulting in a panel of around 40,509 year-individual observations. All the other variables are constant across the panel, and therefore collinear with the fixed effects. To avoid contamination of the estimated iMPC by framing effects, we introduced dummies for the (random) ordering of the three iMPC questions. The coefficients of the year dummies in Table 3 represent the deviation from the benchmark "year 5" dummy. The coefficients of the year dummies are plotted in Figure 2 and show a large response in the first year (especially for the smallest prize), followed by a decline in the later periods.

Respondents were asked to report planned expenditure, and a coarse measure of expenditure on durables but were not asked directly about debt. Since some individuals might consider consumption in the form of debt repayment rather than saving, we estimate the iMPC regressions dropping all individuals with a positive debt in January 2024 (55% of the original sample). Table 4 shows that the year coefficients barely changed. Since the estimated iMPC is quite similar in the two specifications, we assume that respondents allocate the hypothetical lottery win between consumption and saving rather than debt repayment.

4.4. Short run iMPC

To compare our data with the results in the literature here we focus on the relation between the short-run, one year, iMPC and the socioeconomic variables. Figures 1 to 6 plot the sample average of the iMPC for each of three shocks, the fraction of respondents spending the entire winning in the first year, and the relation between iMPC and age, cash-on-hand, and income risk.

Table 5 presents the results of the ordinary least squares (OLS) regression considering only planned consumption in the first year. The control variables include standard demographic characteristics (age, gender, education, family size, region of residence), income risk, and log of cash-on-hand. For the €10,000 and €50,000 wins the effect of age is positive and statistically different from zero. The coefficients of log cash-on-hand are negative in all regressions, but statistically different from zero only for the €10,000 winning, possibly reflecting that cash-on-hand is measured with error.[11] The effect of income risk (proxied by the standard deviation of expected income growth) is negative and statistically different from zero in all three regressions.

Also, the iMPC is negatively correlated with the standard deviation of expected GDP growth. The coefficients of expected income growth and expected GDP growth are not

[11] Notice that our definition of cash-on-hand is coarse, because our survey elicits monthly income and in a single question with 11 brackets, and financial wealth in one question with 5 brackets.

statistically different from zero. In the robustness checks, we found no significant differences for the other economic variables such as occupation, proxies for credit access, and financial literacy (understanding of interest rates, stocks, and inflation).

5. Simulated iMPC

In this section we compare our empirical estimates of the iMPC with simulated consumption profiles produced by standard intertemporal consumption models. Our baseline model is a one-asset, incomplete market model with heterogeneous agents. In section 6 we check the sensitivity of the numerical simulations of the iMPC to other models.

Our baseline framework assumes that the economy is populated by a continuum of households of measure 1 which are heterogeneous in their initial wealth *a* and income *y*. Time is discrete, and household *i* maximizes its expected utility according to:

$$max_{c_{i,t}} \; E_0 \sum_{t=0}^{\infty} \beta u\left(c_{i,t}\right) \tag{2}$$

$$s.t. \qquad a_{i,t} - a_{i,t-1} = r a_{i,t-1} + y_{i,t} - c_{i,t} \tag{3}$$

$$a_{i,t} \geq 0 \tag{4}$$

In equation (2) we assume that the utility function is isoelastic, $u\left(c_{i,t}\right) = \frac{c_{i,t}^{1-\gamma}}{1-\gamma}$. The respective parameters β and γ represent the discount factor and the intertemporal elasticity of substitution. Equation (3) is the dynamic budget constraint. In each period the change in wealth equals disposable income (earnings plus interest income) minus consumption. Equation (4) is a borrowing constraint which prevents wealth from being negative.[12] Log income follows an AR(1) process:[13]

$$logy_{i,t} = \rho logy_{i,t-1} + \varepsilon_{i,t} \tag{5}$$

where $\varepsilon_{i,t}$ is an i.i.d. normal process with mean zero and standard deviation σ_{ε}.

We calibrate the discount factor to match the empirical ratio of average financial wealth to average income (1.11 in our data). We denote this ratio as the liquid ratio. The parameters used in the calibration are reported in Table 6.[14] To mimic the three hypothetical wins (€1,000, €10,000, €50,000) we take as reference the average annual income reported in the ISCE (€27,000).[15] Therefore in the simulations we consider a small shock of approximately 5% of income, a medium shock of 40% of income, and a large shock of twice average income.

As explained in Section 3, the largest planned spendings occur in the first five years after the hypothetical shock, and after the fifth year the responses are quite small. Therefore, to provide an interesting comparison, we consider the simulated iMPC up to the fifth year. We focus on non-durable consumption as the most informative for current macroeconomic policy debate (see Kaplan and Violante, 2022).

Figure 7 compares the theoretical and empirical iMPC for the three prizes. In the short run, the theoretical iMPC is larger for small shocks which is in line with our data. While the

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[12] The iMPC simulations are similar if we allow limited borrowing setting the constraint (4) at a negative and exogenous value of wealth.

[13] In section 6 we also consider a log income process given by the sum of a transitory and a permanent income component.

[14] The model is calibrated at annual frequency. The income process is discretized using Rouwenhorst's (1995) method. The stationary distribution is calculated using the lotteries algorithm, as in Auclert et al. (2021).

[15] The results do not change if wealth shocks are calibrated using median (€21,000) rather than average income.

model closely matches the short-run iMPC for the smallest prize, it underestimates the short-run iMPC for the two larger prizes by approximately 7 percentage points. From the second year onwards, the model overestimates the iMPC across all prize sizes but the gap between the theoretical and empirical iMPCs reduces with the size of the prize.

As noted in Section 4.2, for the smallest prize, our data show a large consumption response. In the model, this response is captured by constrained agents with low resources and high consumption responses. In the long run, the model features greater persistence than evident from our data; this persistence is driven by agents with high cash-on-hand who do not spend the entire prize immediately. For the two largest prizes, the data show lower but more persistent responses compared to the smallest prize. In the model, this pattern arises because large positive shocks are more likely to overcome borrowing constraints.

Our data also allow us to simulate the iMPC of individuals with low and high cash-on-hand. Consistent with the empirical iMPC plotted in Figure 5, we calibrate the discount factors for a group of impatient low-cash households (liquid ratio of 0.77) and a group of patient high-cash households (ratio of 1.49). Figure 8 shows that the consumption response to the €1,000 prize in the first year is about 10 percentage points higher for low-cash households. In the case of the €10,000 and €50,000 shocks, the responses are, respectively, 5 points and 2 points higher than in the low-cash group. Comparing these simulations with figure 5, we see that the model fails to replicate the observed lack of relation between the empirical short-run iMPC and cash-on-hand. Despite this, for both groups we observe a convergence over the long run between the empirical and theoretical iMPC. Simulations also indicate that over time the iMPC converges between low and high-cash groups. This outcome is due to the fact that once low-cash individuals have spent their winnings, they have less to spend in the long run, resulting in limited heterogeneity between the two groups.

