# Discussion Paper Series

IZA DP No. 18602

April 2026

# Subjective Uncertainty and the Marginal Propensity to Consume

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ISSN: 2365-9793

IZA DP No. 18602 April 2026

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## Abstract

Earnings uncertainty is central to most heterogeneous-household models. Yet, there is little evidence on how subjective uncertainty, the uncertainty individuals actually perceive, is related to consumption behavior. Using unique data from the Survey of Consumer Expectations, we show that the marginal propensity to consume (MPC) is increasing and concave in individual–specific earnings growth uncertainty. In the workhorse consumption–savings model augmented with risk heterogeneity, MPCs decline with earnings uncertainty, contrary to the empirical evidence. We pinpoint which mechanisms, central to the model, create this disconnect. Embedding empirically disciplined biased beliefs in the canonical model reconciles the theory with the empirical findings.

## JEL classification

D12, D84, E21

## Keywords

marginal propensity to consume, consumption, subjective uncertainty, heterogeneity

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* The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. We thank Felix Aidala, Augustin Belin, Chris Gresh, Ali Hashim, and Sasha Thomas for excellent research assistance. For helpful comments and conversations, we also thank Orazio Attanasio, Marco Bassetto, Mark Bils, Carola Binder, Nicholas Bloom, Corina Boar, Jarda Borovicka, Richard Crump, Marco del Negro, Keshav Dogra, Andres Drenik, Andreas Fuster, Simon Gilchrist, Cosmin Ilut, Kieran Larkin, Chen Lian, Elena Manresa, Virgiliu Midrigan, Oliver Pfauti, Luigi Pistaferri, Ayşegül Şahin, Chris Tonetti, Javier Turen, Rosen Valchev, Wilbert van der Klaauw, Joe Vavra, Venky Venkateswaran, Basit Zafar, as well as seminar participants at NY Fed, UCL, the SED 2024, UT Austin, Dartmouth, SEA 2024, SAEe 2024, NYU, Boston College, Bocconi University, UVA, Clemson, OIGI Minneapolis Fed, Rochester, the University of Oxford, PUC, the Central Bank of Chile, St Louis Fed, the Richmond Fed, and Williams College.

# 1 Introduction

The nature of earnings risk has important implications for household consumption and savings behavior, welfare, and the effects of fiscal and monetary policy through marginal propensities to consume (MPC). Understanding the relation between earnings risk and consumption behavior comes, however, with several measurement and conceptual challenges. While a large literature has studied earnings risk using data on earnings *realizations*,[1] households' *subjective* uncertainty—the uncertainty individuals actually perceive—is the relevant input for their own economic decisions. These ex-ante perceptions can be heterogeneous, time-varying, and, as shown by Caplin, Gregory, Lee, Leth-Petersen and Sæverud (2023) and Wang (2023), substantially lower than the dispersion of ex-post realized earnings growth rates. MPCs are hard to measure too, implying that we know little of how they empirically relate with measures of households' uncertainty.

In this paper, we measure households' perceived uncertainty directly, provide novel empirical evidence on how it relates with their MPCs, and draw implications for consumption models with household heterogeneity. We proceed in four parts. First, we use novel and unique data on subjective expectations to empirically document that individual-level year-ahead earnings growth uncertainty is heterogeneous across households and significantly correlated with the MPC. Across most households, higher uncertainty is associated with a higher MPC; for large levels of perceived uncertainty, the MPC starts to decline. Second, we find that this hump-shaped relationship is primarily driven by variation between households. Much of this variation in uncertainty remains unexplained by observable household characteristics, suggesting a potentially important role for latent, persistent heterogeneity. Third, we show that our main empirical findings are inconsistent with a standard incomplete markets consumption-savings model augmented with heterogeneous earnings risk. We pinpoint which mechanisms, central to the model, lie behind the disconnect with the data. Fourth, we offer a solution to the mismatch between the predictions of the canonical model with the empirical findings. We document a positive correlation between uncertainty and overoptimism (i.e., positive forecast errors) in future earnings expectations. Incorporating these empirically-disciplined biased beliefs, along with the aforementioned underestimation of risk, reconciles the structural model with our empirical findings.

In the canonical buffer-stock model with household heterogeneity, two main forces connect idiosyncratic uncertainty and the MPC. On the one hand, for a given level of cash on hand,

[1] A vast literature estimates risk heterogeneity. For instance, see Meghir and Pistaferri (2004) for a seminal contribution, Meghir and Pistaferri (2011) for a broad review of the literature on earnings, consumption, and life cycle choices, and Arellano, Bonhomme, De Vera, Hospido and Wei (2022) for a recent investigation on risk heterogeneity.

higher earnings uncertainty increases the precautionary savings motive, typically makes the consumption function more concave, and thus raises the MPC (see Carroll and Kimball (1996) for a seminal contribution). On the other hand, higher savings lead to higher wealth, which is associated with a lower MPC. With these mechanisms in mind, we empirically examine the relationship between uncertainty and the MPC.

We use data from the New York Fed's Survey of Consumer Expectations (SCE) for our analysis. The SCE has the distinct advantage of directly measuring the two objects we are interested in: subjective uncertainty and the MPC. The survey elicits respondents' density forecasts of their year-ahead growth in individual earnings, asking them to assign probabilities to different realizations of these growth rates. We use this elicited information to construct measures of individual-specific (and potentially time-varying) subjective uncertainty—the uncertainty each household perceives and thus the relevant factor in their decision-making.[2] Our baseline measure of uncertainty is the standard deviation of the density forecast of an individual at a given point in time. The survey also includes a direct measure of the MPC, elicited using responses to a hypothetical income shock. This approach has been widely used in the literature, in studies of "reported-preference" MPCs (e.g., Parker and Souleles (2019), Fuster, Kaplan and Zafar (2020), Coibion, Gorodnichenko and Weber (2020), Jappelli and Pistaferri (2020), and Colarieti, Mei and Stantcheva (2024)).

Our main empirical finding is that the MPC is hump-shaped in earnings growth uncertainty. More uncertain households have higher MPCs, except for very uncertain households, whose MPCs are similar to those with very low uncertainty. This concave association holds both unconditionally and when controlling for household demographics, year fixed effects, expected earnings growth, and households' net liquid wealth. Since our uncertainty measure is about on-the-job earnings growth, conditional on working the same number of hours, it has the advantage of isolating a more exogenous component of risk; on the other hand, it likely captures only part of all the risks that households face. To address this concern, we show that MPCs are increasing and concave also in alternative measures of idiosyncratic uncertainty, such as job loss and spending growth uncertainty. The latter measure is a sufficient statistic for all risks that households face and plays an important role in buffer-stock models (see Jappelli and Pistaferri (2000) for a discussion). As such, these results constitute an additional testable implication for the structural model. Finally, our estimated relationship between the MPC and earnings growth uncertainty endures a battery of additional robustness checks, such as controlling for inflation expectations and using alternative question formats to elicit the MPC.

MPCs are, however, statistically unrelated to idiosyncratic uncertainty when we control

[2]For compactness, we refer to this measure simply as "uncertainty" throughout the paper.

for household fixed effects. Our empirical findings therefore gauge variation across households, rather than within. To discipline how to take this empirical result to the structural model, we further investigate the sources of heterogeneity in subjective uncertainty. We document that uncertainty is quite stable within individuals. Moreover, our results are not driven by specific household traits or persistent factors, such as work status, preference heterogeneity, gender, and education. In fact, household characteristics jointly explain only about 10% of the overall variation in earnings growth uncertainty. This suggests that much of the dispersion in uncertainty remains unexplained, or is driven by typically unmodeled household characteristics. In other words, similar to the conclusion reached by a large literature on risk heterogeneity, there might exist "types" of households that differ in their perceived uncertainty.

Next, we evaluate to what extent a standard heterogeneous-agent model can be consistent with our empirical findings. We use an off-the-shelf, one-asset incomplete markets model with a no-borrowing constraint, and add risk heterogeneity, consistent with the empirical evidence on stable and latent heterogeneity in subjective uncertainty in the SCE. To start, we adopt the standard assumption that ex-ante expectations are fully consistent with ex-post earnings realizations. We find that MPCs in this model monotonically decline with earnings growth uncertainty, in stark contrast to our empirical findings. In the model, MPCs typically increase with earnings growth uncertainty at a given level of wealth. However, higher uncertainty is associated with substantially higher levels of wealth, and both the levels and the dispersion of the MPC decline as wealth increases. This latter mechanism dominates in all the quantitative exercises that we consider, implying a negative overall relationship across households. In the data, by contrast, MPCs are highly heterogeneous across the household distribution and only weakly associated with wealth. In addition, uncertainty and wealth are also only weakly correlated.[3]

Our empirical results therefore present a challenge for the canonical consumption-savings model that is the foundation of modern heterogeneous-agent macroeconomics. The mechanisms we have just outlined hold for different parameterizations and common extensions, such as endogenous labor supply or alternative financial constraints. Preference heterogeneity and life cycle patterns are also unlikely to rationalize our empirical findings; indeed we find that, in the data, MPCs increase with uncertainty also conditional on age and preferences.

Deviations from the full–information rational–expectations framework can reconcile theory and empirical evidence, although their nature and success require empirical discipline

[3]The model successfully generates an increasing relationship between the MPC and the endogenous spending uncertainty, although this is mostly driven by low-wealth households in the model but not in the data.

that is often difficult to come by. To overcome this challenge, we once again turn to the SCE. We document that more uncertain households are more overoptimistic (i.e., make positive forecast errors) in their earnings growth expectations, and that this relationship is robust to several controls, including expectations of job loss and quits. Next, we embed these biased beliefs in an otherwise canonical incomplete markets model with risk heterogeneity. Overoptimism is associated with too little savings, ex ante, and lower cash on hand, ex post, all else equal: both raise the MPC. Our empirically-disciplined calibration implies that this new overoptimism channel is particularly strong for the most uncertain households. We show that it quantitatively overturns the forces of the canonical model, implying that MPCs now increase with uncertainty, even more than in the data.

A complete solution to the empirical puzzle is achieved when households' perceived uncertainty is lower than the dispersion of realized earnings growth, consistent with recent empirical evidence by Caplin et al. (2023). We add these risk misperceptions to the model with heterogeneous uncertainty and correlated overoptimism. In this framework, the misperception of earnings risk affects savings decisions, partially offsetting the forces introduced by overoptimism. As a result, MPCs are hump-shaped in uncertainty in the model-generated cross-section, in line with our empirical evidence.

As a final exercise, we quantify the effects of households' biased beliefs, considering a policy experiment that lifts overoptimism and risk misperceptions. A real-world counterpart of this experiment can be found in vertical pay transparency policies, which, by informing workers of coworkers' pay, improve their own earnings forecasts (e.g., Cullen (2024)). Enhancing forecast accuracy leads to welfare gains that cumulate over time, as households gain directly from fewer mistakes, and indirectly through relinquishing undersaving. On the other hand, we show that these policies reduce the aggregate consumption sensitivity to fiscal transfers.

Our paper is related to various strands of literature. Within a burgeoning literature on subjective expectations, we focus on households' uncertainty towards their own idiosyncratic outcomes.[4] Few papers have looked at earnings uncertainty (e.g., Dominitz and Manski (1997), Koşar and Van der Klaauw (2023), Caplin et al. (2023)), but rarely studying how it relates to spending behavior. Among notable exceptions, Guiso, Jappelli and Terlizzese (1992) use a measure of the subjective variance of future earnings in the Italian Survey of Household Income and Wealth to test for the precautionary saving motive. Bertola, Guiso and Pistaferri (2005) use the same dataset to refine the estimation of an Euler equation for

[4]The focus in the literature so far has been predominantly on expectations about macroeconomic outcomes: see Weber, D'Acunto, Gorodnichenko and Coibion (2022) and D'Acunto, Malmendier and Weber (2023) for two comprehensive surveys. Coibion, Georgarakos, Gorodnichenko, Kenny and Weber (2024) show that higher macroeconomic uncertainty reduces households' spending.

consumption, while Christelis, Georgarakos, Jappelli and van Rooij (2020) use Dutch data on consumption uncertainty.[5] Our approach is different in that we empirically relate direct measures of uncertainty and the MPC, and then interpret those findings through a structural model.

As such, we also contribute to a vast literature that empirically documents heterogeneity in the MPC and its drivers (see, for instance, Parker (2017), Jappelli and Pistaferri (2020), Lewis et al. (2022), Fagereng, Holm and Natvik (2021)). To the best of our knowledge, a limited set of papers have looked at the relationship between the MPC and household risk, and none focused on individual-specific subjective earnings uncertainty.[6] Luengo-Prado and Sørensen (2008) use state-level variation to relate MPCs and features of a stochastic income process, such as persistence and risk. Savoia (2024) studies the relationship between the MPC and risk when risk declines with income.

Our results also contribute to and inform a large literature on heterogeneous-agent macro models. A recent set of papers have studied how risk heterogeneity can be incorporated in macroeconomic models (e.g., Broer, Kramer and Mitman (2020)). In this context, we show the performance of this class of models vis-à-vis our empirical findings. Moreover, our empirical analysis suggests the importance of household traits and latent heterogeneity in consumption/savings models, as recently studied by Aguiar, Bils and Boar (2024). Lastly, our empirical findings support recent theoretical work that introduced forms of bounded rationality in consumption-savings models (e.g., Ilut and Valchev (2023)). Our focus on biased beliefs is shared by Pfäuti et al. (2024), who highlight the role of optimism and overconfidence in HANK models, and Malmendier and Shen (2024), who document persistent pessimism and link it to spending pullback.[7] Our evidence is complementary to their work: we show that there exists a correlation between uncertainty and overoptimism, one which rationalizes the empirical relationship between MPC and uncertainty.

This paper is organized as follows. In Section 2 we briefly present the key forces in the standard consumption-savings model to guide our empirical analysis. In Section 3 we present the SCE data. Section 4 discusses our main empirical results, which we then directly compare to the predictions of a canonical quantitative model in Section 5.1. Section 5.3 shows how the model with biased beliefs is consistent with our empirical evidence.

[5] See Dynan (1993) for one of the early examples of a large literature estimating Euler equations.

[6] In recent work, Iao (2024) estimates how *changes* in subjective unemployment risk correlate with changes in the MPC over the business cycle.

[7] Broer et al. (2021) study heterogeneity in macroeconomic expectations in an incomplete markets model with heterogeneous households.

# 2 Conceptual framework

Before presenting the data and our empirical analysis, it is useful to briefly discuss the key forces at play in the standard consumption-savings model, which serves as a guide for our empirical strategy.

The simplest way to generate heterogeneity in earnings growth uncertainty[8] in this model is to assume that households face different degrees of earnings risk. As such, for now, we assume that full information rational expectations (FIRE) holds, and thus ex–ante perceived uncertainty and ex–post realized risk coincide. For simplicity, let us also abstract from factors like borrowing constraints, which will be featured in the more comprehensive models of Section 5. Higher labor income uncertainty in this theoretical framework has two effects. First, at a given level of cash on hand, it *shifts* the optimal consumption function downward and typically makes it more concave, due to an increase in the precautionary motive. As a result, the MPC function (i.e., the slope of the consumption function) shifts upward. In a seminal contribution, Carroll and Kimball (1996) prove that uncertainty increases the level of MPC at a given level of wealth. Second, however, the increase in the precautionary motive as a result of higher uncertainty also increases savings. As such, households move *along* the consumption function and increase their level of wealth. Since MPCs are negatively correlated with wealth in the model, this force has the potential to overturn the first effect, thus generating a negative correlation between MPCs and uncertainty. Indeed, we show later that this is generally the case when we focus on the stationary distribution in the quantitative versions of the model that we consider.[9]

With these channels in mind, we set out to empirically investigate the relationship between the MPC and individual-level subjective uncertainty. Thereafter, we return to a quantitative version of the model, and directly compare the empirical evidence and model predictions.

# 3 Data

We use data from the New York Fed's Survey of Consumer Expectations (SCE) from 2015 to 2023. The SCE is a nationally representative, monthly, internet-based survey of a ro-

[8]Throughout the paper, both in the data and in the model, uncertainty is defined as the standard deviation of year-ahead earnings *growth rates*, conditional on realized earnings. This is the case even when we just refer to earnings uncertainty, without specifying "growth".

[9]Similar forces affect the relationship between consumption growth uncertainty and the MPC, as higher earnings uncertainty results in higher spending uncertainty. Moreover, for a given level of labor income risk, MPCs and spending uncertainty are positively related in the model (see Carroll (1992)), because spending uncertainty endogenously declines with wealth.

tating panel[10] of approximately 1,300 household heads. The survey collects information on household heads' experiences as well as expectations about both macroeconomic aggregates (such as inflation, home price changes, U.S. unemployment) and personal outcomes (such as household income and spending growth, earnings, job turnover, credit access and household finance situation). Each month, the monthly core survey is paired with a rotating module. These modules, each fielded every four months, focus on either the labor market, credit markets, household spending, or public policy changes. In our analysis, we primarily use data from the core, Labor Market, and Household Spending modules.

One key feature of the SCE is its reliance on *density forecasts*. In addition to *point forecasts*, the survey elicits *density forecasts*, by asking for the likelihood a respondent assigns to possible different future values of a variable. In our analysis, we use these density forecasts to construct different measures of subjective, individual-specific, uncertainty. Our main measure is based on the following question on earnings growth expectations that is asked to all employed respondents, including those who are self-employed:

*Suppose that, 12 months from now, you are working in the exact same job at the same place you currently work, and working the exact same number of hours. In your view, what would you say is the percent chance that 12 months from now your earnings on this job, before taxes and deductions, will have ...*

| | | |
|---|---|---|
| *increased by 12% or more* | ______ | *percent chance* |
| *increased by 8% to 12%* | ______ | *percent chance* |
| *increased by 4% to 8%* | ______ | *percent chance* |
| *increased by 2% to 4%* | ______ | *percent chance* |
| *increased by 0% to 2%* | ______ | *percent chance* |
| *decreased by 0% to 2%* | ______ | *percent chance* |
| *decreased by 2% to 4%* | ______ | *percent chance* |
| *decreased by 4% to 8%* | ______ | *percent chance* |
| *decreased by 8% to 12%* | ______ | *percent chance* |
| *decreased by 12% or more* | ______ | *percent chance* |
| *Total* | 100 | |

We follow Engelberg et al. (2009) and assume that the underlying distribution for the reported bin probabilities belongs to the generalized beta family when the respondent assigns positive probability to three or more outcome intervals. We assume an isosceles triangular distribution when the respondent puts all probability mass in two adjacent intervals and a

[10] Each month, roughly 100-120 respondents rotate in and out of the panel and respondents participate in the survey for up to twelve months.

uniform distribution when the respondent puts all probability mass in one interval.[11] After fitting a density to each respondent's reported bin probabilities, we use the estimated density parameters to calculate the mean and the standard deviation of each respondent's density. The standard deviation of the density fitted to the earnings growth expectation bins is our main measure of uncertainty. To check the robustness of our results, we also repeat our analysis using the interquantile range (IQR) of each respondent's density as another uncertainty measure. Another common way the elicited density forecasts are used in the literature is to assume that the likelihood assigned to each bin represents a probability mass at the midpoints of those bins. With this assumption, we can then calculate the standard deviation of the underlying discrete distribution. This discrete approximation will be our third way of measuring subjective uncertainty.

One concern with our measure of earnings growth uncertainty might be that it captures only part of labor income risk, given that it elicits expectations conditional on remaining on the same job. One additional important source of risk for workers is in fact the risk of job loss. We therefore complement our main measure of earnings uncertainty with the job loss expectations over the next 12 months elicited in the monthly, core module of the SCE. Specifically, the probabilistic layoff expectations of those who are working at the time of the survey, and not self-employed, are elicited with the following question:

> *What do you think is the percent chance that you will lose your ["main"/"current"] job during the next 12 months?*

As an additional measure to capture the full extent of uncertainty individuals face and perceive, we also construct a measure of spending growth uncertainty in a similar manner to earnings growth uncertainty. For this measure, we use households' year-ahead spending growth density forecasts elicited every four months in the SCE's Household Spending module. This measure is typically not included in other surveys, and thus is quite unique to the SCE. As we later elaborate, it is a particularly appealing measure because it can be seen as a sufficient statistic for all risks households face.

When confronting our structural model to data in Section 5.3, we also make use of the 4-month ahead annual earnings expectations and the annual earnings elicited in the SCE's Labor Market module every 4 months to construct forecast errors. We defer to that section for a discussion of these variables.

For our measure of the MPC, we focus on a question from the SCE's Household Spending module that asks respondents how they would allocate the extra income if they were to find

[11] For further details on the density-fitting algorithm used in the SCE, see Armantier et al. (2017).

their household with 10% more income than they currently expect.[12] The survey instrument elicits this response in two stages. First, the respondent makes a qualitative statement about the allocation:

> *Suppose next year you were to find your household with 10% more income than you currently expect. What would you do with the extra income?*
>
> ❍ *Save or invest all of it*
> ❍ *Spend or donate all of it*
> ❍ *Use all of it to pay down debts*
> ❍ *Spend some and save some*
> ❍ *Spend some and use part of it to pay down debts*
> ❍ *Save some and use part of it to pay down debts*
> ❍ *Spend some, save some and use some to pay down debts*

In the second stage, a quantitative response is elicited as follows:[13]

*Please indicate what share of the extra income you would use to ...*

| | | |
|---|---|---|
| *Save or invest* | ______________ | *percent* |
| *Spend or donate* | ______________ | *percent* |
| *Pay down debts* | ______________ | *percent* |
| *Total* | 100 | *percent* |

In the second stage, respondents are shown the total of the shares they assign to saving, spending, and paying down debt as they enter their responses. If a respondent tries to proceed with a total that is not equal to 100, the survey gives an error. If they try to proceed again, they see the same error message. After the second error message, the survey lets the respondent proceed. In the data, we have only 7 observations with a total assigned share that is not equal to 100. We do not include these observations in our final sample.

