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Working Paper

Eliciting expectation uncertainty from private households

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Eliciting Expectation Uncertainty from Private Households*

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Abstract

Recently, much attention has been devoted to the measurement of macroeconomic (expectation) uncertainty and its impact on aggregate economic fluctuations. This paper presents a new qualitative measure of macroeconomic expectation uncertainty based on data from a German online survey of consumer expectations. I document that the survey design works well. Elicited expectation uncertainty is related to data volatility and conventional measures of uncertainty as expected. Its dependency on socioeconomic factors is in line with previous evidence based on quantitative uncertainty measures. The new measure offers a very efficient way of eliciting expectation uncertainty and can be used to obtain uncertainty measures on many different expectations at low cost.

JEL Classification: D84, C83

Keywords: macroeconomic expectations, expectation uncertainty, density expectations

1 Introduction

At least since the Great Recession and the seminal paper by [Bloom \(2009\)](#), much attention has been devoted to the impact that macroeconomic (expectation) uncertainty has on aggregate economic fluctuations. Recently, for example, [Coibion et al. \(2021\)](#) provide causal evidence that higher macroeconomic uncertainty leads private households to reduce spending in subsequent months. Expectation uncertainty is also a relevant factor when

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discussing the anchoring of expectations, for instance, in the context of an inflation target (Dovern and Kenny, 2020). Unfortunately, since uncertainty is inherently unobservable, it is not trivial to measure macroeconomic expectation uncertainty.

This paper presents evidence on macroeconomic expectation uncertainty for private households in Germany based on data from a new online survey of consumer expectations. In particular, it shows that a simple qualitative measure of expectation uncertainty, which is based on a qualitative scale with five answer options, exhibits desirable properties. The measure is a cost-effective option to elicit expectation uncertainty for a wide range of (macroeconomic) variables. Maybe even more important than cost-effectiveness is that the survey design does not ask too much of panelists because answering the question used to elicit uncertainty does not require any complex reasoning or any explicit knowledge of probability theory. Thereby, it is likely that the survey design produces little cognitive uncertainty (Enke and Graeber, 2019).

Different approaches have been proposed in the literature to measure macroeconomic (expectation) uncertainty. First, uncertainty can be measured from financial markets, in particular option prices (e.g., by looking at the VIX or comparable indices). Second, uncertainty can be measured from media publications by using text-mining methods (Baker et al., 2016). Third, statistical models can be used to approximate uncertainty by the conditional variance(s) of the unpredictable component(s) of macroeconomic variables (Jurado et al., 2015). Finally, and in the spirit of this paper, uncertainty can be estimated from survey-based expectation data. The advantage of such an approach is that it provides subjective uncertainty of the relevant agents (e.g., private households) and an *ex ante* measure. When only information about point forecasts is available, the dispersion of these point forecasts can serve as a proxy of expectation uncertainty that, however, is very imperfect (Lahiri and Sheng, 2010). Binder (2017) argues that agents might use multiples of numbers like five or ten when providing point forecasts in surveys to indicate that they are uncertain about the outcome variable they have to forecast. She shows that such measure is correlated with uncertainty measures based on density forecasts. More recently, more and more data sets with so-called probabilistic expectations have become

available; such data can be used to compute direct uncertainty measures such as the variance of density expectations (Giordani and Söderlind, 2003). This approach has the disadvantage that it relies on the assumption that survey subjects have well-defined probabilistic expectations and are able to state these in a survey. Since both assumptions might be questionable for certain subjects—like, for instance, private households—qualitative measures that can be elicited easier are potentially good alternatives.

Alternative survey approaches that demand less knowledge about probabilistic thinking have recently been tested in firm surveys. Since 2017 a survey among German firms run by the ifo Institute in Munich asks firms to state their uncertainty with respect to their own business development on a visual analogue scale ranging from “very certain” to “very uncertain” (Lautenbacher, 2021). The Survey of Business Uncertainty in the US (Altig et al., 2022) that was established in 2014 asks firms to attach probabilities to five scenarios (chosen by the firm itself) for an outcome variable; uncertainty is then calculated as the probability weighted standard deviation across the five scenarios. This approach has been adopted by the U.K. Management and Expectation Survey in 2017. An example of a complementary survey design to measure uncertainty in a *household* survey is presented by Coibion et al. (2021). They measure uncertainty based on the difference between a worst case scenario and a best case scenario that panelists are asked to provide in a new consumer expectation survey run by the European Central Bank (ECB).

In 2019, the *Deutsche Bundesbank* launched three pilot waves of a new Online Survey of Consumer Expectations. These surveys contained a number of questions that (directly or indirectly) elicited uncertainty associated with expectations of various macroeconomic variables, including a new qualitative measure that I proposed to elicit expectation uncertainty for six different macroeconomic variables. This paper serves three purposes. First, it presents a descriptive plausibility check for the new measure and describes how it is systematically affected by socioeconomic factors and media consumption. Second, it investigates how the relative reported uncertainty across variables relates to the volatility/predictability of the target variables. Third, it investigates how the qualitative uncertainty measures with respect to inflation and home price expectations relate to the

forecast error variances measured from density forecasts which have also been elicited in the pilot surveys.

The remainder of the paper is organized as follows. Section 2 describes the survey data. Section 3 provides descriptive summary statistics. Section 4 analyzes how—in the cross-section—the reported qualitative measure of expectation uncertainty is related to the corresponding expected forecast error variance implied by density forecasts (for inflation and home price expectations). Section 5 analyzes how the reported uncertainty is affected by socioeconomic factors. Section 6 analyzes whether differences in the way how households inform themselves about economic issues affects expectation uncertainty. Section 7 analyzes the correlation between the reported uncertainty levels for the different macroeconomic variables and their volatility/predictability. Finally, Section 8 concludes.

2 Data

The *Deutsche Bundesbank* conducted three pilot waves of a new Online Survey of Consumer Expectations between April 2019 and July 2019.¹ The sample sizes (number of respondents who completed the survey) were, respectively, 2009, 2052, and 2592. A certain fraction of respondents was surveyed in either all three or two of the three waves. The survey was conducted by the polling company “forsa” and panelists were recruited from an established random sample of the German population. Individual questions are not incentivized but panelists receive a small compensation for properly completing the survey.

