DISCUSSION PAPER SERIES

DP19776

# INFLATION EXPECTATIONS OF SAVERS AND BORROWERS

Riccardo M. Masolo and Francesca Monti

MONETARY ECONOMICS AND FLUCTUATIONS

CEPR

*ISSN 0265-8003*

# INFLATION EXPECTATIONS OF SAVERS AND BORROWERS

*Riccardo M. Masolo and Francesca Monti*

Discussion Paper DP19776
Published 16 December 2024
Submitted 27 November 2024

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
187 boulevard Saint-Germain, 75007 Paris, France
Tel: +44 (0)20 7183 8801
www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Monetary Economics and Fluctuations

Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Riccardo M. Masolo and Francesca Monti

# INFLATION EXPECTATIONS OF SAVERS AND BORROWERS


## Abstract

We study individual level data from the NY Fed's Survey of Consumer Expectations and show that agents' inflation expectations, even controlling for demographic factors and expectations about the economic outlook, depend on the household's financial situation. In particular, there is a wedge between the expectations of savers and borrowers: savers have higher inflation expectations than borrowers. We make sense of this finding with a life-cycle model in which agents first borrow and then work to save for retirement, always having ambiguity about future inflation outcomes. The model also rationalizes the puzzle of the positive comovement between inflation expectations and unemployment expectations, first identified in Coibion et al. (2019).



JEL Classification: E3, E71

Keywords: Inflation expectations, Survey data, Ambiguity



Riccardo M. Masolo - rmmasolo@gmail.com
*Unversita' Cattolica di Milano*

Francesca Monti - francesca.monti@uclouvain.be
*UCLouvain and CEPR*

# Inflation expectations of savers and borrowers*

Riccardo M. Masolo† Francesca Monti‡

November 28, 2024

**Abstract**

We study individual level data from the NY Fed's Survey of Consumer Expectations and show that agents' inflation expectations, even controlling for demographic factors and expectations about the economic outlook, depend on the household's financial situation. In particular, there is a wedge between the expectations of savers and borrowers: savers have higher inflation expectations than borrowers. We make sense of this finding with a life-cycle model in which agents first borrow and then work to save for retirement, always having ambiguity about future inflation outcomes. The model also rationalizes the puzzle of the positive comovement between inflation expectations and unemployment expectations, first identified in Coibion et al. (2019).

## 1 Introduction

The macroeconomic literature has studied the inflation expectations of households extensively (e.g. Coibion and Gorodnichenko (2015),Weber et al. (2022)) and established some key stylized facts. One is that they are, on average, biased upwards. We expand on this, by showing that significant differences exist between the inflation expectations of savers and borrowers. Savers report, on average, higher inflation expectations than borrowers, after controlling for individual charcteristics. This can be explained by noting that inflation is costlier for savers than it is for borrowers. Savings in nominal assets are eroded by high inflation (Doepke and Schneider, 2006). Conversely, the real value of a borrower's nominal debt is reduced by inflation.

*We are grateful to Giovanni Signorini for his research assistance.

†Università Cattolica del Sacro Cuore. e-mail: rmmasolo@gmail.com

‡Université Catholique de Louvain, Belgium, and CEPR, UK. e-mail: francesca.monti@uclouvain.be

We formalize this idea by showing that ambiguity-averse (Epstein and Schneider, 2003) savers act based on inflation expectations that are high relative to the rational-expectations benchmark, while the opposite is true for borrowers. We illustrate this point in a simple overlapping-generations model in which agents live for three periods. Young agents (first period) need to borrow to finance their consumption. In the second period agents work, repay the debt they accumulated, and save for retirement (third period). For young agents low expected inflation increases the real value of the loans they will have to repay next period. Conversely, the concern of the middle-aged is that inflation will erode the value of their retirement plan.

This model captures in very simple terms a "life-cycle" motivation for saving and borrowing, and ties nicely with our empirical proxies for savers and borrowers. At an empirical level, the main challenge of our analysis is to identify savers and borrowers in the data in a synthetic way. We do so by merging various surveys administered by the New York Fed. In particular, the Public Policy Survey provides valuable information on how household welfare would respond to various economic scenarios that relate to the saver or borrower status of a responder. This quarterly survey asks respondents for their expectations about a number of economic policies – including changes in the capital gains tax rate, in the mortgage interest rate tax deduction and in student loans foregiveness – and how their family would be impacted by these changes. For example, we leverage these questions by assuming that a survey respondent reporting that an increase in capital gain taxes will affect her negatively must have savings. Similarly, an individual saying that an increase in mortgage interest-rate deductions will make him better off is classified as a borrower. Importantly, answers to these hypothetical questions not only give us an indication of the assets and liabilities of the responder, they also inform us that they are aware of the effects of such events on their welfare, i.e.,suggesting that the worst-case scenario in our model is indeed a concern for the responder under consideration. Moreover, these scenarios mitigate the risk of reverse-causation. The expectations of changes in capital-gains taxes are unlikely to be caused by one's inflation expectation.

These questions allow us to peer into the economic thinking of the respondent but do not give us the full picture about net and gross savings and debt of survey participants. The Survey of Household Finance helps us in this regard, so that we can control for a number of individual characteristics such as whether the household in question has a mortgage or what percentage of their savings is invested in stocks or bonds. Our results are robust to the inclusion of these controls as well as to controlling for financial literacy. Most importantly, our key findings hold even in two-way panel regressions, i.e., when we include an individual fixed effect that captures individual characteristics above and beyond any individual control we include in our specifications.

