The Effect of Inflation Uncertainty on Household Spending*

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Abstract

We study the effect of inflation uncertainty on household spending and expectations using a nationally representative survey of British households. We isolate inflation uncertainty from expected inflation by providing randomised information treatments about the first and/or second moments of professional forecasters' inflation predictions. Increased inflation uncertainty leads to significantly higher inflation expectations, lower expected nominal income, lower planned spending, and increased precautionary savings. These results are consistent with households attributing inflation to supply-side shocks in the economy. An increase in inflation uncertainty also significantly raises income uncertainty, the perceived risk of job loss, expected interest rates, and long-run inflation uncertainty.

Keywords: Inflation, Uncertainty, Household Spending, Household Finance

JEL Codes: E21, E24, E31, E50

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1 Introduction

This paper investigates the relationship between households' subjective inflation uncertainty[1] and their financial decisions. Uncertainty about inflation stemming from a series of recent economic shocks, combined with elevated saving rates, has raised policymakers' interest in this topic, particularly in the United Kingdom. In theory, the impact of uncertainty about future inflation on current decisions is ambiguous. On the one hand, inflation uncertainty implies uncertainty about future real income, which may increase precautionary saving and lower spending today. On the other hand, inflation uncertainty implies uncertainty about the real rate of return on savings, making saving less attractive to risk-averse consumers. Additionally, higher realised inflation has historically been correlated with elevated inflation uncertainty, because high inflation can lead to uncertainty about the monetary policy response (Friedman, 1977; Ball, 1992). Isolating the effect of inflation uncertainty and separating it from the effect of expected inflation and is therefore not straightforward, but important to understand the transmission of monetary policy.

We study the effect of inflation uncertainty on household behaviour by implementing a randomised controlled trial (RCT) in a representative survey of 6,000 British households. To isolate the effect of inflation uncertainty, we closely follow Coibion et al. (2024) and provide different inflation predictions made by professional forecasters to four randomly selected subgroups of respondents. The first group receives information about average professional forecasts of inflation over the next twelve months, targeting the first moment of households' expectations. The second treatment targets the second moment by providing respondents with the difference between professional forecasters' highest and lowest inflation predictions (without any information about the level of these forecasts). The third treatment group receives both pieces of information, while the fourth group serves as a control group and does not receive any information treatment. Following these information treatments, households report significantly lower expected inflation and inflation uncertainty. This exogenously-induced variation in households' inflation uncertainty and subsequent survey questions allow us to identify the causal impact of inflation uncertainty on consumption plans and expectations about future income, their perceived risk of job loss, expected interest rates, and long-run inflation expectations and uncertainty.

Our RCT provides novel evidence that higher inflation uncertainty leads to lower expected income, both nominal and real. Planned household spending decreases significantly more than expected income, suggesting an increase in precautionary savings. We provide further evidence for the precautionary savings channel and show that inflation uncertainty

[1]Throughout this paper we define inflation uncertainty as a measure of the dispersion of a household's subjective expected inflation outcomes. We use the second moment of the distribution over expected inflation outcomes and the interquartile range as measures of household inflation uncertainty.

significantly increases income uncertainty and households' perceived risk of job loss. Besides the effects on expected household-level outcomes, our results provide new evidence that inflation uncertainty leads to higher expected aggregate inflation (and vice versa, as suggested by Friedman, 1977) and higher expected nominal interest rates (not real rates). Taken together, our findings indicate that households reduce spending in response to inflation uncertainty, because subjective inflation uncertainty reflects uncertainty about adverse supply shocks (or the central bank's reaction to them). That is, the effect of subjective inflation uncertainty reflects a supply-side view of inflation. Finally, we show that changes in inflation uncertainty are very persistent, with increased uncertainty about one-year ahead inflation significantly raising uncertainty about five-year ahead inflation. Thus, sustained short-run inflation uncertainty may drive a de-anchoring of long-run "inflation certainty" to a larger extent than sustained short-run inflation expectations drive long-run inflation expectations.

Literature Our paper is related to the broad literature investigating the effects of macroeconomic uncertainty (see e.g. Bloom (2009)). Much of this literature has focused on the effects of uncertainty on aggregate conditions or firm-level decisions. Using a a dynamic stochastic general equilibrium model, Ascari et al. (2023) show that aggregate inflation uncertainty endogenously increases in response to an inflation expectation shock and is associated with reduced consumption. Recent literature has extended this research by analysing the effects of uncertainty on households' decisions (e.g., Ben-David et al., 2018; Christelis et al., 2020). To overcome the empirical challenge of identifying exogenous movements in economic uncertainty, Coibion et al. (2024) implement an RCT in a large-scale survey of households. Using forecasts made by professional forecasters as information treatments to induce exogenous variation in households' posterior uncertainty, they find that uncertainty about GDP growth causes households to lower consumption of non-durable goods and services. We extend this literature by using an RCT to disentangle inflation uncertainty from expected inflation and document the causal effects of households' subjective inflation uncertainty. Our findings provide further evidence on the importance of households' inflation expectations (see e.g. D'Acunto et al., 2024), particularly their supply-side view of inflation (see e.g. Kamdar et al., 2019; Coibion et al., 2023; Stantcheva, 2024), and how it influences households' spending decisions.

Most closely related to our work are Kostyshyna and Petersen (2024), who study the effect of communicating uncertain inflation forecasts on realised household spending. Our work differs from their analysis in several ways, but most importantly, we identify the effect of uncertainty about future inflation and separate it from the effect of expected inflation.[2] This allows us to document three novel facts about household behaviour. First,

[2]Kostyshyna and Petersen (2024) use an information treatment that either (i) provides expected inflation (a level treatment), or (ii) expected inflation together with the associated forecast uncertainty

higher inflation uncertainty leads to higher expected inflation. Second, higher inflation uncertainty leads to a decrease in planned household spending even *after* controlling for expected inflation. Third, the response to inflation uncertainty is driven by households' supply-side views of inflation. Finally, we document the response of expected interest rates and the pass-through of one-year inflation expectation and uncertainty to five-year ahead inflation expectations and uncertainty.

Our information treatments allow us to contribute to the growing literature that investigates how economic agents form expectations, and the more established literature on the relationship between the level of inflation and the associated uncertainty (Friedman Ball). The present paper contributes to this branch of the literature with, to the best of our knowledge, the first investigation of the causal pass-through from households' inflation expectations to their associated uncertainty (and vice versa). In his Nobel prize acceptance speech, Friedman (1977), and later Ball (1992) hypothesised that higher levels of inflation lead to higher inflation uncertainty, because agents are uncertain about the central bank's reaction. Both considered this to be one of the major costs associated with inflation. With our experiment, we can estimate the effect of increased inflation uncertainty on household consumption and thereby quantify this cost of inflation uncertainty, which is otherwise difficult to separate from the cost of inflation.

Finally, our paper is related to the broader literature on household consumption choices. Precautionary savings have been one of the focal points of attention in recent papers studying the effect of heterogeneous agents' consumption decisions on business cycles and the transmission of monetary policy (Challe and Ragot, 2016; Auclert, 2019; Ravn and Sterk, 2021; Kaplan and Violante, 2022). Our mechanism offers a new channel, inflation uncertainty, which affects precautionary saving decisions. We document that low-income households, in particular, report high levels of inflation uncertainty. Our results show that inflation uncertainty affects households' marginal propensities to consume, implying that the distribution of inflation matters for the transmission of monetary policy.

The remainder of the paper is structured as follows: Section 2 lays out the survey and the randomised controlled trial. Section 3 documents the effects of our information treatment on respondents' expectations, as well as the pass-through between the first and second moments of expected inflation. Section 4 presents our main results, and Section 5 concludes.

(a joint treatment). This approach identifies the effect of inflation uncertainty if the impact of the level and uncertainty treatments is additive. However, our results indicate that an uncertainty treatment alone has a different effect than providing information about inflation uncertainty on top of expected inflation.

2 Data and Survey Design

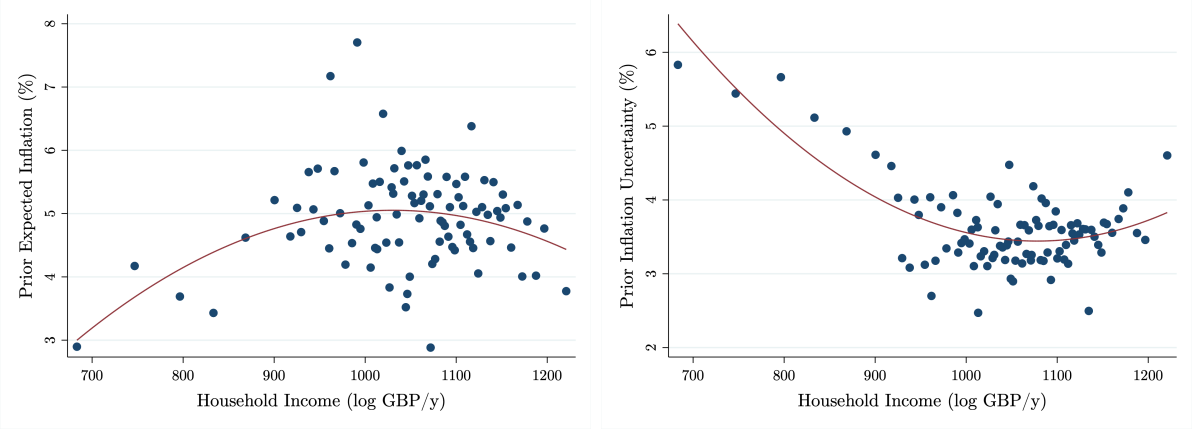
The Survey We use household-level micro data from the Bank of England's survey on household finances, a biannual online rotating panel survey of households in Great Britain (Anderson et al., 2016). Since 2004, the Bank of England has commissioned NMG Consulting to conduct this survey. Each survey wave contains responses from approximately 6,000 respondents, and survey weights ensure that the data are representative of the British population. The survey consists of several parts, starting with general household characteristics, such as age, education, employment status and household income. Part two contains questions about households' spending and saving decisions over the past twelve months, as well as the randomised controlled trial. Parts three and four survey households' expected incomes and consumption plans for the subsequent twelve months. If households owe secured or unsecured debts (i.e., mortgages or credit debt), they are asked additional questions about their finances and whether they are in financial distress. Households are asked about their expectations for the macroeconomy in the final part of the survey. In recent waves, respondents completed the questionnaire with a median response time of approximately 16 minutes.