In addition to the usual information about household characteristics such as income levels and education background, I will make use of two types of questions that help assess the level of expectation uncertainty which households report. First, the surveys contained a question that asks panelists to report the perceived uncertainty associated with their predictions for different macroeconomic variables on a qualitative scale from 1 (“very uncertain”) to 5 (“very certain”). Specifically, the surveys asked

¹The first survey wave was conducted between April 30 and May 8, the second wave between May 29 and June 11, and the final wave between June 19 and July 3.

One more question concerning your assessment of the wider economic development in Germany. The point is to assess how certain you feel when making predictions for individual economic developments.

How certain are you when it comes to predicting ...

- a the unemployment rate twelve months from now;
- b real GDP growth over the next twelve months;
- c the development of stock market prices over the next twelve months;
- d inflation over the next twelve months;
- e the interest rate (for overnight money) twelve months from now;
- f the development of home prices over the next twelve months.²

Respondents could answer with “very uncertain” (1), “somewhat uncertain” (2), “neither uncertain nor certain” (3), “somewhat certain” (4), or “very certain” (5).

The second type of question which I rely on asks respondents to report their density expectations in form of interval probabilities. From these data one can compute the variance of the predictive density as a measure of expectation uncertainty. Specifically, the surveys (wave 2 and 3) asked about the inflation rate in twelve months:

How likely do you think the inflation rate will develop as follows during the next twelve months?³

Respondents were then asked to assign values between 0 (“absolutely unlikely”) and 100 (“absolutely certain”) to the following intervals and were reminded that the sum of the assigned values should be equal to 100.

- The rate of deflation (opposite of inflation) will be 12 % or higher;
- the rate of deflation (opposite of inflation) will be between 8 % and 12 %;
- the rate of deflation (opposite of inflation) will be between 4 % and 8 %;
- the rate of deflation (opposite of inflation) will be between 2 % and 4 %;
- the rate of deflation (opposite of inflation) will be between 0 % and 2 %;
- the inflation rate will be between 0 % and 2 %;
- the inflation rate will be between 2 % and 4 %;

²Own translation. The survey was conducted in German. The exact wording is available upon request.

³Again own translation. The exact wording is available upon request.

- the inflation rate will be between 4 % and 8 %;
- the inflation rate will be between 8 % and 12 %;
- the inflation rate will be 12 % or higher;

An analogous question about the development of home prices over the next twelve months was asked in the third wave of the survey. Unfortunately, this type of question has not been asked for the other variables covered by the questions that ask for a qualitative assessment of expectation uncertainty.

Comparing the two methods for eliciting uncertainty, it is evident that the approach based on the qualitative uncertainty scale is more cost-effective in terms of the survey-time needed and the cognitive burden imposed on the panelists (see also next section).⁴

3 Descriptive Statistics

To analyze whether the survey design was chosen appropriately and the elicited data are plausible it is useful to look at some descriptive statistics for the qualitative uncertainty measure. When giving a qualitative assessment of their subjective expectation uncertainty, the respondents use all possible answer categories, although the extreme options (“very uncertain” and especially “very certain”) are only infrequently used (Table 1). Overall, roughly 10 % of answers are “very uncertain” and only 2 % “very certain”. Approximately one third of respondents state that they are “neither uncertain nor certain” and the remaining 50 % are equally distributed to “somewhat uncertain” and “somewhat certain”.

The fact that one third of the panelists choose the middle option might indicate that they regard it as an implicit default option or, even more problematic, might use it to indicate that they are extremely uncertain. While I cannot test those hypotheses given our

⁴The new measure demands that panelists answer one question by ticking one of five boxes. This is a rather quick exercise. In contrast, panelists have to answer the probabilistic question by entering probabilities for ten predefined intervals after reading a rather long explanation about probabilities. Even abstracting from the cognitive burden of dealing with probabilities, filling out this will take much longer than answering the qualitative question. Note that the *Deutsche Bundesbank* did not record how long it actually took panelists to answer individual questions.

data,⁵ I believe there are two pieces of evidence described in the next section that suggest that panelists did not treat this answer option as a special one. First, I show that panelists who choose this option for inflation do not produce larger forecast errors than expected for an uncertainty level that is in-between “somewhat certain” and “somewhat uncertain”. Second, I show that the average variance of the probabilistic density expectations for inflation are monotonically declining in the qualitative uncertainty measure. Still, this issue remains a limitation of this study.

Table 1: Frequency of Answers for Qualitative Uncertainty Questions

	(1)	(2)	(3)	(4)	(5)
Total	0.09	0.27	0.35	0.26	0.02
Wave 1	0.10	0.27	0.35	0.26	0.02
Wave 2	0.09	0.28	0.34	0.27	0.03
Wave 3	0.09	0.26	0.36	0.26	0.02
Men	0.07	0.25	0.34	0.30	0.03
Women	0.12	0.29	0.37	0.21	0.01
High education	0.09	0.28	0.37	0.23	0.02
Low education	0.09	0.24	0.32	0.32	0.03
High income	0.11	0.28	0.36	0.23	0.02
Low income	0.07	0.26	0.34	0.30	0.03
Employed	0.13	0.26	0.32	0.26	0.03
Not employed	0.09	0.26	0.36	0.27	0.03
Below 30	0.08	0.29	0.35	0.26	0.02
30 to 60	0.09	0.26	0.35	0.27	0.03
Above 60	0.09	0.29	0.35	0.25	0.02

Notes: Answers range from “very uncertain” (1) to “very certain” (5).

The distribution of answers is very stable across waves which is reassuring since one would not expect major shifts in the households’ uncertainty assessment during the short time period of a little more than two months during which the three surveys were conducted.

There is also remarkably little variation in terms of the distribution of answer shares across different types of respondents; overall the shares do not depend substantially on gender, educational background, household income, employment status, or age. Notable

⁵In the future, it would be interesting to investigate this issue by i) randomizing the order of answer options, randomly changing the number of answer categories (including even numbers), or changing the wording of the answer options.

differences are that men (3 %) report more often than women (1 %) being “very certain” and also more often being “somewhat certain” (30 % vs. 21 %).