Next, we investigate whether the theoretical iMPC is related to income risk, and if it matches the iMPC observed in figure 6 for the two groups of respondents with expected standard deviations of income growth below and above 0.50%. These results are more easily presented in tabular form. Table 7 compares iMPCs for two versions of the baseline model. Columns (1) and (2) report the numbers used to construct figure 6 for low and high risk households. To mimic these differences, we report the simulated iMPC setting $\sigma_{\varepsilon} = 0.48$ in column (3) and $\sigma_{\varepsilon} = 0.58$ in column (4). To isolate the effect of higher uncertainty on the iMPC, we calibrate both cases using the same discount factor and the parameters reported in table 6.

We find that compared to the model with relatively low risk the model with higher risk has a lower iMPC, particularly for impact and for a relatively small shock which is in line with the empirical findings. This result stems from the fact that income risk strengthens the precautionary motive for saving, which increases target wealth and reduces the consumption response. Indeed, the ratio of target wealth to income is higher in the higher income risk group (2.08 against 1.11).

In Table 7, we observe that in the first year the simulated iMPC induced by a €1,000 shock is 25% for the low-risk group and 17% for the high risk group, a gap similar to the gap in the data. In the simulations the difference between the high and low risk groups is lower for larger shocks: 14% for the low-risk group and 11% for the high-risk group for the €10,000 shock, and 9% and 8% respectively for the €50,000 shock. As in the data, in the second and third years the simulated iMPC gap between the high and low-risk groups shrinks, and disappears in years 4 and 5.

Overall, the empirical and theoretical iMPCs are fairly consistent in terms of the income risk dimension over the short run in the case of a relatively small shock. However, the model is not a good fit with the other aspects. In contrast with the simulated iMPC, over the short run, the gap between the two groups in the empirical iMPC is much less sensitive to shock size. Also Table 7 shows that the simulated iMPC depends on a particular parametrization of income risk and the assumption that income levels and preferences are the same in both groups.

6. Comparing the models

To compare our baseline simulations with alternative models in this section we present iMPC simulations of different intertemporal models, and use MSE to check their consistency with the empirical iMPC. In addition to our baseline one-asset model, we consider a quadratic utility model, a model with two types of agents (hand-to-mouth and unconstrained as in Campbell and Mankiw 1989), a one-asset model with transitory and permanent income shocks, and a two-asset model as in Kaplan et al. (2014, 2018) and Auclert et al. (2021).

In the quadratic utility model, consumers solve the standard problem of equations (2) and (3) with a quadratic utility function, an AR(1) income process, and no borrowing constraints. Both the discount factor and the interest rate are equal to 0.02. It can be shown immediately that the MPC is constant in this model, regardless of the shock size.

A significant modification to this model is positing that a fraction μ of hand-to-mouth (or myopic) agents follows the simple rule-of-thumb $c_t = y_t$. The remaining fraction $(1 - \mu)$ of unconstrained agents has quadratic utility and solves the problem presented above. The survey does not provide details of wealth and its composition; therefore, we rely on SHIW data and estimate the share of hand-to-mouth agents using the approach in Kaplan et al. (2014). We define the share of hand-to-mouth consumers as the sum of the shares of poor and wealthy hand-to-mouth. Poor hand-to-mouth (9.59%) are households with no illiquid asset holdings and liquid assets equal to less than half their monthly income. Wealthy hand-to-mouth (11.81%) are households with positive amounts of illiquid assets and liquid wealth equal to less than half their monthly income. Accordingly, we set μ=0.214.

In another experiment we replace the AR(1) income process in equation (5) with a more flexible process based on the sum of a random walk and a transitory i.i.d. component:

$$ln y_t = p_t + \varepsilon_t \tag{6}$$

$$p_t = p_{t-1} + \eta_t \tag{7}$$

where ε_t and η_t are independently and identically distributed normal processes with mean zero and standard deviations σ_ε and σ_{η}. Based on the SHIW estimates in Jappelli and Pistaferri (2010), we set the respective transitory and permanent shock variances to 0.025 and 0.080. The remaining parameters are the same as in table 6.

The baseline model can be extended also by assuming that households can save in two assets: a high-return illiquid asset *a* that incurs a transaction cost on deposits and withdrawals, and a low-return liquid asset *b* . Households solve the following problem:

$$max_{c_{i,t}} \; E_0 \sum_{t=0}^{\infty} \beta u\left(c_{i,t}\right) \tag{8}$$

$$s.t. \qquad c_{i,t} + a_{i,t} + b_{i,t} = y_{i,t} + (1 + r_a)a_{i,t-1} + (1 + r_b)b_{i,t-1} - \psi\left(a_{i,t}, a_{i,t-1}\right) \tag{9}$$

$$a_{it} \geq 0 \,, \qquad b_{it} \geq 0 \tag{10}$$

$$\psi\left(a_{i,t}, a_{i,t-1}\right) = \frac{\chi_1}{\chi_2}\left|\frac{a_{i,t}-(1+r_a)a_{i,t-1}}{(1+r_a)a_{i,t-1}+\chi_0}\right|^{\chi_2}\left[(1 + r_a)a_{i,t-1} + \chi_0\right] \tag{11}$$

In the dynamic budget constraint (9), r_a is the interest rate paid on the illiquid asset $a,$ and r_b is the interest rate paid on the liquid asset $b.$ Income follows the AR(1) process in equation (5). In each period the change in total wealth equals disposable income (earnings plus interest income on both assets) net of consumption and portfolio adjustment costs. Equation (10) defines the borrowing limit and the minimum value of the illiquid asset both of which are set to zero.

As in Auclert et al. (2021), the transaction costs of deposits and withdrawals from the illiquid asset are a convex portfolio adjustment cost function defined in (11). The term χ_0 (assumed to be 0.15) is the marginal cost of transacting, the parameter χ_1 (assumed to be 6.5) allows calibration of the desired wealth ratio, and χ_2 (2.0) gives the desired curvature of the adjustment cost function. The utility function is isoelastic and the other model parameters are the same as in the baseline model. In the simulation, we target the liquid asset ratio of 1.11 as in our baseline model, and the illiquid asset ratio from the 2020 SHIW (6.24).

Table 8 reports the iMPC for each model in the five years after the shock, for each of the three shocks. Column titles refer to the quadratic utility model, hand-to-mouth and unconstrained consumers ("two-agents") model, the one-asset model presented in section 5 ("baseline"), the model with transitory and permanent shocks ("two shocks"), and the model with liquid and illiquid assets ("two assets"). For comparison, column (1) reports the empirical iMPC. To evaluate the performance of the different models, we compute the MSE of the iMPC for the first five years following the shocks.

The quadratic utility model predicts a constant iMPC of 2% across shock size and time period, and is the least consistent with the empirical iMPC. It also features the highest MSE.