The empirical proxies for borrowers and savers we have discussed so far mostly relate to a "life-cycle" motivation for borrowing/savings, such as getting a student loan or saving for

retirement. Another common motivation for saving has to do with uninsurable individual risk, e.g., the risk of losing one's job or, more generally, experiencing a decrease in income (Carroll (1997),Carroll et al. (2019)). Using data from the New York Fed's Survey of Consumer Expectations, we find that respondents who expect to be worse off or experience a high unemployment risk tend to report higher inflation expectations. These findings are consistent with our claim that savers have, on average, higher inflation expectations, though we cannot give these coefficients a causal interpretation: it could be that savers expect to be worse off financially precisely because they expect high inflation to eat into their wealth. Nonetheless, these variables are important individual controls. Also, they suggest a possible interpretation, at the individual level, to the households' stagflationary view of inflation, i.e., the finding (Coibion et al. (2019), Candia et al. (2023)) that households tend to associate high inflation expectations to periods of high unemployment. Here, we establish that this relationship holds at the individual level in the form of a positive association between expectations of an increased unemployment risk and the expectation of high inflation. This is consistent with the idea that an ambiguity-averse worker's worst-case scenario is one in which high inflation reduces the real value of the nominal savings he accumulates in anticipation of an increased risk of losing his job.

**Related Literature.** We contribute to the body of work that studies the how inflation expectations differ across households depending on individual characteristics, the salience of certain item prices and so on. For example Bruine de Bruin et al. (2010) and Binder (2015) find that more educated and wealthy respondents tend to display a smaller upward bias. Malmendier and Nagel (2015) show that older respondents have higher inflation expectations with cohort effect relating to the experiences the respondents had in their formative years – i.e. the high-inflation period in the 1970s for the older generation. Coibion and Gorodnichenko (2015) have advanced the idea that actually the household subjective inflation expectations might be driven by prices of particularly salient goods, like gasoline. D´Acunto et al. (2021) use data from the Nielsen Consumer Panel and find that the inflation agents have observed in their own grocery bundles is indeed correlated with their expectations about future inflation.

As mentioned above, our finding speaks to the observed countercyclicality (or stagflationary behavior) of household inflation expectations. Many studies have found a positive correlation between unemployment expectations and subjective inflation expectations (e.g see Coibion et al. (2023) and Bhandari et al. (2023)). This finding, which Coibion et al. (2019) refers to as "stagflationary" expectations, is at odds with standard economic theory and with the Phillips curve, which suggest that inflation and unemployment have a negative relation. It, however, can be rationalized if we consider that agents will tend to increase their saving buffer when they expect a deterioration in the economic outlook.

Our analysis relates to recent work by Michelacci and Paciello (2024), who provide ev-

idence that expections are related to agents' preferences over outcomes. The study data from the UK's Bank of England's Survey of Inflation Attitudes, which asks respondents about preferences of outcome as well as expectations and find that households who dislike inflation have higher expected inflation of households who like inflation. Relative to Michelacci and Paciello (2024) we do not have information about a responder's preferences regarding monetary policy, but we have individual information about the asset position and can exploit the panel structure of the data.

Our model relates to the literature on the effects of ambiguity aversion (see Ilut and Schneider, 2023, for a review). In particular, we had shown in previous work (Masolo and Monti, 2021) that ambiguity about monetary policy can generate a positive bias in inflation expectations and that the bias is larger for patient agents (which are savers in equilibrium). In this paper we show that this insight is not restricted to ambiguity about monetary policy and it applies to a life-cycle model of saving and borrowing. In particular, the same economic agent will typically a borrower, and thus expect relatively low inflation, when young, and become a saver, whom has higher inflation expectations, over the course of her life. This echoes the findings of Malmendier and Nagel (2015) and suggests that observed differences in inflation expectations across age groups are not only the result of different experiences – we control for age – but the inherently different objectives of economic agents at different points in their lifecycle.

The next section presents the various surveys we exploit in our empirical analysis, which is reported in Section 3. Section 4 describes the model in detail.

# 2 The data

We study household expectations from the New York Fed's Survey of Consumer Expectations (SCE). The SCE is a recently developed survey which collects expectations from a rotating panel of household heads on inflation and a range of other issues, including about the households' financial situation.

## 2.1 Survey of Consumer Expectations

The survey of consumer expectations (SCE, see Armantier et al., 2017, for an overview) is a monthly nationally representative survey of roughly 1300 households, which gathers information about consumer expectations of inflation – point forecast and probabilistic forecasts – at different horizons. Launched in June 2013, it is administered online and respondents participate in the panel for up to twelve months, with an approximately equal number rotating in and out each month. The data available online spans the period from June 2013 to 12 months before the current date. Our sample ends in May 2023 and includes 154,582 individual observations.

The survey includes questions on respondents' expectations about their own economic situation in the future and about their views on the economy. We will exploit the following in our analysis:

- current employment status;
- risk of becoming unemployed in the next 12 months;
- expectations about their own income in the next 12 months;
- whether they expect to be financially better or worse off in the next 12 month;
- probability that stock prices in the American stock market will go up in the next 12 month;
- probability that the unemployment will go up in the next 12 month;
- probability that US interest rates will go up in the next 12 month.