Perceived uncertainty is higher for those households that report that they found answering the survey rather difficult. To establish this fact, I use information from a question that asks panelists to report how difficult they found answering the survey overall on a five-point scale ranging from “very difficult” (1) to “very easy” (5). Controlling for wave fixed effects, a regression of the average perceived uncertainty (for each household and across all variables included in the qualitative uncertainty question) on the perceived survey difficulty yields a coefficient of 0.18 that is highly significantly different from zero. The coefficient means that a household that perceives the survey to be very difficult reports, on average, perceived uncertainty that is 0.72 points higher compared to a household that perceives the survey to be very easy to answer. A clear additional indication that the qualitative question design is easier to answer for households are dropout rates. Less than 1 % of panelists refused to answer the six qualitative question on macroeconomic uncertainty and chose either the I-do-not-know option or the I-do-not-want-to-answer option. In contrast, this happened for 4.4 % of panelists in the case of the probabilistic question about inflation expectations and for 4.2 % of panelists in the case of the probabilistic question about home price expectations. Although I can only report these observed correlations instead of estimates of causal effects, the result tentatively suggests that cognitive uncertainty ([Enke and Graeber, 2019](#)) plays a role in this survey, too.

There is major variation in terms of the distribution of answer shares across different macroeconomic variables (Figure 1). Interestingly, the differences confirm plausible priors in the sense that respondents state more often that they are somewhat or very uncertain for volatile variables such as stock prices and GDP growth compared to more persistent variables like the unemployment rate, inflation, and to some extent also the interest rate⁶. This pattern is also stable across the three survey waves. While these results imply that respondents do not simply give the same answer for all six macroeconomic variables, it is of interest to investigate how large the correlations between one respondent’s answers is.

⁶For a more rigorous analysis of this correlation, see Section 7 below.

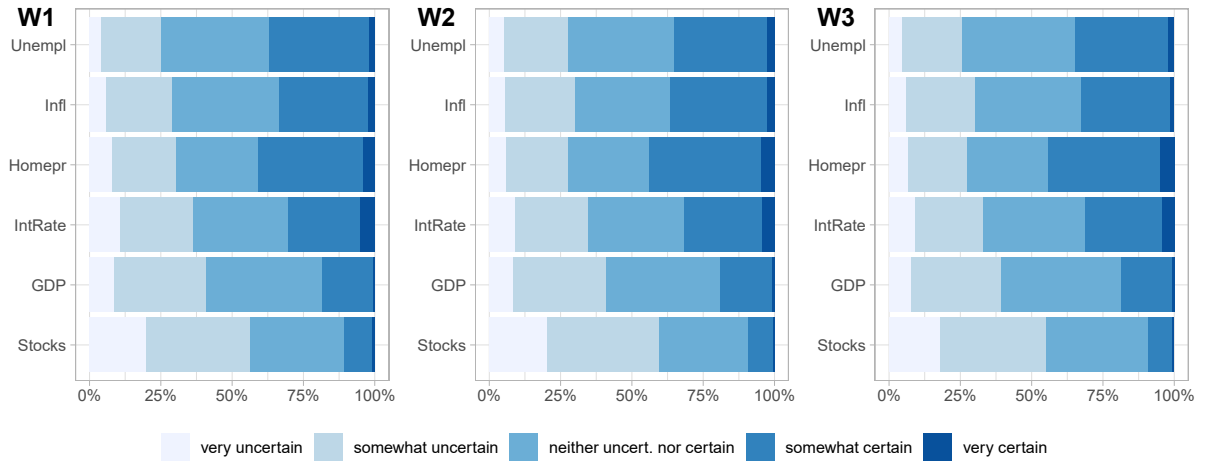


Figure 1: Uncertainty Assessment for Different Macroeconomic Expectations

For the full sample the Kendall rank correlation coefficients indicate substantial positive correlations for all pairwise comparisons that range from 0.19 for stocks vs. home prices to 0.43 for inflation vs. unemployment (Table 2).

Table 2: Correlation of Answers across Variables

	Unempl	GDP	Stocks	Infl	IntRate	Homepr
Unempl	1.00					
GDP	0.39	1.00				
Stocks	0.22	0.36	1.00			
Infl	0.43	0.41	0.25	1.00		
IntRate	0.34	0.34	0.23	0.44	1.00	
Homepr	0.33	0.29	0.19	0.41	0.37	1.00

Notes: Numbers are Kendall rank correlation coefficients computed based on information from all three survey waves.

Since some of the respondents are included in more than one wave, it is also possible to look at the persistence of their answers across time. Table 3 shows the transition probabilities that I obtain by pooling answers for all variables and from all waves. The table shows the observed frequencies of going from the answer indicated by the rows in one survey wave to the answers indicated by the columns in the subsequent survey wave. The likelihood of sticking to the exact same answer is surprisingly low with all five entries on the main diagonal being below 50 %. On the one hand, this is somewhat worrying in terms of consistency of intra-personal consistency since the different survey wave were conducted in close temporal proximity and the fundamental macroeconomic

environment did not change in-between waves. On the other hand, it not too surprising given that we know how much measurement error comparable household surveys produce when expectation data is elicited. Reassuring is also that the answer behavior of most respondents is consistent as indicated by the low probabilities of switching from one extreme answer to the opposite. The frequency, for instance, by which respondents who answer “very certain” in one wave switch to “very uncertain” in the next wave is only 6 %—that of going the opposite way even lower at 2 %. Overall, the set of descriptive statistics provides no evidence that the survey design has led to unplausible outcomes.

Table 3: Transition Probabilities

	(1)	(2)	(3)	(4)	(5)
very uncertain (1)	0.36	0.33	0.21	0.09	0.02
somewhat uncertain (2)	0.10	0.41	0.34	0.15	0.01
neither uncert. nor certain (3)	0.05	0.25	0.46	0.22	0.01
somewhat certain (4)	0.02	0.15	0.29	0.49	0.04
very certain (5)	0.06	0.09	0.10	0.52	0.23

Notes: Numbers are transition probabilities estimated from all subjects for which responses from different waves are available. Answers range from “very uncertain” (1) to “very certain” (5).