In addition to the uncertainty and MPC measures, we use detailed information on demographics as well as a measure of net liquid wealth from the SCE.[14] Specifically, we define net liquid wealth as the difference between liquid assets (i.e., the sum of the value of households' holdings of checking accounts, savings accounts, money market funds, certificates of

[12]The question wording is similar to the the question included in Bank of Italy's Survey of Household Income and Wealth (SHIW). The main differences are the size of the shock and the inclusion of paying down debt as an allocation option. The SCE question has been fielded as part of the SCE's Household Spending module every 4 months since August 2015.

[13]The second stage is only asked to respondents if they did not select the first three options in the first stage. We assign an MPC of 0 if the respondent selects "save of invest all of it" or "use all of it to pay down debts", and assign an MPC of 100 if the respondent selects "spend or donate all of it".

[14]The wealth questions are fielded as part of the annual SCE Housing module between February 2014 and February 2020.

deposits, government/municipal bonds or treasury bills and stocks, bonds and investment trusts) and current total outstanding non-housing debt—thus excluding liabilities such as mortgage debt, home equity loans, and lines of credit). The details of these questions can be found in Appendix A.

We report the demographic characteristics of our sample in the bottom panel of Table 1. The majority of our sample consists of respondents who are white, male, married, college graduate, and working full-time. Since earnings growth expectations questions are only asked to employed respondents, our sample consists of employed household heads, with around 10% being self-employed. The average household income in the sample is around \$101,700 with a sizable dispersion. The average net liquid wealth of the sample is around \$87,400 with 49% of respondents reporting \$0 or negative net liquid wealth.[15]

Table 1: Summary Statistics

| | Mean | Median | SD |
|---|---|---|---|
| Expected Earnings Growth | 3.20 | 2.61 | 4.62 |
| Earnings Growth Uncertainty | 1.99 | 1.02 | 2.37 |
| Expected Spending Growth | 4.09 | 3.00 | 6.19 |
| Spending Growth Uncertainty | 2.71 | 1.63 | 2.64 |
| Job loss expectations | 13.24 | 5.00 | 19.02 |
| MPC | 16.67 | 10.00 | 21.56 |
| White | 0.84 | | 0.37 |
| Female | 0.48 | | 0.50 |
| Married | 0.67 | | 0.47 |
| Ages 35-50 | 0.45 | | 0.50 |
| Ages 51-65 | 0.31 | | 0.46 |
| Graduate | 0.63 | | 0.48 |
| Working PT | 0.15 | | 0.36 |
| Self-employed | 0.10 | | 0.30 |
| HH Income | 101,663.03 | 87,499.50 | 64,535.00 |
| Net Liquid Wealth | 87,410.25 | 2,750.00 | 251,448.28 |
| Observations | 17,311 | | |

*Notes.* Time period: 2015-2023. SD refers to standard deviation. Earnings (spending) growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings (spending) growth. Number of observations is for the baseline sample of Figure 1. Base groups (such as the share of the 25–34 year-olds, singles, etc.) are not reported.

The top panel of Table 1 displays the summary statistics of the main variables used in the empirical analysis. The average year ahead expected earnings growth, measured by the average of the individual density means, is 3.2%, while the average expected spending growth is

[15]Note that we have non-missing wealth information for only 4,092 of our observations.

4.1%. There is sizable dispersion in both expected earnings growth and spending growth, as well as considerable individual uncertainty and cross-sectional dispersion thereof. The average of individual-level standard deviations of the year-ahead earnings growth density—that is, the average of individual earnings growth uncertainty—is 2% and the average spending growth uncertainty is 2.7%. Individuals also differ substantially in the extent of their uncertainty: across households, the top 10% most uncertain households display earnings uncertainty that is 4.3 percentage points higher than those in the bottom 10%. The SCE therefore points to meaningful heterogeneity in perceived uncertainty, thus complementing prior work on heterogeneity in income risk (e.g., Meghir and Pistaferri (2004)). Finally, the household heads in our sample report an average MPC of 17% (i.e., cents to the dollar), with clear cross-sectional heterogeneity in MPCs. We observe that 47.7% of respondents report an MPC of 0% and 1.1% report 100%.

Before proceeding with the empirical analysis, we discuss the validity of the SCE sample and the survey measures we use. First, as shown in other papers such as Fuster et al. (2020) and Koşar and Van der Klaauw (2023), statistics of households' characteristics in the SCE align well with corresponding statistics in the U.S. population. The respondents of the survey are, on average, more educated—a pattern that is observed in all online samples. Importantly, as shown in Koşar and Van der Klaauw (2023), average expected earnings growth rates as well as the perceived layoff and quit probabilities between June 2013 and December 2023 line up reasonably well with the realized earnings growth, layoff, and quit rates in the CPS and JOLTS.

Next, we discuss evidence in support of the credibility of our measures of subjective earnings growth uncertainty. In Appendix Table B.1 we show that the subjective earnings growth uncertainty measure positively correlates with households' reported monthly income variability, which is elicited triannually in the SCE Household Spending module. Households reporting their month-to-month income to vary by more than 5% have significantly higher subjective uncertainty for their year-ahead earnings growth. Furthermore, we find that the distribution of subjective uncertainty across households in the SCE is similar to the distribution of risk estimated by Almuzara (2020) in the PSID. In particular, most respondents report less than half the average uncertainty, but a significant share of respondents have more than twice the average uncertainty in the sample. Finally, subjective uncertainty is higher for demographics such as self-employed and younger workers, for which previous work has estimated higher risk using realized data. We revisit this point in Section 4.3.

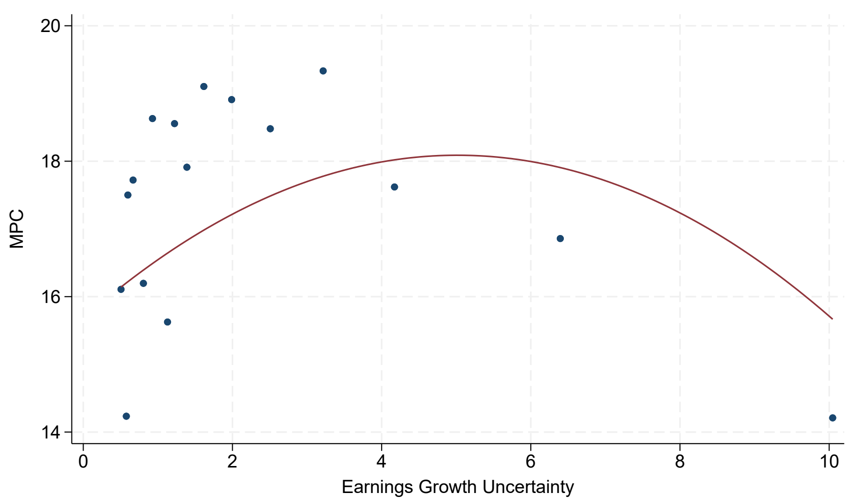
Regarding the measurement of the MPC, recent literature has supported the idea that "reported" MPCs contain relevant information about the actual consumption behavior of households in response to income shocks. For instance, Parker and Souleles (2019) conclude that reported responses to tax rebates are similar to actual spending responses. Kotsogiannis and Sakellaris (2025) find close alignment between "revealed" and "reported" MPCs in Greek administrative and survey data. Shapiro and Slemrod (2003) analyze households' expected spending responses out of an upcoming tax rebate and document that the MPCs elicited this way line up with the ex-post reported MPCs elicited from retroactive questions on realized spending. Finally, Koşar et al. (2023) find that heterogeneity in MPCs out of hypothetical income shocks lines up with heterogeneity in reported MPCs out of stimulus checks.

# 4 Empirical analysis

## 4.1 MPC and earnings growth uncertainty

We start our empirical investigation by plotting a binned scatterplot, in Figure 1, of the relationship between the MPC and the standard deviation of workers' expected year-ahead on-the-job earnings growth density, which we use as our baseline measure of earnings growth uncertainty.[16]

Figure 1: MPC and earnings growth uncertainty




*Notes.* The figure shows a binned scatterplot of MPC and earnings growth uncertainty, in the SCE for the sample period 2015-2023. The solid line displays a quadratic fit. Total number of observations: 17,311.

As shown in the figure, for relatively low levels of uncertainty—up to around the 80th percentile—the relationship between the MPC and earnings growth uncertainty is increas-

[16] In all binned scatterplots in the paper, we use 20 quantiles. Bunching in the distribution of uncertainty can result in fewer than 20 dots in the figures.

ing.[17] Thereafter, however, it quickly bends and turns decreasing. The top 6% of observations with the highest levels of uncertainty has, on average, roughly the same MPC as the bottom 6%. A similar relationship holds for different measures of uncertainty, as we discuss later.

To investigate this association more formally, we estimate a set of regressions all nested in the following specification:

$$\text{MPC}_{itm} = \alpha_i + \beta_1 U_{itm} + \beta_2 U_{itm}^2 + \gamma \mathbb{E}_m[\Delta w_{i,t,m+12}] + \delta_t + \Gamma X_{itm} + \epsilon_{itm} \tag{1}$$

where $\text{MPC}_{itm}$ is the marginal propensity to consume reported by individual $i$ in year $t$ and month $m$, $\alpha_i$ are individual fixed effects, $\delta_t$ are year dummies, $\mathbb{E}_m[\Delta w_{i,m+12}]$ is the expected year-ahead earnings growth of the individual (the density mean) and $X_{itm}$ is a vector of time-varying individual characteristics such as demographics, income, and measures of wealth. Finally, $U_{itm}$ is our variable of interest: subjective uncertainty or, more specifically, the standard deviation of an individual's density forecast for year-ahead earnings growth. The coefficients $\beta_1$ and $\beta_2$ measure the extent of a quadratic relationship between uncertainty and the MPC.

We report the estimates from Equation (1) in Table 2. In panel A we set $\beta_2 = 0$, while in panel B we do not impose any restrictions and estimate $\beta_2$ as well. In the first column of the table, we confirm the quadratic—and statistically significant—relationship shown in Figure 1, even after controlling for household characteristics such as income, age, race, gender, education, marital, and work status of the respondent. Focusing on these variables is motivated by the findings of Koşar and Van der Klaauw (2023), who show that earnings growth uncertainty is significantly higher for female, younger, non-white, single workers, part-time workers, self-employed, and those without a college degree.

Moving to the other columns, the relationship is little affected by controlling for respondents' expected year-ahead earnings growth and year fixed effects. Controlling for the former assuages concerns that higher uncertainty is solely driven by having higher earnings growth expectations. Including year fixed effects addresses the concern that aggregate conditions may simultaneously affect earnings uncertainty and the MPC. We find that adding year fixed effects does not materially change the estimates, in line with Koşar and Van der Klaauw (2023), who show that average earnings growth uncertainty only displayed a minor increase during the pandemic. Relatedly, our main results are little affected if we end the sample before February 2020. The relationship remains increasing and concave, and statistically significant, when we control for net liquid wealth to income ratios, as we do in column

[17] Formally, there is a positive and statistically significant association between MPC and uncertainty when restricting the sample to earnings growth uncertainty below the 80th percentile.

Table 2: MPC and Earnings Growth Uncertainty

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ***Panel A*** | | | | | |
| Earnings Growth Uncertainty | -0.004 | -0.007 | -0.020 | 0.014 | -0.229 |
| | (0.068) | (0.070) | (0.070) | (0.137) | (0.371) |
| Expected Earnings Growth | | 0.007 | 0.007 | -0.096 | 0.136 |
| | | (0.037) | (0.037) | (0.078) | (0.148) |
| ***Panel B*** | | | | | |
| Earnings Growth Uncertainty | 0.797*** | 0.844*** | 0.798*** | 0.917*** | 0.165 |
| | (0.168) | (0.180) | (0.180) | (0.334) | (0.826) |
| Uncertainty squared | -0.076*** | -0.079*** | -0.076*** | -0.080*** | -0.040 |
| | (0.014) | (0.014) | (0.014) | (0.024) | (0.061) |
| Expected Earnings Growth | | -0.034 | -0.033 | -0.144* | 0.121 |
| | | (0.039) | (0.039) | (0.080) | (0.156) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.03 | 16.08 |
| Adj. R-Squared | 0.017 | 0.017 | 0.019 | 0.017 | 0.386 |
| Observations | 17,189 | 17,189 | 17,189 | 4,088 | 2,556 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period for the sample is 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5, due to availability of wealth variables in the data. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. The sample only includes employed individuals. Controls include log annual household income and dummy variables for having a college degree, for part-time work, self-employment, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income ratio is winsorized at the 5th and 95th percentiles and available only until 2020.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

(4). As discussed in Appendix A, net liquid wealth is only available until 2020 and for a subset of the respondents. Repeating the estimation of columns (1)–(3) with the sample of column (4) delivers similar point estimates and statistical significance. Finally, in the last column we add individual fixed effects to our regression. We observe that the relationship between the MPC and uncertainty becomes statistically insignificant when we do so. Repeating the estimation of column (5) with the sample of column (3)—thus not restricting the sample to those with wealth information—also delivers very similar results.

The findings of column (5), compared to the estimates in the other columns, suggest that the relationship we uncover is primarily driven by variation between households. To further corroborate this point, we estimate a set of first-difference regressions and also find an insignificant relationship between within-individual changes in the MPC and changes in uncertainty, as we show in Appendix Table B.2.

Within-individual changes in MPCs and uncertainty might be insignificantly correlated simply because either the MPC, or uncertainty, or both, do not vary much within an individual's tenure in the survey. We investigate this, and how it relates to unobserved heterogeneity, in Section 4.3. In order to overcome the potential lack of statistical power, we also exploit hypothetical scenarios—i.e., vignettes—where we exogenously vary the subjective uncertainty of respondents.[18] Specifically, we present households with different hypothetical scenarios that vary the degree of uncertainty about their earnings growth over the following 12 months. For each scenario, we also elicit respondents' MPCs. This exogenous variation in subjective uncertainty allows us to estimate the subjective ex-ante treatment effect, defined by Kézdi and Shapiro (2023), of uncertainty on the MPC. In the survey, we randomized scenarios across respondents to reduce the cognitive burden and considered different levels of uncertainty across various survey waves. We detail the construction of these scenarios in Appendix A and report the results in Appendix Table B.3. We find that an exogenous increase in uncertainty makes an individual reduce their MPC, although this effect is insignificant when we allow for a nonlinear relationship. These results confirm that the increasing and concave relationship between MPC and earnings uncertainty is driven by the variation between households.

## 4.2 Other channels and robustness

In this section we explore other channels and mechanisms that could be important for the relationship between the MPC and uncertainty, and show the robustness of our main findings.

**Expectations about the macroeconomy** The density forecasts on year-ahead earnings growth in the SCE are all elicited in nominal terms. In Appendix Table B.4, we estimate the specification in Equation (1) controlling for year-ahead inflation expectations and respondents' subjective uncertainty in their year-ahead inflation forecasts. We find that accounting for the role of inflation expectations when households form their earnings growth expectations do not materially change the relationships we document.[19]

Our results are also unchanged when we control for expectations about other macroeconomic variables, such as the change in the U.S. unemployment rate or in stock prices, and households' perceptions and expectations about credit access. These results are shown in Appendix Tables B.5.

[18] See Fuster and Zafar (2023), Kézdi and Shapiro (2023) and Koşar and O'Dea (2023), for detailed discussions and references.

[19] Note that we cannot measure or back out the subjective uncertainty in *real* earnings growth in our dataset. Indeed, we do not observe the subjective, individual-level, covariance between nominal earnings growth and year-ahead inflation. These objects are likely to be heterogeneous across households. Stantcheva (2024) shows that people dislike inflation because they perceive that their nominal wages do not grow at the same pace as prices, thus suggesting the covariances may be negative for most households.

**Job loss expectations** As mentioned in Section 3, one additional important source of risk for workers is the risk of job loss. When we control for individuals' job loss expectations in our main specification, however, the relationship between the MPC and earnings growth uncertainty are little affected, as shown in Appendix Table B.6. Following the literature presenting 50% responses as a reflection of epistemic uncertainty (see De Bruin et al. (2000); Bruine de Bruin et al. (2002)), we also construct a measure of job loss uncertainty, which is maximized at 50% probability of job loss, to reflect respondents' uncertainty about how likely (or not) they might experience a job loss in the next 12 months, and minimized at 0 or 100% probability. Our analysis in Appendix Table B.7 shows that MPCs are increasing and concave in this uncertainty measure, too.

**Spending growth uncertainty** Constructing a measure of workers' *overall* subjective labor market uncertainty would require eliciting expectations of earnings changes associated with job transitions and job loss, along with expectations of earnings changes resulting from changes in work hours even if the workers stay at the current job.[20] Here, to better capture the full extent of uncertainty that individuals face and perceive, we focus on the uncertainty about future spending growth. Indeed, this measure can be seen as a sufficient statistic for all risks households face (Fagereng et al., 2017), since it encompasses the overall uncertainty related to labor market outcomes for all members of the households, as well as the uncertainty associated with risks not specific to the labor market, such as health issues, having a child, etc.

As presented in Table 1, our data indicate that households in the sample experience a substantial degree of spending growth uncertainty, more so than earnings growth uncertainty. Spending uncertainty in fact co-moves positively with earnings growth uncertainty and it is higher than earnings growth uncertainty for 62% of the observations in our sample. This result confirms that other risks, such as labor income risks unrelated to on-the-job earnings changes or risks unrelated to labor income, are also important for a large share of households.

Appendix Table B.8 shows that the MPC is also hump-shaped in spending growth uncertainty. Interestingly, and different from the observed relationship between MPCs and earnings uncertainty, MPCs are statistically increasing in spending uncertainty even when we omit a quadratic term, as can be seen in panel A of the table. However, as shown in the bottom panel, the relationship is in fact concave. The buffer-stock model has implications for the relationship between MPC and spending growth uncertainty, which we revisit in Section 5. Importantly, these implications are conceptually different from those drawn from relating

[20]See Caplin et al. (2023) for an effort to compute such a comprehensive measure of expected earnings growth for Danish households.

the MPC and earnings uncertainty. Indeed, spending uncertainty is an endogenous model outcome in a standard incomplete markets model, as it typically decreases with net liquid wealth. We therefore see these results as complementary to our main analysis on earnings growth uncertainty, which we will instead treat as exogenous in the structural model.

**Alternative definitions of subjective uncertainty** So far in our analyses, we have used uncertainty measures defined as the standard deviation of individuals' density forecasts. Nevertheless, our results are not specific to this particular definition. As mentioned in Section 3, one alternative measure we construct is based on the assumption that the likelihood assigned to each bin in the density forecast represents a probability mass at the midpoints of those bins. We then calculate the standard deviation of this underlying discrete distribution. With this uncertainty measure based on a *discrete-approximation*, in Table B.9, we find the same increasing and concave relationship between uncertainty in earnings growth and the MPC, with all coefficients statistically different from zero and of even larger magnitudes than in our baseline.

One potential concern with our uncertainty measures may be that the density forecasts are measured with error. This would be concerning, if measurement error was more severe for higher levels of uncertainty. However, if this was the case, and assuming that these errors are drawn from a distribution with a zero mean, we would expect attenuation bias to make the relationship between MPCs and uncertainty flatter for high levels of uncertainty. Our results show that this is in fact not the case. To further alleviate these concerns, we perform various robustness checks on our baseline measures of uncertainty. First, we winsorize our uncertainty measure at the top 99th percentile: regression coefficients, in Appendix Table B.10, become quantitatively larger and have lower standard errors. Second, we restrict the sample to those respondents who put zero probability on either the top or the bottom bin of the earnings growth options presented in the survey. This is motivated by the fact that most of the measurement error is likely to arise at the tails of the distribution, due to our parametric assumptions. Appendix Table B.11 shows that the main results in our baseline specifications are once again confirmed in this subsample and, in fact, the regression coefficients are quantitatively larger, although we lose some statistical power when we include net liquid wealth. Finally, we consider the interquartile range of each individual's density forecast as a measure of subjective uncertainty for earnings in Appendix Table B.12. By construction, this measure should be less affected by outliers and tail events. Even in this case, we find an increasing and concave relationship between MPC and earnings growth uncertainty, indicating that the results we report in our analyses are robust to differences in the construction of the uncertainty measure.

**Alternative definitions of the MPC** Next, we consider alternative ways to elicit individuals' MPCs. To start with, we use questions that were fielded in various waves of the SCE Housing Survey and studied by Fuster et al. (2020). We report the survey question in Appendix A. Compared to our baseline elicitation of the MPCs, this approach differs in four ways. First, here, respondents are asked about their allocation of a specific dollar amount (e.g., $500) rather than of a share of their incomes. Second, the hypothetical payment in the question is explicitly stated to be unexpected and one-time. Third, the respondents are given an explicit time frame for the spending response (e.g., 3 months). Finally, the question elicits the allocation of this unexpected, one-time payment in comparison to the counterfactual state of the world (e.g., would you spend more than/the same as/less than if you had not received the transfer). We repeat our analysis using MPCs elicited by Fuster et al. (2020) in Appendix Table B.13 and once again find an increasing and concave relationship between the MPC and earnings growth uncertainty, albeit statistically insignificant. The lack of statistical power is consistent with Fuster et al. (2020), who find little systematic heterogeneity in spending responses to gains, elicited using these questions, including no relationship with income or liquid wealth.

One potential caveat with eliciting MPCs using counterfactuals is that responding to such questions might be cognitively challenging to the respondents. For this reason, as part of the September 2023 and September 2025 SCEs, we fielded a version of our baseline MPC question adapted to reflect the key features of the question in Fuster et al. (2020), but without the counterfactual nature. Our new question, included in Appendix A, explicitly states that the windfall is unexpected, one–time, and specifies the decision horizon to be 3 months. Using responses to this question, in Appendix Table B.14 we still find an increasing and weakly concave relationship between the MPC and earnings growth uncertainty.