We also use the detailed demographic information reported in the survey, which collects information on the respondents' education, income, age, and residence, to control for characteristics that are known to correlate and help explain the well-known bias in inflation expectations. The survey also assesses the respondents' level of financial literacy by asking five questions of varying level of difficulty. We focus on the following one, which requires understanding percentages and compounding, to discriminate between respondents with low vs. high financial literacy.

> *Let's say you have $200 in a savings account. The account earns ten per cent interest per year. Interest accrues at each anniversary of the account. If you never withdraw money or interest payments, how much will you have in the account at the end of two years?*

In our sample, 50.9% of the observations are associated with individuals that have high financial literacy, *i.e.* individuals who are able to answer correctly to the question above. Table 1 reports some summary statistics for inflation expectations over the next 12 month: the first column refers to all the respondents, the second column to reports the statistic when the first and the $99^{th}$ percentile of the responses – the most extreme outliers – are dropped from the sample, while the third column reports the statistics only for the subsample respondents with high financial literacy.

Along with the main SCE survey, the New York Fed administers on a quarterly basis some special survey modules to the respondents of the main SCE survey on inflation expectations on the topics of Housing, Labour Market, Housing, Public Policy, and Credit Access. From 2014 to 2019 it also collected, once a year, a very detailed information about the households' financial situation: their total wealth, their liabilities, a breakdown of their assets in different categories. We exploit the Public Policy Survey and the Household Finance Spending Survey

| | All respondents | Trimmed | Financially literate |
|---|---|---|---|
| Mean | 6.2 | 5.9 | 4.4 |
| Std | 48.1 | 9.4 | 6.2 |
| Min | -100 | -25 | -25 |
| 25% | 2 | 2 | 2 |
| 50% | 3 | 3.2 | 3 |
| 75% | 7 | 7 | 5 |
| Max | 11200 | 60 | 60 |
| Obs | 154,582 | 151,830 | 78,702 |
| Sample | 2013M6 - 2023M5 | | |

**Table 1. Summary statistics for $\mathbb{E}_t^j \pi_{t,t+12}$, inflation expectations over the next 12 months**. This table reports the mean, variance, extreme values and quartiles for one-year ahead inflation expectations for the whole sample (column 1), the trimmed sample obtained dropping the observations in the first and 99th quantiles (column 2), the financially literate sample (column 3).

to recover granular information about the individual respondents' financial situation. As we will show in the following sections, the households' financial situation affects their inflation expectations even after controlling for all the usually mentioned drivers of the known bias in inflation expectations, *i.e.* age, education, income, cohort effects, etc...

### 2.1.1 Survey of Household Finance

The survey of Household Finance collected very detailed information on the households' financial situation and the composition their assets and liabilities. We can gather information on who, among the respondents, has a mortgage or not, what share of their savings is in a checking account, in TBills, in bonds or in stocks. There is also information on the size of the mortgage as well as the households' evaluation of the value of their home (if they own one). This survey has been fielded between 2014 and 2019, and it was fielded once a year, which effectively means that we cannot exploit the panel dimension of the inflation expectations data, when merging it with this data.

### 2.1.2 Public Policy Survey

The SCE Public Policy Survey, which started in November 2015, is fielded every four months as a rotating module of the Survey of Consumer Expectations (SCE). It asks households their expectations about the direction of change of different public policies in the next 12 months, including the capital gain tax rate, the mortgage interest tax deduction and the level of student debt forgiveness. The respondents are then asked how the expected increase/decrease in that policy will affect their household. We use these answers to infer whether the households hold assets, have a mortgage and/or student debt.

- If a respondent answers that an increase (decrease) in the capital gains tax rate will

impact their household negatively (positively), then we infer that this household has a stocks. 38% of the overall responses are from people who have assets, 42% when we only focus on the highly financially literate.

- If a respondent answers that an increase (decrease) in the mortgage interest tax deduction will impact their household positively (negatively), then we infer that this household has a mortgage. 38% of the responses are from people who have a mortgage, 42% of the financially literate.
- If a respondent answers that an increase (decrease) in the student debt forgiveness will impact their household positively (negatively), then we infer that this household has student loans. 20% of the responses are from people who have assets, 19% when we only focus on the financially literate.
- Considering jointly the respondents that have a mortgage and/or a student loan as borrowers, 49% of the responses are from borrowers (52% among financially literate)

We label people with stocks as savers and people with a mortgage and/or a student loan as borrowers. In our sample people can have assets and a debt at the same time, and therefore be, at the same time, savers and borrowers. Among respondents that we identify as savers – i.e. those who would be affected by changes in the capital gain tax rate – there are 50% who are also borrowers: 42% are affected by changes in the mortgage interest rate tax deduction, 16% by changes in degree of student debt forgiveness, and, among these groups, some will be affected by both. We will show the role played by these characteristics for their inflation expectations, because we observe variations in these measures.