The other models are fairly good predictors of the short-run iMPC for the €1,000 prize. After the first year, with the exception of the quadratic utility model and the two-agent model in column (3) all the models overestimate the consumption response. In the two-agent model the shock has a large impact only in the first year, because hand-to-mouth consumers spend the entire prize upfront. In later periods, the consumption response is an average of the propensity to consume of the hand-to-mouth (zero) and of the constant MPC of unconstrained households (2%), weighted by the share of hand-to-mouth households (21%). As a result, after the first year the iMPC is 1.5% for each period and each shock. The model provides a good representation of the iMPC for the €1,000 prize (MSE is only 0.039) but does not capture the iMPC of larger shocks quite so well. Most importantly, the two-agent model fails to capture the relation between the empirical iMPC and the size of the shock.[16]

The model with two shocks generates more precautionary savings than the other models. As a result, the simulated iMPC in the first year is lower than in the baseline model but consumption is more persistent in the long run, with a slower decline of the iMPC over time. Since the empirical iMPC declines quickly over time, the MSE associated with this model is considerably higher than in the other models, and especially for small shocks.

The simulated iMPC of the model with two assets (column 6) is similar to the baseline model for each of the three shocks. This model performs slightly better for the smallest and the intermediate shocks; the MSE associated with the €1,000 shock is 0.269 in the baseline model against 0.199 in the two-asset model (0.212 against 0.173 for the €10,000 shock). For the largest prize, the simulated and empirical iMPC are close but the baseline model outperforms the two-asset model (MSE 0.120 against 0.142).

[16] The model with two agents (hand-to-mouth and unconstrained) replicates the empirical iMPC only under the assumption that the fraction of hand-to-mouth individuals who spend the entire shock declines with the size of the shock. This assumption is clearly ad hoc and unrealistic.

Therefore, with the exception of the quadratic utility model, no single model clearly outperforms the others in terms of MSE. The model with hand-to-mouth consumers captures the short-run iMPC for the €1,000 well but does not account for any relation between iMPC and shock size. Our tentative conclusion from this investigation is that precautionary saving and liquidity constraints (features of the baseline and two-asset models) capture several features of the iMPC distribution, both over time and across shocks.[17] Nevertheless, both of these models predict a negative relation between the consumption response and cash-on-hand for which we find limited evidence in the data, possibly due to measurement erorr.

7. Conclusions

This paper provides new empirical evidence on the iMPC based on an analysis of how Italian households allocate hypothetical lottery wins of varying sizes between consumption and saving over different time horizons. The key advantage of our direct survey evidence approach is that we measure the responses to different shocks by the same individuals which allows for a rigorous identification strategy to assess the impact of different sized shocks over time.

Our findings show that the iMPC from a relatively small shock declines quickly over time. Larger shocks have a smaller immediate impact but are more persistent over the long-run. Additionally, we find that the empirical iMPC is negatively related to income risk and weakly negatively related to initial cash-on-hand.

Comparison of the empirical and simulated iMPC suggests that models with quadratic utility or inclusion of a combination of unconstrained and rule-of-thumb consumers are unable

[17] We also check the sensitivity of the baseline one-asset model for different values of the intertemporal elasticity of substitution (assumed to be 1 in the simulations). In general, assuming lower values of the elasticity of substitution (0.5 or 0.25) modifies the iMPC only slightly: the consumption response is slightly lower in the short run, and slightly higher in the long-run.

to explain the features of the iMPC distributions over time and across different sized shocks. Models with precautionary saving and liquidity constraints capture several features of the iMPC distribution, both over time and across shocks. However, this class of models produces a negative correlation between cash-on-hand and iMPC, especially in the short-run, which is not evident in the data, possibly due to error in our measure of cash-on-hand. Although our analysis is in partial equilibrium, we believe that our results improve understanding of the dynamic response of output to government spending and taxes in the context of more complex and realistic macroeconomic models.

References

Andersen, Asger Lau Johannesen, Niels Sheridan, Adam Dynamic Spending Responses to Wealth Shocks: Evidence from Quasi Lotteries on the Stock Market American Economic Review: Insights 6 3 434–52 2024.

Attanasio, Orazio P., and Guglielmo Weber. 2010. "Consumption and saving: models of intertemporal allocation and their implications for public policy." Journal of Economic Literature, 48: 693–751.

Auclert, Adrien, Bence Bardoczy, Matthew Rognlie, and Ludwig Straub. 2021. "Using the Sequence-Space Jacobian to Solve and Estimate Heterogeneous- Agent Models." Econometrica, 89(5): 2375–2408.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub. 2024. "The Intertemporal Keynesian Cross." Forthcoming, Journal of Political Economy.

Bachmann, R., G. Topa, and W. van der Klaauw. 2022. Handbook of Economic Expectations. Amsterdam: Elsevier.

Bardoczy, Bence, Jae Sim, and Andreas Tischbirek. 2024. "The Macroeconomic Effects of Excess Savings," Finance and Economics Discussion Series No. 2024-062. Board of Governors of the Federal Reserve System.

Campbell, John Y. and N. Gregory Mankiw, "Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence," NBER Macroeconomics Annual, January 1989, 4, 185–216.

Christelis, Dimitris, Dimitris Georgarakos, Tullio Jappelli, Luigi Pistaferri, and Maarten van Rooij. 2019. "Asymmetric Consumption Effects of Transitory Income Shocks." Economic Journal, 129(622): 2322–2341.

Colarieti, Roberto, Pierfrancesco Mei, and Stefanie Stantcheva. 2024. "The How and Why of Household Reactions to Income Shocks." National Bureau of Economic Research Working Paper 32191.

Crawley, Edmund, and Alexandros Theloudis. 2024. "Income Shocks and their Transmission into Consumption." arXiv preprint arXiv:2404.12214.

Druedahl, Jeppe, Emil Bjerre Jensen, Soren Leth-Petersen. 2022. "The Intertemporal Marginal Propensity to Consume out of Future Persistent Cash-Flows. Evidence from Transaction Data." University of Copenhagen Dept. of Economics Discussion Paper No. 13/22.

Fagereng, Andreas, Martin Holm, and Gisle Natvik. 2018. "MPC Heterogeneity and Household Balance Sheets." CESifo Working Paper Series No. 7134.

Fuster, Andreas, Greg Kaplan, and Basit Zafar. 2021. "What Would You Do with $500? Spending Responses to Gains, Losses, News, and Loans." The Review of Economic Studies, 88(4): 1760–1795.

Gelman, Michael. 2021. "What Drives Heterogeneity in the Marginal Propensity to Consume? Temporary Shocks vs. Persistent Characteristics." Journal of Monetary Economics, 117(C): 521–542.

Golosov, Mikhail, Michael Graber, Magne Mogstad, and David Novgorodsky. 2021. "How Americans Respond to Idiosyncratic and Exogenous Changes in Household Wealth and Unearned Income." NBER WP No. 29000.

Guiso, Luigi, and Tullio Jappelli. 2024. "The Italian Survey of Consumer Expectations: Statistical Bulletin." CSEF Working Paper No. 722.

Havranek, Tomas, and Anna Sokolova. 2020. "Do Consumers Really Follow a Rule of Thumb? Three Thousand Estimates from 144 Studies Say "Probably Not"." Review of Economic Dynamics, 35: 97–122.