**Spousal Insurance** A household's family structure influences both the level of risk the household members face and the amount of self-insurance they can access. Single individuals, for example, might face lower overall uncertainty and thus make their consumption decisions accordingly; at the same time, however, they can only rely only on their own savings to insure against fluctuations in income or to smooth consumption (De Nardi et al., 2024). For this reason, the relationship between the MPC and uncertainty might be different based on marital status.

To investigate whether this is indeed the case, we estimate our baseline specifications separately for single and married respondents. We find that the increasing and concave relationship between the MPC and uncertainty is present for both groups, as shown in Appendix Figure B.1 and Table B.15.

**Results across the household distribution** As we briefly discussed in Section 2, the standard buffer-stock model predicts that the positive relationship between MPCs and uncertainty should be stronger at a given level of wealth. In Appendix Table B.16, we show that MPCs are increasing and concave in earnings uncertainty for all quartiles of net liquid wealth—although statistically insignificant for some quartiles. The results for high levels of wealth are particularly interesting, as standard theory suggests that the relationship should eventually fade for wealthy households, who follow the permanent income hypothesis. We see our results to be consistent with a recent strand of empirical literature that finds that MPCs are large even among wealthy households (e.g., Lewis et al. (2022), Holm et al. (2021), Graham and McDowall (2024)). We expand on these findings in the following sections.

Turning to respondent characteristics that tend to be correlated with subjective uncertainty, we find that controlling for industry dummies in our baseline specification makes the quadratic relationship even starker (Appendix Table B.17). Moreover, even though part-time workers and/or those who are self-employed are likely to have higher uncertainty, we show in Appendix Figure B.2 that the relationship between MPC and earnings growth uncertainty is still increasing and concave when we exclude both categories of workers from our sample.

In addition, preference heterogeneity does not seem to drive our results. MPCs are correlated with measures of preferences: for instance, more risk-averse households, and especially more impatient households, have higher MPCs. Subjective uncertainty is also correlated with risk aversion and patience. Nevertheless, we show in Appendix Tables B.18-B.21 that not only our baseline correlations between MPCs and uncertainty are broadly unaffected by controlling for preference heterogeneity, but also that MPCs are still increasing and concave even conditional on different levels of risk aversion and patience.

Finally, MPCs are increasing and concave in uncertainty even at different ages, as we show in Appendix Table B.22. As such, while life-cycle patterns may affect either side of the relationship, specific demographics do not seem to drive our results.

Overall, we find that the relationship we document between the MPC and subjective earnings growth uncertainty is not specific to a certain group in the household distribution and that is robust to accounting for various other channels. In Section 5, we come back to these empirical results in the context of a structural model.

## 4.3 Uncertain types

Our results showing that the relationship between MPCs and uncertainty is quantitatively small and statistically insignificant when controlling for individual–level fixed effects may indicate that the within–person variation in MPCs and/or uncertainty within our panel is limited. This, in turn, suggests an important role for latent, possibly permanent, heterogeneity. In this section, we investigate this possibility further and look especially at potential drivers of these persistent differences.

First, we explicitly assess the stability of MPCs and uncertainty in our sample. Given that our data set is an unbalanced panel, we consider a variance decomposition as follows:

$$\underbrace{\sum_{i=1}^{N}\sum_{t=2}^{T_i}\left(y_{it}-\bar{\bar{y}}\right)^2}_{\text{overall}} = \underbrace{\sum_{i=1}^{N}\sum_{t=2}^{T_i}\left(y_{it}-\bar{y}_i\right)^2}_{\text{within}} + \underbrace{\sum_{i=1}^{N} T_i\left(\bar{y}_i-\bar{\bar{y}}\right)^2}_{\text{between}}, \tag{2}$$

where $\bar{y}_i$ are within-individual averages and $\bar{\bar{y}}$ is the overall sample average. Within–person variation explains only 34% of the overall MPC variation in the sample, suggesting that the majority of the MPC heterogeneity we observe in our sample might have a permanent nature. Respondents' earnings growth uncertainty is even more stable during their tenure in the survey: within–individual variation explains only 30% of the overall variation in earnings growth uncertainty. Note that, due to observing each respondent for up to 12 months, we are unable to test formally whether individuals have permanent MPC or uncertainty types over their life-cycle or whether the time-invariance in these measures is just a short panel phenomenon.

Next, we investigate in Appendix Table B.23 whether there are any observable characteristics that can explain these seemingly permanent differences in uncertainty and whether unobserved heterogeneity may have a role. To start with, in the first column, we find that earnings growth uncertainty increases with net liquid wealth and declines with household income/earnings and age. We find that the association between net liquid wealth and uncertainty is nonlinear, but weak. Importantly, these observable, time-varying characteristics explain very little (about 1%) of the overall variation in earnings growth uncertainty.

We then turn to other household features considered in the literature that might explain the cross-sectional variation in uncertainty. For instance, households may self-select into riskier jobs,[21] which may result in persistent differences in uncertainty. While we observe some selection into certain industries based on respondents' earnings growth uncertainty in our data, industry heterogeneity only explains a negligible fraction of the overall variation in uncertainty. Furthermore, building on work by Koşar and Van der Klaauw (2023), we find that part-time workers and/or those who are self-employed are likely to have higher uncertainty. However, all these job-related characteristics, in addition to the other time-varying respondent characteristics mentioned earlier, explain only about 3% of the overall

[21] See Lusardi (1997) for a discussion on this.

variation in uncertainty.

Preference heterogeneity is another popular explanation for permanent differences across households. Recent work by Aguiar et al. (2024) has illustrated the role of this type of heterogeneity in consumption-savings models and for the MPC in particular. We find that risk-averse households indeed report lower uncertainty, supporting the idea that there is some selection into risk. In addition, our results show that more impatient households are more uncertain, all else equal. Nonetheless, once again, preference heterogeneity explains a negligible share of the overall variation in uncertainty, even when we consider other demographics that might correlate with preferences and occupational choice, such as gender, education, and marital status.

In summary, our analysis shows that unobserved heterogeneity is an important driver of individual-specific uncertainty. We find that uncertainty is correlated with many observable household characteristics, in sensible ways: this is reassuring in terms of the reliability of the responses in the SCE. Still, all the household characteristics discussed so far jointly explain only about 10% of the overall variation in earnings growth uncertainty, as we show in Appendix Table B.23. This suggests that much of the dispersion in uncertainty remains unexplained, or at most is driven by typically unmodeled latent household characteristics. In other words, there might exist "types" of households that differ in their perceived uncertainty. Consistent with this, in Section 5.1, we assume that households are permanently heterogeneous in the earnings risk they face, and test whether the structural model implies that more uncertain households have higher MPCs.

# 5 MPC and uncertainty in incomplete markets models

In this section, we assess our empirical results through the lens of a structural model. First, we investigate the relationship between MPC and uncertainty in a canonical heterogeneous-agent consumption-savings model augmented with risk heterogeneity. We show that the model predictions do not align with our empirical evidence and explore the reasons why. Second, we discuss how several extensions of the canonical model under the full information rational expectations framework do not fix the underlying reasons behind the misalignment between the empirical results and model predictions. Finally, we offer a solution using a heterogeneous-agent consumption-savings model that incorporates biased beliefs and perceived uncertainty that is directly disciplined by the empirical evidence from the SCE.

## 5.1 An incomplete markets model with heterogeneous risk

Our point of departure is a standard consumption-savings incomplete markets model with full information and rational expectations. The economy is populated by a continuum of infinitely lived households, with net asset holdings $a$ and exogenous earnings $y$.[22] For simplicity, we assume that households can borrow and save at the same risk-free interest rate, $r$. As typically assumed in the literature, households face an exogenous borrowing constraint, such that $a' \geq \underline{a}$. Households consume a nondurable good $c$, from which they derive utility. Log labor income follows an AR(1) process, with persistence $\rho$ and Gaussian innovations, $\eta$. In order to generate heterogeneity in the conditional variance of future earnings growth, we assume that earnings risk is heterogeneous. Hence, each household of type $i$ can potentially face different earnings risk, such that innovations to the income process are normally distributed with heterogeneous variances $\sigma_i^2$.[23] This modeling choice is motivated by our empirical findings that uncertainty is stable for a given individual and that the variation in uncertainty is mostly unexplained by observable household characteristics. The household problem is summarized as follows:

$$
\begin{aligned}
V_i(a_i, y_i) &= \max_{c_i > 0, a_i' \geq \underline{a}} u(c_i) + \beta E V_i(a_i', y_i') \\
&\text{s.t.} \\
c_i + a_i' &= y_i + a_i(1+r) \\
\log y_i' &= \rho \log y_i + \eta_i, \qquad \eta_i \sim N(0, \sigma_i^2)
\end{aligned}
$$

**Parameterization** A period is one year, to align with the horizon of expectations elicited in the SCE. As often done in this class of models, we assume a constant-elasticity utility function $u(c) = \frac{c^{1-\gamma}-1}{1-\gamma}$ and set $\gamma = 1$, so that $u(c) = \log(c)$. For simplicity, we set $\underline{a} = 0$, which implies that households cannot borrow. Note that higher uncertainty also affects the shape of the consumption function through the probability of hitting the borrowing constraint in the future. Nevertheless, we show later that a looser borrowing constraint matters only quantitatively and therefore does not affect our conclusions. We follow Kaplan and Violante (2022) and set the risk-free interest rate to 1%. We choose the discount factor, $\beta = 0.9898$, such that 14% of households are "hand-to-mouth". We set $\rho = 0.904$. Finally,

[22] We omit time subscripts and denote next period variables with the superscript $'$. Due to risk heterogeneity, we index the household problem and its components by $i$.

[23] With homogeneous earnings risk, and depending on the definition, the conditional variance of earnings growth is either the same for all households, $VAR(\log y_{t+1} - \log y_t | \log y_t) = \sigma^2$, or different across households only by the earnings level $y_t$, $VAR\left(\frac{y_{t+1}-y_t}{y_t} | y_t\right)$, a case we do not deem interesting.

we calibrate $\sigma$ to the heterogeneity in subjective earnings growth uncertainty as in the SCE. We solve the model for the same 16 quantile values showed in Figure 1 and weight all our model-based results to reflect the share of SCE observations in each quantile of $\sigma$. As we discuss later and show in Appendix D.1, the main conclusions of this section do not depend on any of the specific parameter values we choose, or the quantitative extent of risk heterogeneity. We define individual-level earnings growth uncertainty as $\sigma_i$. Note that in this model realized risk and subjective uncertainty coincide, meaning that households are assumed to have rational expectations and full information. We follow the convention in the literature and define the MPC for a household of type $i$ with state vector $(a_i, y_i)$ as $\frac{c_i(a_i+x,y_i)-c_i(a_i,y_i)}{x}$. To align with the SCE question and, thus, the empirical counterpart, we define $x = 0.1y_i$. In Appendix C.2 we show that all of our results are qualitatively unaffected if $x$ is arbitrarily small, as conventional in the MPC literature. To align the model output with the data, we report growth rates as well as MPCs in percent terms.

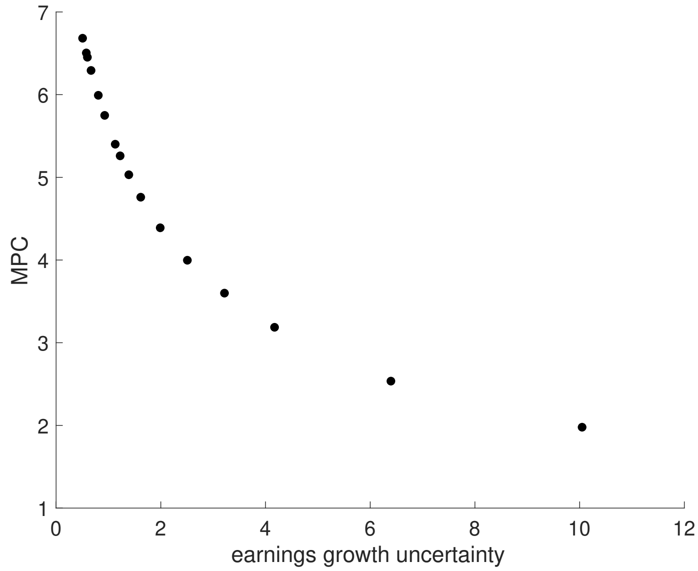
### 5.1.1 MPC and earnings growth uncertainty

In the stationary distribution of the model, MPCs monotonically fall with uncertainty, $\sigma_i$, as we show in Figure 2. We also run, in the model, the same regressions as in Table 2. MPCs remain negatively correlated with earnings growth uncertainty even when controlling for expected earnings growth, assets-to-income ratio, and a quadratic term for uncertainty. We report these results in Appendix Table C.1. Controlling for assets makes the relationship between MPCs and uncertainty slightly less negative. Indeed, the theory suggests that MPCs increase with uncertainty at a *given* level of wealth, as higher risk makes the consumption policy function more concave. However, linearly controlling for assets is not enough to make this effect stand out quantitatively.

**Mechanisms** Conditioning on quartiles of wealth sheds light on the forces at play in the model and why the model's predictions are at odds with the empirical evidence. As we show in Figure 3a, *within* a quartile of wealth, MPCs typically increase with earnings growth uncertainty. This is because, although wealth increases with uncertainty within each quartile, in that limited region this effect is dominated by a more concave consumption function. *Across* quartiles, however, the wealth accumulation effect dominates. Higher uncertainty is associated with much higher wealth (the curves in Figure 3a shift to the right) and higher wealth is associated with lower MPCs (the curves progressively shift down). This force implies that MPCs monotonically fall with earnings growth uncertainty in the model, as we show in Figure 2.

In the data, most of these forces do not show up, as can be seen in Figure 3b. Indeed,

Figure 2: MPC and earnings growth uncertainty in the canonical model

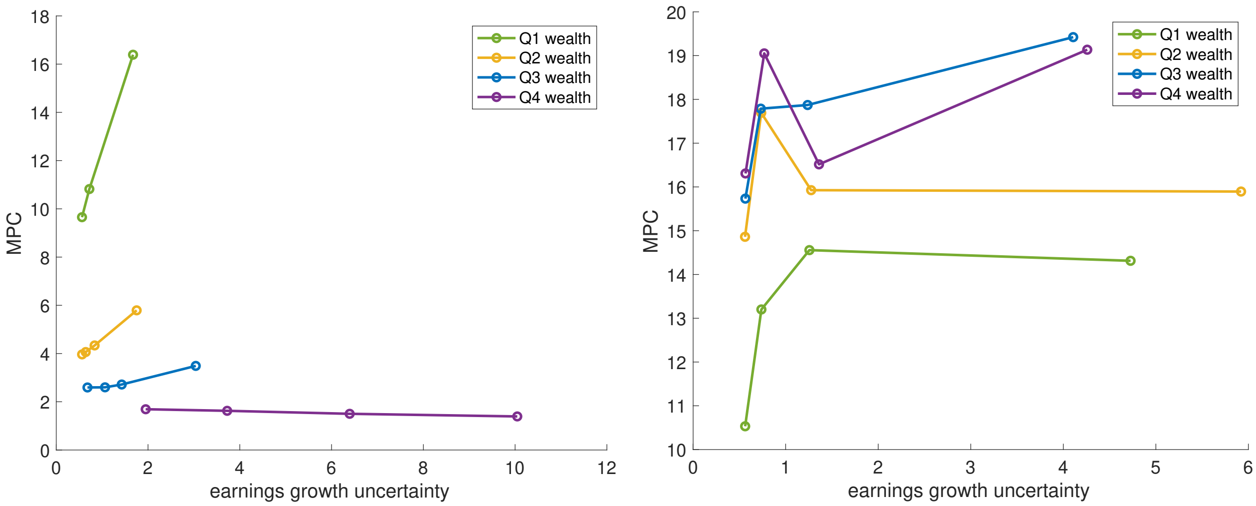



MPCs are broadly increasing and concave in uncertainty across all quartiles of net liquid wealth; moreover, the curves are much closer to each other (both vertically and horizontally). This is due to three main reasons. First, uncertainty and wealth accumulation are much more clearly related in the model than in the data. While the curves clearly shift to the right across wealth quartiles in the model, we do not observe the same pattern in the data. Second, the model features a strong negative correlation between the MPC and wealth, which is not borne in the data. Indeed, the curves across quartiles shift down in the model, while they do not in the data. If anything, in the data MPCs are lowest among net debtors (the bottom quartile): Koşar et al. (2023) show that this is due to strong debt repayment motives among debt holders.

Third, in our data, there is substantial heterogeneity in the MPC even at high levels of net liquid wealth, and MPCs seem to be positively correlated with uncertainty even for those in the upper echelons of the wealth distribution. In contrast, the model's MPCs progressively collapse towards the low, permanent-income, level as wealth increases. Several recent empirical papers are consistent with our observation from the SCE that MPCs are large for wealthy households, and propose various explanations (see for instance Holm et al. (2021), Graham and McDowall (2024), Boutros (2023), and Ilut and Valchev (2023)). We come back to related theories of bounded rationality in Section 5.2.

One concern for the discrepancy we uncover between the model and the data is that net liquid wealth may be measured with error in the data. To work around this issue, we look

Figure 3: MPC and earnings growth uncertainty by wealth quartile




(a) Model

(b) Data

*Notes.* Left panel shows data simulated from the stationary distribution of the model. Households are grouped in four quartiles of wealth ($a$), from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of wealth, dots represent quantiles of earnings growth uncertainty. The right panel repeats the same analysis in the SCE data, grouping households by quartiles of net liquid wealth.

at how MPCs and uncertainty are related within quartiles of expected consumption growth (instead of quartiles of wealth) and report these results in Appendix Figure C.1. In the model, households that engage more forcefully in precautionary savings have higher expected consumption growth, as they have to postpone current consumption and save instead. Due to the concavity of the consumption function, this also implies that they display a higher MPC. Conditional on a certain expected consumption growth, however, MPCs always fall with earnings uncertainty.

In the data, in contrast, MPCs are once again typically increasing and concave in uncertainty for all quartiles of expected spending growth (see Appendix Figure C.1). In line with the model, MPCs are lowest for those with the lowest expected spending growth, although the ranking for the rest of the distribution is less clear than in the model. Differently from the model, however, households in the data also display sizable MPC heterogeneity, and an increasing and concave association with uncertainty. In the model, in contrast, households with low expected consumption growth are close to their target level of wealth: their consumption function becomes approximately linear, and MPCs are all close to zero.

**Short-run dynamics** Throughout this section, we have considered the model's predictions in a stationary distribution of households. This, and allowing for permanent heterogeneity in risk, is motivated by our empirical observation that the relationship between MPC and uncertainty is driven by variation across households. Nevertheless, we find that the model's predictions are also at odds with the data when we consider short-run dynamics, i.e., the predictions of the model after an unexpected change in $\sigma$.[24] In particular, following an unexpected permanent increase in $\sigma$, the average MPC typically increases upon impact, albeit modestly. Thereafter, the MPC falls over time and eventually converges to a value below the one before the shock: in other words, MPCs fall with $\sigma$ in the long-run, as we have shown before in Figure 2. This implies that MPCs are *lower* in the long-run than in the short-run. This is consistent with MPCs typically increasing with $\sigma$ for a given level of wealth, but declining with $\sigma$ in the cross-section, as discussed before.

These patterns stand in sharp contrast with the data. We have indeed found that the correlation between changes in the MPC with changes in uncertainty is *lower* within individuals than across. The hypothetical uncertainty scenarios we have discussed before and presented in Appendix Table B.3 confirm this pattern and even suggest that an exogenous increase in uncertainty leads individuals to reduce their MPC, in contrast with the model's short-run predictions.

**MPC and spending growth uncertainty** As in the data, the model generates an increasing relationship between the MPC and spending growth uncertainty in the stationary distribution, as we show in Appendix C.1. The success of the model alongside this dimension stems from the following channel. Conditional on a level of earnings risk, $\sigma$, spending growth uncertainty is higher for lower levels of wealth. As discussed in Carroll (1992), low-wealth households in buffer-stock models display high MPCs and high expected variance of consumption growth.[25] This mechanism, by itself, sustains a positive correlation between the MPC and spending uncertainty. Across levels of $\sigma$, as discussed before, higher uncertainty is instead associated with higher wealth and lower MPCs, implying a negative correlation. In the model, the former force dominates the latter, because the pass-through from earnings to spending uncertainty is small. As a result, the model generates a positive correlation between MPC and spending uncertainty in the cross-section.

## 5.2 Understanding the puzzle: MPC and earnings uncertainty

Two main reasons lie behind the disconnect between model and data with regard to the relationship between the MPC and earnings uncertainty. First, the MPC is strongly negatively

[24] For this analysis, we consider a version of the model with homogeneous $\sigma$, and analyze the response to an unexpected permanent increase in $\sigma$, restricting the attention to households whose income realization is always equal to the preserved mean.

[25] In the model, the relationship between MPCs and spending growth uncertainty is much steeper for lower quantiles of wealth. This is in contrast with the data, where MPCs are large and heterogeneous even among wealthy households, as we show in Appendix Figure C.3.

correlated with liquid assets, while we do not observe such a monotonic relation in the data. Second, more uncertain households are much wealthier in the model, while that relationship is weak in the data.

As we show in Appendix D, several extensions of the canonical model do not succeed at fixing this puzzle. In some cases, this is because a change that lessens the MPC-assets gradient worsens the relationship between assets and uncertainty vis-à-vis the data. For example, MPCs still fall with earnings uncertainty in the model for different degrees of risk aversion, $\gamma$; persistence of labor income, $\rho$; discount factor, $\beta$; interest rate, $r$; and borrowing constraint, $\underline{a}$, as we show in Appendix D.1, even though these parameters affect the relation between MPCs and liquid assets.