Prior Expectations The randomised controlled trial conducted in the second part of the survey first elicits every respondent's prior inflation expectations and uncertainty. In particular, we ask them to assign probabilities to a set of scenarios for the growth rate of prices of goods and services:

> *In your view, what would you say is the percentage chance that,* ***over the next 12 months****, prices of goods and services . . .*
>
> *Please note: The numbers need to add up to 100.*

go **up** by 12% or more	_____ percent chance
go **up** by 8% to 12%	_____ percent chance
go **up** by 4% to 8%	_____ percent chance
go **up** by 2% to 4%	_____ percent chance
go **up** by 0% to 2%	_____ percent chance
go **down** by 0% to 2%	_____ percent chance
go **down** by 2% to 4%	_____ percent chance
go **down** by 4% to 8%	_____ percent chance
go **down** by 8% to 12%	_____ percent chance
go **down** by 12% or more	_____ percent chance
TOTAL	100 percent

From respondents' answers to this question, we compute a measure of expected inflation, uncertainty about inflation, and skewness of expected inflation in two different ways. First, we compute household i's mean expected inflation $\hat{\mathbb{E}}_{i,t}\pi_{t+1}$, the standard deviation $\hat{\mathbb{E}}_{i,t}\sigma_{\pi_{t+1}}$ and the skewness of expected inflation by weighting the midpoint of each bucket with respondents' subjective probabilities.[3] Second, we fit a standard beta distribution over the survey responses.[4] We calculate the median $\hat{\mathbb{E}}_{i,t}P_{50}(\pi_{t+1})$, the interquartile range $\hat{\mathbb{E}}_{i,t}IQR_{\pi_{t+1}}$, and the skewness of these distributions.



(a) Income and Prior Inflation Expectations (b) Income and Prior Inflation Uncertainty

Note: This binned scatterplot shows the relationship between log annual household income during the past 12 months and prior expected inflation (left panel), as well as prior inflation uncertainty (right panel).

Figure 1: Inflation Expectations & Uncertainty by Income

Table 1 shows that respondents, on average, think that inflation over the past twelve months has been 5.84% - substantially higher than the official inflation rate of 4.20%.[5] Despite this disparity in level-terms, respondents are clearly aware of the downward trend in inflation and, prior to the treatment, expected inflation to fall by roughly 1pp. to 4.94% over the following 12 months. This fall appears to be most pronounced for low- and high-income households, whereas households in the middle of the income distribution still expect comparatively high inflation realisations (see Figure 1a). Furthermore, there is considerable uncertainty about the path of inflation, with the average respondent's

[3]We treat responses assigning a positive probability to inflation outcomes below −12% or above 12% as another 4% step, assigning maximum values of −16% and 16%.

[4]Given that this distribution is only defined in the space between 0 and 1, while the responses given by the respondents are approximately defined for the space [-0.16, 0.16], we shift the answers provided by adding 0.5. We then fit the beta distribution and shift the probability density functions assigned to the space [0.34, 0.66] back to the space [-0.16, 0.16] by subtracting 0.5. Finally, for answers giving adjacent binary positive probability densities, we fit a triangular distribution, and for answers giving singular densities, a uniform distribution. This is a similar procedure to the uncertainty measures computed from probability densities in the Federal Reserve Bank of New York's Survey of Consumer Expectations (Armantier et al., 2017), as well as the approach of Coibion et al. (2023).

[5]The rate of inflation in the 12 months up to January 2024 was 4.20%, released on February 14th, 2024.

distribution of expected inflation featuring a standard deviation of 3.64. Figure 1b shows that low-income households in particular are very uncertain about inflation.

Randomisation Following the prior elicitation, households answer ten questions about their saving and spending choices over the past twelve months. In the next step, we conduct the randomised information treatment, where respondents are randomly assigned into four equally-sized groups. Table 1 provides descriptive statistics about the survey respondents in the respective treatment groups and in the pooled sample. The average respondent is almost 49 years of age, has an average annual household income of approximately £48,000 and lives in a household of average size 2.75. 43% of respondents are full-time employees, 13% are working part-time, and another 4% are self-employed. 24% of respondents have retired, whilst 4% are unemployed, and 3% are in full-time education. Nearly half of respondents have completed tertiary education. The sample is balanced across treatment groups, apart from the somewhat imperfect randomisation along respondents' age, which leads to respondents in the joint treatment arm being slightly older than in the control group.

Information Treatment We conduct the information treatment and the posterior elicitation by referring to the rate of inflation (or deflation) instead of the rate at which *prices of goods and services* are going up (or down). This slight rephrasing of the question, along with the backward-looking saving and spending questions between the prior and posterior elicitation serves to loosen the anchor of the prior.

The first of the four groups is the control group which is shown the following screen:

> *On the next screen, we would like you to think about the different things that may happen to inflation over the next 12 months. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing).*

The remaining three groups receive information treatments and are shown two screens. First, each of these three groups gets shown a descriptive screen similar to the one of the control group:

> *Screen 1: On the next screen, we describe some predictions that professional forecasters have made for inflation in the UK. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing). Please review this information carefully – it will only be shown once.*

Following this screen, each treatment group receives a different piece of information. Similar to Coibion et al. (2024), each treatment consists of a qualitative and a quantitative

Table 1: Summary Statistics

	Control Group	Level Treat.	Uncert. Treat.	Joint Treat.	Full Sample	p-val
Age	47.92	48.11	48.80	49.62	48.61	0.04
	(17.59)	(17.55)	(17.15)	(17.53)	(17.46)	
HH Size	2.76	2.76	2.78	2.70	2.75	0.47
	(1.43)	(1.45)	(1.47)	(1.43)	(1.45)	
HH Income (£/y)	49,067	48,341	48,338	47,271	48,264	0.65
	(36,840)	(36,065)	(36,195)	(33,681)	(35,729)	
HH Spending (£/m)	2,361	2,537	2,691	2,404	2,498	0.61
	(4,285)	(6,520)	(6,390)	(4,922)	(5,605)	
$\hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1}$	5.11	4.98	4.80	4.88	4.94	0.21
	(4.34)	(4.19)	(4.17)	(4.15)	(4.22)	
$\hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}}$	3.59	3.70	3.66	3.62	3.64	0.68
	(2.45)	(2.46)	(2.50)	(2.47)	(2.47)	
Perceived Inflation	5.96	5.75	5.74	5.92	5.84	0.20
	(3.45)	(3.35)	(3.43)	(3.38)	(3.40)	
Female	0.50	0.51	0.52	0.50	0.51	0.81
Liquid assets	0.66	0.67	0.66	0.64	0.66	0.72
Employment Status						
Full-time	0.43	0.45	0.43	0.42	0.43	0.37
Part-time	0.13	0.13	0.13	0.14	0.13	0.91
Self-employed	0.05	0.04	0.04	0.04	0.04	0.58
Student	0.04	0.03	0.04	0.03	0.03	0.19
Unemployed	0.04	0.04	0.04	0.04	0.04	0.94
Retired	0.24	0.24	0.24	0.25	0.24	0.85
Not in labour force	0.08	0.08	0.08	0.08	0.08	0.94
Education Status						
GCSE	0.19	0.18	0.19	0.19	0.19	0.77
A-Levels	0.24	0.22	0.22	0.22	0.22	0.46
Degree level+	0.47	0.49	0.48	0.46	0.48	0.44
Vocational	0.11	0.11	0.11	0.13	0.11	0.34
Housing Status						
Outright owner	0.33	0.35	0.35	0.36	0.35	0.60
Mortgagor	0.29	0.31	0.30	0.28	0.29	0.52
Renter	0.37	0.35	0.35	0.36	0.36	0.53
Observations	1,497	1,503	1,530	1,469	5,999	

Note: This table reports summary statistics for the four different treatment groups and the pooled sample along with the test statistic for equality across treatment groups. Perceived inflation refers to respondents' perceived inflation rate over the 12 months prior to the survey. Liquid assets is a dummy variable indicating whether households have liquid assets worth more than half a month's income.

statement. The qualitative statement provides information about how professional forecasters' expectations have shifted compared to the previous year. The quantitative statement provides numerical information about professional forecasters' expectations about the following year. The first treatment group receives information about professional forecasters' *level* forecasts:

Screen 2.1: ***Professional forecasters expect lower inflation*** *than one*

year ago. The average forecast for inflation over the next year is 2 percent.

The second treatment group receives information about the *range* of professional forecasters' predictions:

> *Screen 2.2:* ***Professional forecasters are less uncertain about inflation*** *than one year ago. The highest forecast for inflation over the next year is 2.1 percentage points higher than the lowest forecast.*

The third treatment group receives information about both the *level* and the *range* of professional forecasters' predictions:

> *Screen 2.3:* ***Professional forecasters expect lower inflation*** *than one year ago. The average forecast for inflation over the next year is 2 percent.* ***Professional forecasters are also less uncertain about inflation*** *than one year ago. The highest forecast for inflation over the next year is 2.1 percentage points higher than the lowest forecast.*

Given the prior beliefs reported in Table 1, these information treatments are equivalent to an anchoring treatment by providing substantially lower and more precise information about future expected inflation.

Posterior Expectations After the information treatments, we elicit households' posterior inflation expectations by asking the following question:

> *In your view, what would you say is the percentage chance that,* ***over the next 12 months****, . . .*
>
> *Please note: The numbers need to add up to 100.*

the rate of inflation will be 12% or higher	_____ percent chance
the rate of inflation will be between 8% and 12%	_____ percent chance
the rate of inflation will be between 4% and 8%	_____ percent chance
the rate of inflation will be between 2% and 4%	_____ percent chance
the rate of inflation will be between 0% and 2%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 0% and 2%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 2% and 4%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 4% and 8%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 8% and 12%	_____ percent chance
the rate of deflation (opposite of inflation) will be 12% or higher	_____ percent chance
TOTAL	100 percent

As before, we compute the first, second, and third moments of respondents' posterior dis-

tribution, as well as the median, interquartile range, and skewness of the beta distribution fitted on their answers.

Further Questions In the subsequent sections of the survey we ask respondents about i) their average expected monthly spending on goods and services (and rent, if applicable) over the next twelve months (see Appendix A.7); ii) the distribution of their income growth expectations over the subsequent twelve months (see Appendix A.6), which we use, combined with annualised income over the past twelve months (see Appendix A.1), to compute the level of expected income; iii) their perceived risk of losing their job, which is grouped into four categories from "very unlikely, my job is very secure" to "almost definite, I do not expect my job to last" (see Appendix A.8); iv) their interest rate expectations in one, two, and five years' time (see Appendix A.9); v) their perception of the inflation rate over the past twelve months (see Appendix A.10); vi) and the distribution of their five-year ahead inflation expectations (see Appendix A.11). Note that the questions referring to interest rate expectations and perceived inflation differ in scale and type: Instead of surveying the distribution of outcomes, they ask respondents to simply select the bucket containing the most likely outcome.

3 Treatment Effects

In this section, we first document the response of the first and second moments of expected inflation before estimating the pass-through from the expected level of inflation to inflation uncertainty (and vice versa).