# 3 Empirical Analysis

The positive correlation between unemployment expectations and inflation expectations identified by Coibion et al. (2019) and Bhandari et al. (2023) is confirmed in our analysis. Table 2 reports the results from the following regression:

$$\mathbb{E}_t^j \pi_{t,t+12} = \mu_j + \mu_t + \underline{x}'_{j,t}\underline{\beta} + \varepsilon_{j,t} \tag{1}$$

where the dependent variable is $\mathbb{E}_t^j \pi_{t,t+12}$, the individual inflation expectation for the next 12 months and the regressors $\underline{x}_{j,t}$ is a vector comprising controls such as responders' subjective risk of being unemployed in the next 12 months, their income expectations for the same period, an indicator variable for whether they expect to be worse off in the next year. It also includes respondents' expectations about the state of the economy – namely the probability they assign to unemployment, stocks and interest rates going up – and the following demographic variables: age, income bracket, education level and employment status. $\mu_t$ is a time fixed-effect, which we always include to capture changes in the macroeconomic landscape, and $\mu_i$ an individual fixed effect that we include in some of our specifications –

| Dependent variable: $\mathbb{E}_t^j \pi_{t,t+12}$ | | (1) | (2) | (3) | (4) |
|---|---|---|---|---|---|
| | unemp. risk | | 0.013*** | 0.005 | 0.006** |
| | | | (0.003) | (0.004) | (0.003) |
| | income expectations | -2.2$e^{-6}$** | 0.003** | 0.001* | 0.0008 |
| | | (8.6$e^{-7}$) | (0.0014) | (0.0007) | (0.0006) |
| | worse off | 1.48*** | 1.19*** | 0.84*** | 0.76*** |
| | | (0.12) | (0.16) | (0.16) | (0.15) |
| | unemployment up | 0.066*** | 0.057*** | 0.038*** | 0.017*** |
| | | (0.002) | (0.002) | (0.003) | (0.002) |
| Economic | stocks up | -0.02*** | -0.02*** | 0.016*** | 0.001 |
| Controls | | (0.002) | (0.002) | (0.003) | (0.003) |
| | interest rate up | 0.003 | -0.002 | 0.006*** | 0.001 |
| | | (0.002) | (0.002) | (0.002) | (0.002) |
| Individual | full time | -0.70*** | -0.49*** | -0.14 | -0.88** |
| Controls | | (0.11) | (0.17) | (0.39) | (0.38) |
| | Other individual characteristics | Yes | Yes | | |
| | Fixed effects | Time | Time | Time | Time |
| | | | | Entity | Entity |
| | Sample | Trimmed | Trimmed | Trimmed | Fin. literate |
| | Observations | 148745 | 88511 | 89295 | 47332 |

**Table 2. Regression results using only SCE data**. This table collects the results of regressing $\mathbb{E}_t^j \pi_{t,t+12}$ on variable in the SCE that relate to people's propensity to save – expecting to be worse off, unemployment risk and own income expectations – along with various controls for expectations about the state of the economy, time fixed effects and either controls for the individual characteristics (columns 1 and 2) or individual fixed effects (column 3 and 4) for the full sample and the sample that only includes financially literate respondents. White's heteroschedasticity robust estimator is used to obtain the parameter standard errors that appear in parentheses. Asterisks denote significance at the 10% (*), 5% (**), and 1% (***) levels.

as reported in the tables below.

The first and second columns of Table 2 report the results of regression (1) for the trimmed sample, i.e. the one that excludes the observations in the $1^{st}$ and $99^{th}$ percentile, including as regressors individual demographic characteristics and fixed time effects, including or excluding as a control the individuals' perception of their own unemployment risk, a variable relevant for our analysis, but which affects the sample size substantially. The results for the regression with both time and entity fixed effects are reported in the third and fourth column, for the full sample and the financially literate only.

There is a positive strongly significant correlation between inflation expectations and expectations for overall unemployment, even after controlling for time and individual fixed effects. There is also a largely significant positive correlation between one-year ahead inflation expectations and the respondents' perception of their unemployment risk. These

results hold in the full sample as well as when considering only the respondents with high financial literacy. As discussed in the introduction, this is at odds with textbook economic intuition, which would suggest that unemployment and inflation should move in opposite directions.

It is possible to make sense of this results if one considers that unemployment risk increases a person's desire to save. If there is ambiguity about expected inflation and the respondents are ambiguity averse, then their expectations will reflect the scenario with respect to which they want to be robust, which, in the case of savers, is higher inflation. Similarly, a borrower will benefit from high inflation, will therefore consider lower inflation their worst case scenario, and this will be reflected in their expectations.

Some of the questions in the surveys described in Section 2 relate to motives for saving or reflect the respondents' status as a borrower or saver. Among these variables is the question on whether they expect to be worse off in the next year, which appears to be strongly significantly related to their inflation expectations. There is obviously a two way relationship among these two variables, as it is naturally the case that, if people expect inflation to be higher without an equivalent increase in income, they will expect to be worse off. The answers to the New York Fed's Public Policy Survey provide some ideal proxies for the information we are after, and are plausibly exogenous to the agents 12 months ahead inflation expectations.

As discussed in the previous section, we identify as a saver a respondent who indicates that their household will be negatively (positively) affected by an expected increase (decrease) in the capital gains tax rate. Similarly we identify as borrowers respondents who indicate that i) an expected increase (decrease) in the mortgage interest tax deduction affects their household positively (negatively) and/or ii) that an expected increase (decrease) in student debt forgiveness affects their household positively (negatively). Households can have both borrower and saver status at the same time and we can account separately for the effect of either of these characteristics. Table 3 report the result of regression (1) when we add these indicators of borrower and/or saver status to all the regressors we considered in Table 2. Having a mortage and/or student debt (borrower row in Table 3) leads to lower one-year-ahead inflation expectations while having stocks (saver row in Table 3) is associated with higher inflation expectations. This is true regardless of the sample considered, both when accounting for time fixed effects only and when considering both time and entity fixed effects, even if the significance of the effect of having loans decreased when considering separately the two types of borrowing (having a mortgage and/or student debt).