Other extensions, such as permanent income heterogeneity, life-cycle mechanisms, endogenous labor supply, and alternative financial constraints do not fundamentally alter the key forces of the canonical model (Appendix D.2-D.5). As a result, MPCs still fall with earnings uncertainty. This is also the case when we consider debt repayment motives through a nonlinear pricing schedule for debt, as in Koşar et al. (2023). While this channel makes the MPC-assets relationship locally increasing as in the data, it is quantitatively too weak to generate the MPC-uncertainty pattern observed in the SCE, as we show in Appendix D.6. As discussed earlier, we empirically document that our results are not driven by standard forms of preference heterogeneity (i.e., impatience and risk aversion). Incorporating richer forms of preference heterogeneity to the model, especially if the heterogeneity is correlated with uncertainty, might rationalize our empirical findings but is hard to discipline empirically.[26]

Recent papers have shown that deviations from the full-information rational-expectations (FIRE) benchmark can raise the MPC, especially of households with high liquid wealth. To the best of our knowledge, however, the interaction between these mechanisms and risk heterogeneity has not been studied. We discuss some of these theories in Appendix D.7, in the context of our empirical evidence. We show that the bounded rationality model by Ilut and Valchev (2023) could generate MPCs that at least do not decline with uncertainty. A fundamental issue of all these existing model deviations from FIRE, however, is that their key parameters are especially hard to discipline empirically.

In the next section, we make progress along these lines using new empirical evidence. First, we document that individuals are overly optimistic with respect to their future earnings in the SCE and that, crucially, this overoptimism increases with their perceived uncertainty. Second, we embed these biased beliefs into a canonical consumption-savings model and show

[26]One form of non-standard preference heterogeneity, which we unfortunately cannot test in the data, involves temptation. Attanasio et al. (2024) show how temptation preferences generate demand for illiquidity and, in turn, high MPCs. Even in this setup, however, one would need to take a stand on how temptation and subjective uncertainty correlate in order for the model to generate the observed empirical facts.

how these affect the relationship between MPC and uncertainty. Finally, we show that an empirically plausible degree of overoptimism about future earnings and misperceptions about future income risk rationalize our empirical findings.

## 5.3 Biased beliefs and heterogeneous risk

### 5.3.1 Empirical evidence

In order to construct forecast errors in future earnings growth, we use a question from the SCE labor market module which elicits individuals' expected annual earnings four months from now. Given the rotating panel nature of the survey, we also observe these respondents' realized earnings 4 months after.[27] This allows us to define the forecast error of an individual $i$ at month $t$ as the difference between their expected earnings and realized earnings, divided by current earnings: $\frac{\mathbb{E}_{i,t}(y_{i,t+4})-y_{i,t+4}}{y_{i,t}} \times 100$, where $y$ is annual earnings.

Forecast errors are, on average, positive (see Appendix Table A.1) and, as shown in Table 3, positively and statistically significantly correlated with perceived uncertainty. The fact that workers' future forecast errors can be predicted with their current subjective uncertainty provides evidence against full information rational expectations. The positive relationship is robust to many individual characteristics that might correlate with uncertainty or forecast errors. For example, we observe that part-time workers, those who are self-employed, older workers, and college graduates have higher forecast errors, but the inclusion of these controls does not materially affect the correlation between forecast errors and uncertainty. In the last column, we also control for the perceived probability of losing a job and the probability of moving to a different employer and the probability of moving to non-employment over the same 4-month horizon. These subjective job separation expectations are important because, differently from our measure of uncertainty, the 4-months ahead earnings expectations question used to construct forecast errors is not conditional on remaining at the same job. We find that individuals with a higher perceived likelihood of moving to a new employer make more positive forecast errors while those with a higher perceived probability of moving to non-employment are more pessimistic and make negative forecast errors. Nevertheless, controlling for these expectations on job transitions barely affects the correlation between overoptimism and uncertainty.[28]

[27] Since respondents stay in the survey for up to 12 months, we cannot construct forecast errors for the on-the-job earnings growth expectations question we use to construct our earnings growth uncertainty measure.

[28] Our analysis is therefore fundamentally different, although complementary, to Balleer et al. (2026), who document an optimistic bias in households' expectations about labor market transitions. Appendix Table A.1 shows the summary statistics for the 4-month ahead labor market transition expectations.

Table 3: Overoptimism and uncertainty

| | Forecast Error | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Earnings Growth Uncertainty | 0.670*** | 0.631*** | 0.629*** |
| | (0.162) | (0.162) | (0.162) |
| % chance of moving to a new employer - 4 months | | | 0.080*** |
| | | | (0.015) |
| % chance of moving to non-emp. - 4 months | | | -0.133*** |
| | | | (0.041) |
| Constant | -0.453 | -8.693 | -11.733* |
| | (0.337) | (6.300) | (6.362) |
| Controls | | ✓ | ✓ |
| Dep. Var. Mean | 0.776 | 0.766 | 0.765 |
| Adj. R-Squared | 0.004 | 0.015 | 0.022 |
| Observations | 8,289 | 8,270 | 8,268 |

*Notes.* Robust standard errors are reported in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable, earnings growth rate forecast error, is defined as $100 * \frac{\mathbb{E}_{it}[y_{i,t+4}] - y_{i,t+4}}{y_{it}}$ where $y_{it}$ is individual $i$'s annual earnings reported in month $t$. Uncertainty is the standard deviation of the 12-month-ahead subjective earnings growth distribution. Column (2) adds as controls log annual household income and dummy variables for having a college degree, for part-time work, self-employment, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Column (3) adds as controls the subjective probability of being employed at a different employer in four months, and separately the subjective probability of being unemployed or out of the labor force in four months.

### 5.3.2 Structural model

Motivated by the empirical evidence just presented, we now introduce biased beliefs in the canonical consumption-savings model of Section 5.1.

We deviate from the FIRE framework and assume that, besides the risk heterogeneity previously introduced, households also differ with respect to their beliefs on future earnings. We discipline this relation directly from the data.[29] For simplicity, we assume that households perceive the log of income to be i.i.d. and normally distributed, with perceived mean $\hat{\mu}_i$ and standard deviation $\sigma_i$.[30] As in the earlier sections, we assume there are 16 types of $i$ with each $\sigma_i$ is taken from the SCE. We assume that the perceived mean of future log income is linearly correlated with uncertainty and set as follows:

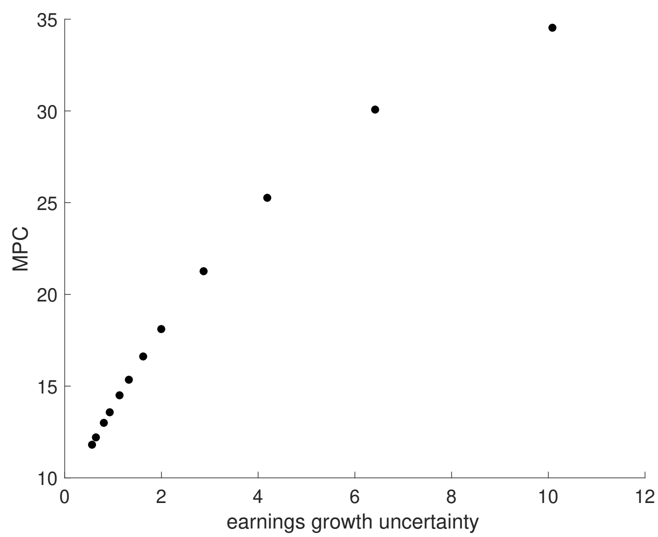
$$\hat{\mu}_i = \alpha_0 + \alpha_1 \sigma_i, \tag{3}$$

[29] We see the microfoundations for this empirical finding as an interesting avenue for future research.

[30] To keep the model in this section consistent with the model introduced in Section 5.1, we set one period to be a year. In Appendix E.2 we show that our results are broadly unchanged if one model-period is instead set to be 4 months and the timing mismatch in the data between forecast errors and subjective uncertainty is properly incorporated.

where we calibrate $\alpha_0$ and $\alpha_1$ to match the regression coefficients of column (1) in Table 3.[31] We further set realized log income to be i.i.d. and normally distributed with realized mean 0 and standard deviation $\sigma_i$, implying a gap between expectations and realizations.

Figure 4: MPC and uncertainty: heterogeneous risk and correlated overoptimism




We show in Figure 4 that the model with heterogeneous risk and correlated overoptimism, in fact, generates MPCs that are increasing with uncertainty in the stationary distribution.[32] Overoptimism bias has two effects in this model. First, all else equal, given that households expect their earnings to be higher than the realization, they save less compared to the baseline and face a more concave consumption function. Second, because realized income is lower than expected, it makes households relatively less wealthy ceteris paribus. Both effects raise the MPC. If households had a common degree of overoptimism, however, MPCs would still decline with uncertainty. The MPC-uncertainty curve just shifts upwards in this case, compared to the canonical model, as we show in Appendix E.3.

The fact that more uncertain households are also more overoptimistic introduces an offsetting force to those in the canonical model: households with higher uncertainty now have

[31]Similar to uncertainty types, we assume that biased beliefs on $\mu$ are permanent. While our data does not have enough power to explicitly test this assumption for 4-month ahead earnings expectations, Malmendier and Shen (2024) and Pfäuti et al. (2024) show evidence of persistent biased beliefs in different contexts. Kaufmann and Pistaferri (2009) also show a persistent fixed effect in subjective expectations of future earnings from the Survey of Household Income and Wealth and mention that this can be interpreted as persistent optimism/pessimism or persistent measurement error.

[32]To align the MPC *levels* in the model to the data, we have calibrated $\beta = 0.9893$ to match the average MPC.

relatively higher MPCs, because their larger overoptimism bias makes them more willing to bring consumption forward. Quantitatively, our empirical evidence suggests that this force prevails and offsets the standard forces of the canonical model. Overall, MPCs are increasing and concave in earnings growth uncertainty, although the hump is much less pronounced than what found in the data (Figure 1).

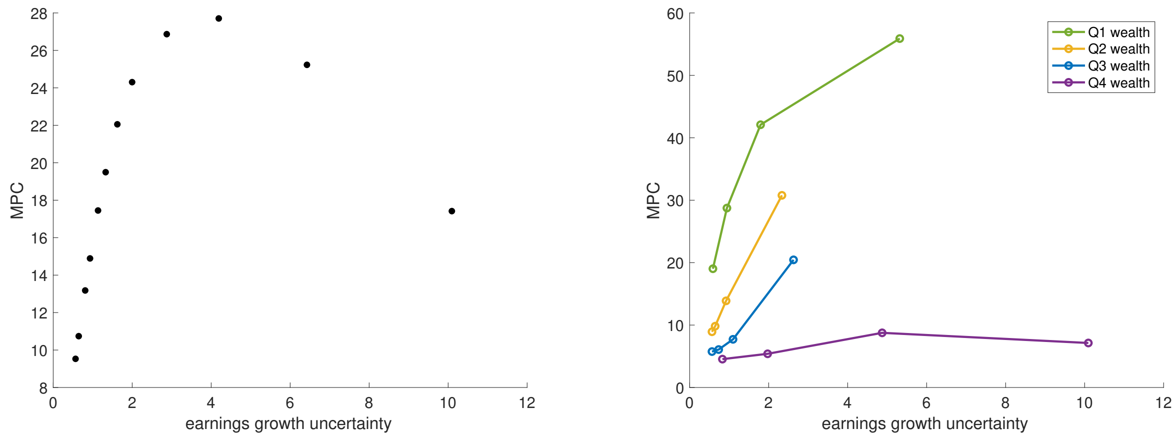
To weaken the effect stemming from overoptimism, we add to the model another form of biased beliefs: risk misperceptions. Caplin et al. (2023) and Wang (2023) empirically show that subjective uncertainty is lower than the dispersion of realized earnings growth in Denmark and in the U.S., respectively. We implement this idea in our model by assuming that households perceive the log of next period's income to be normally distributed with mean $\hat{\mu}_i$ and standard deviation $\hat{\sigma}_i$. The realizations of the log of next period's income are instead assumed to be normally distributed with mean 0 and standard deviation $\kappa\hat{\sigma}_i$. We maintain $\hat{\sigma}_i$ from the SCE, as in the rest of the paper, and choose $\kappa = \frac{1}{0.18}$, in line with evidence presented by Caplin et al. (2023).[33] We then recalibrate $\hat{\mu}_i$ to match the relationship between forecast errors and uncertainty, as in Equation (3). We also recalibrate $\beta = 0.9893$ to match the average MPC in the data, but our conclusions are qualitatively unchanged if we pick $\beta$ to match the share of zero-asset households instead.

As shown in Figure 5a, MPCs in this model are hump-shaped in earnings growth uncertainty, matching what we observe in the data. Moreover, this increasing and concave relationship is robust to controlling for expected earnings growth and the wealth–to–income ratio, as we show in Appendix Table E.1. In addition, MPCs remain increasing in spending uncertainty as we show in Appendix Figure E.1, and also when controlling for expected spending growth and the wealth–to–income ratio.

In order to understand the mechanisms behind this result, it is useful to decompose the various channels in the model. We do so in a comparative statics exercise reported in Appendix E.3, which compares several models. Across all models, we fix $\beta$ to the value calibrated in the full model that includes both overoptimism correlated with uncertainty and risk misperceptions, and we set perceived uncertainty to the $\sigma_i$ values drawn from the SCE. Starting from the canonical model, in which beliefs are accurate and ex-ante uncertainty coincides with ex-post risk, MPCs decline with uncertainty. We start by adding risk misperceptions to this model, so that realized earnings are more dispersed than what agents think. In this setup, households engage in the same conditional amount of savings

[33]This estimate comes from Figure 9 of Caplin et al. (2023) where they compare households' elicited subjective uncertainty about future earnings to realizations from administrative data in Denmark. This is, to the best of our knowledge, the only empirical estimate quantifying the discrepancy between perceived and realized risk. For simplicity, we attribute the entirety of this discrepancy to risk misperceptions; private information could also play a role, although it will likely be associated with smaller absolute forecast errors.

Figure 5: MPC and uncertainty: overoptimism and risk misperceptions




(a) Full distribution (b) Relationship by wealth quartiles

*Notes.* Data simulated from the stationary distribution of the full model with biased beliefs. In the right panel, households are grouped in four quartiles of wealth ($a$), from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of wealth, dots represent quantiles of earnings growth uncertainty.

as in the canonical model—because perceptions have not changed—but they end up being wealthier on average, because of the relative skewness of realized income.[34] In other words, risk misperceptions in earnings *growth* induce negative forecast errors in the *level* of income, which in turn raises households' ex post wealth. As a result, for a given $\beta$, the MPC is lower. Quantitatively, this effect is stronger for higher perceived $\hat{\sigma}$, making MPCs more steeply declining with uncertainty. Overoptimism that is positively correlated with uncertainty, by itself, instead makes MPCs increasing with uncertainty, as we have shown before. Combining this channel with risk misperceptions, and the standard forces of a canonical model with heterogeneous risk, generates MPCs that are hump-shaped in uncertainty.

Figure 5b also sheds light on how these effects unfold along the asset distribution. MPCs still decline with liquid assets, particularly for more uncertain households. For these households, overoptimism bias is strongest.[35] Compared to the canonical model, MPCs increase with uncertainty more strongly within each quartile of wealth. Moreover, overly optimistic households save less than they would under FIRE. Overoptimism—and its correlation with uncertainty—substantially weakens the relationship between asset accumulation and uncertainty. Indeed, the curves by wealth quartiles in Figure 5b do not shift right as markedly as they do in Figure 3a (canonical model).

[34] Note that this is different from comparing an economy in which perceived risk $\hat{\sigma}$ is lower than true risk $\sigma$ to an economy in which perceived and true risk are both $\sigma$. We discuss this scenario in Section 6.

[35] As an unpleasant side effect of this, MPCs are more dispersed in the model than in the data.

# 6 Policy experiment

With a model that matches the empirical relationship between the MPC and uncertainty, we next try to quantify the aggregate effects of households' biased beliefs, that is overoptimism and risk misperceptions, in the economy. Starting from the stationary distribution of the calibrated full model just presented, with heterogeneous uncertainty, correlated overoptimism, and risk misperceptions, we consider a policy that lifts both sources of biased beliefs. Practically, lifting risk misperceptions implies that perceived uncertainty is now raised from $\sigma_i$ (as measured in the SCE) to ex-post $\hat{\sigma}_i$. After the policy, households also do not make first-moment forecast errors, as they are not overoptimistic anymore. This exercise can be thought of as representing the effects of real-world policies that improve frictions, such as salary taboos (Cullen and Perez-Truglia, 2023) or misperceptions about outside options (Jäger et al., 2024), preventing households to form accurate earnings forecasts. Our analysis in this section is therefore broadly related to pay transparency policies of all kinds. However, since we are more focused on earnings growth on the job, we are particularly thinking about vertical pay transparency policies, where workers of the same organization but different seniority are informed of each other's pay (e.g., Cullen (2024)), allowing workers to better predict their earnings trajectories.

In the first column of Table 4, we consider the instantaneous welfare effects of the policy. To do so, we compare aggregate welfare before the policy to aggregate welfare with no biased beliefs but evaluated at the pre-policy stationary distribution. This short-run calculation therefore gauges the ex-ante effects of more accurate forecasts. Households do not underestimate risk and not overestimate future earnings growth anymore: both effects lead to more accurate forecasts and, even ex ante, optimal consumption and savings decisions. In the short-run, the policy is welfare-improving for all households, although there is substantial heterogeneity. More uncertain households gain the most. Conditional on perceived uncertainty, poorer households have the biggest welfare gains, but that is not true unconditionally, as more uncertain households are wealthier. In the aggregate, welfare increases by 13% (0.17% in consumption-equivalent terms, using a homogeneous consumption-equivalent variation).

In the second column of Table 4, we assess the long-run effects of this permanent policy. In other words, we compare welfare before the policy to aggregate welfare evaluated at the post-policy stationary distribution. As we discussed before, lifting the overoptimism bias lowers households' expectations about future income, especially for those with high uncertainty, and increases their savings. Lifting risk misperceptions operates in an analogous way, inducing households to correctly assess the true extent of risk and thus save accordingly. These effects

Table 4: Policy experiment

| | Aggregate welfare change (short-run, CEV, %) | Aggregate welfare change (long-run, CEV, %) | Average MPC |
|---|---|---|---|
| Pre-policy | – | – | 0.16 |
| Post-policy | 0.17 | 0.72 | 0.08 |

*Notes.* Aggregate welfare is calculated as $W = \sum_i \left[\int_a \int_y \hat{V}_i(a_i, y_i) f_i(a, y) dz dy\right] \phi_i$, where $\hat{V}$ is the value defined below, $f$ the stationary distribution, and $i$ denotes the uncertainty-type with associated mass $\phi$. $W_{\text{pre-policy}}$ uses the optimal value and the stationary distribution of the calibrated model with biased beliefs. $W_{\text{policy,short-run}}$, used in the first column, uses $\hat{V}_i(a_i, y_i) = u(\tilde{c}_i) + \beta E \hat{V}_i(\tilde{a}'_i, y'_i)$, where $\tilde{c}$ and $\tilde{a'}$ are the policy functions under biased beliefs $\tilde{E}$, whereas $E$ in the computation of $\hat{V}$ denotes the "true" (ex-post correct) transition matrices. The stationary distribution $f$ in this column is maintained at pre-policy. In the second column (long-run), welfare is instead calculated using the post-policy stationary distribution. We report an aggregate consumption-equivalent variation $\lambda$ such that if every agent in the pre-policy economy got $1 + \lambda$ times their consumption in every period and in every state $(a, y)$, aggregate welfare would be equivalent to the post-policy economy. With log utility, $\lambda = \left[\exp\left[(1-\beta)\left(W_{\text{policy}} - W_{\text{pre-policy}}\right)\right] - 1\right] * 100$. In the final column, we compute the average MPC out of a uniform lump-sum transfer equal to 10% of the cross-sectional average annual income, calculated in the stationary distribution pre-policy (first row) and post-policy (second-row).

do not only affect households' decisions in the short-run, as previously discussed, but also their asset accumulation in the long-run. Households are wealthier than before the policy, with a higher aggregate wealth to income ratio and a lower share of borrowing constrained households. Both effects further enhance aggregate welfare.

In the post-policy world, however, the average MPC out of a uniform lump-sum transfer is substantially lower, as we show in the last column of the Table. Indeed, as shown before, biased beliefs raised the MPC, especially for uncertain households. This implies that even though the policy experiments we consider in this section are welfare-enhancing, they may also decrease the effectiveness of fiscal policy by lowering the consumption sensitivity to transfers.

In conclusion, we find that policies that improve households' forecasting accuracy about their future earnings, such as pay transparency laws or within-company salary range postings, are welfare-enhancing, but lower the consumption sensitivity to fiscal transfers.

# 7 Conclusion

We have used directly elicited measures of households' subjective uncertainty to empirically document how uncertainty relates to marginal propensities to consume across households. Our main finding is that the MPC is increasing and concave in measures of uncertainty. This contrasts the predictions of a canonical consumption-savings model, in which strong precautionary saving motives, and MPCs declining with wealth, imply that MPCs also decline with earnings risk. We see our findings as highlighting not only the disconnect between canonical models and data, but also the underlying mechanisms that do not find support in the data.

An empirically plausible deviation from the full-information rational-expectations benchmark reconciles theory and empirical evidence. In the data, households are overly optimistic about their future earnings, on average, and this overoptimism has a positive correlation with perceived uncertainty. Embedding biased beliefs in a canonical consumption-savings model generates MPCs that are increasing and concave in uncertainty, consistent with our empirical evidence.