3.1 The Effect of the Information Treatment

We estimate the information treatment effects on respondents' posterior expectations by estimating

$$\begin{aligned}\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1} = a_0 + b_0\hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} + \Sigma_{j=1}^{3}a_j \times I_{\{i\in Treat\,j\}} \\ + \Sigma_{j=1}^{3}b_j \times I_{\{i\in Treat\,j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} + \varepsilon_i \end{aligned} \tag{1}$$

where $\mathbb{E}_{i,t}^{prior}\pi_{t+1}$ denotes respondent i's prior mean expected inflation, $\mathbb{E}_{i,t}^{post}\pi_{t+1}$ denotes the posterior belief, and $I_{\{j\in Treat\,i\}}$ is a dummy indicating that respondent i is in treatment group j. Similarly, we estimate the effect of the information treatments on respondents' posterior uncertainty by estimating

$$\begin{aligned}\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}} = a_0 + b_0\hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}} + \Sigma_{j=1}^{3}a_j \times I_{\{i\in Treat\,j\}} \\ + \Sigma_{j=1}^{3}b_j \times I_{\{i\in Treat\,j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}} + \varepsilon_i \end{aligned} \tag{2}$$

We also estimate the effect of the treatment on the median expected inflation and the interquartile range of expected inflation. In both cases, we estimate specification 1 and 2 using Huber-robust regressions to account for outliers. We drop respondents in the three treatment groups who spent less than 3 seconds on the treatment screen. In this specification, the coefficients $\{a_j\}_{j=1}^3$ can be interpreted as the difference in expectations (uncertainty) of the treatment groups relative to the control group, and the coefficients $\{b_j\}_{j=1}^3$ can be interpreted as the weight put on the prior belief by the different treatment groups. This specification therefore captures how respondents form beliefs as a combination of their priors and the information treatment they receive, i.e., a Bayesian updating process. In this updating process, we would expect the weight on the prior beliefs to be between 0 and 1. A coefficient of $b_0 = 1$ would indicate that respondents in the control group perceive the two questions as essentially identical. Similarly, a coefficient of $b_j = 1$ would indicate that respondents in the treatment group j put no weight on the new information and full weight on their prior beliefs. On the other hand, a coefficient of $b_0 = 0$ would indicate that respondents in the control group perceive the two questions as completely unrelated, so that their responses are uncorrelated. In the treatment groups, a coefficient of $b_j = 0$ would indicate that respondents in treatment group j put full weight on the new information and essentially disregard their prior beliefs.

Column (1) of Table 2 shows that respondents in the control group put a weight of 0.68 on the prior belief when forming their posterior inflation expectations. This weight is smaller than one because of the difference in wording (i.e., prices vs. inflation) and a gap of ten questions between prior and posterior. Furthermore, we find that the 3 treatments generate significant differences in posterior beliefs. Respondents who receive the level treatment put a weight of $b_0 + b_1 = 0.41$ on their prior belief, significantly lower than the control group. Respondents who receive the uncertainty treatment revise their beliefs by a smaller, but still significant degree, putting a weight of $b_0 + b_2 = 0.54$ on their prior belief. Finally, the joint treatment leads to a slightly larger revision than the level treatment alone, reducing the weight put on the posterior by 0.37, but the difference is not statistically significant. When using median expected inflation, the weight put on the prior in the control group is slightly smaller, as column (3) shows. At the same time, the treatments have a slightly smaller impact.

These results confirm and extend the findings of Kostyshyna and Petersen (2024). Consistent with their results, we find that communicating inflation uncertainty on top of inflation forecasts has no additional significant effect on households' expected inflation. We extend their findings by showing that communicating inflation uncertainty alone does in fact affect households' inflation expectations. Therefore, the effect of an uncertainty treatment alone is not equal to the difference between the joint and the level treatment, i.e., is non-additive. This highlights the importance of provide a pure uncertainty inform-

Table 2: Treatment Effects of First and Second Moments of Expected Inflation

	(1) $\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$ b/se	(2) $\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$ b/se	(3) $\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$ b/se	(4) $\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$ b/se
$\hat{\mathbb{E}}^{prior}_{i,t}\pi_{t+1}$	0.68***			
	(0.02)			
$\hat{\mathbb{E}}^{prior}_{i,t}\sigma_{\pi_{t+1}}$		0.95***		
		(0.01)		
$\hat{\mathbb{E}}^{prior}_{i,t}P_{50}(\pi_{t+1})$			0.67***	
			(0.01)	
$\hat{\mathbb{E}}^{prior}_{i,t}IQR_{\pi_{t+1}}$				0.96***
				(0.01)
Level Treat.$\times\hat{\mathbb{E}}^{prior}_{t}\pi_{t+1}$	-0.27***			
	(0.03)			
Uncert. Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}\pi_{t+1}$	-0.14***			
	(0.03)			
Joint Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}\pi_{t+1}$	-0.31***			
	(0.02)			
Level Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}\sigma_{\pi_{t+1}}$		-0.05***		
		(0.02)		
Uncert. Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}\sigma_{\pi_{t+1}}$		-0.09***		
		(0.02)		
Joint Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}\sigma_{\pi_{t+1}}$		-0.10***		
		(0.02)		
Level Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}P_{50}(\pi_{t+1})$			-0.28***	
			(0.03)	
Uncert. Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}P_{50}(\pi_{t+1})$			-0.13***	
			(0.03)	
Joint Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}P_{50}(\pi_{t+1})$			-0.30***	
			(0.02)	
Level Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}IQR_{\pi_{t+1}}$				-0.04**
				(0.02)
Uncert. Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}IQR_{\pi_{t+1}}$				-0.08***
				(0.02)
Joint Treat.$\times\hat{\mathbb{E}}^{prior}_{i,t}IQR_{\pi_{t+1}}$				-0.09***
				(0.02)
Level Treat.	0.50***	-0.03	0.52***	-0.14**
	(0.13)	(0.05)	(0.13)	(0.07)
Uncert. Treat.	0.33**	0.09*	0.34**	0.07
	(0.13)	(0.05)	(0.13)	(0.07)
Joint Treat.	0.59***	-0.02	0.58***	-0.11
	(0.13)	(0.05)	(0.13)	(0.07)
R^2	0.532	0.853	0.527	0.845
N	4,273	4,179	4,271	4,210

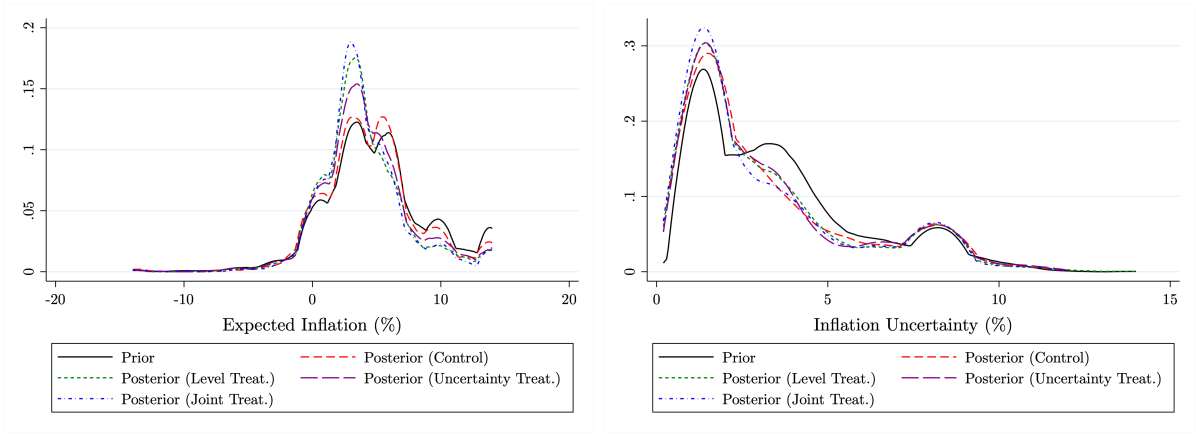
Note: This table reports the results from estimating equations (1) (columns 1 and 3) and 2 (columns 2 and 4). All estimates are obtained using a Huber-robust regression with survey weighted data. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

ation treatment to isolate the causal effects of inflation uncertainty.

Column (2) of Table 2 shows that prior uncertainty about inflation is significantly stickier.

The correlation between prior and posterior beliefs is 0.95 in the control group, despite the difference in wording and a gap of ten questions between prior and posterior. Nonetheless, all three treatments successfully reduce the weight on the prior beliefs, with the uncertainty treatment leading to the largest revision, but the weight put on the prior uncertainty remains high. Column (4) shows that the prior is slightly more persistent when using the interquartile range as an alternative measure of uncertainty, but the treatments shift expectations in a very similar fashion.

In general, our information treatments are successful in generating exogenous movements in inflation expectations and uncertainty. However, in the latter case, the posterior remains relatively close to the prior, indicating that respondents perceive the treatments as less informative about the dispersion in potential inflation outcomes than about the central scenario for inflation. Figure 2 visualises this effect by plotting the density of prior inflation expectations and uncertainty along with the posterior belief of the control group and the respective treatment groups. The left panel indicates that the treatments are indeed successful in shifting the mass of the distribution of expected inflation to the left, with most of the updating occurring by respondents with high prior inflation expectations. The right panel indicates a similar, but weaker shift for inflation uncertainty.



(a) Prior & Posterior Inflation Expectations (b) Prior & Posterior Inflation Uncertainty

Note: This figure displays the density of prior and posterior expected inflation (left panel) and inflation uncertainty (right panel) for each treatment group.

Figure 2: Density Plot of Treatment Effects

3.2 Pass-through between the First and Second Moments of Inflation Expectations

The exogenous variation induced in respondents' inflation expectations (uncertainty) also allows us to investigate the pass-through from expected inflation to inflation uncertainty (and vice versa). The Friedman-Ball hypothesis suggests that higher levels of inflation

will cause greater uncertainty about inflation because they lead to greater uncertainty about monetary policy Friedman (1977); Ball (1992). Arce-Alfaro and Blagov (2023) find a strong pass-through during the great inflation, but only a weak pass-through from the great moderation onwards. We estimate this pass-through in our experiment by estimating the following regression

$$\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}} = a_0 + b_0\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1} + b_1\hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} + b_2\hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}} + \varepsilon_i \tag{3}$$

using only the control group and the level treatment group. We instrument posterior inflation expectations using prior expected inflation, the treatment dummy, and the treatment dummy interacted with prior expected inflation, i.e.

$$\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1} = a_0 + b_0 \times I_{\{i\in LevelTreat.\}} + b_1\hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} + b_2 \times I_{\{i\in LevelTreat.\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} + \varepsilon_i \tag{4}$$

Columns 1 and 2 of Table 3 show that the pass-through from expected inflation to inflation uncertainty is significantly positive, in line with the argument of the Friedman-Ball hypothesis: A 1pp. increase in expected inflation increases the standard deviation (interquartile range) of expected inflation by 0.08pp. (0.14pp.). We also estimate the pass-through in the other direction, i.e., from inflation uncertainty to expected inflation. For this we estimate Equation (3) with posterior inflation expectations as the outcome using only the control group and the uncertainty treatment group. Columns 3 and 4 of Table 3 show that the pass-through from inflation uncertainty to expected inflation is positive and significant: A 1pp. increase in inflation uncertainty increases the mean (median) of expected inflation by 0.75pp. (0.72pp.). That is, a one standard deviation increase in inflation uncertainty would increase expected inflation by roughly 1.9pp. (almost half a standard deviation).