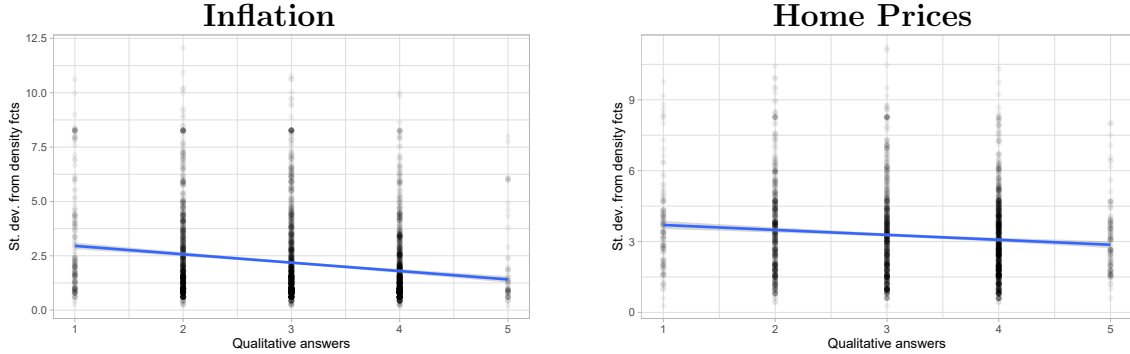
4 Qualitative vs. Quantitative Expectation Uncertainty

A useful new measure of expectation uncertainty should be correlated with other commonly used uncertainty measures. One popular approach to measure expectation uncertainty in surveys is to elicit density forecasts and to compute expected forecast error variances based on these. This approach, however, might have some drawbacks in the case of household surveys. First, answering this type of question is very demanding for private households who presumably have little practice in thinking in a probabilistic way (see discussion on cognitive uncertainty above). Second, respondents might not even have well-defined probabilistic expectations (see [Manski, 2018](#); [Bachmann et al., 2020](#)). The data from the Online Survey of Consumer Expectation allows to investigate how this common measure of expectation uncertainty relates to the new qualitative measure. Because

density forecasts are only available for inflation and (in the third wave) home prices, I focus on these two variables in this section.

To compute the expected forecast error variance from the elicited interval probabilities I follow the commonly used approach that assumes that all probability mass assigned to a particular interval is located at the mid point of this interval.

I then compare the resulting forecast error variance for each respondent to her reported qualitative assessment of inflation expectation uncertainty. The two measures are correlated such that, indeed, respondents that report to be relatively certain about their inflation expectations report, on average, density inflation forecasts with a lower variance (Figure 2).⁷ Each dot represents one observation (pooling across waves) and the blue line indicates the slope of a linear regression.⁸ The average standard deviation of the density inflation (home price) expectations is 3.19 (3.68) for those respondents who report that they are “very uncertain” about the inflation (home price) outlook while is only 1.92 (3.10) for those who say that they are “very certain” about the outlook.



Notes: Answers displayed on the horizontal axes range from “very uncertain” (1) to “very certain” (5). The intensity of the color of each dot represents the number of observations with identical outcomes. The blue line indicates the slope of a linear regression of the standard deviation of the density forecasts on the reported qualitative uncertainty. Households who use only one bin when reporting their density forecast are excluded from the analysis.

Figure 2: Quantitative versus Qualitative Measures of Expectation Uncertainty

⁷For this analysis, I excluded those households with a forecast error variance of zero, i.e., with all probability mass allocated to one single interval. Results do not change much if I include also those cases.

⁸The slopes are -0.39 with a standard error of 0.03 for inflation and -0.21 with a standard error of 0.04 for home prices.

Looking at subgroups of the respondents reveals that the correlation is much stronger for those with at least a high school degree in the case of home prices and larger for women than for men in the case of inflation.

Another benchmark against which the new measure can be evaluated is the uncertainty measure proposed by [Binder \(2017\)](#) that makes use of point forecasts. Since the survey used for this paper does only contain point forecasts for the inflation rate, home prices (only in the two last waves) and saving and mortgage interest rates (only in the second wave), I have to focus on those outcome variables. Following [Binder \(2017\)](#), I construct indicators that measure whether panelists provide point forecasts that are a multiple of 5 % or not for these four variables. I regress the qualitative uncertainty measure on those indicators (linking uncertainty on future interest rate for overnight money to the rounding indicators of both types of interest rates point forecasts), controlling for wave fixed effects. The results show that the correlation is as expected (Table 4). Households that provide rounded point forecasts for a variable indicate lower certainty levels. The association is larger for inflation (-0.42) and mortgage rates (-0.30) than for home prices (-0.06) and saving rates (-0.01), the latter being not significantly different from 0.

A final check against quantitative information is to analyze whether respondents who report high uncertainty ex ante produce large forecast errors ex post.⁹ Point forecasts are available for the inflation rate. I calculate forecast errors by subtracting the inflation rate from twelve month after the respective survey month.¹⁰ It turns out that (abstracting from the rather small group of responses indicating extremely low inflation uncertainty) indeed panelists who report relatively high uncertain produce also rather large forecast errors (Table 5). One potential reason behind the fact that panelists who report to be very certain about future inflation produce very large forecast errors might be that their statements of about (un-)certainty are influenced by overconfidence ([Clements, 2014](#)).

⁹In a sense, this makes only sense if records of long sequences of forecasts are available. Still, for tentative evidence we can look at this association for the available sample from only three waves (covering the period between late-April and early-July 2019).

¹⁰This means that I match the inflation rates from April 2020 to July 2020.

Table 4: Uncertainty and Rounding of Point forecasts

	Inflation	Home prices	Saving rate	Mortg. rate
Dwave2	0.02 (0.03)			
Dwave3	−0.05+ (0.03)	−0.01 (0.03)		
Round. inflation	−0.42*** (0.03)			
Round. home price		−0.06+ (0.04)		
Round. saving rate			−0.01 (0.05)	
Round. saving rate				−0.30*** (0.06)
Constant	3.08*** (0.02)	3.24*** (0.03)	2.94*** (0.03)	3.00*** (0.03)
Num.Obs.	6435	3773	1999	1922
R2	0.023	0.001	0.000	0.012

Note:

⁺p<0.1; *p<0.05; **p<0.01; ***p<0.001

The dependent variables are the qualitative uncertainty measure for the respective variables. The rounding dummies indicate whether a panelist provides a corresponding point forecast that is a multiple of 5 %.