Our paper offers a novel example of how household surveys can be used to inform and discipline heterogeneous-agent macroeconomic models. Probabilistic surveys allow direct measurements of objects that, while being crucial for structural models of economic behavior, are often hard to identify in standard datasets with information only on revealed preferences. We hope our work will spur further research in this direction.

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# A Data appendix

Year-ahead household spending growth expectations are elicited via the following question:

*Now we would like you to think about the different things that may happen to the total spending of all members of your household (including you) over the next 12 months. What do you expect will happen to the total spending of all members of your household (including you) over the next 12 months?*

| | | |
|---|---|---|
| *increase by 12% or more* | ______ | *percent chance* |
| *increase by 8% to 12%* | ______ | *percent chance* |
| *increase by 4% to 8%* | ______ | *percent chance* |
| *increase by 2% to 4%* | ______ | *percent chance* |
| *increase by 0% to 2%* | ______ | *percent chance* |
| *decrease by 0% to 2%* | ______ | *percent chance* |
| *decrease by 2% to 4%* | ______ | *percent chance* |
| *decrease by 4% to 8%* | ______ | *percent chance* |
| *decrease by 8% to 12%* | ______ | *percent chance* |
| *decrease by 12% or more* | ______ | *percent chance* |
| *Total* | 100 | |

The net liquid wealth measure we use in our analysis is based on questions from the SCE Housing Survey between the years 2014-2020. In particular, we subtract gross unsecured debt from liquid wealth. The latter is the amount that households report to have invested in checking accounts or cash, savings accounts, money market funds, Certificates of Deposit, Government/Municipal Bonds or Treasury Bills, and stocks or bonds in publicly held corporations, stock or bond mutual funds, or investment trusts. The question explicitly states to "NOT include any investments in retirement accounts (401k, 403b, 457, IRA, thrift savings plans etc.) or employer-sponsored pensions". Gross unsecured debt is the reported "current total outstanding debt, EXCLUDING all housing debt (such as mortgage debt, home equity loans, and lines of credit)".

Because the question is asked in bins, we assign the respondent the midpoint of their selected bin for both liquid wealth and gross unsecured debt. For debt, we assign $125,000 when respondents choose *$100,000 or more*. For liquid wealth, if the respondent chooses *Less than $500*, we assign $249.50, and for *$1,000,000 or more* we assign $1,250,000. Respondents can also state they hold exactly zero liquid wealth. The Housing survey is fielded every February, so we only observe respondents' net household wealth once a year. In matching this information with observations at monthly frequency, we use the same wealth value across all observations of a respondent in the same year. Since wealth is measured in February, before any spending module containing MPC information for that year, wealth is always predetermined with respect to the MPC in our empirical analysis.

The year-ahead earnings growth expectations questions are included in the survey since June 2013, while the MPC questions are included starting from 2015. For this reason the majority of our analysis uses data from 2015 to 2023. Wealth variables are included in the survey once a year, starting from 2014 February and matched to the rest of the data as described above. This implies that we have information for uncertainty, MPCs and wealth for observations between 2015 to 2020. Appendix Tables B.18 – B.21 use measures of risk aversion and patience. Both the self-assessed risk taking behavior and patience are elicited the first time each respondent takes the survey and only once during a respondent's tenure. The risk aversion question is included in the survey since April 2015, while the patience question is included in the survey since March 2016.

To consider alternative definitions of the MPC, we first use survey questions that were designed and studied by Fuster et al. (2020). In these questions respondents are asked:

> *Now consider a hypothetical situation where you unexpectedly receive a one-time payment of $500 today.*
> *We would like know whether this extra income would cause you to change your spending behavior in any way over the next 3 months.*
> *Please select only one*
>
> - ❍ *Over the next 3 months, I would spend/donate more than if I had not received the $500.*
> - ❍ *Over the next 3 months, I would spend/donate the same as if I had not received the $500.*
> - ❍ *Over the next 3 months, I would spend/donate less than if I had not received the $500.*
>
> *You indicated that you would increase your spending/donations over the next 3 months following the receipt of the $500 payment.*
> *How much more would you spend/donate than if you had not received the $500?*

Next, we fielded an alternative MPC question in the September 2023 and September 2025 SCEs. The question reads as follows, and results using this MPC measure are reported in Table B.14.

> *Suppose tomorrow you were to receive an unexpected, one-time payment equivalent to*

*10% of your total pre-tax annual household income. Please indicate how you would allocate this extra income over the next 3 months...*

Next, we describe the vignettes data mentioned in Section 4.1. We included vignettes that vary the uncertainty in year-ahead earnings growth in the November 2023, March 2024, July 2024, November 2024, and July 2025 SCE waves. In these modules, each respondent received three scenarios. The first scenario tells the respondents that their year-ahead earnings growth will be exactly the same as they expect, with certainty.[1] The second scenario specified a case in which the respondent's year-ahead earnings growth would be $x + \delta$ with probability $p$, and $x - \delta$ with probability $1 - p$, where $x$ is their previously reported earnings growth expectation. The scenario introduced a mean-preserving spread and we set $p = 0.5$ such that uncertainty is $\delta$. The third scenario specified a case in which the respondent's year-ahead earnings growth would be $x + \delta$ with probability $\tilde{p}$, $x - \delta$ with probability $\tilde{p}$, and $x$ with probability $1 - 2\tilde{p}$, where $\tilde{p}$ was set to 0.25. This scenario once again introduced a mean-preserving spread and the implied uncertainty is $\delta\sqrt{2\tilde{p}}$. After each scenario, we elicited respondents' MPCs using the exact question wording we have in the SCE. We vary $\delta$ across randomization groups within waves and across waves, in order to span various values of implied uncertainty. Overall, different scenarios covered a range of uncertainty levels from 0 to 7.1.

Finally, in Table A.1 we present the summary statistics of the variables introduced in Section 5.3.

Table A.1: Summary Statistics for the Overoptimism Analysis

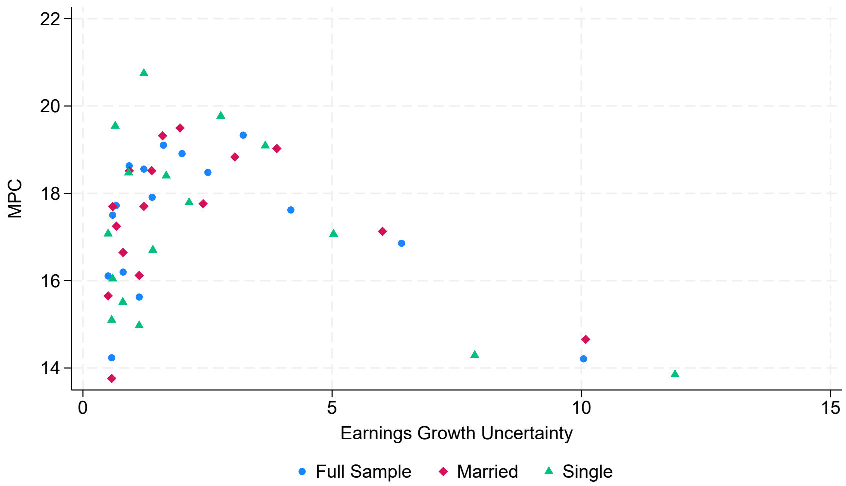
| | Mean | Median | SD |
|---|---|---|---|
| Earnings expectations (4-month ahead) | 67,983.26 | 60,000.00 | 39,742.30 |
| Annual earnings | 66,328.89 | 58,000.00 | 38,981.68 |
| Forecast errors | 0.78 | 0.00 | 22.56 |
| % chance of moving to non-emp. - 4 months | 2.35 | 0.00 | 6.86 |
| % chance of moving to a new employer - 4 months | 12.69 | 1.00 | 23.43 |
| Earnings Growth Uncertainty | 1.83 | 1.00 | 2.15 |
| Observations | 8,289 | | |

*Notes.* Time period: 2015-2023. SD refers to standard deviation. Forecast errors are defined as $100 * \frac{\mathbb{E}_{it}[y_{i,t+4}] - y_{i,t+4}}{y_{it}}$ where $y_{it}$ is individual $i$'s annual earnings reported in month $t$. Job loss expectations are defined as the sum of the subjective probabilities that four months from now an individual will be unemployed or out of the labor force. Quit expectations are defined as the subjective probability that four months from now an individual will be employed and working for a different employer. The observation count of 8,448 reflects the observations with non-missing values for forecast errors and earnings growth uncertainty (defined as the standard deviation of an individual's density forecast for year-ahead earnings growth). We calculate summary statistics for each variable shown in this table using the 8,448 observation sub-sample.

[1] In the March, July, November 2024, and July 2025 surveys, we explicitly reminded the respondents about their earnings growth forecasts and in all surveys we used their year-ahead earnings growth point forecasts as the mean of the mean-preserving spread.

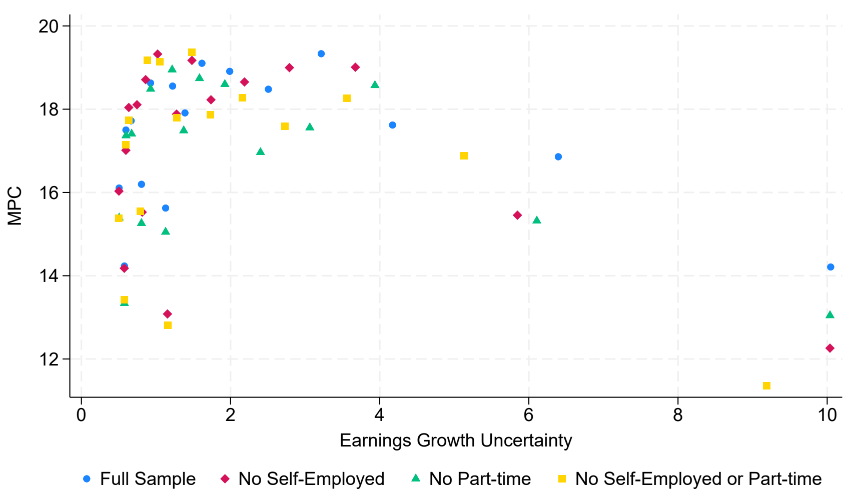
# B Additional empirical results: Figures and Tables

Figure B.1: MPC and Earnings Uncertainty by Marital Status




*Notes.* The figure shows a binned scatterplot of MPC and earnings growth uncertainty, in the SCE, sample period 2015-2023. Total number of observations in the four samples are: 17,311 (full sample), 11,609 (married), 5,702 (single).

Figure B.2: MPC and Earnings Uncertainty by Worker Status




*Notes.* The figure shows a binned scatterplot of MPC and earnings growth uncertainty, in the SCE, sample period 2015-2023. Total number of observations in the four samples are: 17,311 (full sample), 15,613 (no self-employed), 14,664 (no part-time), 13,606 (no self-employed or part-time).

Table B.1: Household Income Variability and Earnings Growth Expectations

| How much does your hh income change from month to month .. | Earnings Growth Uncertainty |
|---|---|
| Vary by less than 5% | 1.75 |
| Vary between 5% and 15% | 2.92*** |
| Vary by more than 15% | 3.40*** |
| Observations | 17,459 |

*Notes.* The stars show the significance of pairwise tests for equality of means against the "Vary by less than 5%" group. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Household income variability question is included in the SCE Household Spending Survey, which is fielded every 4 months.

Table B.2: MPC and Earnings Uncertainty: First Differences

| | [Δ] MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ***Panel A*** | | | | | |
| [Δ] Earnings Growth Uncertainty | -0.118 | -0.120 | -0.094 | -0.093 | -0.185 |
| | (0.129) | (0.129) | (0.134) | (0.134) | (0.223) |
| [Δ] Expected Earnings Growth | | | -0.039 | -0.041 | -0.045 |
| | | | (0.058) | (0.058) | (0.097) |
| ***Panel B*** | | | | | |
| [Δ] Earnings Growth Uncertainty | -0.111 | -0.128 | -0.076 | -0.073 | 0.061 |
| | (0.271) | (0.271) | (0.283) | (0.284) | (0.504) |
| [Δ] Uncertainty squared | -0.001 | 0.001 | -0.002 | -0.002 | -0.025 |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.039) |
| [Δ] Expected Earnings Growth | | | -0.039 | -0.041 | -0.052 |
| | | | (0.058) | (0.058) | (0.100) |
| Dep. Var. Mean | -0.317 | -0.305 | -0.305 | -0.305 | -0.0757 |
| Adj. R-Squared | -0.000 | 0.000 | 0.000 | 0.000 | -0.001 |
| Observations | 8,902 | 8,896 | 8,896 | 8,896 | 2,985 |
| Controls | ✓ | | | | |
| FD Controls | | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | | ✓ | ✓ |
| Net liquid wealth over income | | | | | ✓ |

*Notes.* Robust standard errors are included in parentheses. Time period: 2015-2023 for columns 1-4 and 2015-2020 for column 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Uncertainty, its square, expected earnings growth, and the MPC are in first differences. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.3: MPC and Earnings Uncertainty: Hypothetical Scenarios

| | [Δ] MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ***Panel A*** | | | | | |
| [Δ] Earnings Growth Uncertainty | -0.327*** | -0.316*** | -0.304*** | -0.305*** | -0.333*** |
| | (0.067) | (0.067) | (0.067) | (0.068) | (0.082) |
| Expected Earnings Growth | | | 0.035 | 0.041 | 0.040 |
| | | | (0.045) | (0.048) | (0.033) |
| ***Panel B*** | | | | | |
| [Δ] Earnings Growth Uncertainty | 0.027 | 0.047 | 0.052 | 0.033 | 0.085 |
| | (0.192) | (0.194) | (0.195) | (0.202) | (0.227) |
| [Δ] Uncertainty squared | -0.061** | -0.063** | -0.062** | -0.059* | -0.074** |
| | (0.031) | (0.031) | (0.031) | (0.032) | (0.036) |
| Expected Earnings Growth | | | 0.035 | 0.042 | 0.040 |
| | | | (0.045) | (0.048) | (0.033) |
| Dep. Var. Mean | -0.427 | -0.425 | -0.441 | -0.385 | -0.385 |
| Adj. R-Squared | 0.004 | 0.003 | 0.003 | 0.003 | 0.004 |
| Observations | 6,117 | 6,059 | 6,005 | 5,613 | 5,613 |
| Controls | | ✓ | ✓ | ✓ | ✓ |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Survey Dummies | | | | | ✓ |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Data is from three survey waves: November 2023, March 2024, July 2024, November 2024, and July 2025. The dependent variable in the regressions is the within-individual difference in MPCs elicited across scenarios. Earnings growth uncertainty and it's square are also included as differences in the regressions. Earnings growth uncertainty is defined in Appendix A, together with a description of these special questions. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.4: MPC and Earnings Uncertainty: Inflation Expectations

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 0.864*** | 0.886*** | 0.842*** | 0.956*** | 0.258 |
| | (0.171) | (0.186) | (0.186) | (0.351) | (0.847) |
| Uncertainty squared | -0.082*** | -0.083*** | -0.078*** | -0.082*** | -0.047 |
| | (0.014) | (0.014) | (0.014) | (0.024) | (0.062) |
| Expected Earnings Growth | | -0.015 | -0.011 | -0.136 | 0.118 |
| | | (0.040) | (0.040) | (0.083) | (0.159) |
| Expected Inflation | -0.179*** | -0.176*** | -0.218*** | -0.139* | -0.085 |
| | (0.033) | (0.033) | (0.034) | (0.082) | (0.116) |
| Inflation Uncertainty | -0.048 | -0.054 | -0.107 | -0.085 | -0.117 |
| | (0.079) | (0.081) | (0.081) | (0.187) | (0.393) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.04 | 16.12 |
| Adj. R-Squared | 0.019 | 0.019 | 0.022 | 0.018 | 0.386 |
| Observations | 17,081 | 17,081 | 17,081 | 4,073 | 2,541 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Expected inflation is the mean of an individual's density forecast for year-ahead inflation and inflation uncertainty is the standard deviation of this density. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.5: MPC and Earnings Uncertainty with Credit, Stock Market, and Unemployment Expectations

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 0.766*** | 0.837*** | 0.782*** | 0.911*** | 0.200 |
| | (0.168) | (0.180) | (0.180) | (0.335) | (0.834) |
| Uncertainty squared | -0.073*** | -0.078*** | -0.074*** | -0.080*** | -0.042 |
| | (0.014) | (0.014) | (0.014) | (0.024) | (0.063) |
| Expected Earnings Growth | | -0.051 | -0.051 | -0.154* | 0.117 |
| | | (0.039) | (0.039) | (0.081) | (0.155) |
| Harder to obtain credit than year ago | 0.124 | 0.120 | -0.077 | -0.483 | 0.007 |
| | (0.475) | (0.475) | (0.483) | (1.053) | (1.748) |
| Harder to obtain credit than one year from now | -0.977** | -0.980** | -1.149** | -0.166 | -0.290 |
| | (0.478) | (0.478) | (0.477) | (1.036) | (1.477) |
| Percent chance of higher avg US stock prices in 12mths | 0.056*** | 0.056*** | 0.057*** | 0.038*** | -0.010 |
| | (0.007) | (0.007) | (0.007) | (0.014) | (0.030) |
| Percent chance of higher US unemployment rate in 12mths | 0.009 | 0.008 | 0.011 | 0.002 | -0.009 |
| | (0.007) | (0.007) | (0.007) | (0.013) | (0.024) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.01 | 16.09 |
| Adj. R-Squared | 0.021 | 0.021 | 0.023 | 0.018 | 0.385 |
| Observations | 17,169 | 17,169 | 17,169 | 4,085 | 2,552 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.6: MPC and Earnings Uncertainty with Expected Job Loss

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 0.742*** | 0.803*** | 0.750*** | 0.910** | 0.686 |
| | (0.183) | (0.198) | (0.197) | (0.389) | (0.829) |
| Uncertainty squared | -0.079*** | -0.083*** | -0.080*** | -0.087*** | -0.058 |
| | (0.015) | (0.016) | (0.016) | (0.031) | (0.062) |
| Expected Earnings Growth | | -0.044 | -0.043 | -0.117 | 0.025 |
| | | (0.042) | (0.042) | (0.084) | (0.130) |
| Percent chance lose job w/in 12 months | -0.021** | -0.022** | -0.020** | 0.000 | 0.067* |
| | (0.009) | (0.009) | (0.009) | (0.018) | (0.035) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.40 | 16.40 | 16.40 | 15.63 | 15.79 |
| Adj. R-Squared | 0.015 | 0.015 | 0.017 | 0.011 | 0.370 |
| Observations | 15,496 | 15,496 | 15,496 | 3,689 | 2,299 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

## Table B.7: MPC and Job loss Uncertainty

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ***Panel A*** | | | | | |
| Job loss uncertainty | -0.013** | -0.012* | -0.011* | 0.006 | 0.014 |
| | (0.006) | (0.006) | (0.006) | (0.013) | (0.025) |
| Expected Earnings Growth | | -0.000 | -0.004 | -0.064 | 0.045 |
| | | (0.039) | (0.039) | (0.079) | (0.119) |
| ***Panel B*** | | | | | |
| Job loss uncertainty | 0.085*** | 0.084*** | 0.088*** | 0.082** | -0.008 |
| | (0.020) | (0.020) | (0.020) | (0.039) | (0.084) |
| (Job loss uncertainty)$^2$ | -0.001*** | -0.001*** | -0.001*** | -0.001** | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) |
| Expected Earnings Growth | | 0.003 | -0.001 | -0.061 | 0.042 |
| | | (0.039) | (0.039) | (0.079) | (0.121) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.38 | 16.40 | 16.40 | 15.63 | 15.79 |
| Adj. R-Squared | 0.015 | 0.015 | 0.017 | 0.011 | 0.368 |
| Observations | 15,605 | 15,496 | 15,496 | 3,689 | 2,299 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period for the sample is 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5, due to availability of wealth variables in the data. The sample only includes employed individuals who are not self-employed. Controls include log annual household income and dummy variables for having a college degree, for part-time work, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income ratio is winsorized at the 5th and 95th percentiles and available only until 2020.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

## Table B.8: MPC and Spending Growth Uncertainty

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ***Panel A*** | | | | | |
| Spending Growth Uncertainty | 0.222*** | 0.164*** | 0.144** | 0.051 | 0.199 |
| | (0.062) | (0.063) | (0.064) | (0.124) | (0.286) |
| Expected Spending Growth | | 0.107*** | 0.095*** | 0.158*** | 0.010 |
| | | (0.028) | (0.028) | (0.059) | (0.096) |
| ***Panel B*** | | | | | |
| Spending Growth Uncertainty | 1.082*** | 1.204*** | 1.161*** | 0.876*** | 0.242 |
| | (0.148) | (0.161) | (0.161) | (0.304) | (0.593) |
| Uncertainty squared | -0.078*** | -0.096*** | -0.094*** | -0.076*** | -0.004 |
| | (0.012) | (0.013) | (0.013) | (0.024) | (0.046) |
| Expected Spending Growth | | 0.068** | 0.059** | 0.133** | 0.010 |
| | | (0.029) | (0.029) | (0.060) | (0.096) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.66 | 16.67 | 16.67 | 16.01 | 16.06 |
| Adj. R-Squared | 0.019 | 0.020 | 0.021 | 0.019 | 0.381 |
| Observations | 17,215 | 17,212 | 17,212 | 4,096 | 2,565 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period for the sample is 2015-2023 for columns 1-3, 2015-2020 for columns 4 and 5, due to availability of wealth variables in the data. Spending growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead spending growth. The sample only includes employed individuals. Controls include log annual household income and dummy variables for having a college degree, part-time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income ratio is winsorized at the 5th and 95th percentiles and available only until 2020.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.9: MPC and Earnings Uncertainty using Discrete Approximation of Subjective Probability Functions