Table 3: Pass-through between First and Second Moments

	(1) $\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$ b/se	(2) $\hat{\mathbb{E}}_{i,t}^{post}IQR_{\pi_{t+1}}$ b/se	(3) $\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$ b/se	(4) $\hat{\mathbb{E}}_{i,t}^{post}P_{50}(\pi_{t+1})$ b/se
$\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$	0.08***			
	(0.02)			
$\hat{\mathbb{E}}_{i,t}^{post}P_{50}(\pi_{t+1})$		0.14***		
		(0.03)		
$\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$			0.75**	
			(0.32)	
$\hat{\mathbb{E}}_{i,t}^{post}IQR_{\pi_{t+1}}$				0.72***
				(0.25)
First-stage F-stat	108.531	110.448	19.727	20.276
R^2	0.871	0.865	0.598	0.586
N	2,302	2,321	2,291	2,306

Note: This table reports the results from equation (3) estimated using only the control and level treatment groups (columns 1 and 2) as well as the results of equation (3) estimated using only the control and uncertainty treatment groups (columns 3 and 4). All estimates are obtained using a Huber-robust regression with survey weighted data. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

4 Main Results

In this section, we first illustrate the theoretical link between inflation uncertainty and consumption in Section 4.1 before turning to our main empirical results in Section 4.2. We then investigate the main drivers of the response of consumption to inflation uncertainty in Section 4.3. In a final step, we document the pass-through from short-term to long-term inflation expectations in Section 4.4.

4.1 The Euler Equation with Inflation Uncertainty Saving

We first provide theoretical intuition as to why inflation uncertainty may affect household consumption choices and then present and discuss our findings. A rational agent's consumption choice in a given period is the result of the intertemporal Euler equation,

$$u'\left(\frac{C_{i,t}}{P_t}\right) = \beta_i \hat{\mathbb{E}}_{i,t}[R_{t+1}u'\left(\frac{C_{i,t+1}}{P_{t+1}}\right)] \ , \tag{5}$$

where $C_{i,t}$ is the nominal consumption spending by agent i and P is the consumer price index, so that $\frac{C_{i,t}}{P}$ is real spending. β_i is a, possibly agent-specific, discount factor (see Christelis et al., 2020). R_t is the prevailing interest rate on savings set by central bank

policy. Finally, $\hat{\mathbb{E}}_{i,t}[.]$ denotes the agent's subjective expectations and $u(.)$ denotes a concave utility function with constant intertemporal elasticity of substitution equal to the inverse of the coefficient relative risk aversion.[6]

We can then approximate nominal consumption growth to a second order with a Taylor series as:

$$
\begin{aligned}
(\frac{C_{i,t}}{P_t})^{-\zeta} &= \beta_i \hat{\mathbb{E}}_{i,t}[R_{t+1}(\frac{C_{i,t+1}}{P_{t+1}})^{-\zeta}], \\
C_{i,t} &= P_t(\beta_i)^{-\frac{1}{\zeta}}(\hat{\mathbb{E}}_{i,t}[R_{t+1}(\frac{C_{i,t+1}}{P_{t+1}})^{-\zeta}])^{-\frac{1}{\zeta}} \\
&= \psi + \frac{\psi}{\bar{P}}\hat{P}_t - \frac{\psi}{\zeta\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}_{t+1}) + \psi\hat{\mathbb{E}}_{i,t}(\hat{C}_{i,t+1}) - \frac{\psi}{\bar{P}}\mathbb{E}_{i,t}(\hat{P}_{t+1}) \\
&\quad + \frac{\psi(1+\zeta)}{2\zeta^2\bar{R}^2}\hat{\mathbb{E}}_{i,t}(\hat{R}^2_{t+1}) + \frac{\psi}{2}\mathbb{E}_{i,t}(\hat{C}^2_{i,t+1}) + \frac{\psi}{P^2}\hat{\mathbb{E}}_{i,t}(\hat{P}^2_{t+1}) \\
&\quad - \frac{\psi}{\zeta\bar{R}\bar{P}}\hat{\mathbb{E}}_{i,t}(\hat{R}_{t+1})\hat{P}_{i,t} + \frac{\psi}{\bar{P}}\hat{\mathbb{E}}_{i,t}(\hat{C}_{i,t+1})\hat{P}_{i,t} - \frac{\psi}{\bar{P}^2}\hat{\mathbb{E}}_{i,t}(\hat{P}_{t+1})\hat{P}_t - \frac{\psi}{\zeta\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{C}_{i,t+1}\hat{R}_{t+1}) \\
&\quad + \frac{\psi}{\zeta\bar{P}\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{P}_{t+1}\hat{R}_{t+1}) - \frac{\psi}{\bar{P}}\hat{\mathbb{E}}_{i,t}(\hat{C}_{i,t+1}\hat{P}_{t+1}) + \Xi_{x,2}.
\end{aligned}
$$

Here ψ is the original consumption level of the agent at time t. A hat denotes the variable's (expected) deviation from the steady state (denoted with a bar). $\Xi_{x,2}$ is an error term. We assume that future prices are a function of current prices and a stochastic shock $P_{t+1} = P_t + P\sigma_\pi\epsilon_t$, where ϵ_t follows an independent unit normal distribution, i.e. $\epsilon_t \sim (0,1)$.[7] Collecting terms and similarly approximating the left-hand side to a second order yields the consumption change from an initial level $C_{i,t}$,

$$
\Delta\hat{\mathbb{E}}_{i,t}(C_{i,t+1}) = \hat{\mathbb{E}}_{i,t}\left(\pi_{t+1} - \sigma^2_\pi + \frac{1}{\zeta\bar{R}}\hat{R}_{t+1}(1+\hat{C}_{i,t+1}) - \frac{1+\zeta}{2\zeta^2\bar{R}}\hat{R}^2_{t+1} - \frac{1}{2}\Delta\hat{C}^2_{i,t+1}\right) + \Xi_{x,2}. \quad (6)
$$

where $\hat{\mathbb{E}}_{i,t}(\pi_{t+1}) = \frac{\Delta P_{t+1}}{P}$ is the expected inflation rate, $\hat{\mathbb{E}}_{i,t}\sigma^2_\pi$ is agent i's uncertainty over inflation. We denote agent i's consumption growth uncertainty with $\hat{\mathbb{E}}_{i,t}\sigma^2_C = \frac{1}{2}\Delta\mathbb{E}_{i,t}(\hat{C}^2_{i,t+1})$. We then arrive at

$$
\Delta\hat{\mathbb{E}}_{i,t}(C_{i,t+1}) \approx \hat{\mathbb{E}}_{i,t}(\pi_{t+1}) - \hat{\mathbb{E}}_{i,t}\sigma^2_\pi - \hat{\mathbb{E}}_{i,t}\sigma^2_C + \frac{1}{\zeta\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}_{t+1}(1+\hat{C}_{i,t+1}) - \frac{1+\zeta}{2\zeta^2\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}^2_{t+1}). \quad (7)
$$

Equation 7 states that the growth of expected nominal consumption increases in inflation expectations but decreases in inflation uncertainty σ^2_π. Consumption growth is also reduced by uncertainty about future consumption σ^2_C, as standard in the literature. Finally, consumption growth increases in expected interest rates $\left(\frac{1}{\zeta\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}_{t+1}(1+\hat{C}_{i,t+1}))\right)$ but

[6] These results are applicable for any other functional form which implements agent relative risk aversion $u'(\frac{C_{i,t}}{P_t}) = (\frac{C_{i,t}}{P_t})^{-\zeta}$.

[7] We will later discuss the non-independence of D, which introduces the effects of monetary policy uncertainty.

decreases in interest rate uncertainty $\left(\frac{1+\zeta}{2\zeta^2\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}^2_{t+1})\right)$.

The impact of inflation uncertainty on consumption growth, therefore, depends on the perceived reaction of monetary policy. On the one hand, if higher inflation uncertainty is associated with higher expected inflation (i.e. $\text{cov}(\hat{\mathbb{E}}_{i,t}\pi_{t+1}, \hat{\mathbb{E}}_{i,t}\sigma_\pi) > 0$) and if households expect the central bank to raise interest rates in response to higher inflation, inflation uncertainty will increase consumption growth. However, higher inflation uncertainty also increases interest uncertainty directly, thereby lowering consumption growth.

We summarise the relationship between consumption growth and inflation uncertainty by categorising and collecting terms depending on their sign. We define $\tilde{\sigma}^2_\pi(\sigma^2_\pi) = \hat{\mathbb{E}}_{i,t}\sigma^2_\pi + \hat{\mathbb{E}}_{i,t}\sigma^2_C + \frac{1+\zeta}{2\zeta^2\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}^2_{t+1}(\sigma^2_\pi))$ where $\frac{\delta\tilde{\sigma}^2_\pi}{\delta\sigma^2_\pi} > 0$, and $\tilde{R}_{t+1}(\sigma^2_\pi) = \frac{1}{\zeta\bar{R}}\hat{\mathbb{E}}_{i,t}(\hat{R}_{t+1}(\sigma^2_\pi)(1+\hat{C}_{i,t+1}))$ with $\frac{\delta\tilde{R}_{t+1}(\sigma^2_\pi)}{\delta\sigma^2_\pi} > 0$. We can then see the influence of inflation uncertainty on consumption growth ultimately depends on whether $\frac{\delta\tilde{\sigma}^2_\pi}{\delta\sigma^2_\pi} > \frac{\delta\tilde{R}_{t+1}(\sigma^2_\pi)}{\delta\sigma^2_\pi}$. When this is the case, consumption growth response will be negative, while otherwise it will be positive, as illustrated in Equation 8.

$$\Delta\hat{\mathbb{E}}_{i,t}(C_{i,t+1}) \approx \hat{\mathbb{E}}_{i,t}(\pi_{t+1}) + \tilde{R}_{t+1}(\sigma^2_\pi) - \tilde{\sigma}^2_\pi(\sigma^2_\pi). \tag{8}$$

We now turn to an empirical evaluation of the impact of inflation uncertainty defined in equation 8.