Jappelli, Tullio and Pistaferri, Luigi. 2010. "Does Consumption Inequality Track Income Inequality in Italy?," Review of Economic Dynamics 13, 133-153.

Jappelli, Tullio, and Luigi Pistaferri. 2010. "The Consumption Response to Income Changes." Annual Review of Economics, 2(1): 479–506.

Jappelli, Tullio, and Luigi Pistaferri. 2014. "Fiscal Policy and MPC Heterogeneity." American Economic Journal: Macroeconomics, 6(4): 107–36.

Jappelli, Tullio, and Luigi Pistaferri. 2017. "The Economics of Consumption: Theory and Evidence." Oxford University Press.

Kaplan, Greg, and Giovanni L. Violante. 2022. "The Marginal Propensity to Consume in Heterogeneous Agent Models." Annual Review of Economics, 14(1): 747–775.

Kaplan, Greg, Benjamin Moll, and Giovanni Luca Violante. 2018. "Monetary Policy According to HANK." American Economic Review, 108(3): 697–743.

Kaplan, Greg, Giovanni Luca Violante, and Justin Weidner. 2014. "The Wealthy Hand-to-Mouth." Brookings Papers on Economic Activity, 45(1), 77–153.

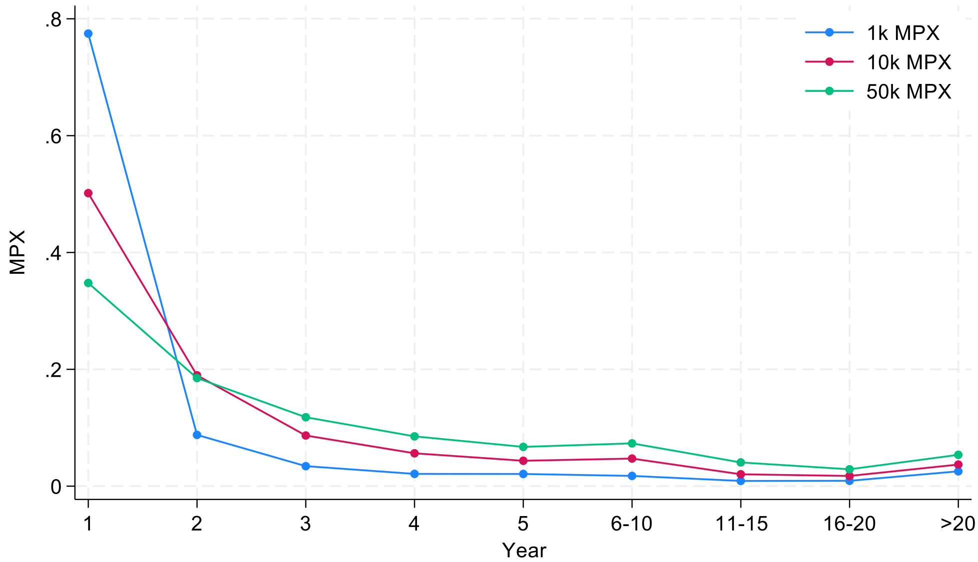
Rouwenhorst, K. G. 1995. "Asset Pricing Implications Of Equilibrium Business Cycle Models." Princeton University Press, 294–330.

Savoia, Ettore. 2023. "The Effects of Labor Income Risk Heterogeneity on the Marginal Propensity to Consume." European Central Bank, Working Paper Series 2866.

Stantcheva, Stefanie. 2023. "How to Run Surveys: A Guide to Creating your Own Identifying Variation and Revealing the Invisible." Annual Review of Economics, 15(1): 205–234.

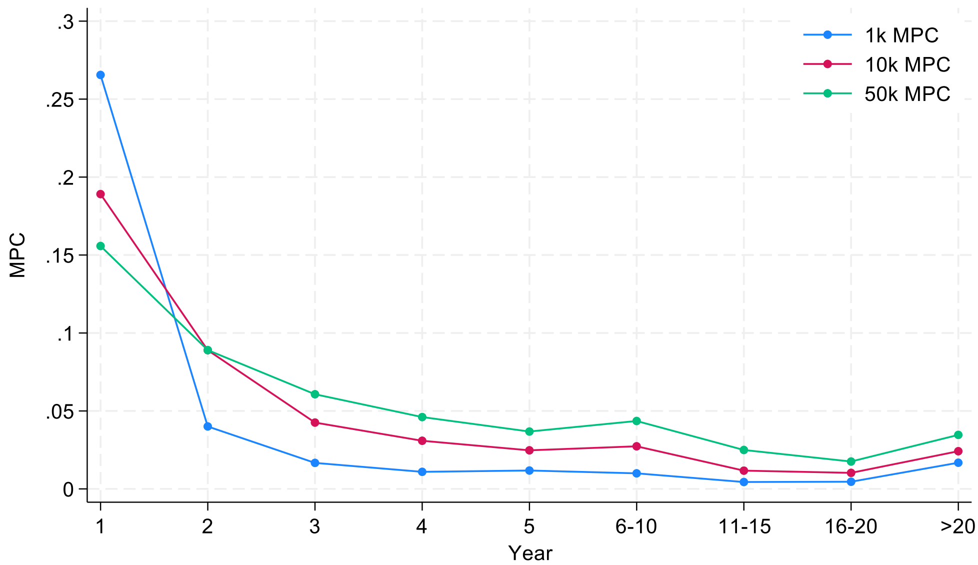
Violante, Gianluca. 2024. "Consumption," in Macroeconomics: A Comprehensive Textbook for First-year Ph.D. Courses in Macroeconomics, edited by Marina Azzimonti, Per Krusell, Alisdair McKay, and Toshihiko Mukoyama. Unpublished (https://phdmacrobook.org).

Figure 1. The intertemporal Marginal Propensity to Spend (iMPX)