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 1.154*** | 1.199*** | 1.174*** | 1.095*** | 0.191 |
| | (0.118) | (0.122) | (0.122) | (0.229) | (0.535) |
| Uncertainty squared | -0.087*** | -0.090*** | -0.088*** | -0.083*** | -0.038 |
| | (0.009) | (0.009) | (0.009) | (0.016) | (0.041) |
| Expected Earnings Growth | | -0.047 | -0.048 | -0.157** | 0.062 |
| | | (0.034) | (0.034) | (0.071) | (0.139) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.00 | 16.06 |
| Adj. R-Squared | 0.020 | 0.020 | 0.022 | 0.020 | 0.382 |
| Observations | 17,278 | 17,278 | 17,278 | 4,109 | 2,571 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. As discussed in the text, we assume that the likelihood assigned to each earnings growth bin represents a probability mass at the midpoints of those bins. Uncertainty is the standard deviation of the resulting distribution. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.10: MPC and Earnings Uncertainty: Winsorization

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 1.554*** | 1.677*** | 1.610*** | 1.554*** | 0.355 |
| | (0.237) | (0.251) | (0.251) | (0.514) | (1.059) |
| Uncertainty squared | -0.172*** | -0.181*** | -0.175*** | -0.161*** | -0.069 |
| | (0.024) | (0.025) | (0.025) | (0.052) | (0.102) |
| Exp Earnings Growth DM (Winsorized) | | -0.068* | -0.068* | -0.175** | 0.153 |
| | | (0.041) | (0.041) | (0.084) | (0.170) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.03 | 16.08 |
| Adj. R-Squared | 0.018 | 0.018 | 0.020 | 0.017 | 0.386 |
| Observations | 17,189 | 17,189 | 17,189 | 4,088 | 2,556 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. In this table, it is winsorized at the top 99th percentile. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. Standard deviation squared takes this into account. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.11: MPC and Earnings Uncertainty: No Probability in Tail Bins

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 4.057*** | 4.523*** | 4.297*** | 2.776 | -3.309 |
| | (0.850) | (0.896) | (0.897) | (1.704) | (3.030) |
| Uncertainty squared | -0.679*** | -0.781*** | -0.728*** | -0.292 | 0.875 |
| | (0.230) | (0.237) | (0.236) | (0.423) | (0.575) |
| Expected Earnings Growth | | -0.140 | -0.132 | -0.292 | 0.407 |
| | | (0.094) | (0.095) | (0.183) | (0.308) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.41 | 16.41 | 16.41 | 15.94 | 15.99 |
| Adj. R-Squared | 0.016 | 0.016 | 0.018 | 0.014 | 0.361 |
| Observations | 12,523 | 12,523 | 12,523 | 3,153 | 1,828 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. The sample is also restricted to respondents who put zero probability on the tail bins (i.e., "increased by 12% or more" and "decreased by 12% or more"). Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.12: MPC and Earnings Uncertainty: IQR as Uncertainty

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 0.378*** | 0.395*** | 0.366*** | 0.448** | 0.031 |
| | (0.101) | (0.109) | (0.109) | (0.207) | (0.519) |
| Uncertainty squared | -0.024*** | -0.024*** | -0.023*** | -0.025*** | -0.010 |
| | (0.005) | (0.005) | (0.005) | (0.009) | (0.023) |
| Expected Earnings Growth | | -0.020 | -0.018 | -0.130 | 0.125 |
| | | (0.039) | (0.039) | (0.081) | (0.159) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.03 | 16.08 |
| Adj. R-Squared | 0.017 | 0.017 | 0.019 | 0.017 | 0.386 |
| Observations | 17,189 | 17,189 | 17,189 | 4,088 | 2,556 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the interquartile range of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.13: MPC and Earnings Uncertainty: Fuster et al. (2020)

| | MPC | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Earnings growth uncertainty | 1.177 | 0.772 | 0.774 | 0.668 |
| | (0.793) | (0.759) | (0.761) | (1.060) |
| Uncertainty squared | -0.069 | -0.048 | -0.048 | -0.035 |
| | (0.067) | (0.065) | (0.065) | (0.110) |
| Expected earnings growth | | 0.407** | 0.408** | 0.341* |
| | | (0.181) | (0.180) | (0.190) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ |
| Net liquid wealth over income | | | | ✓ |
| Dep. Var. Mean | 9.800 | 9.800 | 9.800 | 9.641 |
| Adj. R-Squared | 0.004 | 0.008 | 0.007 | -0.006 |
| Observations | 1,119 | 1,119 | 1,119 | 923 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2016-2017. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. MPCs are from Fuster et al. (2020), as detailed in the main text. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Liquid wealth over income is winsorized at the 5th and 95th percentile. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.14: MPC and Earnings Uncertainty: Special Survey (alternative MPC)

| | MPC | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Earnings growth uncertainty | 2.025* | 2.092* | 2.138** | 2.258* |
| | (1.048) | (1.086) | (1.072) | (1.162) |
| Uncertainty squared | -0.051 | -0.055 | -0.062 | -0.061 |
| | (0.084) | (0.087) | (0.086) | (0.092) |
| Expected earnings growth | | -0.081 | -0.075 | 0.034 |
| | | (0.233) | (0.222) | (0.235) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ |
| Net liquid wealth over income | | | | ✓ |
| Dep. Var. Mean | 13.59 | 13.59 | 13.59 | 13.93 |
| Adj. R-Squared | 0.043 | 0.040 | 0.048 | 0.059 |
| Observations | 319 | 319 | 319 | 285 |

*Notes.* Standard errors are robust and in parentheses. Time period: September 2023 and September 2025. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Liquid wealth over income is winsorized at the 5th and 95th percentile. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.15: MPC and Earnings Uncertainty: Marital Status

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 0.482* | 0.530* | 0.482* | 0.582 | -0.501 |
| | (0.259) | (0.277) | (0.278) | (0.560) | (1.182) |
| Married=1 × Earnings Growth Uncertainty | 0.490 | 0.490 | 0.493 | 0.508 | 1.140 |
| | (0.335) | (0.359) | (0.360) | (0.694) | (1.660) |
| Uncertainty squared | -0.058*** | -0.062*** | -0.059*** | -0.058 | -0.004 |
| | (0.019) | (0.021) | (0.021) | (0.043) | (0.112) |
| Married=1 × Uncertainty squared | -0.027 | -0.027 | -0.026 | -0.032 | -0.062 |
| | (0.027) | (0.028) | (0.028) | (0.052) | (0.136) |
| Expected Earnings Growth | | -0.034 | -0.034 | -0.190* | 0.203 |
| | | (0.061) | (0.061) | (0.109) | (0.126) |
| Married=1 × Expected Earnings Growth | | -0.000 | 0.000 | 0.084 | -0.161 |
| | | (0.079) | (0.079) | (0.157) | (0.297) |
| Married=1 | -0.277 | -0.283 | -0.220 | -0.806 | 10.712** |
| | (0.588) | (0.595) | (0.595) | (1.164) | (5.062) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.65 | 16.65 | 16.65 | 16.03 | 16.08 |
| Adj. R-Squared | 0.017 | 0.017 | 0.019 | 0.017 | 0.385 |
| Observations | 17,189 | 17,189 | 17,189 | 4,088 | 2,556 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.16: MPC and Earnings Uncertainty by Net Liquid Wealth Quartiles

| | MPC | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Earnings Growth Uncertainty | 1.307** | 0.277 | 0.932 | 0.662 |
| | (0.593) | (0.558) | (0.923) | (1.084) |
| Uncertainty squared | -0.118*** | -0.042 | -0.068 | -0.001 |
| | (0.040) | (0.036) | (0.082) | (0.129) |
| Expected Earnings Growth | -0.134 | -0.016 | -0.211 | -0.170 |
| | (0.139) | (0.146) | (0.191) | (0.175) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | ✓ | ✓ | ✓ | ✓ |
| Quartile | 1 | 2 | 3 | 4 |
| Dep. Var. Mean | 12.95 | 15.95 | 17.59 | 17.65 |
| Adj. R-Squared | 0.008 | 0.004 | 0.018 | 0.020 |
| Observations | 1,029 | 1,024 | 1,025 | 1,010 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2015-2020. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.17: MPC and Earnings Uncertainty: Industry dummies

| | MPC | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Earnings Growth Uncertainty | 1.125*** | 1.214*** | 1.165*** | 1.209*** | 0.390 |
| | (0.219) | (0.236) | (0.237) | (0.460) | (1.031) |
| Uncertainty squared | -0.112*** | -0.118*** | -0.115*** | -0.107*** | -0.051 |
| | (0.018) | (0.019) | (0.019) | (0.036) | (0.071) |
| Expected Earnings Growth | | -0.065 | -0.068 | -0.135 | -0.127 |
| | | (0.051) | (0.051) | (0.100) | (0.176) |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry Dummies | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ | |
| Net liquid wealth over income | | | | ✓ | ✓ |
| Individual Fixed Effects | | | | | ✓ |
| Dep. Var. Mean | 16.20 | 16.20 | 16.20 | 15.51 | 15.64 |
| Adj. R-Squared | 0.016 | 0.016 | 0.017 | 0.012 | 0.378 |
| Observations | 10,388 | 10,388 | 10,388 | 2,562 | 1,611 |

*Notes.* Robust standard errors are included in parentheses and are clustered at the individual level in column 5. Time period: 2015-2023 for columns 1-3 and 2015-2020 for columns 4 and 5. Earnings growth uncertainty is measured as the standard deviation of an individual's density forecast for year-ahead earnings growth. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. All regressions contain two sets of dummies, type of employer (e.g., government, private sector for–profit, nonprofit) and industry (e.g., construction, manufacturing). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.18: MPC and Earnings Uncertainty with Risk Aversion

| | MPC | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Earnings Growth Uncertainty | 0.801*** | 0.851*** | 0.805*** | 0.771** |
| | (0.171) | (0.183) | (0.183) | (0.348) |
| Uncertainty squared | -0.076*** | -0.080*** | -0.076*** | -0.073*** |
| | (0.014) | (0.015) | (0.015) | (0.025) |
| Expected Earnings Growth | | -0.036 | -0.036 | -0.163** |
| | | (0.039) | (0.039) | (0.081) |
| Middle Risk Aversion | 1.174*** | 1.155*** | 1.108*** | 1.141 |
| | (0.403) | (0.403) | (0.403) | (0.808) |
| High Risk Aversion | 1.501*** | 1.481*** | 1.496*** | 2.971*** |
| | (0.463) | (0.464) | (0.464) | (0.914) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ |
| Net liquid wealth over income | | | | ✓ |
| Dep. Var. Mean | 16.68 | 16.68 | 16.68 | 16.04 |
| Adj. R-Squared | 0.018 | 0.018 | 0.019 | 0.018 |
| Observations | 16,622 | 16,622 | 16,622 | 3,765 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2015-2023 for columns 1-3 and 2016-2020 for column 4. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. (Inverse) Risk Aversion is a categorical scale variable on willingness to take risks in daily activities. Since it is measured once per individual, we do cannot estimate column (V) with individual fixed effects. We define "high risk aversion" as 1,2 on the scale, "middle risk aversion" as 3,4 on the scale, and "low risk aversion" as 5,6,7 on the scale. We leave out the "low risk aversion" group in the regression. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.19: MPC and Earnings Uncertainty by Degrees of Risk aversion

| | MPC | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Earnings Growth Uncertainty | 0.277 | 1.002*** | 1.208*** |
| | (0.315) | (0.285) | (0.381) |
| Uncertainty squared | -0.036 | -0.082*** | -0.121*** |
| | (0.023) | (0.024) | (0.031) |
| Expected Earnings Growth | -0.027 | -0.029 | -0.020 |
| | (0.065) | (0.064) | (0.084) |
| Controls | ✓ | ✓ | ✓ |
| Year Dummies | ✓ | ✓ | ✓ |
| Risk Aversion | Low | Middle | High |
| Dep. Var. Mean | 15.88 | 16.96 | 17.21 |
| Adj. R-Squared | 0.020 | 0.019 | 0.029 |
| Observations | 5,276 | 6,895 | 4,451 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2015-2023. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). (Inverse) Risk Aversion is a categorical scale variable on willingness to take risks in daily activities. We define "high risk aversion" as 1,2 on the scale, "middle risk aversion" as 3,4 on the scale, and "low risk aversion" as 5,6,7 on the scale. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.20: MPC and Earnings Uncertainty with Patience

| | MPC | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Earnings Growth Uncertainty | 0.702*** | 0.872*** | 0.808*** | 0.627 |
| | (0.206) | (0.223) | (0.224) | (0.403) |
| Uncertainty squared | -0.078*** | -0.089*** | -0.084*** | -0.068** |
| | (0.016) | (0.017) | (0.017) | (0.030) |
| Expected Earnings Growth | | -0.124** | -0.122** | -0.152* |
| | | (0.050) | (0.050) | (0.091) |
| Medium Patience | -1.393* | -1.372* | -1.465* | -1.673 |
| | (0.771) | (0.771) | (0.771) | (1.334) |
| High Patience | -1.883*** | -1.843** | -2.042*** | -2.132* |
| | (0.719) | (0.719) | (0.719) | (1.246) |
| Controls | ✓ | ✓ | ✓ | ✓ |
| Year Dummies | | | ✓ | ✓ |
| Net liquid wealth over income | | | | ✓ |
| Dep. Var. Mean | 16.84 | 16.84 | 16.84 | 15.97 |
| Adj. R-Squared | 0.018 | 0.018 | 0.020 | 0.014 |
| Observations | 10,818 | 10,818 | 10,818 | 2,969 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2016-2023 for columns 1-3 and 2017-2020 for column 4. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Net liquid wealth over income is winsorized at the 5th and 95th percentile and available only until 2020. Patience is a categorical scale variable on whether the respondent, in comparison to others, is a person who is generally willing to give up something today in order to benefit in the future. Since it is measured once per individual, we cannot estimate column (V) with individual fixed effects. We define "low patience" as 1–4 on the scale, "medium patience" as 5–6, and "high patience" as 7–10. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.21: MPC and Earnings Uncertainty by Degrees of Patience

| | MPC | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Earnings Growth Uncertainty | 1.477** | 1.136** | 0.522* |
| | (0.637) | (0.461) | (0.279) |
| Uncertainty squared | -0.156*** | -0.114*** | -0.050** |
| | (0.048) | (0.035) | (0.021) |
| Expected Earnings Growth | -0.107 | -0.145 | -0.116* |
| | (0.169) | (0.100) | (0.062) |
| Controls | ✓ | ✓ | ✓ |
| Year Dummies | ✓ | ✓ | ✓ |
| Patience | Low | Medium | High |
| Dep. Var. Mean | 18.09 | 16.60 | 16.70 |
| Adj. R-Squared | 0.036 | 0.016 | 0.019 |
| Observations | 1,269 | 2,674 | 6,875 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2016-2023. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender, and age groups (25-34,35-50,51-65). Patience is a categorical scale variable on whether the respondent, in comparison to others, is a person who is generally willing to give up something today in order to benefit in the future. We define "low patience" as 1–4 on the scale, "medium patience" as 5–6, and "high patience" as 7–10. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.22: MPC and Earnings Uncertainty by Age Groups

| | MPC | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Earnings Growth Uncertainty | 1.337*** | 0.385 | 1.310*** |
| | (0.362) | (0.244) | (0.367) |
| Uncertainty squared | -0.138*** | -0.051*** | -0.095*** |
| | (0.030) | (0.018) | (0.030) |
| Expected Earnings Growth | -0.172** | -0.057 | 0.138* |
| | (0.074) | (0.053) | (0.080) |
| Controls | ✓ | ✓ | ✓ |
| Year Dummies | ✓ | ✓ | ✓ |
| Age Group | Ages 25-34 | Ages 35-50 | Ages 51-65 |
| Dep. Var. Mean | 16.56 | 16.48 | 16.97 |
| Adj. R-Squared | 0.016 | 0.016 | 0.035 |
| Observations | 4,125 | 7,679 | 5,385 |

*Notes.* Standard errors are robust and in parentheses. Time period: 2015-2023. Sample only includes employed individuals. Controls include log household income and dummy variables for college education, part time work status, self-employment status, marital status, white vs non-white, gender. Age groups are 25-34, 35-50, 51-65. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table B.23: Drivers of earnings growth uncertainty

| | Earnings Growth Uncertainty | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Net Liquid Wealth (in 10000s) | 0.001* | 0.001 | 0.002** | 0.001 | 0.002* |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| HH Income (in 10000s) | -0.025*** | -0.024*** | -0.016*** | -0.019*** | -0.034*** |
| | (0.004) | (0.005) | (0.006) | (0.006) | (0.006) |
| Individual Earnings (in 10000s) | -0.003 | 0.010 | 0.005 | -0.002 | 0.005 |
| | (0.005) | (0.006) | (0.008) | (0.007) | (0.008) |
| Ages 35-50 | -0.271*** | -0.305*** | -0.353*** | -0.224*** | -0.283*** |
| | (0.037) | (0.043) | (0.051) | (0.049) | (0.055) |
| Ages 51-65 | -0.394*** | -0.492*** | -0.574*** | -0.405*** | -0.367*** |
| | (0.041) | (0.047) | (0.058) | (0.057) | (0.066) |
| Working PT | | 0.229*** | 0.285*** | 0.299*** | 0.316*** |
| | | (0.067) | (0.081) | (0.080) | (0.093) |
| Self-employed | | 1.489*** | 1.503** | 1.097* | 1.081* |
| | | (0.567) | (0.635) | (0.562) | (0.619) |
| Female | | | -0.002 | -0.013 | -0.019 |
| | | | (0.044) | (0.041) | (0.048) |
| Married | | | -0.200*** | -0.163*** | -0.116** |
| | | | (0.052) | (0.051) | (0.059) |
| Middle Risk Aversion | | | -0.161*** | -0.129*** | -0.169*** |
| | | | (0.049) | (0.047) | (0.058) |
| High Risk Aversion | | | -0.228*** | -0.163*** | -0.309*** |
| | | | (0.059) | (0.057) | (0.068) |
| Graduate | | | -0.175*** | -0.157*** | -0.140*** |
| | | | (0.044) | (0.043) | (0.050) |
| Expected Earnings Growth | | | | 0.138*** | 0.159*** |
| | | | | (0.013) | (0.013) |
| Mean 1yr Inflation Exp. | | | | -0.013* | -0.026*** |
| | | | | (0.007) | (0.007) |
| Medium Patience | | | | | -0.248*** |
| | | | | | (0.093) |
| High Patience | | | | | -0.315*** |
| | | | | | (0.086) |
| Constant | 2.168*** | 2.255*** | 2.611*** | 2.160*** | 2.436*** |
| | (0.042) | (0.075) | (0.105) | (0.113) | (0.154) |
| Industry Controls | | ✓ | ✓ | ✓ | ✓ |
| Dep. Var. Mean | 1.678 | 1.711 | 1.710 | 1.714 | 1.741 |
| Adj. R-Squared | 0.010 | 0.020 | 0.026 | 0.090 | 0.111 |
| Observations | 19,123 | 13,502 | 10,079 | 10,035 | 7,881 |

*Notes.* Time period: January 2014- December 2020. (Inverse) Risk Aversion is a categorical scale variable on willingness to take risks in daily activities, measured in February since 2016. We define "high risk aversion" as 1,2 on the scale, "middle risk aversion" as 3,4 on the scale, and "low risk aversion" as 5,6,7 on the scale. We leave out the "low risk aversion" group in the regression. Patience is a categorical scale variable on whether the respondent, in comparison to others, is a person who is generally willing to give up something today in order to benefit in the future. We define "low patience" as 1–4 on the scale, "medium patience" as 5–6, and "high patience" as 7–10. We leave out the "low patience" group in the regression. Since patience is measured in February starting from the 2017 Housing module, thus reducing the sample size, we include it in a separate column. 18 industry controls are added based on standard classification systems. Inflation expectations are one-year ahead. Heteroskedasticity-robust standard errors are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

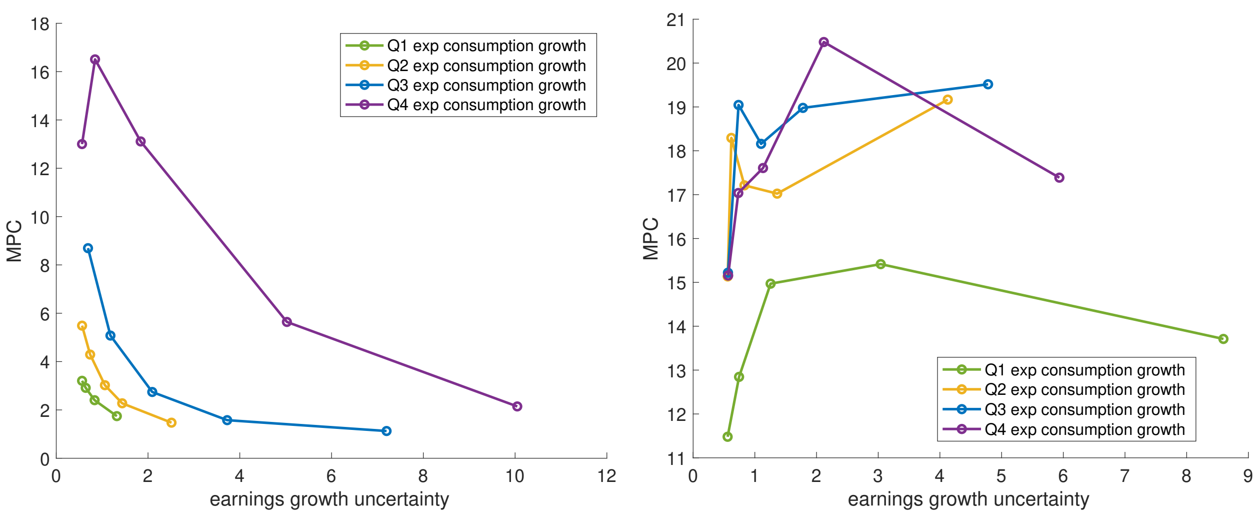
# C Additional results: canonical model

Table C.1: MPC and Earnings Uncertainty in the canonical model

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| ***Panel A*** | | | | |
| Earnings growth uncertainty | -0.549*** | -0.356*** | -0.669*** | -0.425*** |
| | ( 0.006) | ( 0.008) | ( 0.006) | ( 0.008) |
| ***Panel B*** | | | | |
| Earnings growth uncertainty | -1.312*** | -1.281*** | -1.318*** | -1.282*** |
| | ( 0.020) | ( 0.020) | ( 0.019) | ( 0.019) |
| Uncertainty squared | 0.083*** | 0.110*** | 0.071*** | 0.102*** |
| | ( 0.002) | ( 0.002) | ( 0.002) | ( 0.002) |
| Expected earnings growth | | | ✓ | ✓ |
| Wealth to income ratio | | ✓ | | ✓ |

*Notes.* Standard errors are robust and in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure C.1: MPC and earnings growth uncertainty by quartiles of expected spending growth




(a) Model (b) Data

*Notes.* Left panel shows data simulated from the stationary distribution of the model. Households are grouped in four quartiles of the expected spending growth, from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of expected spending growth, dots represent quantiles of earnings growth uncertainty. The right panel repeats the same analysis in the SCE data. In unreported results, we regress MPCs on earnings growth uncertainty (and its square) for each quartile of expected spending growth, and find an increasing and concave relationship for each quartile.