4.2 Consumption

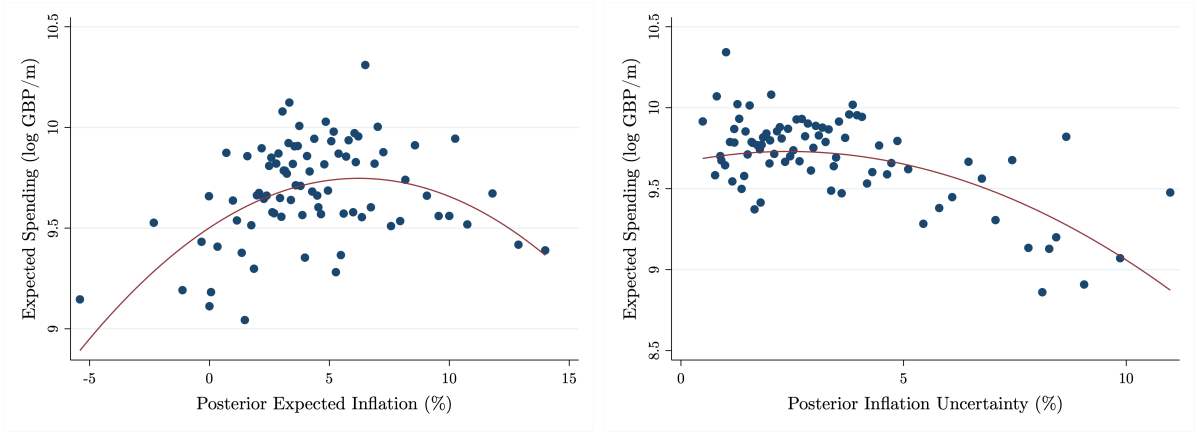
Figure 3 shows that the raw correlation between posterior inflation expectations and planned consumption is positive for low to average values of expected inflation, but turns negative for higher levels of expected inflation. The raw correlation between posterior inflation uncertainty and planned consumption, on the other hand, is flat for low values of inflation uncertainty but becomes negative for medium to high values of inflation uncertainty.

To assess the causal impact of inflation uncertainty, we estimate the response of nominal and real[8] expected consumption to changes in inflation uncertainty, measured by the standard deviation and the interquartile range of expected inflation. To estimate the response of nominal expected consumption to changes in the standard deviation of expected inflation, we estimate the following regression:

$$\hat{\mathbb{E}}_{i,t}\ln C_{i,t+1} = \alpha_0 + \beta_1\mathbb{E}^{post}_{i,t}\pi_{t+1} + \beta_2\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}} + \Gamma\mathbf{X}_{i,t} + \epsilon_i \tag{9}$$

where $\hat{\mathbb{E}}_{i,t}\ln C_{i,t+1}$ is the log of expected, nominal consumption of respondent i over the next twelve months and $\mathbf{X}_{i,t}$ is a vector containing household-level controls (prior infla-

[8]We compute real consumption by deflating expected consumption using the expected price level, thus assuming independence of the two variables.



(a) Consumption and Inflation Expectations (b) Consumption and Inflation Uncertainty

Note: This binned scatterplot shows the relationship between log expected monthly household spending and posterior expected inflation (left panel), as well as posterior inflation uncertainty (right panel).

Figure 3: Expected Consumption and Inflation Expectations & Uncertainty

tion expectations, prior inflation uncertainty, education level, age, sex, household size, liquidity status, log annual income, and perceived inflation over the past 12 months). We instrument the posterior inflation expectations and posterior inflation uncertainty using

$$\begin{aligned}\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1} = a_0 + \Sigma_{j=1}^{3} a_j \times I_{\{i \in Treat\, j\}} + \Sigma_{j=1}^{3} b_j \times I_{\{i \in Treat\, j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} \\ + \Sigma_{j=1}^{3} c_j \times I_{\{i \in Treat\, j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}} + \Theta \mathbf{X}_{i,t} + \varepsilon_i \end{aligned} \tag{10}$$

as well as

$$\begin{aligned}\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}} = a_0 + \Sigma_{j=1}^{3} a_j \times I_{\{i \in Treat\, j\}} + \Sigma_{j=1}^{3} b_j \times I_{\{i \in Treat\, j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\pi_{t+1} \\ + \Sigma_{j=1}^{3} c_j \times I_{\{i \in Treat\, j\}} \times \hat{\mathbb{E}}_{i,t}^{prior}\sigma_{\pi_{t+1}} + \Theta \mathbf{X}_{i,t} + \varepsilon_i \end{aligned} \tag{11}$$

We estimate Equation (9) using the same two-step approach as Coibion et al. (2024): We estimate the (survey-weighted) first stage using a Huber-robust regression to generate the Huber weights. In a second step we use the resulting weights together with the survey weights in a standard two-stage instrumental variable regression, applying a jackknife procedure to control for any remaining outliers. The resulting coefficient $\hat{\beta}_1$ ($\hat{\beta}_2$) is the causal estimate of the effect of changes in inflation expectations (uncertainty) on planned consumption. We proceed analogously for real consumption and our alternative measure of inflation uncertainty, the expected interquartile range of inflation. Since our randomised information treatments only lead to a small revision of households' inflation expectations and inflation uncertainty, our instrument is likely to be weak (which is also indicated by a low first-stage F-statistic). Therefore, we report robust weak instrument

confidence bands 95% for each endogenous value that is obtained using the L2 test[9] in the lower panel of the table.

Table 4: Response of Expected Consumption to Inflation Uncertainty

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.60		-0.22	
	(2.17)		(2.18)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-19.33**		-20.18**	
	(8.08)		(8.15)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.27		0.33
		(2.41)		(2.41)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-17.12**		-17.13**
		(6.87)		(6.87)
F-stat (mean)	12.118	11.817	12.084	11.817
F-stat (unc)	5.908	5.458	5.870	5.458
95% CI (mean)	[-20.14, 35.72]	[-30.10, 42.00]	[-17.62, 24.83]	[-31.05, 41.07]
95% CI (unc)	[-39.21, -8.63]	[-198.99, -7.96]	[-40.27, -9.36]	[-196.44, -7.97]
R^2	0.241	0.200	0.233	0.197
N	1,996	2,007	1,997	2,007

Note: This table reports the results from estimating equation ((9)) for nominal (columns 1 and 2) and real consumption (columns 3 and 4) using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (columns 1 and 3), as well as the median and interquartile range of expected inflation (columns 2 and 4). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

Table 4 shows the estimated effect of inflation uncertainty on expected nominal (real) consumption (see Table B.1 in the Appendix for the full results including controls). We find no significant effect of expected inflation on planned spending. However, we find a significantly negative effect of inflation uncertainty on nominal and real consumption, even after controlling for expected inflation. This holds for uncertainty measured as the standard deviation of expected inflation as well as the interquartile range of expected inflation. Furthermore, this result is still significant even when accounting for the likely weakness of the instrument, as the weak-instrument robust confidence intervals in the lower panel show. However, the effect of uncertainty on spending is estimated quite imprecisely, covering severe contractionary effects to relatively small effects. Finally, Table B.4 shows that we find significant effects only for female respondents, for non-hand-to-mouth respondents,[10] and for respondents without a mortgage (either renters or outright owners). However, given the larger uncertainty around these estimates, we cannot reject the null hypothesis that there is no significant heterogeneity between respondents.

[9] In particular, we use the LC2sls test provided by Sun (2018).

[10] Households are classified as hand-to-mouth if they hold less than half a month's income in liquid assets.

This result is robust to using log uncertainty as an uncertainty measure (see Table B.2), and controlling for the skewness of prior inflation expectations (see Table B.3).

4.3 Drivers

This section explores the main drivers behind the negative relationship between inflation uncertainty and planned household spending. For this, we first estimate the response of log expected nominal (real) income using the same empirical strategy as in the previous section. Table 5 shows that higher expected inflation leads to higher expected nominal income over the following 12 months. However, the pass-through of expected inflation to expected nominal income is smaller than one, so that expected real incomes fall significantly (consistent with Hajdini et al., 2022). Inflation uncertainty, on the other hand, leads to significantly lower expected income even after controlling for expected inflation, both in nominal and in real terms. While expected incomes fall in response to higher inflation uncertainty, they decrease less than planned spending, so that the expected consumption-to-income ratio increases (Table 8).

Table 5: Response of Expected Income to Inflation Uncertainty

	(1) $\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1})$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(Y_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.25**		-0.73***	
	(0.11)		(0.12)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.56**		-0.59**	
	(0.22)		(0.23)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		0.24**		-0.74***
		(0.10)		(0.11)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.47***		-0.46**
		(0.18)		(0.18)
F-stat (mean)	16.275	17.441	16.104	17.436
F-stat (unc)	10.061	9.681	10.043	9.859
95% CI (mean)	[0.06, 0.44]	[0.06, 0.42]	[-0.94, -0.52]	[-0.94, -0.54]
95% CI (unc)	[-1.03, -0.17]	[-0.92, -0.16]	[-1.09, -0.18]	[-0.92, -0.14]
R^2	0.999	0.999	0.999	0.999
N	3,228	3,234	3,230	3,237

Note: This table reports the results from estimating equation ((9)) for nominal (columns 1 and 2) and real income (columns 3 and 4) using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (columns 1 and 3), as well as the median and interquartile range of expected inflation (columns 2 and 4). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

Furthermore, higher expected inflation leads to higher expected nominal interest rates, but the pass-through is smaller than one: expected real rates fall in response to higher expected inflation. Higher inflation uncertainty, on the other hand, increases nominal in-

terest rate expectations, but has no effect on expected real rates. However, neither lower expected incomes nor higher expected interest rates can (fully) explain the effect of inflation uncertainty on consumption: The effect remains significant even when controlling for expected income (Table B.8) or expected interest rates (Table B.9).

Table 6: Response of Income Uncertainty to Inflation Uncertainty

	(1) $\hat{\mathbb{E}}_{i,t}\sigma_{\Delta y_{i,t+1}}$ b/se	(2) $\hat{\mathbb{E}}_{i,t}IQR_{\Delta y_{i,t+1}}$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	-0.05**	
	(0.02)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	0.93***	
	(0.12)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		-0.15***
		(0.04)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		1.07***
		(0.13)
F-stat (mean)	20.187	19.193
F-stat (unc)	6.957	7.191
95% CI (mean)	[-0.09, -0.01]	[-0.23, -0.10]
95% CI (unc)	[0.72, 1.19]	[0.83, 1.41]
R^2	0.721	0.700
N	3,261	3,274

Note: This table reports the results from estimating equation ((9)) for nominal income growth uncertainty using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (column 1), as well as the median and interquartile range of expected inflation (column 2). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

Instead, the decline in spending reflects increased precautionary savings. Table 6 shows that higher inflation uncertainty leads to significantly higher income growth uncertainty. This is consistent with the finding that higher inflation uncertainty causes households to perceive a higher subjective risk of losing their jobs (Table 7). Table B.10 shows that the significant negative effect of inflation uncertainty disappears once controlling for nominal income growth uncertainty, confirming that this is the primary channel through which inflation uncertainty affects household spending.