In the sixth column of Table 3 we consider a regression with time and individual fixed effects in which we interact the variables that indicate whether the respondents have loans (borrower) and/or have stocks (saver) with their employment status, and specifically with the variable that indicated whther they are in full time (FT) work or not. It is interesting

| Dependent variable: $\mathbb{E}_t^j \pi_{t,t+12}$ | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| | borrower | -0.30*** | -0.18* | -0.35** | | | |
| | | (0.08) | (0.10) | (0.16) | | | |
| | mortgagor | | | | -0.23* | -.23 | |
| | | | | | (0.14) | (0.17) | |
| | student loans | | | | -0.008 | -0.01 | |
| | | | | | (0.20) | (0.25) | |
| | saver | 0.25*** | 0.28*** | 0.52** | 0.28* | 0.51** | |
| | | (0.08) | (0.10) | (0.22) | (0.15) | (0.22) | |
| | borrower x FT | | | | | | -0.34** |
| | | | | | | | (0.16) |
| | borrower x not FT | | | | | | 0.44 |
| | | | | | | | (0.48) |
| | saver x FT | | | | | | 0.48** |
| | | | | | | | (0.23) |
| | saver x not FT | | | | | | 0.89* |
| | | | | | | | (0.49) |
| | worse off | 1.62*** | 1.49*** | 0.87*** | 0.96*** | 0.87*** | 0.87*** |
| | | (0.13) | (0.16) | (0.17) | (0.15) | (0.17) | (0.17) |
| Own | income | $-5.5e^{-7}$ | 0.008** | 0.004 | $-2.2e^{-6}$*** | 0.004 | 0.004 |
| situation | expectations | ($3.6e^{-7}$) | (0.003) | (0.003) | ($7.3e^{-7}$) | (0.003) | (0.003) |
| | unemp. risk | | 0.009*** | 0.003 | | 0.003 | 0.003 |
| | | | (0.003) | (0.004) | | (0.004) | (0.004) |
| | unemp rate ↑ | 0.03*** | 0.03*** | 0.02*** | 0.02*** | 0.02*** | 0.02*** |
| | | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Economic | stocks ↑ | -0.02*** | -0.03*** | -0.005* | -0.004* | -0.005* | -0.005* |
| outlook | | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| | interest rate ↑ | -0.01*** | -0.01*** | 0.004** | 0.004 | 0.003 | 0.003 |
| | | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) | (0.003) |
| Indiv. | full time (FT) | 0.04 | -0.11 | -0.65* | 0.19 | -0.65** | -0.52 |
| Controls | | (0.13) | (0.20) | (0.35) | (0.30) | (0.35) | (0.46) |
| | Other characteristics | Yes | Yes | Yes | No | No | No |
| | Fixed effects | Time | Time | Time Entity | Time Entity | Time Entity | Time Entity |
| | Observations | 46444 | 28193 | 28460 | 47011 | 28460 | 28460 |

**Table 3. Regression results using SCE data plus proxies from the Public Policy Survey**. This table collects the results of regressing $\mathbb{E}_t^j \pi_{t,t+12}$ on all regressors from the previous regressions plus the proxies for borrower and saver status extracted from the Public Policy Survey. White's heteroschedasticity robust estimator is used to obtain the parameter standard errors that appear in parentheses. Asterisks denote significance at the 10% (*), 5% (**), and 1% (***) levels.

to notice that savers that are not in full time work, i.e. for whom presumably their saving are their source of income, have a stronger, though less significant, effect on inflation

| Dependent variable: $\mathbb{E}_t^j \pi_{t,t+12}$ | | (1) | (2) | (3) | (4) |
|---|---|---|---|---|---|
| | Mortgagor | | -0.71*** | | -0.32*** |
| | | | (0.15) | | (0.12) |
| | NonMortgagor | 0.70*** | | 0.32*** | |
| | | (0.15) | | (0.12) | |
| | NegativeHousingWealth | | 1.88*** | | -0.28 |
| | | | (0.37) | | (0.24) |
| | infla_sensitive Share | -0.003 | -0.003 | -0.007 | -0.007 |
| | | (0.008) | (0.008) | (0.013) | (0.013) |
| | Saving Share stocks | -0.002 | -0.003 | -0.007 | -0.008 |
| | | (0.009) | (0.009) | (0.13) | (0.013) |
| | worse off | 0.85*** | 0.84*** | 0.51*** | 0.50*** |
| | | (0.26) | (0.26) | (0.17) | (0.17) |
| | income expectations | 0.0015** | 0.0015** | 0.0009** | 0.0009** |
| | | (0.007) | (0.007) | (0.0004) | (0.0004) |
| | unemployment up | 0.04*** | 0.04*** | 0.02*** | 0.02*** |
| | | (0.003) | (0.003) | (0.002) | (0.002) |
| Economic Controls | stocks up | -0.01*** | -0.01*** | -0.008** | -0.008** |
| | | (0.003) | (0.003) | (0.003) | (0.003) |
| | interest rate up | -0.02*** | -0.02*** | -0.009*** | -0.01*** |
| | | (0.003) | (0.003) | (0.002) | (0.002) |
| | housePriceEval | $1.2e^{-7}$ | $1.4e^{-7}$ | $-9.9e^{-8}$** | $-1.0e^{-7}$* |
| | | $(1.0e^{-7})$ | $(1.0e^{-7})$ | $(5.3e^{-8})$ | $(5.3e^{-8})$ |
| Individual Controls | full time | -0.22 | -0.27 | 0.29 | -0.29 |
| | | (0.25) | (0.25) | (0.25) | (0.25) |
| | Other individual characteristics | Yes | Yes | Yes | Yes |
| | Fixed effects | Time | Time | Time | Time |
| | Sample | Trimmed | Trimmed | Fin. literate | Fin. literate |
| | Observations | 21242 | 21233 | 13081 | 13081 |