## C.1 MPC and spending growth uncertainty

Figure C.2: MPC and spending growth uncertainty in the canonical model

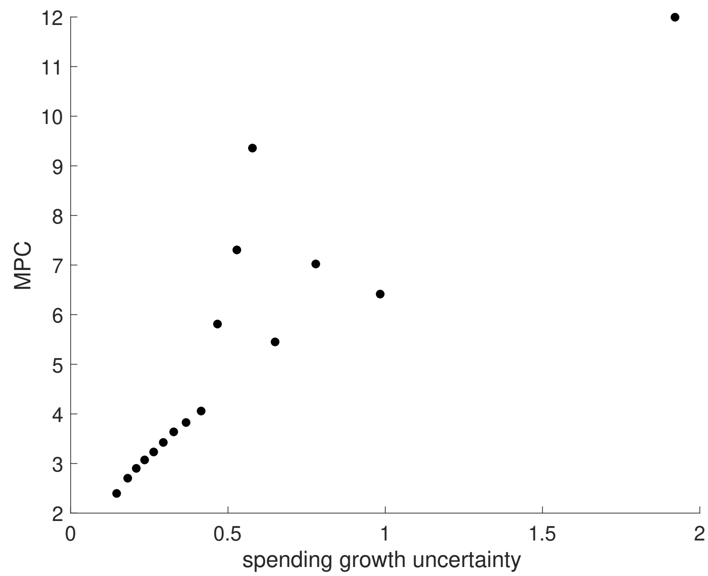
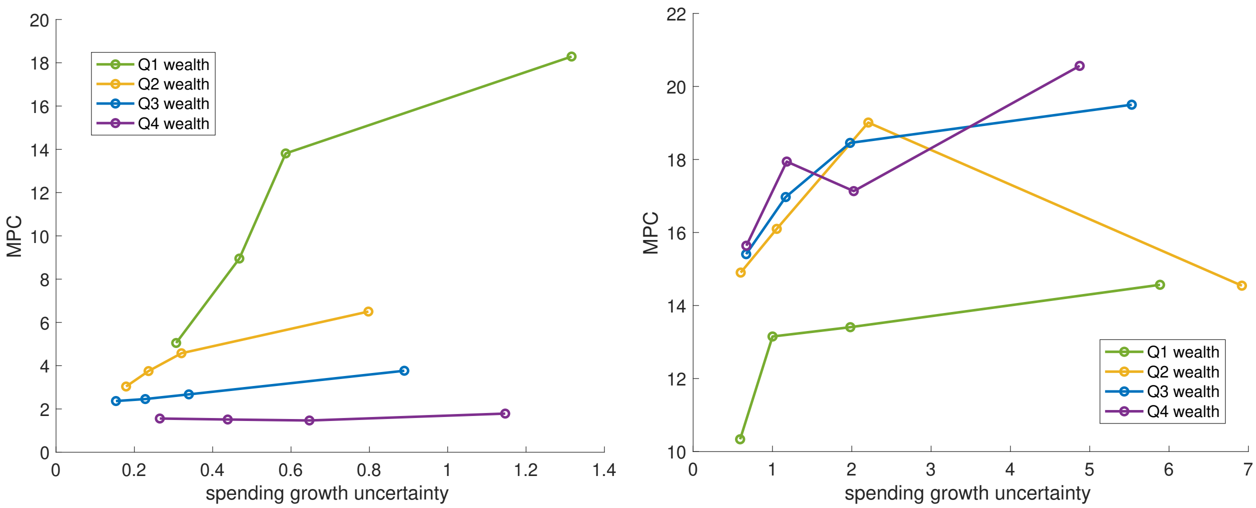



Table C.2: MPC and Spending Uncertainty in the canonical model

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| ***Panel A*** | | | | |
| Spending growth uncertainty | 5.419*** | 5.722*** | 0.519*** | 0.940*** |
| | ( 0.024) | ( 0.023) | ( 0.021) | ( 0.020) |
| ***Panel B*** | | | | |
| Spending growth uncertainty | 5.732*** | 6.611*** | 4.162*** | 4.863*** |
| | ( 0.041) | ( 0.039) | ( 0.026) | ( 0.024) |
| Uncertainty squared | -0.078*** | -0.220*** | -1.139*** | -1.208*** |
| | ( 0.008) | ( 0.008) | ( 0.006) | ( 0.005) |
| Expected spending growth | | | ✓ | ✓ |
| Wealth to income ratio | | ✓ | | ✓ |

*Notes.* Standard errors are robust and in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Spending growth uncertainty is the standard deviation of a household's year-ahead consumption growth rate, conditional on current consumption.

Figure C.3: MPC and spending growth uncertainty by wealth quartile




(a) Model

(b) Data

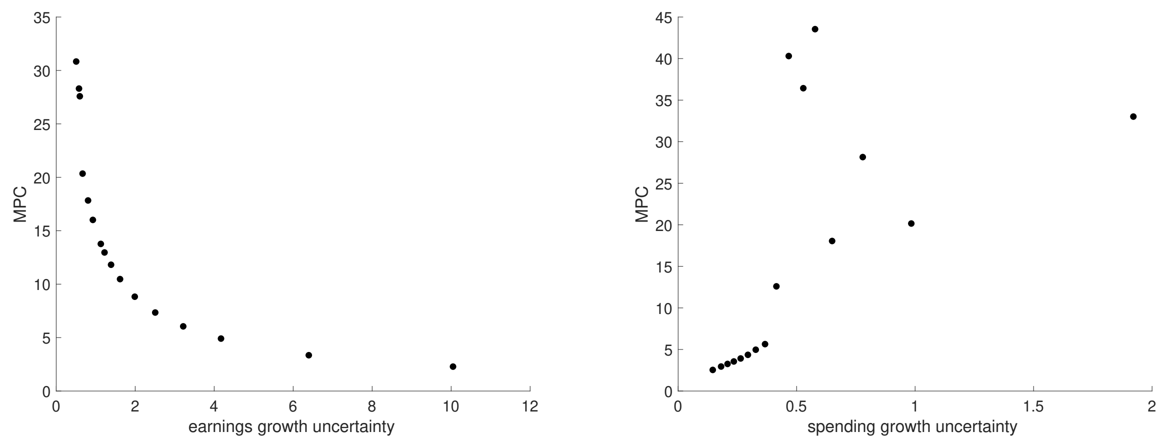
*Notes.* Left panel shows data simulated from the stationary distribution of the model. Households are grouped in four quartiles of wealth ($a$), from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of wealth, dots represent quantiles of spending growth uncertainty. The right panel repeats the same analysis in the SCE data, grouping households by quartiles of net liquid wealth.

## C.2 Conventional MPC

To align with the SCE question and the empirical counterpart, we have defined in the main text the MPC as $\frac{c_i(a_i+x,y_i)-c_i(a_i,y_i)}{x}$, where the size of the windfall $x$ is equal to 10% of household's current income. In this section, we follow what is often done in the MPC literature, and define $x$ as arbitrarily small. As we show below, the results are qualitatively preserved, with model MPCs falling even more steeply with earnings growth uncertainty. Assuming an income-specific $x$ introduces two effects. First, it lowers the MPC, as we consider the consumption sensitivity to relatively large shocks. Second, because the size of the shock depends on current income, and it also potentially correlates with risk heterogeneity.

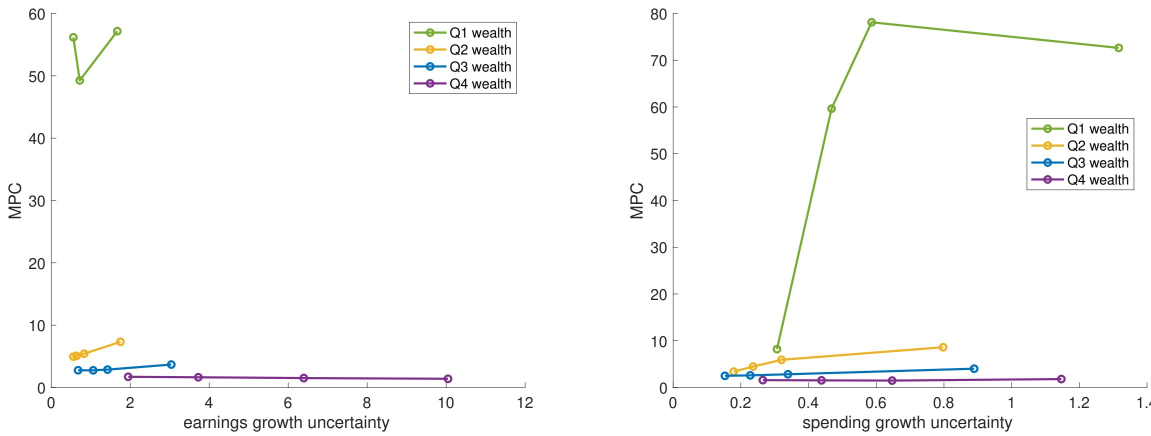
Despite these differences, our conclusions are unaffected, as we show in Figure C.4 and C.5. MPCs fall with earnings growth uncertainty and increase with spending growth uncertainty. Also note that using these alternative MPCs does not change any of the conclusions in each of the robustness exercises discussed in the following Appendix subsections.

Figure C.4: MPC and uncertainty: alternative MPCs




(a) Earnings uncertainty (b) Spending uncertainty

Figure C.5: MPC and uncertainty by wealth quartile: alternative MPCs




(a) Earnings uncertainty (b) Spending uncertainty

# D Alternative models

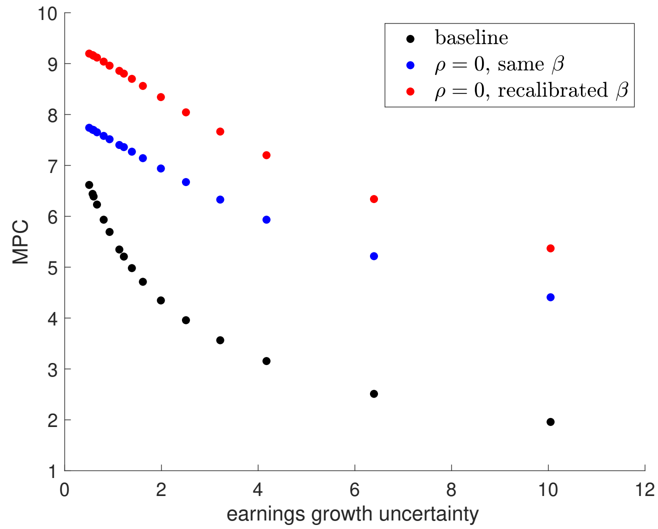
## D.1 Alternative parameterizations

As a first sensitivity check, we show in Figure D.1 that the model predicts a negative relationship between MPCs and earnings growth uncertainty even when earnings are purely transitory, that is $\rho = 0$. In this setup, the incentive to save is weaker, especially for larger values of $\sigma$. As a result, uncertain households are less wealthy compared to the baseline and have relatively higher MPCs. On the other hand, a lower $\rho$ also affects the concavity of the consumption function at a given level of wealth, and the extent to which households hit the borrowing constraint. For a given $\beta$, MPCs are slightly flatter in uncertainty, but still markedly declining (see blue dots). When we again lower $\beta$ in order to match the share of hand-to-mouth households, MPCs are shifted up and, once again, they fall with earnings uncertainty (see red dots).

Next, we show in Figure D.2 that our main conclusions are also unaffected with a higher risk aversion, $\gamma$. Higher values of $\gamma$ strengthen the precautionary savings motive. This makes the consumption function more concave but, at the same time, pushes households away from the borrowing constraint. For a given $\beta$, MPCs are lower, but nevertheless still declining with earnings uncertainty. When we lower $\beta$ in order to match again the share of hand-to-mouth households, MPCs are shifted up and, once again, they fall with earnings uncertainty.

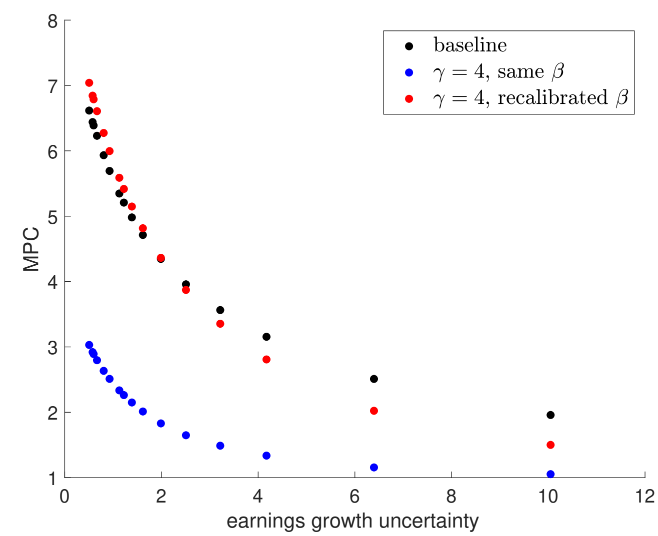
These results also implicitly show that the model's prediction of MPCs falling with earnings growth uncertainty is robust to the choice of the discount factor $\beta$. To visualize this even further, we compare results with a very low and very high $\beta$ in Figure D.3. In ei-

Figure D.1: MPC and uncertainty: income persistence



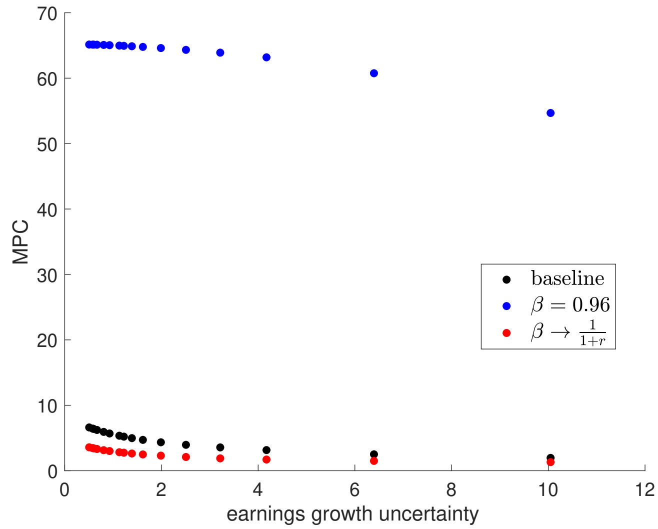

*Notes.* Data simulated from the stationary distribution of three versions of the baseline model. In black, the baseline model with parameterization described in Section 5.1. In blue, a model in which $\rho = 0$ and all other parameters are unchanged. In red, $\rho = 0$ and $\beta = 0.9897$ is recalibrated to match the share of hand-to-mouth households. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

Figure D.2: MPC and uncertainty: risk aversion




*Notes.* Data simulated from the stationary distribution of three versions of the baseline model. In black, the baseline model with parameterization described in Section 5.1. In blue, a model in which $\gamma = 4$ and all other parameters are unchanged. In red, $\gamma = 4$ and $\beta = 0.9896276057$ is recalibrated to match the share of hand-to-mouth households. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

Figure D.3: MPC and uncertainty: discount factor




*Notes.* Data simulated from the stationary distribution of three versions of the baseline model. In black, the baseline model with parameterization described in Section 5.1. In blue, a model in which $\beta = 0.96$ and all other parameters are unchanged. In red, $\beta = \frac{1}{1+r} - 0.0001 = 0.9900$. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

ther case, MPCs fall with earnings growth uncertainty. When $\beta$ is very low, MPCs also counterfactually fall with spending growth uncertainty.

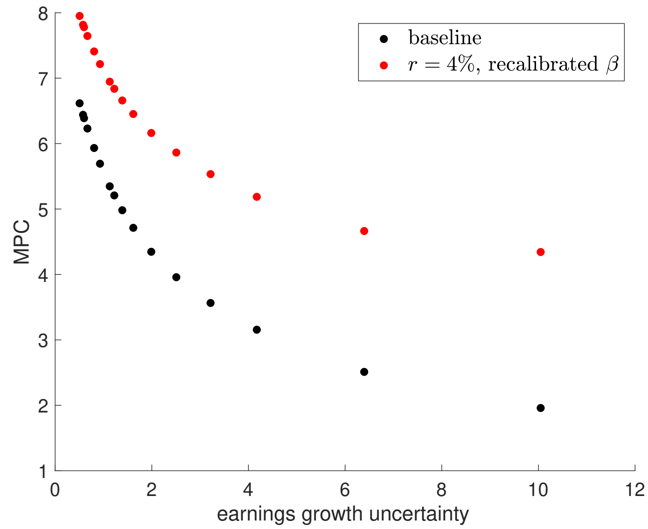
The level of the interest rate also does not affect our conclusions, as we show in Figure D.4.

Finally, we investigate whether different parameter combinations can generate a positive gradient between MPCs and $\sigma$. We consider $N_\gamma = 9$ values of the inverse elasticity of intertemporal substitution, ranging from $\gamma = 10$ to $\gamma = 0.4$, $N_\beta = 10$ values of the discount factor, ranging from $\beta = 0.96$ to $\beta = 0.99$, $N_\rho = 3$ values of persistence, ranging from $\rho = 0$ to $\rho = 0.904$, and $N_{\underline{a}} = 3$ values of the borrowing constraint, from the natural debt limit to 0. In all $\{N_\gamma \cdot N_\beta \cdot N_\rho \cdot N_{\underline{a}}\} = 810$ parameter combinations we explore, MPCs do not increase with earnings growth uncertainty.

## D.2 Permanent income heterogeneity

Permanent differences in income do not change our conclusion that MPCs fall with $\sigma$ in the canonical model of Section 5.1. To see this, assume that household's income is the product of a stochastic component $y$, defined as above, and a permanent component $p$, heterogeneous across households. Then one can show that the model scales exactly. In other

Figure D.4: MPC and uncertainty: interest rate



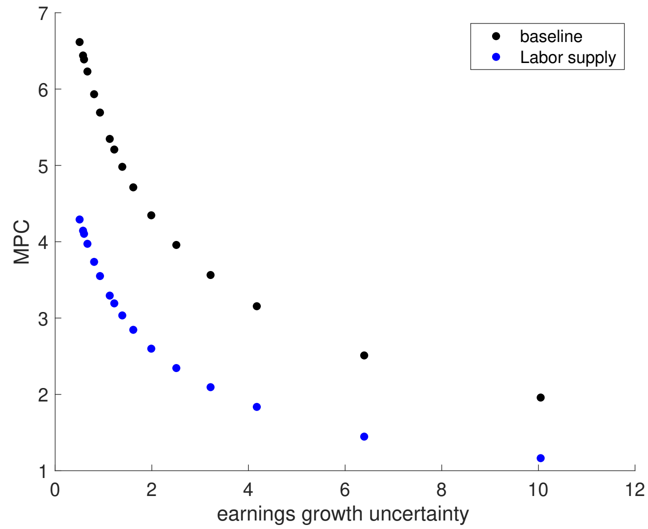

*Notes.* Data simulated from the stationary distribution of two versions of the model. In black, the baseline model with parameterization described in Section 5.1. In red, a model in which $r = 0.04$, and $\beta$ is recalibrated to match the share of hand-to-mouth households. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

words, the consumption policy function satisfies: $c(a, y, p) = c\left(\frac{a}{p}, y\right) p$. As such, the MPC is unaffected. Even if we assumed that $p$ and $\sigma$ were correlated, the relationship between MPCs and $\sigma$ would be the same as in Figure 2. This is because the stationary distribution of $\frac{a}{p}$ and, in turn, of the MPC, is independent of $p$ conditional on $\sigma$.

## D.3 Mechanisms over the life cycle

Our canonical model of Section 5.1 abstracts from life-cycle considerations, motivated by our empirical results that MPCs are increasing and concave in uncertainty even within different age groups. Nevertheless, the model implications outlined thus far broadly hold also in a life-cycle model. In this theoretical framework, MPCs can be U-shaped, as shown by Meghir and Pistaferri (2011) and Kaplan and Violante (2010). They are high for young households, which are closer to the borrowing constraint, but increase again later in life, due to a shortening time horizon. The latter channel has little quantitative impact on our analysis since our sample focuses on employed households. For the remainder of the distribution, the forces at play are similar to those in our infinite-horizon model, with MPCs typically declining with $\sigma$ across households due to wealth accumulation patterns.

Figure D.5: MPC and uncertainty: labor supply




*Notes.* Data simulated from the stationary distribution of two models. In black, the baseline model with parameterization described in Section 5.1. In blue, a model with endogenous labor supply. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

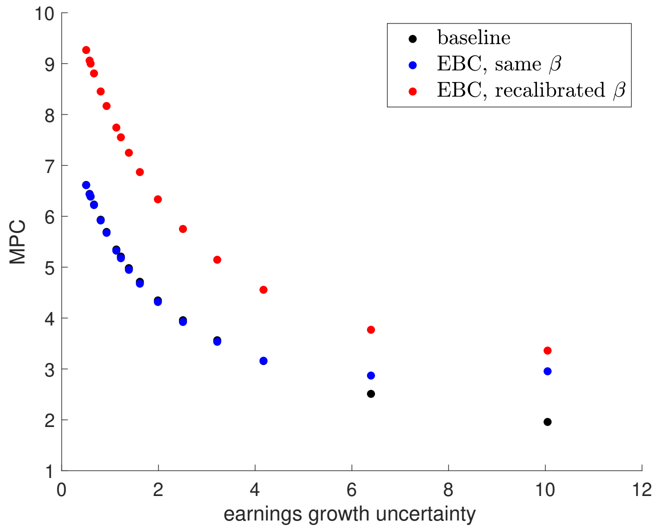
## D.4 Endogenous labor supply

We allow for endogenous labor supply considering the following utility function: $U = \frac{c^{1-\gamma}-1}{1-\gamma} - \varphi\frac{n^{1+\frac{1}{\kappa}}}{1+\frac{1}{\kappa}}$. Hours worked are denoted by $n$, such that the budget constraint becomes $c + a' = yn + a(1+r)$. Earnings growth uncertainty, in the data, is conditional on working the same number of hours. As such, in the model it remains equal to the standard deviation of the innovations to the process for $y$: $VAR\left(\log\left(y_{t+1}n_{t+1}\right) - \log\left(y_t n_t\right) \mid \log\left(y_t n_t\right), n_{t+1} = n_t\right) = \sigma^2$.

We start by considering $\kappa = 1$ and report the results in Figure D.5. Since introducing endogenous labor supply with this choice of $\kappa$ lowers the share of hand-to-mouth only marginally, we show the results keeping $\beta$ at the value calibrated in Section 5.1. Recalibrating $\beta$ has a negligible impact. We also choose $\varphi$ to normalize aggregate labor supply to 1. As in our baseline findings, MPCs fall with $\sigma$, whereas they increase with spending growth uncertainty.

We find qualitatively similar results for different values of $\kappa$, such as 10 or 0.5.

Figure D.6: MPC and uncertainty: earnings-based borrowing constraint




*Notes.* Data simulated from the stationary distribution of the baseline model of Section 5.1, in black, and two versions of a model with an earnings-based borrowing constraint (EBC), as described in the text. In blue, we keep all parameters are unchanged. In red, $\beta = 0.9896$ is recalibrated to match the share of hand-to-mouth households. The dots are associated with the 16 quantile values of $\sigma$ as described in the text: for each of them, we compute the average MPC displayed on the vertical axis.

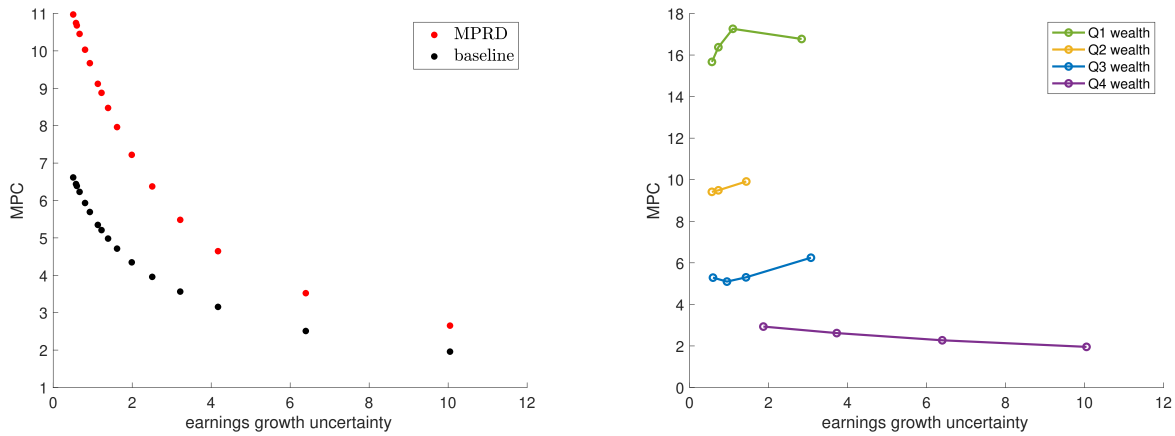
## D.5 Earnings-based borrowing constraint

In this section we replace the no-borrowing constraint of Section 5.1 with an earning-based constraint, such that households can borrow up to a certain fraction of their current labor income. Formally, this imposes that $a' \geq -\psi y$. We calibrate $\psi = 0.185$, as in Kaplan and Violante (2014). As we show in Figure D.6, the model predicts a negative relationship between MPCs and earnings growth uncertainty even in this model. For a given $\beta$, households are typically less likely to be financially constrained than in the baseline model, because we have effectively relaxed the borrowing limit. However, borrowing limits potentially bind more often for uncertain households, all else equal, because they face larger negative income shocks. This makes the relationship between MPCs and uncertainty slightly flatter, but still clearly declining. If we raise $\beta$ to get about 14% of households at the borrowing constraint, MPCs are obviously higher, but still decline with $\sigma$.

## D.6 Interest rate schedule

In Figure D.7 we consider an extension of the model proposed by Koşar et al. (2023). Households are allowed to borrow up to their natural debt limit. However, they face a debt price schedule $q(a')$ such as the budget constraint becomes $c + q(a')a' = y + a$. For the functional

Figure D.7: MPC and earnings growth uncertainty: debt repayment motives




(a) Full distribution

(b) Wealth quartiles

*Notes.* Data simulated from the stationary distribution of the model with a nonlinear pricing schedule. In the right panel, households are grouped in four quartiles of net liquid wealth ($a$), from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of wealth, dots represent quantiles of earnings growth uncertainty.

form of the pricing schedule, we follow Koşar et al. (2023):

$$q = \begin{cases} \max\left[\frac{1}{1+r} - \phi_1 \left(-a'\right)^{\phi_2}, 0\right] & \text{if } a' \leq 0 \\ \frac{1}{1+r} & \text{if } a' > 0 \end{cases}$$

We calibrate $\beta = 0.9893$, $\phi_1 = 0.0146$ and $\phi_2 = 0.6$ to match three moments from the SCE, as in Koşar et al. (2023): (i) the share of households with negative net liquid assets, (ii) the MPC of households in the bottom quintile of net liquid wealth-to-income ratio, conditional on negative net liquid assets, and (iii) the MPC in the top quintile, also for negative asset holders.

The interest rate schedule makes the MPCs locally increasing in net liquid wealth among net debtors. This lowers the MPCs in the bottom quartile relative to our baseline model, and increases the MPCs in the second quartile, as showed in Figure D.7. Nevertheless, MPCs still decline with earnings growth uncertainty, at odds with the data.

## D.7 Deviations from FIRE

In this section, we consider some deviations from the full-information rational expectations (FIRE) benchmark that have recently been studied in the context of the MPC.

First, Lian (2023) sets up a framework in which households misperceive their wealth, and future consumption mistakes lead to higher MPCs. This setting has the potential to get the model closer to the data, by the virtue of flattening the relationship between MPC and wealth. The overall success of the model, however, hinges on the specific assumptions on the quantitative nature of wealth misperceptions, and potentially how they correlate with uncertainty, which are, again, very difficult to test empirically.[2]

Second, we consider the bounded rationality model by Ilut and Valchev (2023) and extend it to incorporate risk heterogeneity. We we discuss these results in Section D.7.1.

### D.7.1 Bounded rationality and risk heterogeneity

Ilut and Valchev (2023) formalize a model of bounded rationality in which the reasoning of economic agents is the result of the interplay between automatic thinking (i.e., through intuitive associations) and analytical thinking (which is cognitively costly). The authors show that this framework helps address various existing puzzles related to consumption behavior, such as (i) large MPCs of high-liquidity households, and (ii) persistent hand-to-mouth status. We extend their framework to allow for risk heterogeneity, calibrated as before to the uncertainty observed in the SCE data.

We follow the quantitative implementation of Ilut and Valchev (2023) and defer to their paper for details.[3] Households have log–utility, face i.i.d. income shocks, and a no–borrowing constraint. We extend their setup to allow for heterogeneity in the variance of income innovations, calibrated to the SCE heterogeneity in uncertainty. We set $\beta = 0.9898$ and $r = 0.01$ as in our baseline parameterization. Let us now summarize the key elements of their theoretical framework and defer to Ilut and Valchev (2023) for an extensive discussion. Agents perfectly observe all constraints and cash–on–hand, $y_{i,t}$, but do not know the optimal policy function for consumption, $c^*(y_{i,t})$. Rather, they estimate it from a history of costly deliberation signals that follows the equation below

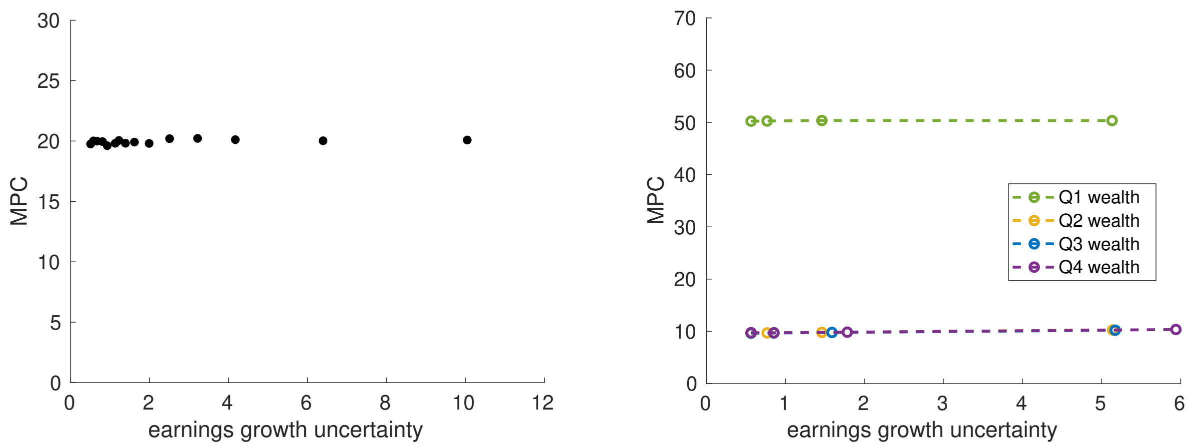
$$\eta_{i,t} = c^*(y_{i,t}) + \epsilon_{i,t} \ , \ \epsilon_{i,t} \sim \mathcal{N}\left(0, \sigma^2_{\eta,i,t}\right).$$

Agents reason following two "systems". First, they can engage in active deliberation about $c^*$, that is unknown. When they do so, they choose the precision of the signals, $\sigma^2_{\eta,i,t}$, but face a cost, which depends on the marginal cost of deliberation effort, $\kappa$. Second, they can decide to follow "automatic" intuition, the so–called "System 1" type of thinking, in which case they have an estimate of $\mathbb{E}\left(c^*|\eta^{t-1}, y^{t-1}\right)$ that is immediately available and does not require additional conscious effort. This form of associative memory depends on two parameters: $\psi$, which controls the informativeness of a given state about another state

[2]For example, MPCs are positively correlated with the "degree of future mistakes" in this model, as well as with the degree of sophistication. These parameters might also correlate with subjective earnings uncertainty, in turn affecting the relationship between MPC and subjective uncertainty.

[3]We thank the authors for sharing the code and for helpful discussions.

Figure D.8: MPC and uncertainty: bounded rationality




(a) Full distribution (b) Wealth quartiles

*Notes.* Data simulated from the model by Ilut and Valchev (2023), extended with risk heterogeneity, as discussed in the text. In the right panel, households are grouped in four quartiles of net liquid wealth (a), from the lowest (Q1, in green) to the highest (Q4, in purple). For each quartile of wealth, dots represent quantiles of earnings growth uncertainty.

realization, and $\sigma_c$, which controls the agent's prior uncertainty about the true, unknown, policy function $c^*$, at any given state. Agents endogenously cycle through the two types of thinking systems.

In the quantitative exercise of Figure D.8, we keep $\kappa$, $\sigma_c$, and $\psi$, at the values calibrated by Ilut and Valchev (2023). Moreover, we assume that households perceiving different risk face the same parameter triplet above. The partial success of the model is the result of two mechanisms. First, the model generates stable behavior characterized by a consumption policy function that is steeper than the permanent-income-hypothesis counterpart. In other words, as discussed by Ilut and Valchev (2023), this mechanism raises the MPC of the wealthy. Even in our environment with risk heterogeneity, this implies a flattening of the MPC–wealth gradient: as shown in Figure D.8b, the curves for wealth quartiles 2–4 overlap, close to what is observed in the data. Second, the presence of learning traps subdues wealth accumulation. The curves of Figure D.8b do not shift to the right as wealth increases, differently from the canonical model and closer to what is observed in the data. In other words, the model is successful insofar as there are many low-wealth households who perceive high earnings uncertainty and high-wealth households with low uncertainty. Differently from the data, however, households in the lowest quartile of net liquid wealth have much higher MPCs than everyone else. Because lower-uncertainty households are still slightly more likely to be hand-to-mouth in this model, this force makes the MPC–uncertainty gradient less positive.

Finally, we explore how our quantitative results change as we change these parameters.

Higher $\sigma_c$ increases the MPC and, beyond certain values, seems to make the MPC slightly more increasing with earnings uncertainty. Higher $\psi$ also has similar effects. Hence, different parameterizations could get the model even closer to our empirical findings. This seems especially true if households perceiving higher earnings uncertainty also had a higher cognitive uncertainty. Disciplining these parameters, and especially heterogeneity thereof, is however a challenging endeavor, which requires data beyond the scope of this paper. We nevertheless see this as a very promising avenue for future research.

# E Additional results: model with biased beliefs

Table E.1: MPC and Earnings Uncertainty in the model with biased beliefs

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| ***Panel A*** | | | | |
| Earnings growth uncertainty | 1.538*** | 2.881*** | 0.105*** | 1.918*** |
| | ( 0.027) | ( 0.031) | ( 0.028) | ( 0.028) |
| ***Panel B*** | | | | |
| Earnings growth uncertainty | 8.734*** | 8.228*** | 8.121*** | 6.843*** |
| | ( 0.091) | ( 0.090) | ( 0.085) | ( 0.080) |
| Uncertainty squared | -0.783*** | -0.610*** | -0.881*** | -0.561*** |
| | ( 0.009) | ( 0.010) | ( 0.009) | ( 0.009) |
| Expected earnings growth | | | ✓ | ✓ |
| Wealth to income ratio | | ✓ | | ✓ |

*Notes.* Standard errors are robust and in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Model with overoptimistic households, heterogeneous uncertainty, and risk misperceptions.

## E.1 MPC and spending uncertainty

## E.2 Time aggregation

In this section, we consider an alternative calibration in which one period is 4 months. As in the data, forecast errors are defined over the 4-month horizon, whereas earnings growth uncertainty is 12 months ahead. We then recalibrate $\alpha_0$, $\alpha_1$, and $\beta$ in this new environment. For consistency with the rest of the paper, we define the MPC over 1-year horizon. As we show in Figure E.2, the results under time aggregation are qualitatively similar: MPCs are increasing and concave in earnings growth uncertainty, consistent with the data.

## E.3 Comparative statics

Table E.2: MPC and Spending Uncertainty in the model with biased beliefs

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| ***Panel A*** | | | | |
| Spending growth uncertainty | 17.913*** | 17.815*** | 16.416*** | 16.360*** |
| | ( 0.049) | ( 0.049) | ( 0.094) | ( 0.093) |
| ***Panel B*** | | | | |
| Spending growth uncertainty | 30.602*** | 30.442*** | 22.544*** | 22.463*** |
| | ( 0.070) | ( 0.070) | ( 0.076) | ( 0.075) |
| Uncertainty squared | -1.586*** | -1.577*** | -2.373*** | -2.359*** |
| | ( 0.007) | ( 0.007) | ( 0.007) | ( 0.007) |
| Expected spending growth | | | ✓ | ✓ |
| Wealth to income ratio | | ✓ | | ✓ |

*Notes.* Standard errors are robust and in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Model with overoptimistic households, heterogeneous uncertainty, and risk misperceptions.

Figure E.1: MPC and spending uncertainty: model with biased beliefs

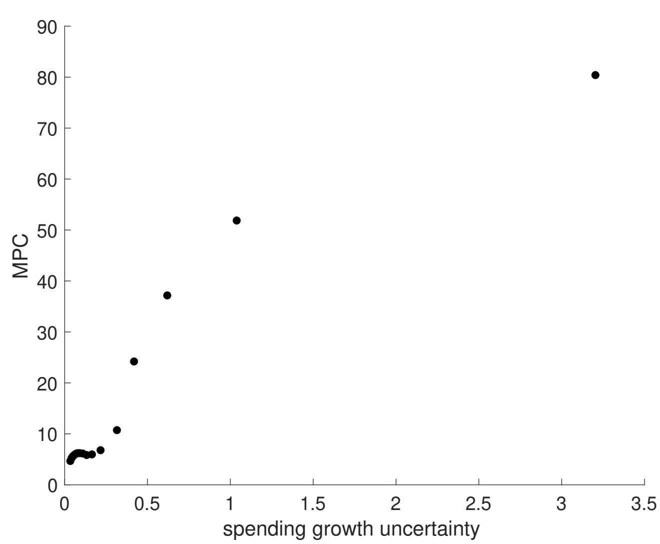


Figure E.2: MPC and uncertainty: biased beliefs with time aggregation

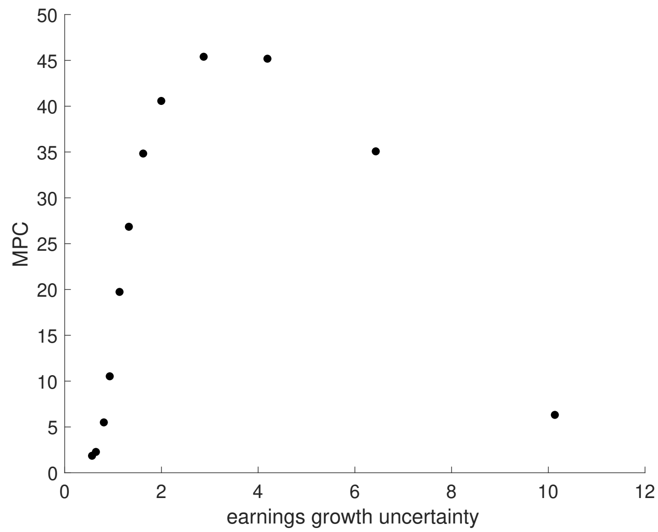
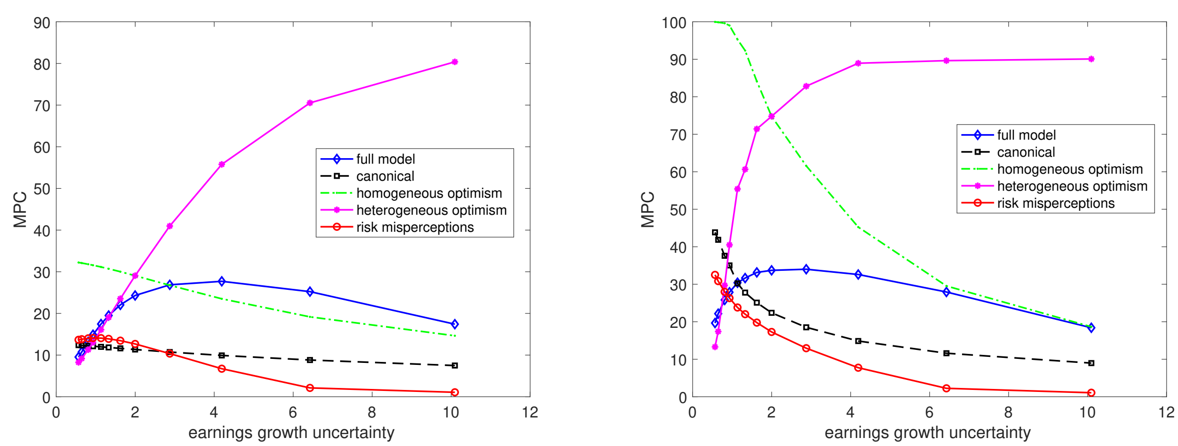



Figure E.3: MPC and uncertainty: comparative statics




(a) MPC out of 10% income shock

(b) MPC out of arbitrarily small shock

*Notes.* The figures show the MPC by quantiles of perceived earnings uncertainty for five different models: (i) the full model with both overoptimism and risk misperceptions in solid blue, (ii) the canonical model of Section 5.1 in dashed black, (iii) a model with only risk misperceptions in solid red, (iv) a model with only overoptimism correlated with uncertainty in purple, and (v) a model with a homogeneous degree of overoptimism in green. Across models, we fix $\beta$ to the value calibrated in the full model (i), and perceived uncertainty to the $\sigma_i$ values drawn from the SCE. We also keep the values for $\hat{\mu_i}$ unchanged, unless when the model requires to be set to zero. In the model with homogeneous optimism, we set $\hat{\mu_i}$ approximately to its mean value.