Taken together, these results indicate that households' perceived inflation uncertainty reflects a supply-side view of inflation, where heightened inflation uncertainty is due to heightened uncertainty about adverse supply shocks (or the central bank's reaction to

them): An increased subjective risk of adverse supply shocks increases inflation expectations and, at the same time, increases households' perceived risk of job loss, thus giving rise to a precautionary savings motive. If, instead, households' inflation uncertainty reflected an increased risk of demand shocks, we would expect a positive pass-through to expected inflation combined with a *lower* instead of a *higher* risk of job loss. This supply-side view of inflation has recently been documented, for example, by Kamdar et al. (2019) and Coibion et al. (2023). Our results show that this interpretation extends not only to the level of expected inflation but also to inflation uncertainty.

Table 7: Response of Expected Job Loss Risk to Uncertainty about Inflation

	(1) $\Pr(JobLoss_{i,t+1} = \{(very)\, likely\})$ b/se	(2) $\Pr(JobLoss_{i,t+1} = \{(very)\, likely\})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	-0.44	
	(0.73)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	5.28**	
	(2.28)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		-1.12
		(0.72)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		4.01***
		(1.55)
F-stat (mean)	8.244	7.904
F-stat (unc)	5.184	6.539
95% CI (mean)	[-30.70, 5.05]	[-9.30, -0.15]
95% CI (unc)	[2.19, 111.84]	[1.30, 19.40]
R^2	-0.008	-0.019
N	1,318	1,332

Note: This table reports the results from estimating equation ((9)) for perceived job loss risk using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (column 1), as well as the median and interquartile range of expected inflation (column 2). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

4.4 5-year Expectations

We also investigate the pass-through of short-term inflation expectations and uncertainty to long-term inflation expectations and uncertainty. We report these results in Table 9. Short-term inflation expectations are positively associated with long-term inflation expectations, whether measured as the average or median expectations in Columns 1 and 2. Meanwhile, changes in inflation uncertainty have a negative effect on the level. This can be interpreted as higher uncertainty spreading equally around the long-term inflation target, resulting in a decline in the level expectation.

We further find a positive pass-through of inflation uncertainty to five-year ahead in-

Table 8: Response of the Expected Consumption Share to Uncertainty about Inflation

	(1) $\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/Y_{i,t+1})$ b/se	(2) $\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/Y_{i,t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.36	
	(2.29)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-17.14**	
	(8.30)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.20
		(2.36)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-14.70**
		(6.61)
F-stat (mean)	11.424	11.717
F-stat (unc)	5.917	5.571
95% CI (mean)	[-∞, 154.44]	[-30.47, 43.88]
95% CI (unc)	[-37.59, -2.98]	[-36.09, -3.38]
R^2	0.274	0.245
N	1,993	2,008

Note: This table reports the results from estimating equation ((9)) for the expected consumption-to-income ratio using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (column 1), as well as the median and interquartile range of expected inflation (column 2). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

flation uncertainty: Increased inflation uncertainty in the short term is strongly passed through to five-year ahead inflation uncertainty, as Columns 3 and 4 show. Meanwhile, higher short-term inflation expectations are associated with lower long-term uncertainty, suggesting that agents may expect a limited and smooth reaction function of the central bank. Thus sustained short-run inflation uncertainty can drive a de-anchoring of long-run inflation certainty to a larger extent than sustained short-run inflation expectations drive long-run inflation expectations.

5 Conclusion

In this paper, we investigate the causal effect of inflation uncertainty on household behaviour using a randomised controlled trial in a population-representative survey of British households. By providing different subsets of respondents with varying information about professional forecasters' inflation predictions, we induce exogenous variation in households' inflation expectations and uncertainty. This approach allows us to overcome

Table 9: Response of 5-year ahead Inflation Expectations to Inflation Uncertainty

	(1) $\hat{\mathbb{E}}_{i,t}\pi_{t+5}$ b/se	(2) $\hat{\mathbb{E}}_{i,t}P_{50}(\pi_{t+5})$ b/se	(3) $\hat{\mathbb{E}}_{i,t}\sigma_{\pi_{t+5}}$ b/se	(4) $\hat{\mathbb{E}}_{i,t}IQR_{\pi_{t+5}}$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.50***		-0.06***	
	(0.08)		(0.02)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.35**		0.80***	
	(0.17)		(0.08)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		0.55***		-0.09***
		(0.08)		(0.03)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.39***		0.79***
		(0.14)		(0.09)
F-stat (mean)	15.858	15.960	18.089	18.947
F-stat (unc)	9.655	9.909	9.908	9.655
95% CI (mean)	[0.36, 0.64]	[0.40, 0.73]	[-0.11, -0.02]	[-0.16, -0.03]
95% CI (unc)	[-0.71, -0.05]	[-0.76, -0.13]	[0.65, 0.98]	[0.63, 0.98]
R^2	0.496	0.472	0.786	0.773
N	3,243	3,266	3,278	3,311

Note: This table reports the results from estimating equation ((9)) for 5-year expected inflation (columns 1 and 2) and inflation uncertainty (columns 3 and 4) using two expectation measures: the mean and standard deviation of expected inflation (column 1 and 3), as well as the median and interquartile range of expected inflation (column 2 and 4). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate.

the inherent correlation between the first and second moments of inflation expectations, enabling us to isolate the causal impact of inflation uncertainty.

Our main finding is that higher inflation uncertainty leads to significantly lower planned spending by households, both in nominal and real terms. This result is robust to different measures of uncertainty and holds even when accounting for the potential weakness of our instruments. Remarkably, this negative effect occurs despite inflation uncertainty being positively correlated with expected inflation, which theoretically would encourage households to spend more in the present.

The primary driver behind this negative effect is that households' inflation uncertainty reflects uncertainty about adverse supply shocks, or uncertainty about the central bank's reaction to them, in the spirit of the Friedman-Ball hypothesis. Higher inflation uncertainty significantly raises households' income uncertainty and their perceived risk of job loss, leading to an increase in precautionary savings. This result is consistent with households attributing inflation uncertainty to supply-side shocks in the economy. If, instead, households interpreted inflation uncertainty as reflecting demand-side shocks, we would expect to see a positive effect on expected income and a lower perceived risk of job loss.

Our results offer important insights for policymakers. We show that inflation uncertainty is a significant cost of inflation, distinct from the level of inflation itself. This cost operates primarily through a precautionary savings channel, as households interpret uncertainty about inflation as a signal of potential adverse supply shocks. This interpretation results in a higher perceived income risk. Our findings suggest that by reducing inflation uncertainty, central banks can lower households' precautionary savings motives and stimulate consumption. This underscores the importance of central bank communication in shaping households' expectations and decisions.

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Appendix for "The Effect of Inflation Uncertainty on Household Spending"

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23rd September 2024

Contents

A Survey Questions

A.1 Past Income

Please state the **total annual income** of **each adult in your household**, before anything is deducted for tax, National Insurance, pension schemes etc. For items of joint income, allocate it to whichever member of the household would pay tax on that income.

Enter a zero if no income is earned by that person.

Please remember all the answers you provide are confidential and please try to be as accurate as possible, entering an amount in pounds without any decimals (you **do not** need to use all the nine spaces for digits).

[Respondents are shown each of the following rows based on the number of adults other than the survey respondent in the household.]

Yourself	£ [OPEN NUMERIC BOX] Don't know Prefer not to state
Partner/other main earner	£ [OPEN NUMERIC BOX] Don't know Prefer not to state
For all **other** adults in the household, the total of their **annual** incomes	£ [OPEN NUMERIC BOX] Don't know Prefer not to state

[Sum of components is displayed to respondents at the bottom of the page. Warning message appears if total annual household income $\leq$ £1,000 *or* $\geq$ £200,000.*]*

You have entered:
Total annual household income = £__

This means:
Total monthly household income = £__
Total weekly household income = £__

Please edit the figures if this is not correct.

A.2 Prior Inflation Expectations

Before survey respondents are asked to assign probabilities to their expected outcomes for inflation and incomes, they receive the following instruction:

> Before moving on to the next section, we will ask you to think about the percentage chance of something happening in the future. Your answers can range from 0 to 100, where 0 means there is absolutely no chance, and 100 means that it is absolutely certain.
>
> For example, numbers like:
>
> 3 and 5 percent may indicate "almost no chance"
> 17 percent or so may mean "not much chance"
> 48 or 53 percent may be "pretty even chance"
> 82 percent or so may mean a "very good chance"
> 95 or 98 percent may be "almost certain".

Households are then asked to assign probabilities to their expected realisations of inflation over the next twelve months. This allows us to elicit the distribution of their inflation expectations prior to receiving any treatment.

> We would like you to think about the different things that may happen to prices of goods and services **over the next 12 months**.

In your view, what would you say is the percentage chance that, **over the next 12 months**, prices of goods and services ...

Please note: The numbers need to add up to 100.

go **up** by 12% or more	_____ percent chance
go **up** by 8% to 12%	_____ percent chance
go **up** by 4% to 8%	_____ percent chance
go **up** by 2% to 4%	_____ percent chance
go **up** by 0% to 2%	_____ percent chance
go **down** by 0% to 2%	_____ percent chance
go **down** by 2% to 4%	_____ percent chance
go **down** by 4% to 8%	_____ percent chance
go **down** by 8% to 12%	_____ percent chance
go **down** by 12% or more	_____ percent chance
TOTAL	100 percent

[ERROR MESSAGE if sum not equal to 100] Your total adds up to __ percent. Please change the numbers in the table so they add up to 100.

A.3 Past Consumption

Following the elicitation of their prior distribution of expected inflation, households are asked a set of backward-looking questions about their saving and consumption behaviour over the past year. The backward-looking consumption question (stated below) is used to calculate households' expected change in spending after receipt of the treatment.

How much did your household spend on **average per month** on **everything** over the **last** 12 months?

Please **include** all your spending on goods and services [*IF TENURE = RENT* including rent], but **exclude** money put into savings or used to repay mortgages, overdrafts, credit cards and other loans.

Please try to be as accurate as possible, entering an amount in pounds without any decimals (you do not need to use all the nine spaces for digits).

£ [OPEN NUMERIC BOX] **per month**
Don't know
Prefer not to state

A.4 Information Treatment

Households are then randomly assigned into four groups, of which one is a control group that does not receive an information treatment. Following this treatment, households are asked to assign probabilities to their expected realisations of inflation and income over the next twelve months to compute their posterior distributions.