**Table 4. Regression results using SCE data plus proxies from the Household Finance Survey**. This table collects the results of regressing $\mathbb{E}_t^j \pi_{t,t+12}$ on all regressors from the previous regressions plus data from the Household Finance Survey. White's heteroschedasticity robust estimator is used to obtain the parameter standard errors that appear in parentheses. Asterisks denote significance at the 10% (*), 5% (**), and 1% (***) levels.

expectations from their status as savers. The wedge between the inflation expectations of savers and borrowers is confirmed also when we use the data on the financial situation of the respondents collected in the Household Finance Survey, conducted yearly by the New York Fed between 2014 and 2019. Unfortunately their are not enough observations for each individual to introduce individual fixed effects, so we only be able to run the regressions with time fixed effects and controls for individual characteristics, such as age, income, education. These results are reported in Table 4. Also with this data we find that respondents who have a mortgage report significantly lower expectations, while not having a mortgage is associated to higher expectations.

# 4 A Model of Savers' Expectations

The observed wedge between the inflation expectations of savers and borrowers obtains naturally if we model them as ambiguity averse. A saver whose wealth is, at least in part, held in nominal assets will be worse off the higher the future level of inflation. Conversely a borrower will see the real value of the sums he owes reduced by future high inflation. Low inflation thus represents his worst-case scenario.

We present a very simple overlapping-generations model to study the life-cycle behavior of borrowing and saving and its impact on inflation expectations under ambiguity aversion. The economy comprises a continuum of agents $i$ who live for three periods. In each period $t$ a third of the agents will be young ($y$), a third will be middle-aged ($m$), and a third old ($o$). At the end of the period old agents die out and are replaced by a new cohort of young. Within each cohort, agents will have the same wealth and make the same decisions. So we ultimately only need to model a representative agent for each cohort.

It is easiest to start by considering the problem of an old agent, who will maximize:

$$V_{o,t}\left(a_{m,t-1}\right) = \max_{c_{o,t},a_{o,t}} \log\left(c_{o,t}\right), \tag{2}$$

$$\text{s.t.} \quad c_{o,t} + a_{o,t} \leq \frac{1+i_{t-1}}{e^{\pi_t}} a_{m,t-1}, \tag{3}$$

$$a_{o,t} \geq 0. \tag{4}$$

An old consumer starts the period off with wealth $a_{m,t-1}$, i.e. the savings of a middle-aged agent from period $t-1$. The old consumer's income equals those savings plus the accrued real interest rate $\frac{1+i_{t-1}}{e^{\pi_t}} a_{m,t-1}$, where $i_{t-1}$ is the nominal rate from the previous period[1] and $\pi_t$ the inflation rate.[2] The old representative consumer can either consume ($c_{o,t}$) her income or potentially save it ($a_{o,t}$) - we assume log utility for simplicity. She cannot borrow in the last period of her life. It will also never be optimal to save either, insofar as she does not care for her descendants. So the solution to her optimization problem is trivial, with $c_{o,t} = \frac{1+i_{t-1}}{e^{\pi_t}} a_{m,t-1}$ and $a_{o,t} = 0$. Ambiguity aversion does not play any role in the decision of an old agent because her decision is not forward looking. Importantly, though, an old agent's utility is decreasing in the level of inflation $\pi_t$.

[1] We assume the interest rate follows $i_t = \phi \pi_t$.

[2] We actually model the log of inflation as it naturally comes out of a linearized Phillips curve. Which is why we express headline inflation as $e^{\pi_t}$, which rests on the maintained assumption of zero steady state inflation.

A type-m consumer faces the following problem:

$$V_{m,t}\left(a_{y,t-1}\right) = \max_{c_{m,t},a_{m,t}} \log\left(c_{m,t}\right) + \beta \min_{\mu_{t+1}\in[-\overline{\mu},\overline{\mu}]} \mathbb{E}_t V_{o,t+1}\left(a_{m,t}\right), \tag{5}$$

$$\text{s.t.} \qquad c_{m,t} + a_{m,t} \leq \frac{1+i_{t-1}}{e^{\pi_t}} a_{y,t-1} + w_t - T_t, \tag{6}$$

$$a_{m,t} \geq -\overline{d}. \tag{7}$$

A middle-aged consumer decides her consumption level ($c_{m,t}$) and savings ($a_{m,t}$) based on her start-of-the-period wealth ($a_{y,t-1}$) and her labor income $w_t$ net of the lump-sum taxes she pays to finance the production subsidy. Middle-aged agents provide one unit of labor inelastically. They are subject to a borrowing constraint $-\overline{d}$, for some $\overline{d} > 0$. Their optimization problem includes the continuation value represented by the expected utility of an old agent in period $t+1$. In this model (the log of) inflation follows a simple autoregressive process in equilibrium - details below:

$$\pi_t = \rho_\pi \pi_{t-1} + u_t, \qquad 0 < \rho_\pi < 1, \tag{8}$$

where $u_t \sim \mathcal{N}\left(0, \sigma_u^2\right)$ is a cost-push shock. Agents are ambiguous in that they entertain a family of distributions for $u_t$, with different means, $u_t \sim \mathcal{N}\left(\mu_t, \sigma_u^2\right)$. Moreover, they cannot attach a prior probility to $\mu_{t+1}$ over the interval $[-\overline{\mu},\ \overline{\mu}]$, for some $\overline{\mu} > 0$.[3] Being ambiguity averse, they solve a min-max problem. They act under the assumption that $\mu_{t+1}$ will take on the value that makes them worst off, over the interval $[-\overline{\mu},\ \overline{\mu}]$. In other words they make their consumption-saving decision as if inflation followed the law of motion $\tilde{\pi}_{t+1} = \rho_\pi \pi_t + u_{t+1} + \mu_{t+1}$.

The solution to the minimization problem is trivial. $a_{m,t}$ will always optimally be chosen to be strictly positive as the marginal utility of consumption, $c_{o,t+1}^{-1}$, converges to infinity as the consumption of the old-type goes to zero. So then $\mathbb{E}_t V_{o,t+1}\left(a_{m,t}\right)$ will be strictly decreasing in the level of future inflation. The worst case scenario will thus correspond to $\mu_{t+1} = \overline{\mu} > 0$. We have thus established that the middle-aged type will be a saver ($a_{m,t} > 0$) and that her inflation expectations will exceed a purely rational benchmark.

As for the maximization, consumption and savings are pinned down by the following Euler equation:

$$c_{m,t}^{-1} = \beta \mathbb{E}_t \frac{1+i_t}{e^{\tilde{\pi}_{t+1}}} c_{o,t+1}^{-1}, \tag{9}$$

where we have used the envelope condition $\frac{\partial V_{o,t}}{\partial a_{m,t-1}} = \frac{1+i_{t-1}}{e^{\pi_t}} c_{o,t}^{-1}$ and used the worst-case process for inflation $\tilde{\pi}_t$. Combining this with the budget constraint obtains the level of

[3] Our findings do not require the interval to be symmetric around zero.

assets and consumption as a function of the disposable income of the middle aged:

$$a_{m,t} = \frac{1}{1+\beta^{-1}e^{\overline{\mu}}}\left(\frac{1+i_{t-1}}{e^{\pi_t}}a_{y,t-1}+w_t\right), \tag{10}$$

$$c_{m,t} = \frac{\beta^{-1}e^{\overline{\mu}}}{1+\beta^{-1}e^{\overline{\mu}}}\left(\frac{1+i_{t-1}}{e^{\pi_t}}a_{y,t-1}+w_t\right). \tag{11}$$

It is worth noting that an ambiguity-averse worker will save less and consumer more of her disposable income than a purely rational one as $e^{\overline{\mu}} > 1$. Moreover, her disposable income – the term in brackets – is increasing in inflation so long as she borrowed while young ($a_{y,t-1} < 0$).

Young agents enter the economy with zero wealth and no income and face the following problem:

$$V_{y,t}(0) = \max_{c_{y,t},a_{y,t}} \log(c_{y,t}) + \beta \min_{\mu_{t+1}\in[-\overline{\mu},\overline{\mu}]} \mathbb{E}_t V_{m,t+1}(a_{y,t}), \tag{12}$$

$$\text{s.t.} \quad c_{y,t} + a_{y,t} \leq 0 \tag{13}$$

$$a_{y,t} \geq -\overline{d}. \tag{14}$$

Clearly, a young agent will borrow, as her marginal utility goes to infinity as her consumption level approaches zero. This means that her expected disposable income as a middle-aged person is increasing in the level of expected inflation. So her worst-case scenario correspoands to $\mu_{t+1} = -\overline{\mu}$. We will maintain that the borrowing constraint is sufficiently tight to be binding ($a_{y,t} = -\overline{d}$ ).
The supply side is extremely simple A continuum of firms $f \in [0,1]$ compete monopolistally and face the following demand function: $Y_{f,t} = \left(\frac{P_{f,t}}{P_t}\right)^{-\epsilon} Y_t$. Firms are subject to a Rotemberg (1982) quadratric price adjustment cost $\Gamma_{f,t} = -\frac{\vartheta}{2}\left(\frac{P_{f,t}}{P_{f,t-1}}-1\right)^2 Y_{f,t}$. Production is linear in labor, with production function $Y_{f,t} = A_t N_{f,t}$. Labor supply is fixed and the real wage set to $w_t = A_t$. The firm marginal cost of firms, net of the production subsidy, is $MC_{f,t} = (1-\tau_t)\frac{W_t}{A_t} = (1-\tau_t)$. We model $(1-\tau_t)$ as a exogenous process around its optimal value, or $(1-\tau_t) = (1-1/\epsilon)\Xi_t$, where $\xi_t = \log(\Xi_t)$, $\xi_t = \rho_\xi \xi_{t-1} + u_t^\xi$.

Marginal cost is exogenous and proportional to $\Xi_t$, so the log-liner Phillips curve can be written out as:

$$\pi_t = \kappa\xi_t + \beta\mathbb{E}_t\pi_{t+1}. \tag{15}$$

Which implies that $\pi_t = \frac{\kappa}{1-\beta\rho_\xi}\xi_t$, i.e. that (the log of) inflation is an AR(1) process as posited above.
The model is closed by the resource constraint, $Y_t(1-\Gamma_t) = c_{o,t}+c_{m,t}+c_{y,t}$, and by clearing on the asset market, $a_{y,t}+a_{m,t}+a_{o,t} = 0$, which pins down $a_{m,t} = \overline{d}$.

# 5 Conclusions

Households' subjective inflation expectations display features that are difficult to make sense of in the context of the full information rational expectations paradigm. They are significantly upward biased and show a counterintuitive positive correlation between expected unemployment and expected inflation. In this paper we present another fact: the households' expectations depend on their financial situation, and in particular on whether the are borrowers and/or savers.

We merge data from the Survey of Consumer Expectations with data from the Public Policy Survey and the Survey of Household Finance, which provide a more detailed account of the respondents personal finances, and show that savers will have on average higher inflation expectations than borrowers. This result is robust regardless of the level of financial literacy of the respondents, and holds even after controlling for the usual demographic factors and other plausible drivers of inflation expectations, as the respondents' expectations about the economic outlook.

Assuming that agents are ambiguity averse and are uncertain, in a Knightian sense, regarding the future path for inflation can help rationalize many puzzling features of inflation expectations. Masolo and Monti (2021) show that in can make sense of the bias in the expectations and here we show that it can explain both this wedge between the inflation of savers and borrowers and the puzzle of the "stagflationary" expectations.

## References


Armantier, O., G. Topa, W. van der Klaauw, and B. Zafar (2017): "An Overview of the Survey of Consumer Expectations," *FRBNY Economic Policy Review*.

Bhandari, A., J. Borovička, and P. Ho (2023): "Survey Data and Subjective Beliefs in Business Cycle Models," .

Binder, C. C. (2015): "Whose expectations augment the Phillips curve?" *Economics Letters*, 136, 35–38.

Bruine de Bruin, W., W. van der Klaauw, J. S. Downs, B. Fishhof, G. Topa, and O. Armatier (2010): "Expectations of Inflation: The Role of Demographic Variables, Expectation Formation, and Financial Literacy," *Journal of Consumer Affairs*, 44, 381–402.

Candia, B., O. Coibion, and Y. Gorodnichenko (2023): "Chapter 11 - The macroeconomic expectations of firms," in *Handbook of Economic Expectations*, ed. by R. Bachmann, G. Topa, and W. van der Klaauw, Academic Press, 321–353.

Carroll, C. D. (1997): "Buffer-Stock Saving and the Life Cycle/Permanent Income Hypothesis," *The Quarterly Journal of Economics*, 112, 1–55.

Carroll, C. D., J. Slacalek, and M. Sommer (2019): "Dissecting Saving Dynamics: Measuring Wealth, Precautionary, and Credit Effects," Working Paper 26131, National Bureau of Economic Research.

Coibion, O., D. Georgarakos, Y. Gorodnichenko, and M. van Rooij (2023): "How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial," *American Economic Journal: Macroeconomics*, 15, 109–52.

Coibion, O. and Y. Gorodnichenko (2015): "Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation," *American Economic Journal: Macroeconomics*, 7, 197–232.

Coibion, O., Y. Gorodnichenko, and T. Ropele (2019): "Inflation Expectations and Firm Decisions: New Causal Evidence," *The Quarterly Journal of Economics*, 135, 165–219.

D´Acunto, F., U. Malmandier, J. Ospina, and M. Weber (2021): "Exposure to Grocery Prices and Inflation Expectations," *Journal of Political Economy*, 129 (5).

Doepke, M. and M. Schneider (2006): "Inflation and the Redistribution of Nominal Wealth," 114, 1069–1097.

Epstein, L. G. and M. Schneider (2003): "Recursive multiple-priors," *Journal of Economic Theory*, 113, 1–31.

Ilut, C. and M. Schneider (2023): "Chapter 24 - Ambiguity," in *Handbook of Economic Expectations*, ed. by R. Bachmann, G. Topa, and W. van der Klaauw, Academic Press, 749–777.

Malmendier, U. and S. Nagel (2015): " Learning from Inflation Experiences *," *The Quarterly Journal of Economics*, 131, 53–87.

Masolo, R. M. and F. Monti (2021): "Ambiguity, Monetary Policy and Trend Inflation," *Journal of the European Economic Association*, 19, 839–871.

Michelacci, C. and L. Paciello (2024): "Ambiguity Aversion and Heterogeneity in Households' Beliefs," *American Economic Journal: Macroeconomics*, 16, 95–126.

Rotemberg, J. J. (1982): "Monopolistic Price Adjustment and Aggregate Output," 49, 517.

Weber, M., F. D'Acunto, Y. Gorodnichenko, and O. Coibion (2022): "The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications," *Journal of Economic Perspectives*, 36, 157–84.