Table 5: Qualitative Uncertainty and Forecast Errors

	(1)	(2)	(3)	(4)	(5)
MAE	5.62	3.55	2.59	1.86	3.53
RMSE	10.53	8.74	6.42	3.58	9.83
Observations	166	786	1140	1148	63

Notes: Subsamples defined based on reported inflation uncertainty ranging from “very uncertain” (1) to “very certain” (5).

5 Expectation Uncertainty and Socioeconomic Factors

For other surveys it has been documented that socioeconomic factors predict a certain fraction of the variation of reported macroeconomic expectation uncertainty ([Ferland et al., 2018](#); [Krüger and Pavlova, 2020](#); [Federal Reserve Bank of New York, 2019](#)).

To investigate whether there are similar differences due to socioeconomic factors in the qualitative uncertainty measure, I estimate a linear regression model for each macroeconomic variable.¹¹ I use these models to explain the variation in survey responses by a number of variables that are informative about the character of the responding household (head). In particular, I include in the model i) a discrete measure of household income levels (*IncCat*), ii) a gender dummy (*Female*) that indicates whether the household head is female, iii) the age of the respondents (*Age*), iv) two dummies that indicate, respectively, if the respondents have at least a high school degree (*HSchool*) and if they have an academic degree (*Academ*), v) two dummies that indicate, respectively, if the respondents are working (*Working*) and if they are working full time (*FTime*). Because being a civil servant or already retired makes one’s income relatively independent of the business cycle I include a dummy variable (*Pub.Sec./Retired*) indicating whether a household falls into one of the two categories in the regressions for uncertainty about future growth and unemployment. Likewise, I include a dummy indicating whether a household owns some residential property (*Property*) in the regression for uncertainty about home prices. In addition, I include dummies for the survey waves to capture any (survey-)time fixed effects (*Dwave2* and *Dwave3*).

¹¹Note that a multinomial logit/probit model would be a natural alternative specification.

Although magnitude and significance level of the effects vary across the different target variables, a few results stand out. First, respondents with higher income tend to report significantly lower uncertainty (Table 6). In the case of inflation expectations, for instance, a respondent in the highest income category (above 4,500 Euro) reports, on average, a value which is 0.29 points higher (on the five-point scale) than the typical respondent from the lowest income category (less than 500 Euro).

Second, women report much higher uncertainty compared to men (between 0.12 and 0.31 points, depending on the target variable)—this is the strongest and statistically most significant effect. At least for inflation, gender differences in expectations are well documented. [D’Acunto et al. \(2021\)](#) show that women have higher inflation expectations because traditionally they are the household member who do grocery shopping. The combination of frequent and volatile price changes for grocery items and the fact that consumers focus disproportionately on price increases their inflation perceptions. One hypothesis—linking our results to the evidence in [D’Acunto et al. \(2021\)](#)—is that an exposure to frequently changing prices does lead to a higher perceived uncertainty about future inflation.

Third, older respondents tend to report less uncertainty, but the effect is rather small. Each year increases the reported value by between 0.001 (unemployment) and 0.01 (interest rate). Fourth, respondents with at least a high school degree report significantly less uncertainty (with the exception of stock market expectations). There is no clear additional effect for those having an academic education.¹²

Fourth, there is evidence that, when controlling for all other socioeconomic characteristics considered here, respondents in employment perceive a little bit less macroeconomic expectation uncertainty relative to those that are not working.¹³ The results remain

¹²Recently, [D’Acunto et al. \(2022\)](#) provide evidence from a Finish household survey that IQ is associated with smaller inflation forecast errors. Referring to the discussion of cognitive uncertainty, a natural hypothesis is that IQ has an impact on expectation uncertainty, too. Unfortunately, our survey data provide no information about IQ or other measures of cognitive ability.

¹³In the spirit of [Coibion et al. \(2021\)](#), I also confirmed that there are positive correlations between the degree of certainty about future inflation and GDP growth, respectively, and households’ intention to spend on different product categories in subsequent months. (Note that I cannot provide causal estimates as there is no exogenous variation in the measures of uncertainty.) Results are given in Appendix A.

mainly unchanged when I exclude the “extreme” panelists who report to be either very certain or very uncertain from the sample.

Table 6: Uncertainty and Socioeconomic Factors

	Uncertainty about ...					
	Unempl	GDP	Stocks	Infl	IntRate	Homepr
Dwave2	−0.05 (0.04)	−0.04 (0.04)	−0.07** (0.03)	0.01 (0.03)	0.01 (0.03)	0.06** (0.03)
Dwave3	−0.08** (0.04)	−0.03 (0.04)	−0.02 (0.03)	−0.05* (0.03)	0.02 (0.03)	0.06** (0.03)
IncCat	0.03*** (0.01)	0.03*** (0.01)	0.004 (0.01)	0.03*** (0.01)	0.06*** (0.01)	0.03*** (0.01)
Female	−0.10*** (0.04)	−0.22*** (0.03)	−0.21*** (0.02)	−0.31*** (0.02)	−0.26*** (0.03)	−0.23*** (0.03)
Age	0.001 (0.002)	0.001 (0.002)	0.005*** (0.001)	0.003*** (0.001)	0.01*** (0.001)	0.001 (0.001)
HSchool	0.14* (0.08)	0.02 (0.08)	−0.08* (0.04)	0.18*** (0.04)	0.11** (0.05)	0.13*** (0.05)
Academ	0.01 (0.08)	−0.04 (0.08)	−0.06 (0.04)	0.005 (0.04)	0.16*** (0.05)	0.10** (0.05)
Work	0.02 (0.07)	0.09 (0.06)	0.04 (0.04)	−0.01 (0.04)	0.07* (0.04)	0.09** (0.04)
FTime	0.03 (0.09)	−0.06 (0.08)	0.01 (0.03)	0.07** (0.03)	0.04 (0.04)	0.07** (0.04)
Pub.Sec./Retired	−0.04 (0.08)	0.08 (0.08)				
Property						0.14*** (0.03)
Constant	3.01*** (0.15)	2.72*** (0.15)	2.43*** (0.08)	3.01*** (0.08)	2.47*** (0.09)	2.90*** (0.09)
Observations	2,939	2,936	6,232	6,236	6,238	6,237
Adjusted R ²	0.02	0.02	0.02	0.05	0.06	0.05

Note: *p<0.1; **p<0.05; ***p<0.01

In each case, the dependent variable is the uncertainty measure ranging from “very uncertain” (1) to “very certain” (5).