Group	Statement for Screen
1	Screen 1: On the next screen, we would like you to think about the different things that may happen to inflation over the next 12 months. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing). No additional screen
2	Screen 1: On the next screen, we describe some predictions that professional forecasters have made for inflation in the UK. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing). Please review this information carefully – it will only be shown once. Screen 2.1: **Professional forecasters expect lower inflation** than one year ago. The average forecast for inflation over the next year is 2 percent.
3	Screen 1: On the next screen, we describe some predictions that professional forecasters have made for inflation in the UK. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing). Please review this information carefully – it will only be shown once. Screen 2.2: **Professional forecasters are less uncertain** about inflation than one year ago. The highest forecast for inflation over the next year is 2.1 percentage points higher than the lowest forecast.
4	Screen 1: On the next screen, we describe some predictions that professional forecasters have made for inflation in the UK. Inflation is the rate at which prices of goods and services increase (Note: deflation means prices are decreasing). Please review this information carefully – it will only be shown once. Screen 2.3: **Professional forecasters expect lower inflation** than one year ago. The average forecast for inflation over the next year is 2 percent. **Professional forecasters are also less uncertain about inflation** than one year ago. The highest forecast for inflation over the next year is 2.1 percentage points higher than the lowest forecast.

A.5 Posterior Inflation Expectations

In your view, what would you say is the percentage chance that, **over the next 12 months**, ...

Please note: The numbers need to add up to 100.

the rate of inflation will be 12% or higher	_____ percent chance
the rate of inflation will be between 8% and 12%	_____ percent chance
the rate of inflation will be between 4% and 8%	_____ percent chance
the rate of inflation will be between 2% and 4%	_____ percent chance
the rate of inflation will be between 0% and 2%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 0% and 2%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 2% and 4%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 4% and 8%	_____ percent chance
the rate of deflation (opposite of inflation) will be between 8% and 12%	_____ percent chance
the rate of deflation (opposite of inflation) will be 12% or higher	_____ percent chance
TOTAL	100 percent

[ERROR MESSAGE if sum not equal to 100] Your total adds up to __ percent. Please change the numbers in the table so they add up to 100.

A.6 Income Expectations

Households are asked the following question about their expected distribution of income growth expectations over the next 12 months, following receipt of the treatment:

> We would still like you to think about your **total annual household income**, before anything is deducted for tax, National Insurance, pension schemes, etc. **over the next 12 months**. We realise that the following question may take a little more effort.
>
> In your view, what would you say is the percentage chance that **over the next 12 months**, your **total annual household income**, before anything is deducted for tax, National Insurance, pension schemes etc., will ...
>
> Please note: The numbers need to add up to 100.

go **up** by 12% or more	_____ percent chance
go **up** by 8% to 12%	_____ percent chance
go **up** by 4% to 8%	_____ percent chance
go **up** by 2% to 4%	_____ percent chance
go **up** by 0% to 2%	_____ percent chance
go **down** by 0% to 2%	_____ percent chance
go **down** by 2% to 4%	_____ percent chance
go **down** by 4% to 8%	_____ percent chance
go **down** by 8% to 12%	_____ percent chance
go **down** by 12% or more	_____ percent chance
TOTAL	100 percent

[ERROR MESSAGE if sum not equal to 100] Your total adds up to __ percent. Please change the numbers in the table so they add up to 100.

From the answers to this question, we compute the first and second moments of respondents' subjective distributions about their household's income growth. We again compute both the mean and the median expected income growth as well as the standard deviation and interquartile range of income growth expectations.

A.7 Consumption Expectations

Households are then asked a set of forward-looking questions about their expected consumption behaviour over the next year. The forward-looking consumption question (stated below) is used to calculate households' expected change in spending.

> How much do you expect your household to spend **on average per month** on **everything** over the **next** 12 months?
>
> Please **include** all your spending on goods and services [*IF TENURE = RENT* including rent], but **exclude** money put into savings or used to repay mortgages, overdrafts, credit cards and other loans.
>
> Please try to be as accurate as possible, entering an amount in pounds without any decimals (you do not need to use all the nine spaces for digits).
>
> £ [OPEN NUMERIC BOX] **per month**
> Don't know
> Prefer not to state

A.8 Job Loss Risk

The following question asks households who are working full-time or part-time about their perceived risk of job loss:

> To the best of your knowledge, what would you say is the likelihood that you will lose your job during the next 12 months?

Very unlikely, my job is very secure
Unlikely, but there is a chance I will lose my job
Quite likely, my job is not very secure
Almost definite, I do not expect my job to last
Don't know
Prefer not to state

A.9 Interest Rates

The final part of the survey asks households about their macroeconomic expectations, including interest rates, their distribution about expected inflation five years from now, and their perceptions of inflation over the past twelve months. To compute households' expectations about interest rates, we use the following question:

The level of interest rates set by the Bank of England (Bank Rate) was 5.25% on 4 March, when this survey opened. At what level do you expect that interest rate to be in each of the following time periods?

Rows	
One year from now	<drop-down menu>
Two years from now	<drop-down menu>
Five years from now	<drop-down menu>

<drop-down menu>
10% or more
9 to 9.9%
8 to 8.9%
7 to 7.9%
6 to 6.9%
5 to 5.9%
4 to 4.9%
3 to 3.9%
2 to 2.9%
1 to 1.9%
0 to 0.99%
0%
0 to -0.99%
-1% or less
Don't know

From the responses to this question, we impute values of 10.5% if respondents said that they expect Bank Rate to be "10% or more", and -1.5% if they expect Bank Rate to be "-1% or less". We impute the respective mid-points of the other banded response options, excluding "Don't know".

A.10 Perceived Inflation

To obtain households' perceived inflation rates over the past 12 months, we ask the following question:

> Which of these options best describes how prices in the shops have changed over the last 12 months?

Gone down
Not changed
Up by 1% or less
Gone up by 1% but less than 2%
Gone up by 2% but less than 3%
Gone up by 3% but less than 4%
Gone up by 4% but less than 5%
Gone up by 5% but less than 6%
Gone up by 6% but less than 7%
Gone up by 7% but less than 8%
Gone up by 8% but less than 9%
Gone up by 9% but less than 10%
Gone up by 10% or more
Don't know

Note that this question asks about how prices in shops have changed instead of prices of goods and services, and that the response scale differs from the distributional inflation questions described earlier. From the response options, we impute values of -0.5% if respondents said that prices have "gone down", 0% if they have "not changed", and 10.5% if prices have "gone up by 10% or more. We use the respective mid-points of the response bands for the other options, excluding "Don't know".

A.11 5-year Inflation Expectations

Finally, we asked households about their expectations about inflation five years from now by asking the following question:

> And in your view, what would you say is the percentage chance that over the **12-month period between March 2028** and **March 2029**, prices of goods and services ...
>
> Please note: The numbers need to add up to 100.

go **up** by 12% or more	_____ percent chance
go **up** by 8% to 12%	_____ percent chance
go **up** by 4% to 8%	_____ percent chance
go **up** by 2% to 4%	_____ percent chance
go **up** by 0% to 2%	_____ percent chance
go **down** by 0% to 2%	_____ percent chance
go **down** by 2% to 4%	_____ percent chance
go **down** by 4% to 8%	_____ percent chance
go **down** by 8% to 12%	_____ percent chance
go **down** by 12% or more	_____ percent chance
TOTAL	100 percent

> *[ERROR MESSAGE if sum not equal to 100]* Your total adds up to __ percent. Please change the numbers in the table so they add up to 100.

From the answers to this question, we compute the first and second moments of respondents' subjective distributions about 5-year ahead inflation. We again compute both the mean and the median expected inflation rate as well as the standard deviation and interquartile range of inflation expectations.

B Robustness

Table B.1: Response of Consumption to Inflation Uncertainty

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.60		-0.22	
	(2.17)		(2.18)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-19.33**		-20.18**	
	(8.08)		(8.15)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.27		0.33
		(2.41)		(2.41)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-17.12**		-17.13**
		(6.87)		(6.87)
$\hat{\mathbb{E}}^{prior}_{i,t}\pi_{t+1}$	-0.23		-0.26	
	(1.03)		(1.03)	
$\hat{\mathbb{E}}^{prior}_{i,t}\sigma_{\pi_{t+1}}$	13.56*		14.29**	
	(6.98)		(7.04)	
$\hat{\mathbb{E}}^{prior}_{i,t}P_{50}(\pi t+1)$		-0.50		-0.50
		(1.18)		(1.18)
$\hat{\mathbb{E}}^{prior}_{i,t}IQR_{\pi_{t+1}}$		12.94**		12.95**
		(6.02)		(6.02)
Income	0.43***	0.43***	0.43***	0.43***
	(0.02)	(0.02)	(0.02)	(0.02)
Perceived Inflation	1.52***	1.59***	1.51***	1.59***
	(0.57)	(0.61)	(0.57)	(0.61)
Female	-1.24	-0.46	-1.44	-0.46
	(3.11)	(3.28)	(3.12)	(3.28)
Age	0.09	0.05	0.08	0.05
	(0.13)	(0.13)	(0.13)	(0.13)
Liquidity Status	-6.11	-4.37	-5.69	-4.37
	(3.78)	(4.19)	(3.81)	(4.19)
Household Size	5.32***	5.21***	5.38***	5.21***
	(1.47)	(1.58)	(1.48)	(1.58)
GCSE level	0.29	0.44	0.34	0.44
	(5.50)	(5.64)	(5.52)	(5.64)
A level	9.57*	10.11*	9.13*	10.11*
	(5.51)	(5.62)	(5.54)	(5.62)
Degree level+	16.31***	14.46***	16.40***	14.45***
	(4.87)	(4.98)	(4.89)	(4.98)
F-stat (mean)	12.118	11.817	12.084	11.817
F-stat (unc)	5.908	5.458	5.870	5.458
95% CI (mean)	[-20.14, 35.72]	[-30.10, 42.00]	[-17.62, 24.83]	[-31.05, 41.07]
95% CI (unc)	[-39.21, -8.63]	[-198.99, -7.96]	[-40.27, -9.36]	[-196.44, -7.97]
R^2	0.241	0.200	0.233	0.197
N	1,996	2,007	1,997	2,007

Note: This table reports the results from estimating model (9) for nominal (columns 1 and 2) and real consumption (columns 3 and 4) using two measures of inflation expectations and uncertainty: the mean and standard deviation of expected inflation (columns 1 and 3), as well as the median and interquartile range of expected inflation (columns 2 and 4). F-stat refers to the F-test of coefficients on excluded instruments being equal to zero. 95% CI refers to weak-instrument robust confidence intervals (in square brackets) for the respective variable constructed using conditional likelihood estimation. These intervals can extend to positive or negative infinity. We omit intervals that do not contain the point estimate. Perceived inflation refers to the perceived inflation rate over the previous 12 months. Liquid assets is a dummy variable indicating whether households have liquid assets worth more than a half month's income.