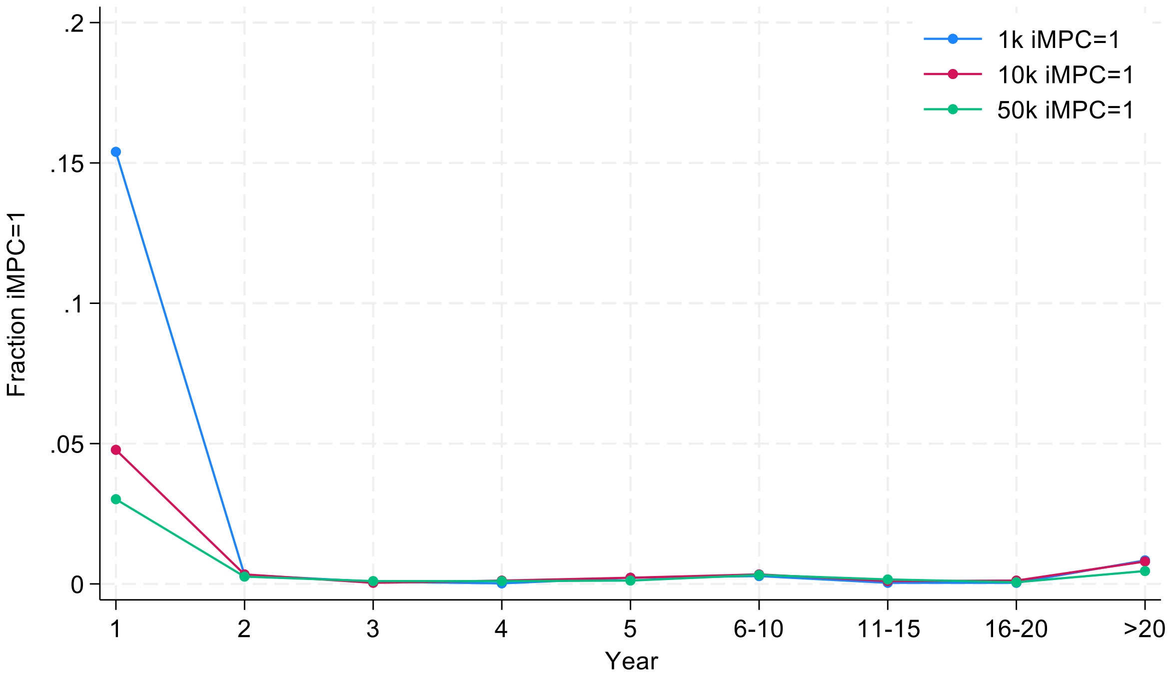
Note. The figure plots the average intertemporal Marginal Propensity to Spend (iMPX) from three hypothetical lottery prizes.

Figure 2. The intertemporal Marginal Propensity to Consume (iMPC)



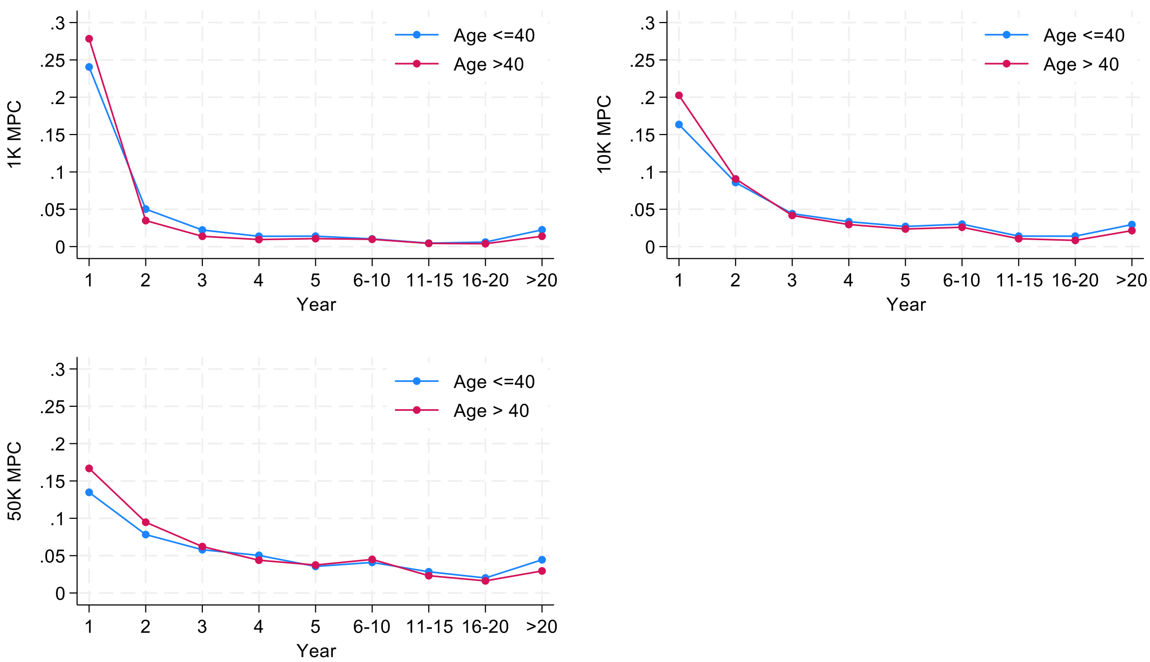
Note. The figure plots the average intertemporal Marginal Propensity to Consume (iMPC) from three hypothetical lotteries.

Figure 3. Proportion of respondents with iMPC=1



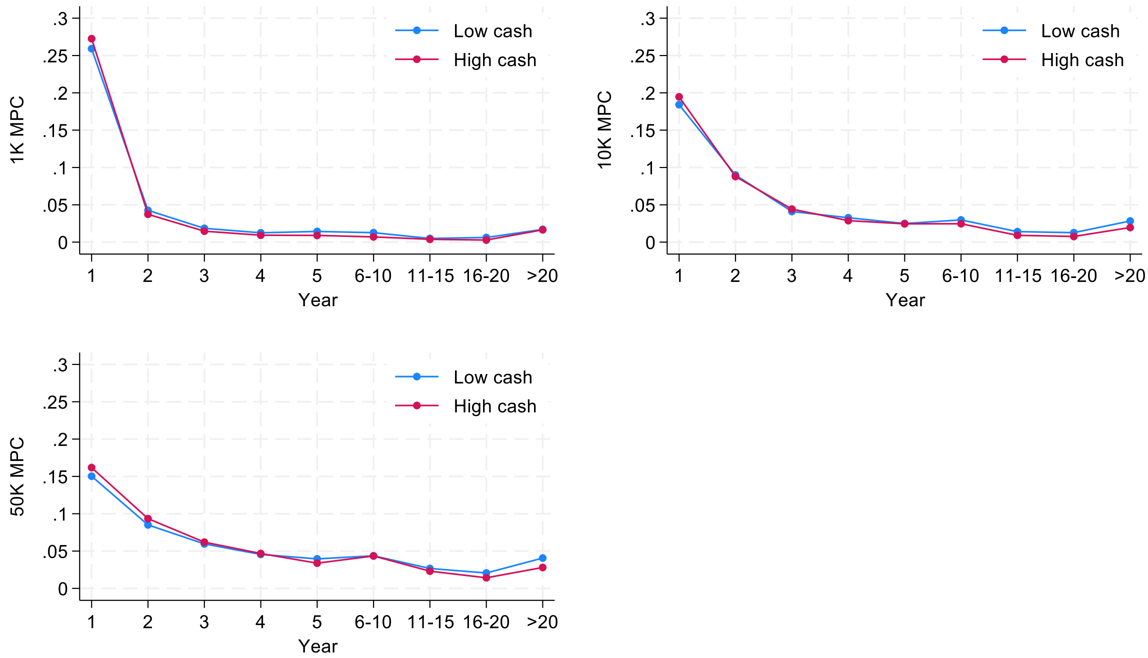
Note. The figure plots the fraction of respondents reporting MPC=1 at different horizons and for different size of the hypothetical prize.

Figure 4. iMPC for different age groups and shock size



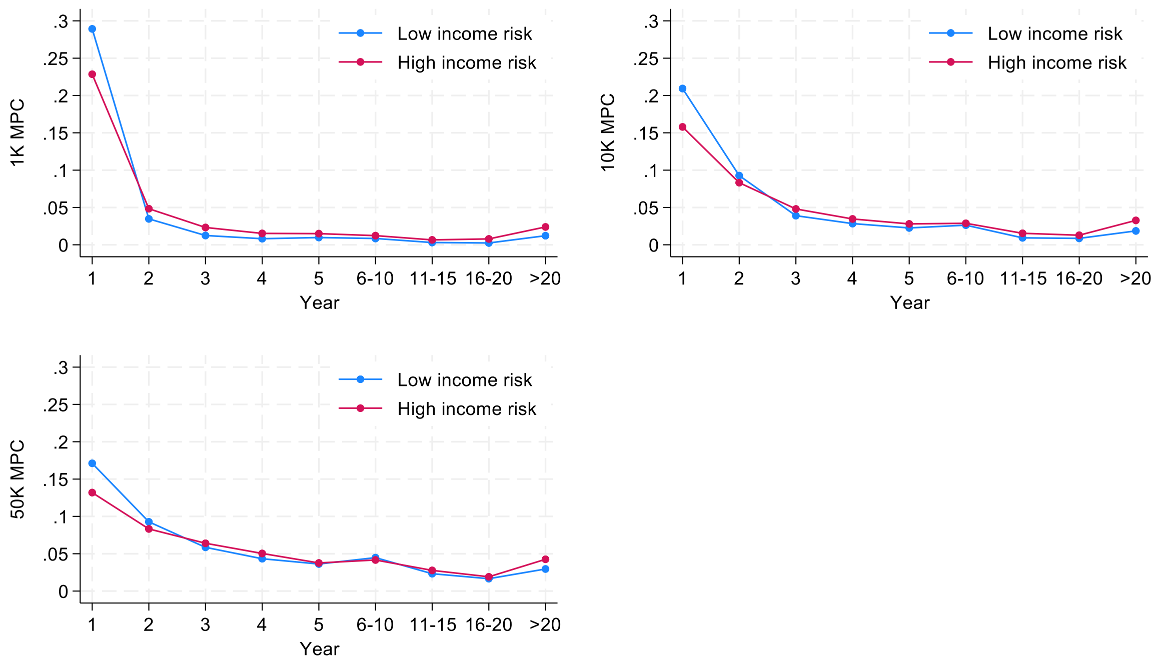
Note. The figures plots the iMPC for different lottery winnings in two age groups. The sample includes 34% of respondents with age less than or equal to 40 years, and 66% respondents older than 40.

Figure 5. iMPC for different levels of cash-on-hand and shock size



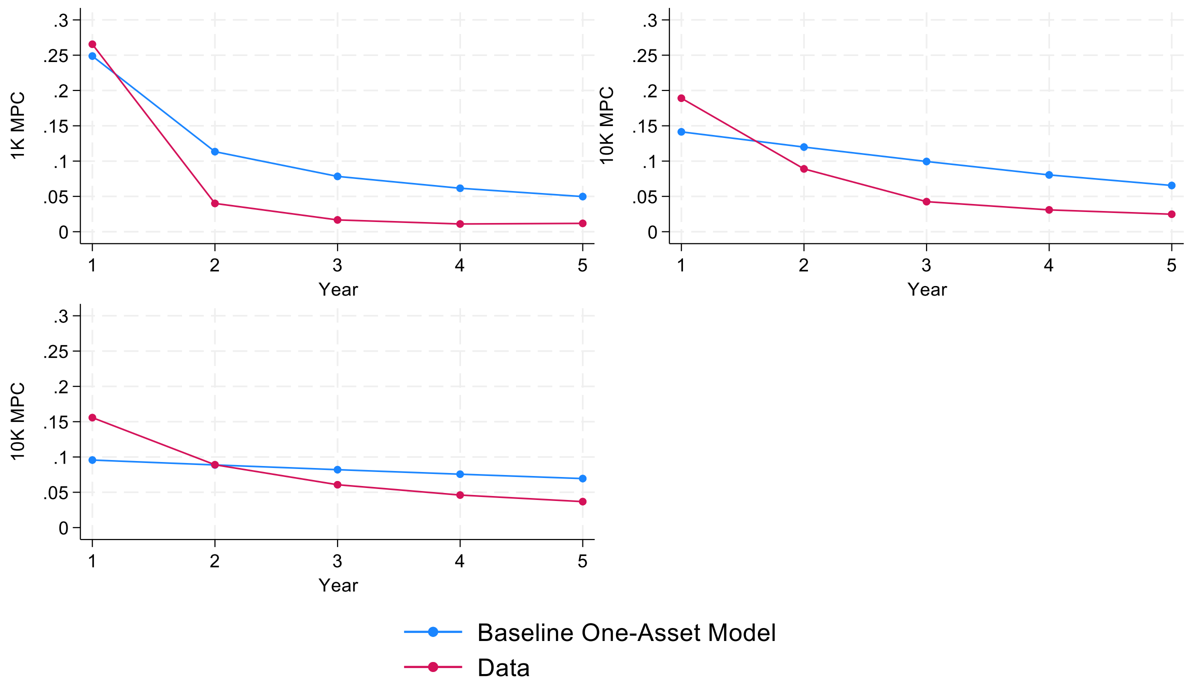
Note. The figures plots the iMPC for high and low levels of cash-on-hand (below or above the median) and different lottery winnings. Cash-on-hand is the sum of monthly income plus financial assets.

Figure 6. iMPC for different levels of income risk and shock size



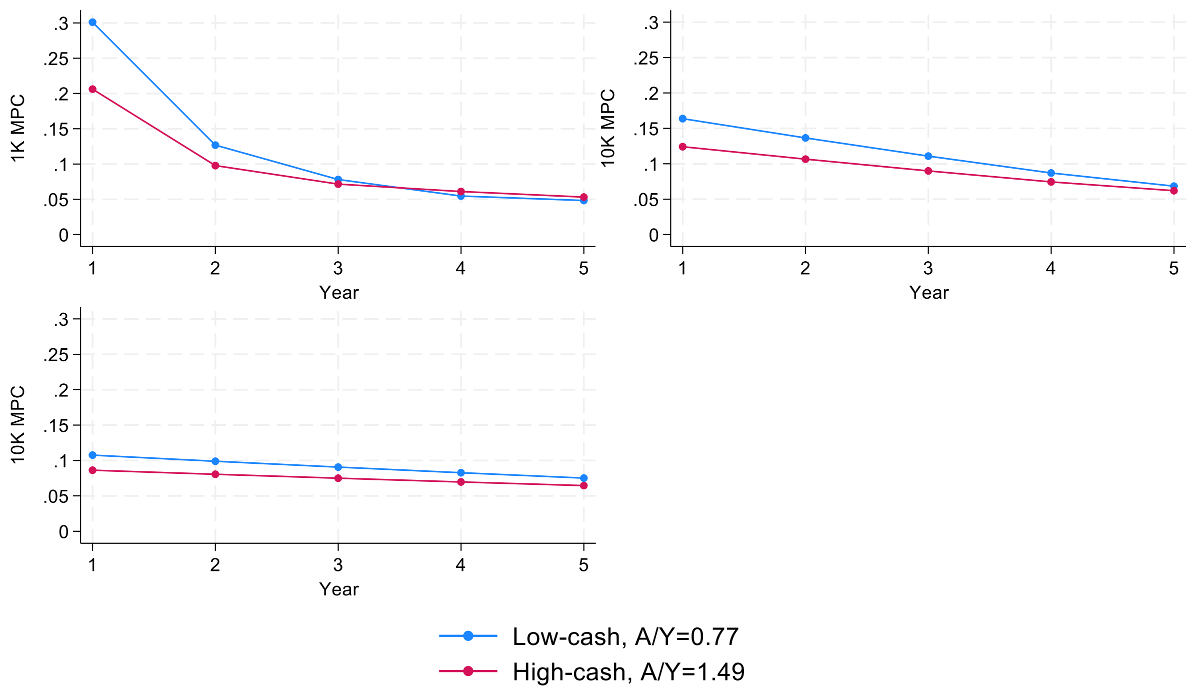
Note. The figures plots the iMPC for high and low levels of income risk and different lottery winnings. The group with low income risk (61% of the sample) reports a standard deviation of future income growth of 0.5% or less, the group with relatively high income growth (39% of the sample) reports a standard deviation above 0.5%.

Figure 7. Simulated iMPC for different shock size



Note. The figures plot the empirical iMPC and the simulated iMPC obtained from the one-asset model of equations (2)-(5). The model is calibrated to match the empirical ratio of the ratio of average financial wealth to average income (1.11 in the data).

Figure 8. Simulated iMPC for different shock size and cash-on-hand group



Note. The figures plots the simulated iMPC obtained from the one-asset model of equations (2)-(5) for the three lottery winnings. We calibrate the discount factors of a group of low cash-on-hand and impatient households (liquid asset to income ratio of 0.77) and of a group of patient and high cash-on-hand households (ratio of 1.49).

Table 1. Descriptive statistics

	ISCE	SHIW (2020)
Male	0.49	0.49
Age	48.04	48.48
Family size	2.79	2.97
College	0.24	0.15
Resident in the South	0.34	0.35
Expected income growth	-1.08	n.a
S.d. of income growth	1.55	n.a.
Expected GDP growth	-1.23	n.a.
S.d. of GDP growth	1.06	n.a.
Disposable income	21,000	23,533
Total consumption	15,000	14,500
Financial wealth	25,000	9,726
Real assets	150,000	155,000
Debt	13,574	0
Total wealth	127,397	154,000
Number of observations	4,137	5,065

Note. The table reports the means of demographic variables and the medians of income, consumption and wealth in the ISCE and in the SHIW. Data for income, consumption and wealth are expressed in euros.

Table 2. Fraction of consumption that respondents intend to spend on durable goods

	€1,000	€10,000	€50,000
0.00	24.1	16.6	12.5
0.25	8.3	20.1	33.0
0.50	8.5	16.3	16.7
0.75	14.2	20.5	21.0
1.00	44.9	26.4	16.6
Total	100.0	100.0	100.0

Note. The table shows the fraction of total consumption that respondents plan to spend to purchase durable goods. Statistics are computed using sample weights.

Table 3. iMPC regressions, by shock size

	€1,000	**€10,000**	**€50,000**
Year 1	25.371	16.434	11.899
	(0.301)***	(0.260)***	(0.244)***
Year 2	2.826	6.424	5.223
	(0.301)***	(0.260)***	(0.244)***
Year 3	0.489	1.780	2.390
	(0.301)	(0.260)***	(0.244)***
Year 4	-0.085	0.613	0.928
	(0.301)	(0.260)**	(0.244)***
Year 6-10	-0.182	0.258	0.674
	(0.301)	(0.260)	(0.244)***
Year 11-15	-0.737	-1.302	-1.183
	(0.301)**	(0.260)***	(0.244)***
Year 16-20	-0.719	-1.447	-1.924
	(0.301)**	(0.260)***	(0.244)***
Year >20	0.499	-0.057	-0.216
	(0.301)*	(0.260)	(0.244)
Constant	2.378	3.044	4.272
	(0.481)***	(0.415)***	(0.388)***
R^2	0.24	0.16	0.11
N	40,509	39,924	40,158

The table reports OLS regressions of the iMPC. The excluded category is “Year 5”. The iMPC is multiplied by 100. The -p-value refers to an F-test that the group dummies indicating the order of the questions are jointly equal to zero. Standard errors are reported in parenthesis. One star indicates significant at the 10% level, two stars at 5%, three stars at 1%.

Table 4. iMPC regressions, by shock size (individuals with no debt)

	€1,000	€10,000	€50,000
Year 1	25.118	14.952	10.439
	(0.464)***	(0.399)***	(0.369)***
Year 2	3.516	7.042	4.857
	(0.464)***	(0.399)***	(0.369)***
Year 3	0.380	1.834	2.442
	(0.464)	(0.399)***	(0.369)***
Year 4	-0.172	0.768	0.770
	(0.464)	(0.399)*	(0.369)**
Year 6-10	-0.090	0.306	0.688
	(0.464)	(0.399)	(0.369)*
Year 11-15	-0.643	-1.370	-1.462
	(0.464)	(0.399)***	(0.369)***
Year 16-20	-0.815	-1.618	-2.209
	(0.464)*	(0.399)***	(0.369)***
Year >20	0.966	0.092	-0.174
	(0.464)**	(0.399)	(0.369)
Constant	3.528	3.969	4.891
	(0.746)***	(0.639)***	(0.590)***
R^2	0.23	0.15	0.10
N	17,334	16,794	16,929

Note. The table reports OLS regressions of the iMPC dropping individuals with positive debt. The excluded category is "Year 5". The iMPC is multiplied by 100. The -p-value refers to an F-test that the group dummies indicating the order of the questions are jointly equal to zero. Standard errors are reported in parenthesis. One star indicates significant at the 10% level, two stars at 5%, three stars at 1%.

Table 5. iMPC regressions in the year of the shock, by shock size

	€1,000	€10,000	€50,000
Male	-2.766	-0.240	0.847
	(1.124)**	(0.785)	(0.654)
Age	0.040	0.096	0.071
	(0.042)	(0.029)***	(0.024)***
Family size	-0.789	-0.226	-0.419
	(0.510)	(0.356)	(0.295)
College	1.132	-0.100	-0.840
	(1.379)	(0.959)	(0.798)
Log cash-on-hand	-0.217	-0.953	-0.442
	(0.489)	(0.342)***	(0.285)
Resident in the South	-3.908	-2.876	-1.838
	(1.232)***	(0.861)***	(0.714)**
Expected income growth	-0.074	0.037	0.160
	(0.169)	(0.118)	(0.098)
S.d. of income growth	-1.434	-1.032	-0.640
	(0.423)***	(0.295)***	(0.245)***
Expected GDP growth	-0.014	0.104	-0.110
	(0.160)	(0.111)	(0.093)
S.d. of GDP growth	-1.226	-0.685	-0.407
	(0.453)***	(0.315)**	(0.262)
Constant	38.365	25.393	18.771
	(3.470)***	(2.420)***	(2.011)***
R^2	0.04	0.03	0.02
N	4,501	4,436	4,462

Note. The table reports OLS regressions of the iMPC in the first year of the shock. The iMPC is multiplied by 100. Standard errors are reported in parenthesis. One star indicates significant at the 10% level, two stars at 5%, three stars at 1%.

Table 6. Model calibration

Parameters	Value	Description
r	0.02	Interest rate
γ	1	elasticity of intertemporal substitution
β	0.96	Implied discount factor
a_{min}	0.0	Minimum value of assets grid
N_y	7	Points in Markov chain for the income process
N_a	500	Points on asset grid
ρ	0.95	Autocorrelation of log earnings
σ_ϵ	0.50	Standard deviation of log earnings

Note: The table reports the parameters of the baseline model presented in equations (2)-(5). We target the asset ratio $A/Y = 1.11$ to match the liquid asset ratio in ISCE.

Table 7. iMPC for different income risk groups and shock size

	Data		Model	
	Low risk	**High risk**	**Low risk**	**High risk**
	(1)	(2)	(3)	(4)
iMPC from €1.000				
Year 1	0.29	0.23	0.25	0.17
Year 2	0.04	0.05	0.11	0.08
Year 3	0.01	0.02	0.08	0.07
Year 4	0.01	0.02	0.06	0.06
Year 5	0.01	0.02	0.05	0.05
iMPC from €10.000				
Year 1	0.21	0.16	0.14	0.11
Year 2	0.09	0.08	0.12	0.09
Year 3	0.04	0.05	0.10	0.08
Year 4	0.03	0.04	0.08	0.07
Year 5	0.02	0.03	0.07	0.06
iMPC from €50.000				
Year 1	0.17	0.13	0.09	0.08
Year 2	0.09	0.08	0.09	0.08
Year 3	0.06	0.06	0.08	0.07
Year 4	0.04	0.04	0.07	0.07
Year 5	0.04	0.04	0.07	0.06

Note. The table compares the iMPC for low and high-risk households. Columns (1) and (2) display the empirical iMPC for respondents whose income growth standard deviation is above and below the median. Columns (3) and (4) show the simulated iMPC of two versions of the baseline model. In column (3) we set $\sigma_\varepsilon = 0.48$, while in column (4) $\sigma_\varepsilon = 0.58$. The remaining parameters are the same as the baseline model and are reported in Table 6.

Table 8. iMPC and MSE performance of the models

	Data	Quadratic utility	Two-agents	Baseline	Two shocks	Two assets
	(1)	(2)	(3)	(4)	(6)	(7)
€1.000						
Year 1	0.265	0.020	0.229	0.249	0.204	0.202
Year 2	0.040	0.020	0.015	0.113	0.163	0.081
Year 3	0.017	0.020	0.015	0.078	0.124	0.059
Year 4	0.011	0.020	0.015	0.062	0.101	0.050
Year 5	0.012	0.020	0.015	0.050	0.081	0.044
MSE		**1.220**	**0.039**	**0.269**	**0.866**	**0.199**
€10.000						
Year 1	0.189	0.020	0.229	0.141	0.189	0.116
Year 2	0.089	0.020	0.015	0.120	0.155	0.098
Year 3	0.043	0.020	0.015	0.100	0.121	0.080
Year 4	0.031	0.020	0.015	0.080	0.100	0.064
Year 5	0.025	0.020	0.015	0.065	0.083	0.053
MSE		**0.684**	**0.162**	**0.212**	**0.375**	**0.173**
€50.000						
Year 1	0.156	0.020	0.229	0.096	0.150	0.078
Year 2	0.089	0.020	0.015	0.089	0.131	0.073
Year 3	0.061	0.020	0.015	0.082	0.113	0.068
Year 4	0.046	0.020	0.015	0.076	0.100	0.063
Year 5	0.037	0.020	0.015	0.069	0.085	0.058
MSE		**0.521**	**0.286**	**0.120**	**0.194**	**0.142**

Note. The table reports the iMPC and the Mean Squared Error (multiplied by 100) of the simulated iMPC against the empirical iMPC. “Quadratic utility” is the permanent income model with quadratic utility. “Two-agents” is a model where the share of hand-to-mouth consumers is 21.4%. “Baseline” is the one-asset model of equations (2)-(5). “Two shocks” is the one-asset model with permanent and transitory income shocks described in equations (6)-(7). “Two-assets” is the model with liquid and illiquid assets of equations (8)-(11).

Appendix. Survey questions

1. Imagine having a winning lottery ticket worth €1,000 / €10,000 / €50,000 today. Think about how you would spend this sum in the coming years. You can choose how to distribute the sum over the next 10 years and beyond. *The order of the questions is randomized in six different permutations.*

	€1,000	**€10,000**	**€50,000**
2024	g1_1_1	g1_1_2	g1_1_3
2025	g1_2_1	g1_2_2	g1_2_3
2026	g1_3_1	g1_3_2	g1_3_3
2027	g1_4_1	g1_4_2	g1_4_3
2028	g1_5_1	g1_5_2	g1_5_3
2029-2023	g1_6_1	g1_6_2	g1_6_3
2034-2038	g1_7_1	g1_7_2	g1_7_3
2029-2043	g1_8_1	g1_8_2	g1_8_3
Use in subsequent years	g1_9_1	g1_9_2	g1_9_3

2. In the coming years, would you spend the €1,000 / €10,000 / €50,000 prize on durable goods? (cars, household appliances, computer/electronic equipment, furniture/furnishings, etc.). *The order of the questions follows the same randomization as question 1.*

	€1,000	**€10,000**	**€50,000**
Yes, I would spend the full amount	1	1	1
Yes, I would spend a good part of the amount (more than 50%)	2	2	2
Yes, I would spend half the amount (50%)	3	3	3
Yes, I would spend less than half the amount (less than 50%)	4	4	4
No, I wouldn't spend anything on durable goods	5	5	5
Don't know	6	6	6

3. Income risk. In the next 12 months, you expect that your **household's total annual earned and retirement income**, after tax, compared to last year ...

	Percentage
Will decrease by more than 8%	X
Will decrease between 6 and 8%	X
Will decrease between 4 and 6%	X
Will decrease between 2 and 4%	X
Will decrease between 0 and 2%	X
Will remain constant	X
Will increase between 0 and 2%	X
Will increase between 2 and 4%	X
Will increase between 4 and 6%	x
Will increase between 6 and 8%	x
Will increase more than 8%	x
Total	**100**