Finally, being a civil servant or retired does not seem to influence uncertainty perception about the unemployment rate or GDP growth. In contrast, households that own some kind of residential property report, on average, significantly less uncertainty about future home prices.

6 Expectation Uncertainty and Media Consumption

It is plausible that whether and how private households inform themselves about economic developments affects their level of expectation uncertainty. The survey contains one question that is informative about one particular aspect of media consumption of the households. In the third wave of the survey, households were asked which media channels they use frequently to obtain information about the policy of the European Central Bank (ECB). Households could indicate that they do not consume any information about monetary policy developments or which type of media they consume for this purpose. To elicit the latter, they were asked to select one or more from the following list: i) classical media such as newspapers, radio or TV, ii) social media such as Twitter or Facebook, iii) direct communication by the ECB such as its website or monthly press conferences, or iv) other media sources. I use the responses to this question about monetary policy as a proxy for whether a particular household consumes media products about economic issues in general.¹⁴

Table 7: Uncertainty and Media

	Uncertainty about ...					
	Unempl	GDP	Stocks	Infl	IntRate	Homepr
No media	−0.35*** (0.06)	−0.43*** (0.06)	−0.20*** (0.06)	−0.47*** (0.06)	−0.47*** (0.07)	−0.43*** (0.07)
Constant	2.97*** (0.12)	2.94*** (0.12)	2.53*** (0.12)	3.15*** (0.12)	2.53*** (0.14)	3.18*** (0.14)
Controls	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Observations	2,417	2,415	2,416	2,418	2,419	2,418
Adjusted R ²	0.04	0.04	0.02	0.08	0.09	0.06

Note: *p<0.1; **p<0.05; ***p<0.01
In each case, the dependent variable is the uncertainty measure ranging from “very uncertain” (1) to “very certain” (5). Standard errors in parantheses. The control variables are IncCat, Female, Age, HSchool, Academ, Working, and FTime as defined in the previous section.

¹⁴I cannot rule out the possibility that consumption of media reports about monetary policy is highly correlated with economic literacy. In this case, the answer to the media question would be a proxy for economic literacy.

Expectation uncertainty seems indeed to be higher for households that consume no economic news even after controlling for all socioeconomic factors discussed in the previous section (Table 7). Households that indicate that they do not inform themselves about the ECB report, on average, between 0.20 points (stock prices) and 0.47 points (inflation and interest rate) lower scores compared to households that use at least one type of media (remember that smaller values indicate more uncertainty due to the way the variable was coded by the *Deutsche Bundesbank*).¹⁵

Another question is whether the choice of a particular media channel has heterogeneous effects on uncertainty. The data reveal that conditional on using at least one type of media, there is only tentative evidence that this is the case systematically (Table 8). The point estimates indicate a general tendency that households who consume classical media report lower uncertainty (with the exception of stock prices) while the opposite is true for those that report obtaining economic information via social media (with the exception of unemployment). The marginal effects are, however, not significantly different from zero in most cases and a Wald test of the hypothesis that all four coefficients are equal—performed separately for each macroeconomic variable—reveals only for unemployment and home prices that one should reject the hypothesis at a 5%-significance level. The results for inflation expectation uncertainty are in contrast to findings in [Conrad et al. \(2022\)](#) who document such significant effects based on the quantitative measure used in Section 4.¹⁶

Interestingly, households who report consuming direct communication by the ECB are slightly less uncertain about future inflation developments compared to those who use classical or social media platforms, which indicates the importance of making direct communication about economic policy accessible for a wide audience. This effect of direct central bank communication on expectation *uncertainty* is similar to evidence on its effects on inflation expectations presented in [Coibion et al. \(2022\)](#).

¹⁵In terms of the standard deviation of the dependent variables, the effect varies between 0.22 standard deviations (stock prices) and 0.51 standard deviations (inflation).

¹⁶Using the quantitative measure, I can confirm their results.

Table 8: Uncertainty and Media Sources

	Uncertainty about ...					
	Unempl	GDP	Stocks	Infl	IntRate	Homepr
Classical media	0.31*** (0.10)	0.13 (0.10)	−0.03 (0.10)	0.15 (0.10)	0.15 (0.11)	0.10 (0.11)
Social media	0.03 (0.08)	−0.13* (0.08)	−0.04 (0.08)	−0.05 (0.08)	−0.14 (0.09)	−0.22** (0.09)
ECB comm.	0.04 (0.07)	0.05 (0.07)	0.08 (0.08)	0.14* (0.07)	0.06 (0.08)	−0.03 (0.08)
Other media	0.04 (0.06)	−0.01 (0.06)	0.04 (0.06)	0.15** (0.06)	0.12* (0.06)	0.06 (0.07)
Constant	2.72*** (0.16)	2.91*** (0.16)	2.56*** (0.16)	3.01*** (0.16)	2.38*** (0.18)	3.11*** (0.18)
Controls	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Equal Effects						
Wald	2.95	1.94	0.63	1.68	2.16	2.64
pval	0.0315	0.1212	0.5937	0.1682	0.0905	0.0478
Observations	2,169	2,167	2,168	2,170	2,171	2,169
Adjusted R ²	0.03	0.02	0.01	0.05	0.07	0.05

Note: *p<0.1; **p<0.05; ***p<0.01

In each case, the dependent variable is the uncertainty measure ranging from “very uncertain” (1) to “very certain” (5). Standard errors in parantheses. The control variables are IncCat, Female, Age, HSchool, Academ, Working, and FTime as defined in the previous section.

The results concerning the question if some media consumption changes the perception of uncertainty remain mainly unchanged when I exclude the “extreme” panelists who report to be either very certain or very uncertain from the sample. In contrast, some of the results concerning the impact of particular information channels seem to be driven by those “extreme” panelists. The reduced sample, for instance, does no longer provide evidence that consuming direct communication by the ECB reduces inflation uncertainty; instead it suggests an impact on uncertainty about future interest rates.

7 Expectation Uncertainty and Data Volatility

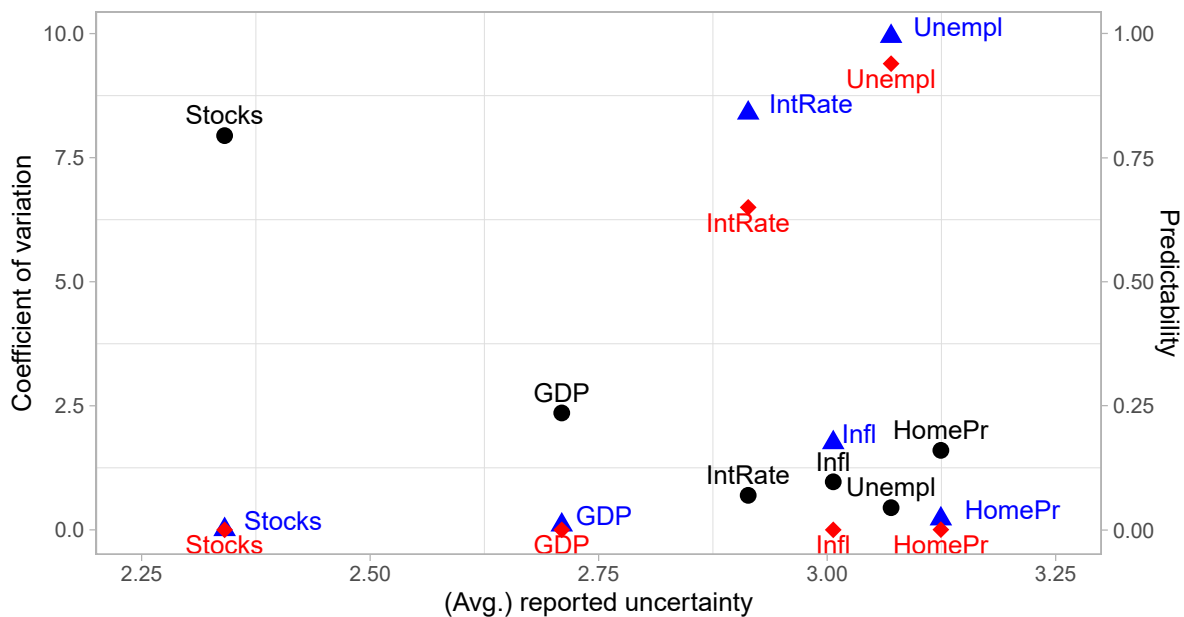
One would expect that economic subjects perceive expectation uncertainty to be larger in the case of those macroeconomic variables that are hard to forecast. To investigate whether this is true for the newly elicited uncertainty measure, I compare the reported (av-

erage) uncertainty level for each macroeconomic variable with the unconditional volatility of that variable (at quarterly frequency) and with a measure of predictability proposed by [Diebold and Kilian \(2001\)](#).¹⁷ The second comparison is made because it might be the case that while a time series exhibits large volatility it is relatively predictable.

This does not at all mean that volatility and predictability are the only determinants that we should expect to influence uncertainty perception. Perceived uncertainty about a particular variable might, for instance, also be influenced by how familiar a household is with that variable and how up-to-date her information are at the time of the survey. Theories of rational inattention (e.g., [Sims, 2003](#); [Maćkowiak and Wiederholt, 2009](#)) suggest that agents pay more attention to those variables, i.e., aspects of the economy that are most relevant for them. In the case of Germany, on the one hand attention to stock market developments is, for example, likely to be low because most households do not invest in equity. On the other hand, most households perceive the inflation rate as very important. The theory predicts that uncertainty for those variables that households choose not to pay much attention to will, *ceteris paribus*, be higher. In fact, the attention attributed to one particular variable is likely to vary across households. This is one factor why the qualitative uncertainty scale can translate to different quantitative uncertainty levels across panelists. When focusing on average uncertainty (as I do here) that introduces measurement error. Still, it is informative as an additional sanity check to investigate whether, on average, the elicited uncertainty levels relate to measures of predictability/volatility.

Figure 3 shows the correlation between reported uncertainty on the one hand and volatility and predictability on the other hand. Confirming the prior, the results of the survey are such that large expectation uncertainty is reported for GDP growth and, especially, stock market returns which are, at the same time, the variables that are most volatile (based on the coefficient of variation) while households report relatively moder-

¹⁷Effectively, this measure compares the expected forecast loss for a certain forecast horizon (which I choose to be one year in line with the horizon in the survey) to the expected forecast loss of a long-run forecast.



Notes: The plot shows the relation between the average reported uncertainty for each of the target variables and the variables' coefficient of variation (black dots, left scale) and the variables' predictability (right scale) at a horizon of 1 quarter (blue triangles) and 4 quarters (red diamonds).

Figure 3: Reported Uncertainty and Data Volatility/Predictability

ate uncertainty associated with their expectations of the other variables which are also substantially less volatile.

A similar, albeit less clear, picture emerges when focusing on the relation between average uncertainty assessment and the predictability of the target variables. Here, I focus on predictability at forecast horizons of one and four quarter(s), and relative to a long-term forecast with a horizon of 40 quarters.¹⁸ While relatively high uncertainty is reported, on average, for stock market returns, which cannot be well predicted, lower uncertainty is reported for the persistent variables in levels that are easier to predict (unemployment rate, interest rate). However, the remaining three variables (GDP growth, inflation, and home prices) do not fit well into the picture. Overall, however, I conclude that the relative uncertainty levels across variables, as elicited by the new qualitative measure, are plausible with respect to the objectively measured difficulty of forecasting the respective target variables.

¹⁸Technically, the predictability measures are based on the assumption of ARMA(2,1) models for the level of the unemployment rate and the interest rate and for the quarterly (log) differences of the remaining variables, estimated over the respective available sample period. For details on how to compute the measure, see [Diebold and Kilian \(2001\)](#).

8 Conclusion

In this paper, I analyze new survey data on expectation uncertainty elicited from private households in Germany in (the pilot waves of) the new Online Survey of Consumer Expectations conducted by the *Deutsche Bundesbank*. The new measure of expectation uncertainty is qualitative and easy to obtain. Respondents are asked to indicate their uncertainty associated with their expectation of different macroeconomic variables on a five-point scale ranging from “very certain” to “very uncertain”.

The main results: There is little variation in the frequency of answers across survey waves which are conducted with close temporal proximity, but the intra-personal consistency of answers is only moderate. Differences of the measure across target variables reflect the different degrees of volatility/predictability of the different macroeconomic variables. The new qualitative measure is significantly correlated with expected forecast error variances computed from density expectations (only available for inflation and home price expectations). It exhibits a number of substantial differences across socioeconomic groups that are in line with previous evidence and tentative evidence suggest that media consumption patterns affect the degree of expectation uncertainty across households.

The results are good news for institutions and researchers who want to elicit subjective uncertainty on a wide range of macroeconomic (or other) expectations. The new measure is very easily elicited. The simple format of the associated survey question does not require much explanation and can be answered quickly by survey participants. This makes the approach a very cost-effective way for eliciting uncertainty about macroeconomic expectations, allowing to measure uncertainty associated with a wide range of macroeconomic variables.

Given the potential relevance of “Knightian” uncertainty and the implied difficulty to state probabilistic expectations, a qualitative measure of expectation uncertainty might even be preferred to quantitative alternatives in some situations.

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Appendix

A Uncertainty and Spending Intentions

Table A1: Inflation Uncertainty and Spending Intentions

	Durables	Grocery	Leisure	Mobility	Services	Vacation	Housing	Savings
Dwave2	-0.03 (0.03)	0.03+ (0.02)	0.02 (0.02)	0.01 (0.02)	0.00 (0.02)	-0.05+ (0.03)	0.01 (0.02)	-0.05* (0.02)
Dwave3	0.08** (0.03)	0.04* (0.02)	0.09*** (0.02)	0.09*** (0.02)	0.06** (0.02)	0.03 (0.02)	0.04+ (0.02)	0.03 (0.02)
HinCat	0.04*** (0.01)	0.03*** (0.00)	0.05*** (0.00)	0.03*** (0.00)	0.04*** (0.00)	0.05*** (0.00)	0.00 (0.00)	0.04*** (0.00)
Female	-0.05* (0.02)	-0.05** (0.02)	-0.04+ (0.02)	0.01 (0.02)	-0.05** (0.02)	0.02 (0.02)	0.02 (0.02)	0.01 (0.02)
Age	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00*** (0.00)
HSchool	0.07+ (0.04)	0.06* (0.03)	0.01 (0.04)	-0.01 (0.04)	0.05 (0.03)	0.02 (0.04)	0.05 (0.03)	0.06+ (0.03)
Academ	0.02 (0.04)	-0.02 (0.03)	0.05 (0.04)	0.07+ (0.04)	0.00 (0.03)	0.03 (0.04)	0.04 (0.03)	-0.09** (0.04)
Work	0.00 (0.04)	-0.03 (0.02)	0.04 (0.03)	-0.03 (0.03)	0.00 (0.03)	0.02 (0.03)	-0.01 (0.03)	0.05 (0.03)
FTime	0.03 (0.03)	0.00 (0.02)	-0.02 (0.03)	0.04 (0.03)	0.01 (0.02)	0.00 (0.03)	-0.02 (0.03)	-0.03 (0.03)
Infl. uncert.	0.05*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.03** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.02* (0.01)	0.03** (0.01)
Constant	0.88*** (0.04)	1.58*** (0.03)	1.26*** (0.04)	1.36*** (0.04)	1.20*** (0.06)	1.17*** (0.04)	1.32*** (0.07)	1.36*** (0.03)
Num.Obs.	6597	6603	6598	6227	6232	6598	6229	6228
R2 Adj.	0.00	0.01	0.01	0.00	0.03	0.00	0.01	0.00

Note: ⁺p<0.1; *p<0.05; **p<0.01; ***p<0.001

In each case, the dependent variable is a measure that indicates if households intent to spend less (-1), about the same (0), or more (1) on the indicated spending category.

Table A2: GDP Growth Uncertainty and Spending Intentions

	Durables	Grocery	Leisure	Mobility	Services	Vacation	Housing	Savings
Dwave2	-0.03 (0.03)	0.03+ (0.02)	0.02 (0.02)	0.00 (0.02)	0.00 (0.02)	-0.04 (0.03)	0.01 (0.02)	-0.06* (0.02)
Dwave3	0.07** (0.03)	0.04* (0.02)	0.09*** (0.02)	0.08*** (0.02)	0.06** (0.02)	0.02 (0.02)	0.03 (0.02)	0.03 (0.02)
IncCat	0.04*** (0.01)	0.03*** (0.00)	0.05*** (0.00)	0.03*** (0.00)	0.04*** (0.00)	0.05*** (0.00)	0.00 (0.00)	0.04*** (0.00)
Female	-0.05+ (0.02)	-0.05** (0.02)	-0.03 (0.02)	0.01 (0.02)	-0.05* (0.02)	0.02 (0.02)	0.02 (0.02)	0.01 (0.02)
Age	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00*** (0.00)
HSchool	0.07+ (0.04)	0.06* (0.03)	0.01 (0.04)	-0.01 (0.04)	0.05 (0.03)	0.02 (0.04)	0.05 (0.03)	0.06+ (0.03)
Academ	0.02 (0.04)	-0.01 (0.03)	0.05 (0.04)	0.07+ (0.04)	0.01 (0.03)	0.03 (0.04)	0.04 (0.03)	-0.09* (0.04)
Work	-0.01 (0.04)	-0.03 (0.02)	0.04 (0.03)	-0.03 (0.03)	0.00 (0.03)	0.02 (0.03)	-0.01 (0.03)	0.04 (0.03)
FTime	0.03 (0.03)	0.01 (0.02)	-0.01 (0.03)	0.04 (0.03)	0.01 (0.02)	0.01 (0.03)	-0.02 (0.03)	-0.02 (0.03)
GDP uncert.	0.03** (0.01)	0.05*** (0.01)	0.07*** (0.01)	0.03* (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.03** (0.01)	0.05*** (0.01)
Constant	0.92*** (0.04)	1.59*** (0.03)	1.24*** (0.03)	1.37*** (0.03)	1.52*** (0.03)	1.14*** (0.04)	1.51*** (0.03)	1.32*** (0.03)
Num.Obs.	6592	6598	6593	6591	6596	6593	6593	6225
R2 Adj.	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.02

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

In each case, the dependent variable is a measure that indicates if households intent to spend less (-1), about the same (0), or more (1) on the indicated spending category.