Table B.2: Response of Expected Spending to log Inflation Uncertainty

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	1.65		0.71	
	(2.22)		(2.22)	
$\ln\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.42*		-0.42*	
	(0.22)		(0.22)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		2.10		1.17
		(2.40)		(2.40)
$\ln\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.35		-0.35
		(0.22)		(0.22)
F-stat (mean)	10.140	10.747	10.140	10.747
F-stat (unc)	4.776	5.604	4.776	5.604
95% CI (mean)	[-131.60, 25.52]	[-∞, 19.53]	[-132.54, 24.59]	[-∞, 18.59]
95% CI (unc)	[-1.07, 0.06]	[-0.99, 0.13]	[-1.07, 0.06]	[-0.99, 0.13]
R^2	0.239	0.234	0.236	0.232
N	1,996	2,012	1,996	2,012

Note:

Table B.3: Response of Expected Spending to Inflation Uncertainty (Controlling for Skewness)

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	2.02		1.08	
	(2.12)		(2.12)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-20.14***		-20.15***	
	(7.67)		(7.67)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.56		0.62
		(2.42)		(2.42)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-17.35**		-17.36**
		(6.90)		(6.90)
F-stat (mean)	13.016	11.871	13.016	11.871
F-stat (unc)	6.560	5.454	6.560	5.454
95% CI (mean)	[-1.70, 7.40]	[-28.95, 47.08]	[-2.64, 6.46]	[-29.89, 45.22]
95% CI (unc)	[-39.37, -6.82]	[-223.29, -8.17]	[-39.39, -9.79]	[-220.76, -8.18]
R^2	0.234	0.200	0.231	0.198
N	1,994	2,007	1,994	2,007

Note:

Table B.4: Response of Expected Spending to Inflation Uncertainty by Group

	(1) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se
Male $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$	2.67		
	(4.09)		
Female $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$	-2.30		
	(3.60)		
Male $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$	-4.62		
	(11.78)		
Female $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$	-19.65*		
	(11.61)		
HtM $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$		-3.30	
		(5.89)	
Non-HtM $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$		0.89	
		(3.01)	
HtM $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$		-22.48*	
		(11.75)	
Non-HtM $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$		-17.45*	
		(10.00)	
No Mortgage $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$			-2.02
			(3.22)
Mortgage $\times\hat{\mathbb{E}}_{i,t}^{post}\pi_{t+1}$			4.37
			(4.14)
No Mortgage $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$			-23.44**
			(10.77)
Mortgage $\times\hat{\mathbb{E}}_{i,t}^{post}\sigma_{\pi_{t+1}}$			-12.91
			(13.09)
p-value for equality (level)	0.359	0.525	0.221
p-value for equality (uncertainty)	0.348	0.742	0.528
R^2	0.256	0.238	0.230
N	1,997	1,997	1,997

Note: Hand-to-mouth (HtM) indicates whether households hold less than half a month's income in liquid assets.

Table B.5: Response of Expected Income to Inflation Uncertainty (Controlling for Skewness)

	(1) $\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.18*		0.18*	
	(0.10)		(0.10)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.43*		-0.43*	
	(0.24)		(0.24)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		0.24**		-0.72***
		(0.10)		(0.11)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.46***		-0.49***
		(0.18)		(0.19)
F-stat (mean)	17.606	17.442	17.606	17.233
F-stat (unc)	8.765	9.475	8.765	9.675
95% CI (mean)	[-0.04, 0.35]	[0.05, 0.42]	[-0.04, 0.35]	[-0.92, -0.52]
95% CI (unc)	[-0.96, -0.00]	[-0.90, -0.15]	[-0.96, -0.00]	[-0.96, -0.16]
R^2	0.999	0.999	0.999	0.999
N	3,223	3,235	3,223	3,233

Note:

Table B.6: Response of Expected Income to log Inflation Uncertainty

	(1) $\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1})$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(Y_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.33***		-0.68***	
	(0.13)		(0.13)	
$\ln\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.02*		-0.02*	
	(0.01)		(0.01)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		0.36***		-0.65***
		(0.12)		(0.13)
$\ln\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.02**		-0.02**
		(0.01)		(0.01)
F-stat (mean)	13.734	16.336	13.597	16.445
F-stat (unc)	7.397	9.127	7.321	9.208
95% CI (mean)	[0.11, 0.60]	[0.15, 7.21]	[-0.91, -0.39]	[-0.87, ∞]
95% CI (unc)	[-0.04, 0.00]	[-0.03, -0.00]	[-0.04, -0.00]	[-0.04, -0.00]
R^2	0.999	0.999	0.999	0.998
N	3,286	3,272	3,287	3,282

Note:

Table B.7: Response of Consumption Share to log Inflation Uncertainty

	(1) $\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/Y_{i,t+1})$ b/se	(2) $\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/Y_{i,t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.34	
	(2.29)	
$\ln\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-0.33	
	(0.21)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.88
		(2.44)
$\ln\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-0.27
		(0.22)
F-stat (mean)	9.903	10.812
F-stat (unc)	5.212	5.774
95% CI (mean)	[-∞, 20.56]	[-∞, 38.74]
95% CI (unc)	[-0.88, 0.13]	[-0.83, 0.20]
R^2	0.289	0.287
N	1,997	2,013

Note:

Table B.8: Response of Consumption to Inflation Uncertainty (Controlling for Income Expectations)

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	1.33		1.94	
	(2.16)		(2.89)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-21.30***		-23.34***	
	(8.20)		(7.85)	
$\ln\hat{\mathbb{E}}_{i,t}Y_{i,t+1}$	0.29			
	(0.33)			
$\ln\hat{\mathbb{E}}_{i,t}(Y_{i,t+1}/P_{t+1})$			0.47	
			(0.65)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		1.95		2.41
		(2.42)		(2.99)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-17.20**		-18.35***
		(7.03)		(6.29)
$\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1})$		0.26		
		(0.35)		
$\ln\hat{\mathbb{E}}_{i,t}P_{50}(Y_{i,t+1}/P_{t+1})$				0.53
				(0.67)
F-stat (mean)	12.710	12.097	8.822	9.221
F-stat (unc)	5.725	5.287	5.962	5.937
95% CI (mean)	[-20.97, 22.79]	[-23.85, 39.01]	[-37.19, 9.32]	[-50.83, 12.35]
95% CI (unc)	[-41.50, -10.43]	[-155.38, -7.81]	[-46.38, -12.59]	[-36.70, -9.79]
R^2	0.234	0.200	0.229	0.193
N	1,996	2,009	1,981	1,996

Note:

Table B.9: Response of Interest Rate Expectations

	(1) $\hat{\mathbb{E}}_{i,t} i_{t+1}$ b/se	(2) $\hat{\mathbb{E}}_{i,t} i_{t+1}$ b/se	(3) $\hat{\mathbb{E}}_{i,t}(i_{t+1} - \pi_{t+1})$ b/se	(4) $\hat{\mathbb{E}}_{i,t} i_{t+1} - P_{50}\pi_{t+1}$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.12***		-1.09***	
	(0.04)		(0.07)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	0.27**		0.23	
	(0.12)		(0.20)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		0.09**		-1.07***
		(0.04)		(0.07)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		0.21**		0.17
		(0.09)		(0.16)
F-stat (mean)	14.233	14.794	16.644	16.798
F-stat (unc)	7.850	7.596	8.848	8.110
95% CI (mean)	[0.05, 0.21]	[0.02, 0.18]	[-1.19, -1.00]	[-1.20, -0.97]
95% CI (unc)	[0.01, 0.53]	[0.01, 0.42]	[-0.05, 0.68]	[-0.06, 0.58]
R^2	0.121	0.110	0.499	0.495
N	3,037	3,055	3,306	3,320

Note:

Table B.10: Response of Consumption to Inflation Uncertainty (Controlling for Income Uncertainty)

	(1) $\ln\hat{\mathbb{E}}_{i,t} C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t} C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t} P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	1.22		-0.14	
	(2.73)		(3.22)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-30.93		-28.22	
	(20.61)		(20.63)	
$\hat{\mathbb{E}}_{i,t}\sigma_{\Delta y_{i,t+1}}$	13.72		12.06	
	(9.82)		(9.89)	
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		2.53		1.46
		(3.20)		(3.50)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-18.63		-19.37
		(15.33)		(14.88)
$\hat{\mathbb{E}}_{i,t}IQR_{\Delta y_{i,t+1}}$		7.39		8.24
		(6.81)		(6.75)
F-stat (mean)	11.980	11.449	9.240	9.312
F-stat (unc)	2.829	3.582	2.871	3.000
95% CI (mean)	[-21.36, ∞]	[-16.20, ∞]	[-30.25, 109.87]	[-29.97, ∞]
95% CI (unc)	[$-\infty$, -3.30]	[$-\infty$, -9.97]	[$-\infty$, -1.32]	[$-\infty$, 0.43]
R^2	0.152	0.178	0.180	0.191
N	1,919	1,923	1,883	1,888

Note:

Table B.11: Response of Consumption to Inflation Uncertainty (Controlling for Interest Rate Expectations)

	(1) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(2) $\ln\hat{\mathbb{E}}_{i,t}C_{i,t+1}$ b/se	(3) $\ln\hat{\mathbb{E}}_{i,t}(C_{i,t+1}/P_{t+1})$ b/se	(4) $\ln\hat{\mathbb{E}}_{i,t}P_{50}(C_{i,t+1}/P_{t+1})$ b/se
$\hat{\mathbb{E}}^{post}_{i,t}\pi_{t+1}$	0.30		-0.87	
	(2.41)		(2.40)	
$\hat{\mathbb{E}}^{post}_{i,t}\sigma_{\pi_{t+1}}$	-20.72***		-20.72***	
	(6.88)		(6.88)	
$\hat{\mathbb{E}}_{i,t}i_{t+1}$	3.59***	4.12***	3.67***	4.12***
	(1.28)	(1.42)	(1.27)	(1.42)
$\hat{\mathbb{E}}^{post}_{i,t}P_{50}(\pi_{t+1})$		-0.03		-0.97
		(2.55)		(2.55)
$\hat{\mathbb{E}}^{post}_{i,t}IQR_{\pi_{t+1}}$		-15.41***		-15.41***
		(5.00)		(5.00)
F-stat (mean)	8.955	9.333	8.997	9.333
F-stat (unc)	5.755	5.540	5.756	5.540
95% CI (mean)	[-22.92, 8.36]	[-45.57, 12.48]	[-26.81, 6.20]	[-46.52, 11.54]
95% CI (unc)	[-38.07, -8.70]	[-28.00, -6.70]	[-38.07, -8.72]	[-27.99, -6.70]
R^2	0.253	0.221	0.251	0.218
N	1,894	1,912	1,893	1,912

Note: