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The Formation of Subjective House Price Expectations

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Discussion Paper No. 491

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The Formation of Subjective House Price Expectations*

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Abstract

Subjective house price expectations drive individual housing choices and market dynamics. We study the formation of subjective expectations about local house prices using novel survey data from Britain, a country with high homeownership rates and widely varying local housing dynamics. There is a substantial and heterogeneous perception gap and individuals extrapolate strongly from perceived but not from realized past price changes. In addition, expectations are predicted by wider, easily observable measures of local economic conditions, especially among individuals with low financial sophistication. Individuals residing in local housing markets where past prices are less informative or less observable rely more strongly on local economic conditions in their belief formation. Our results emphasize the role of heterogeneity in expectations formation processes, and their underlying information set.

JEL classification: D12; D84

Keywords: Subjective Expectations; Local Housing Markets; Local Economic Conditions

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1 Introduction

Subjective expectations about economic and financial outcomes crucially affect individual economic choices.¹ On housing markets, subjective expectations play an important role in shaping individuals’ investment and debt behavior (Armona et al., 2019; Bailey et al., 2018, 2019; Bottan and Perez-Truglia, 2020; Chopra et al., 2023). They can also drive dynamics at the aggregate level, including housing booms and busts (Burnside et al., 2016; Case et al., 2012; Kaplan et al., 2020; Kindermann et al., 2021; Landvoigt, 2017; Piazzesi and Schneider, 2009). The literature on the formation of subjective house price expectations shows that there is substantial heterogeneity but its sources are still poorly understood (Koşar and O’Dea, 2023; Kuchler et al., 2023).

In this paper, we study belief formation in survey data on subjective local house price expectations and perceptions of past house price changes from Britain, a country with high home ownership and transaction rates, and profound and persistent geographical variation in house price dynamics (Agrawal and Phillips, 2020; Overman and Xu, 2022). We focus on two predictors of subjective house price expectations, past house price changes and local economic conditions.

Traditional prediction models for house prices, going back to Case and Shiller (1989), are based on past realized changes, establishing a natural starting point for modeling subjective house price expectations. More recently, perceptions of past price changes have been shown to matter for expectations regarding house price changes and inflation (Armona et al., 2019; Cavallo et al., 2017; Fuster et al., 2022; Kuchler and Zafar, 2019). Moreover, Armona et al. (2019) argue that individuals may “take into account information other than past home price growth, and we do not know their ‘mental model’ nor their information set.” However, there is little theoretical guidance as to which variables individuals might use in their mental models. In the context of house price expectations, local macroeconomic conditions might matter as they are part of an individual’s salient experiences. A growing literature shows that experiences, broadly defined,

¹A large literature shows that subjective expectations matter for individual decision-making. For example, subjective expectations about future equity returns and risks predict individual portfolio choices (e.g., Ameriks et al., 2020; Dominitz and Manski, 2007; Giglio et al., 2021; Hurd et al., 2011; Merkle and Weber, 2014), and subjective inflation expectations predict individual consumption-savings decisions (e.g., Armantier et al., 2013; Coibion et al., 2023; Vellekoop and Wiederholt, 2019).

affect belief formation.² Our findings are consistent with these views: Perceived house price changes *and* local economic conditions matter and there are important differences between individuals.

We present four important observations in this paper. First, individuals do *not* extrapolate from realized past house price changes, but rather from their *perceptions* of past local house price changes. Second, locally experienced economic conditions also matter in the formation of subjective expectations about local house price changes. The importance of such locally experienced economic conditions in individuals' beliefs varies across subgroups, and it matters in particular for respondents who are less financially sophisticated, risk averse, and reside in local housing markets where past prices display high volatility and no short-run momentum. These results are consistent with locally experienced economic conditions being an easily observable predictor of subjective expectations, particularly in settings where past house prices may be less informative or individuals may be less informed.

Finally, our results point to large heterogeneity in subjective expectations that are driven in part by large and heterogeneous gaps between perceived and realized price changes, echoing findings in Armona et al. (2019). While we find little evidence of systematically higher or lower levels of perceptions based on observables, perception gaps are driven both by local market factors such as past house price volatility, as well as individual characteristics. They are larger for women and particularly for individuals with low financial sophistication.

The data we analyze come from a newly designed survey module on subjective expectations, conducted by the Financial Conduct Authority as part of the Financial Lives survey between August 2019 and February 2020, i.e., shortly before the onset of the COVID-19 pandemic. Our comparatively large analysis sample covers almost 2,800 individuals living in 364 local housing markets. We elicit perceptions of house price changes over the past year in their local area of residence, and their subjective expectations of one-year-ahead local house price changes using probabilistic elicitation techniques (Manski, 2004). We link this survey data with the UK House Price Index, in a respondent's local area at the time of interview, and with locally experienced economic conditions to study the role of realized local house price

²For instance, Malmendier (2021) discusses the role of individual long-run experiences in the formation of subjective inflation expectations. Bailey et al. (2018) find social interactions, through out-of-town friends' experiences of housing investment, to be an important influence in belief formation.

changes and local economic conditions in the expectation formation process. More specifically, we consider local unemployment rates at the time of interview and, as an alternative measure of local economic conditions, local deprivation scores from 2019.

Our paper contributes to the literature on the formation of subjective expectations about housing markets. There is evidence that people extrapolate from past house price changes when forming expectations about future house price changes (Armona et al., 2019; Case et al., 2012). In addition, Armona et al. (2019) point out that not only realizations but also perceptions of past (national) house price changes matter in the expectation formation process. Our results emphasize the importance of perceptions in belief formation. Estimating a reduced-form model of local house price expectations in Britain, we find that realized local house price changes over the past year do not predict subjective expectations of local house price changes over the next 12 months.³ Rather, individuals form house price expectations by extrapolating strongly from their perceptions: A one percentage-point increase in the perceived past one-year local house price change is associated with a 0.13 percentage-point increase in individuals' house price expectations (which is 0.99 of a standard deviation).

Individuals form house-price beliefs in a manner and magnitude that echoes the well-established short-run momentum in house-price fundamentals (e.g., Case and Shiller, 1989; Guren, 2018). Using monthly-level data from the UK HPI, we estimate dependencies in local housing markets in Britain. For the time period between 2010 and 2019, we find an average short-run momentum of 0.156.⁴ Yet, individual perceptions are biased, hence realizations deviate substantially from individuals' beliefs of past house price changes (by around 5 percentage points), creating a sizeable perception gap. While individuals extrapolate in a manner that is consistent with the average short run-momentum in house price fundamentals, they overestimate the short-run momentum due to inflated perceptions. This result rationalizes a frequently stated stylized fact about house-price beliefs; namely that individuals overestimate the short-run momentum in *realized* house prices (Glaeser and Nathanson, 2017)

³For ease of exposition, we use “house price expectations” as a short hand for “subjective expectations about local house price changes over the next year.”

⁴A closer look shows that local house price dynamics are heterogeneous: for 44.2% of the local authorities, there is a positive and significant relation between past one-year and future one-year house price growth, while the remainder of localities display negative or no momentum. Since at the time of the survey, the consequences of the COVID-19 pandemic – which only unfolded after – could not have been anticipated by survey respondents, we cannot compare the extent of extrapolation in the expectations data with the extent of autocorrelation in the realized house price data for the time after the survey was conducted.

Building on this, a series of papers looks at various definitions of “personalized” past house price changes and their role in explaining subjective house price expectations (Malmendier, 2021), taking into account personal background characteristics such as an individual’s place of residence (Kuchler and Zafar, 2019) or an individual’s social network (Bailey et al., 2018, 2019). For instance, Kuchler and Zafar (2019) use past house price changes in an individual’s place of residence as measure of personal housing experiences, and identify a positive relationship with individuals’ expectations about nationwide house price changes. Bailey et al. (2018, 2019) emphasize the role of (geographically distant) friends’ housing-market experiences in shaping individuals’ subjective expectations about local house price growth. In this paper, we consider whether local macroeconomic conditions matter for subjective expectations as they are part of an individual’s salient experiences. We find that individuals expect lower house price growth when local unemployment rates are higher. A one standard-deviation change in local economic conditions leads to a change in subjective beliefs of around -0.17 percentage points—about one sixth the magnitude of a one standard-deviation change in perceived local house price changes. Taken together, our findings suggest that individuals use a wider set of local factors in their belief formation models, and provide new support for the rising body of evidence that personal experiences matter in the formation of subjective expectations.

Finally, we consider heterogeneity in individuals’ extrapolation models depending on features of local housing markets, and individuals’ financial sophistication. We find that extrapolation from local economic conditions is stronger in local housing markets where past price changes are less informative or less observable, i.e., in markets characterized by high house price volatility over the past five years or those that did not display short-run momentum in prices.⁵

Similarly, individuals with low financial sophistication additionally use easily observable local economic conditions as a heuristic in their formation of house price expectations. Our survey data allows us to distinguish between more and less financially-sophisticated individuals (using different measures such as general financial literacy about interest compounding, inflation, and risk diversification following Lusardi and Mitchell (2008), or understanding of the risk-and-return-profile of savings accounts). Both those with high and low financial sophistication

⁵A closer look at dependencies in local housing markets in Britain revealed that a positive and significant relation between past one-year and future one-year house price growth was present in 44.2% of the local authorities, while the remainder of localities displayed negative or no momentum.

extrapolate from perceived rather than realized past house price changes, but those with high sophistication rely more heavily on their perceptions.

The paper proceeds as follows. Section 2 outlines the survey data set and introduces our measures of local house price changes and local economic conditions. In Section 3, we describe the empirical framework and report reduced-form empirical evidence on perceived and realized local house price changes and local economic conditions as predictors of subjective expectations regarding local house price changes, and their heterogeneity across local markets and individuals, and we study dependence in realized price changes in the local housing markets in Great Britain. Section 4 concludes.

2 Data

In a newly designed survey module, we measure people’s perceptions of recent local house price changes, and subjective expectations of future house price dynamics. Respondents were also asked about subjective expected and perceived past stock market returns.⁶ It was pretested by the Financial Conduct Authority (FCA) and implemented in the 2020 wave of the *Financial Lives survey*—a comprehensive, large, and nationally representative survey of 16,000 adults aged 18 and older living in the UK.⁷ The module was presented to a randomized subset of just under 4,000 participants who were interviewed between August 2019 and February 2020, i.e., fieldwork completed shortly before the onset of the COVID-19 pandemic. COVID-related online searches increased only after the end of the survey in March 2020 (see Online Appendix C for a detailed analysis), so it is unlikely that the beliefs and expectations of survey respondents about future house price changes were distorted by the upcoming COVID-19 pandemic. Social distancing measures were not introduced until mid March 2020.

The Financial Lives survey includes rich information on socio-economic characteristics and attitudes, individuals’ use of financial products, and their experiences in dealing with financial products and services. In addition, it elicits measures of financial sophistication.

⁶It also elicited savings account returns as well as the relative riskiness of broad asset classes.

⁷The wording of the survey questions on perceptions and expectations of house price changes was carefully pre-tested and piloted by the Financial Conduct Authority (FCA) in cooperation with an independent survey institute. Pre-testing included cognitive testing in different local authorities at different points in time.

We restrict our sample to respondents residing in Great Britain, for whom information on the place of residence is available, and who provide answers to the survey questions about perceived past and expected future house price changes, resulting in a final sample of 2,799 respondents living in 364 local authorities (LAs).⁸ Respondents’ local authority of residence⁹ is used to link the survey data with administrative data to obtain relevant local measures of realized house prices and economic conditions.

The survey data reflects the high home ownership rates in Great Britain and the prime role housing plays in households’ portfolios: Almost three quarters of respondents in our sample report owning a home (either outright or with a mortgage); 42% hold other assets (e.g., stocks, bonds, or investment funds). Table A2 in the Online Appendix reports summary statistics.

2.1 Subjective house price expectations

We measure subjective expectations about local house price changes using probabilistic elicitation techniques (see Dominitz and Manski, 1997; Giglio et al., 2021; Hurd and McGarry, 2002; Manski, 2004). More specifically, we ask respondents to assign probabilities to a range of possible future house price changes, requiring them to add up to 100%.¹⁰ We tie their beliefs to house prices in their local area, and not to their own homes. Respondents were prompted to imagine that they received an unexpected inheritance of £100,000 which they put towards buying a house in their local area, and to subjectively assess the percentage chances that—in 12 months’ time—the house will have *decreased in value* by (i) 10% or more, (ii) 9.9% to 5%, or (iii) 4.9% to 0%; or *increased in value* by (iv) 0.1% to 5%, (v) 5.1% to 10%, (vi) 10.1% to 15%, or (vii) 15.1% or more.¹¹

Figure 1 depicts the distribution of subjective expectations about future changes in local house prices. The realization of gains in local housing markets is assessed as considerably more likely

⁸The randomized sample comprises 3,662 individuals of which we drop 3 observations with a missing local authority and 860 observations who did not understand the probabilistic question format of the risk-and-return questions, and thus refused to answer. These were more likely to be female, younger, less educated and less financially literate. Our sample does not include respondents from seven local authorities (Barrow-in-Furness, City of London, Derbyshire Dales, Hertsmere, Isles of Scilly, Blaenau Gwent, and Merthyr Tydfil).

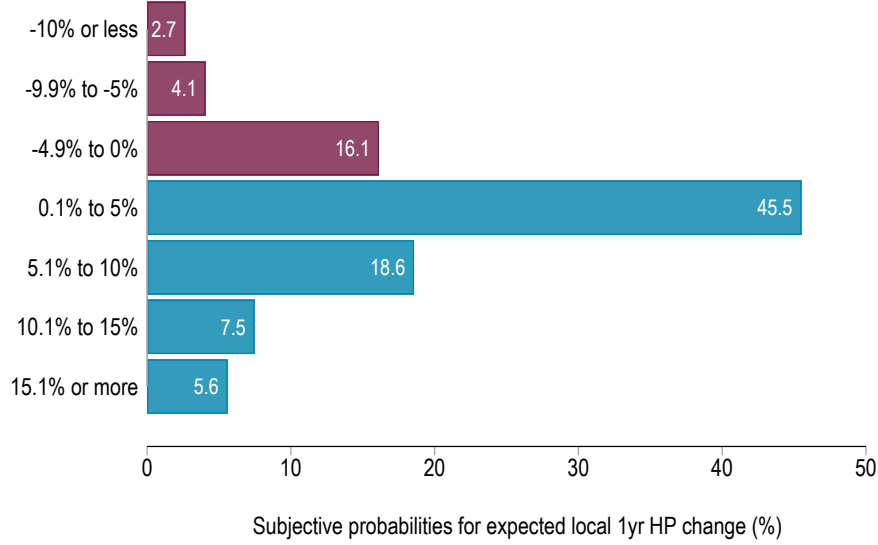
⁹We use the terms *local authority* and *local area* as synonyms.

¹⁰If reported probabilities did not add up to a 100%, respondents were shown a message reminding them of this requirement to ensure consistency (see also Giglio et al. 2021).

¹¹Brackets were chosen to reflect the distribution of past returns. For the exact wording of the survey questions, see Online Appendix A.

than the realization of losses. Modest positive changes (between 0.1% and 5%) were deemed most likely. The average probability of large gains (of 15.1% or more) is—at around 6%—twice as large as that of large losses (of at least -10%).

Figure 1: Subjective expected one-year local house price changes



Notes: The figure shows the distribution of one-year-ahead expected local house price (HP) changes, $N=2,799$. For detailed summary statistics, see Table A3 in the Online Appendix. *Data Source:* Financial Lives 2020 survey.

Using these responses, we construct a measure of subjective expected one-year house price changes, adopting the estimation approach suggested in Hurd et al. (2011). They construct non-parametric estimates of the mean of the expected rate of return distribution for stock market investments. The model is given by

$$E(\pi) = \sum_j P(\pi \in B_j) E(\pi | \pi \in B_j) \quad (1)$$

where, $P(\pi \in B_j)$, is an individual's subjective probability assigned to bracket j , and, $E(\pi | \pi \in B_j)$, is the historical average of one-year rates of return conditional on the return being in bracket j .

We use the same methodology to construct a measure of the subjective expected house price change from the probabilities corresponding to the seven brackets B_j described above. We compute historical UK-wide year-on-year house price changes r_t for each month using the

quality-adjusted UK House Price Index for the time between January 2002 and July 2019.¹² We then assign these historical returns to the return brackets B_j to get bracket-specific average returns $E(r|r \in B_j)$. Panel A in Table 1 shows the non-parametric estimates: in 12 months' time, respondents expect a mean change in local house prices of 3.71%, with a standard deviation of 4.45 percentage points. For more detail on the non-parametric estimation, see Online Appendix B.

Table 1: Summary statistics: expectations, perceptions, and realizations

	Mean	Std Dev	P10	P50	P90
<i>Panel A: Expectations</i>					
Expected 1yr HP change (%)	3.71	4.45	0.13	2.69	8.52
<i>Panel B: Perceptions</i>					
Perceived 1yr HP change (%)	3.79	7.52	0.00	3.00	10.00
<i>Panel C: Realizations</i>					
Realized 1yr HP change (%)	1.11	2.68	-2.16	1.20	4.20
<i>Panel D: Perception gap</i>					
Absolute perception gap (%-points)	5.04	6.73	0.63	3.51	10.24
N	2,799				

Notes: The table shows summary statistics. The absolute perception gap denotes the difference between realized and perceived past one-year (1yr) local house price (HP) changes in absolute terms. Computation of expectations is based on the non-parametric estimation approach by Hurd et al. (2011); for details, see Online Appendix B. *Data Source:* Financial Lives 2020 survey, and historical values from the UK HPI.

2.2 Perceptions of past local house price changes

We also elicited respondents' perceptions of house price changes in their local area in the past year. Following the *Survey of Consumer Expectations Housing Survey* (fielded by the Federal Reserve Bank of New York), we use a two-step format in the survey where respondents first report their beliefs regarding the direction of house price changes in the last 12 months and are then requested to give a point estimate (see Online Appendix A1). On average, respondents' perceptions were that house prices increased by 3.79% over the previous 12 months (Panel B in Table 1). Only 5.8% of respondents believed house price had fallen. The standard deviation

¹²Figure B2 in the Online Appendix shows that estimates of subjective expected house price changes are qualitatively unchanged when we instead use house price changes that vary by geographic localities (the individual's government office region or local authority instead of the whole UK) or use alternative time horizons (1969–2019 instead of 2002–2019) in the computation of $E(r|r \in B_j)$.

of 7.52 percentage points is high, pointing to large variation in respondents’ perceptions of past local house price growth.

2.3 Past local house prices

Next, we construct measures of the realized past house price change individuals experienced in their local area of residence. We compute past house price changes from the *UK House Price Index (UK HPI)*, published by *HM Land Registry*. The local authority-specific index is updated monthly, and is mix-adjusted to account for changes in housing quality and composition (HM Land Registry, 2021). It produces highly accurate price trends as residential property sales occur frequently in the majority of local authorities. In 2019 (2018), more than 1,000 residential properties were sold annually in 95% (96%) of the 339 local authorities in England and Wales, and above 2,000 in 50% (58%) of them (Office for National Statistics, 2023).

To compute past experienced local house price changes, we follow the approach in Kuchler and Zafar (2019).¹³ We link local house prices into the Financial Lives survey data by respondents’ area of residence and interview month, and use the most recent annual percentage change in local house prices, relative to the month a respondents’ interview was conducted.

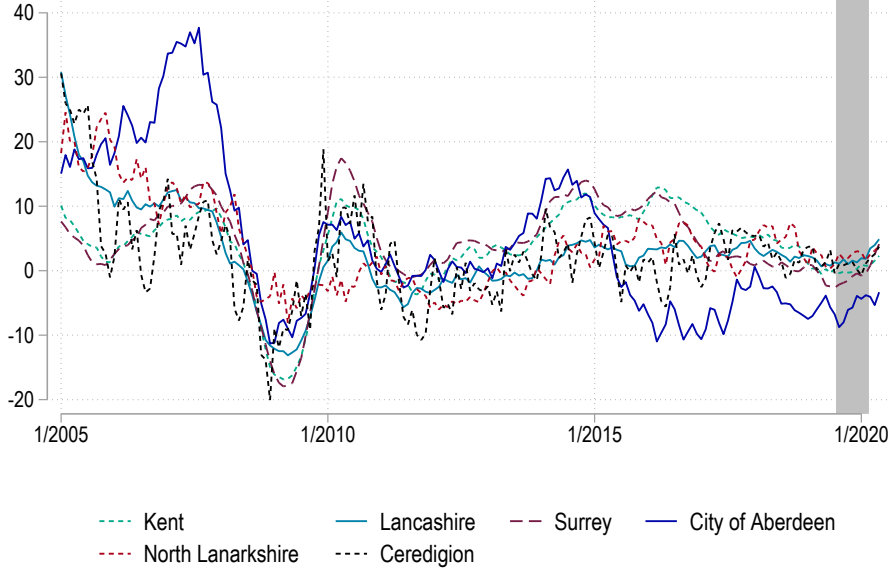
British house price dynamics vary considerably across time and place, as Figure 2 exemplifies for six local authorities (see also Online Appendix D). Panel C in Table 1 shows that local house prices rose on average by a modest 1.11% with a standard deviation of 2.68.

2.4 Local economic conditions

As suggested by Armona et al. (2019), individuals may take into account ‘information other than past home price growth, [...] including local macroeconomic conditions’, when they form beliefs about future house prices. We consider two salient, widely used measures of local

¹³In the literature on the effects of past experiences on subjective expectations, more sophisticated aggregation functions for historic experiences have been proposed. As a robustness check, we followed the approach by Malmendier and Nagel (2011) and constructed a weighted average of annual local house price changes, selecting a combination of lookback period and weights that yielded the best goodness-of-fit. We achieve the best fit for the 5-year lookback period with slowly decreasing weights. Our main results are robust to using this alternative measure of historic return experiences. See Online Appendix F for details, and robustness of our estimates.

Figure 2: Realized local house price dynamics



Notes: The figure shows (monthly computed) annual house price changes for the time from 2005 to 2020 for an arbitrary selection of six different local authorities. The shaded area indicates the survey period. *Data Source:* Historical values from the UK HPI.

macroeconomic conditions, (i) the unemployment rate and (ii) an index of social and economic deprivation.

Table 2: Summary statistics: local economic conditions

	<i>N</i>	Mean	Std Dev	P10	P50	P90
Local unemployment rate	364	2.59	1.13	1.33	2.41	4.23
Local deprivation score	312	19.66	7.99	10.24	18.58	30.72

Notes: The table shows summary statistics for the local authorities covered in our sample. Monthly local unemployment rates averaged for the survey period between August 2019 and February 2020. Local deprivation score as of 2019 (only available for English local authorities). *Data Source:* Office for National Statistics (data from Nomis) and Ministry of Housing, Communities & Local Government.

Local unemployment rate. The unemployment rate is frequently reported in the news specifically for local areas, and is one of the most commonly used measures of local economic conditions. We measure local unemployment rates as the total number of people (i) claiming Jobseeker’s Allowance, plus those (ii) claiming Universal Credit and being out of work, divided by the resident local population aged 16–64. These administrative “claimant counts,”

are lower than officially reported unemployment rates.¹⁴ We consider unemployment rates in the respondent’s local authority of residence in the month in which the survey interview was conducted. Table 2 reports average local unemployment rates for the survey period. Even in a period of low unemployment, we see large variation across the local authorities in our sample, visualized in Figure 3. The mean (median) unemployment rate is 2.6% (2.4%), with a standard deviation of 1.13 percentage points. Older industrial areas, some seaside towns, and some London boroughs are among the places with the highest unemployment rates.

Local deprivation score. Our alternative measure of local economic conditions, the social and economic deprivation score, is taken from the 2019 Index of Multiple Deprivation, provided by the *Ministry of Housing, Communities & Local Government*. It aggregates indicators of local conditions across a broad spectrum of social and economic dimensions, and is frequently considered in the design of local and national policies, such as the UK government’s ‘Levelling Up’ agenda.

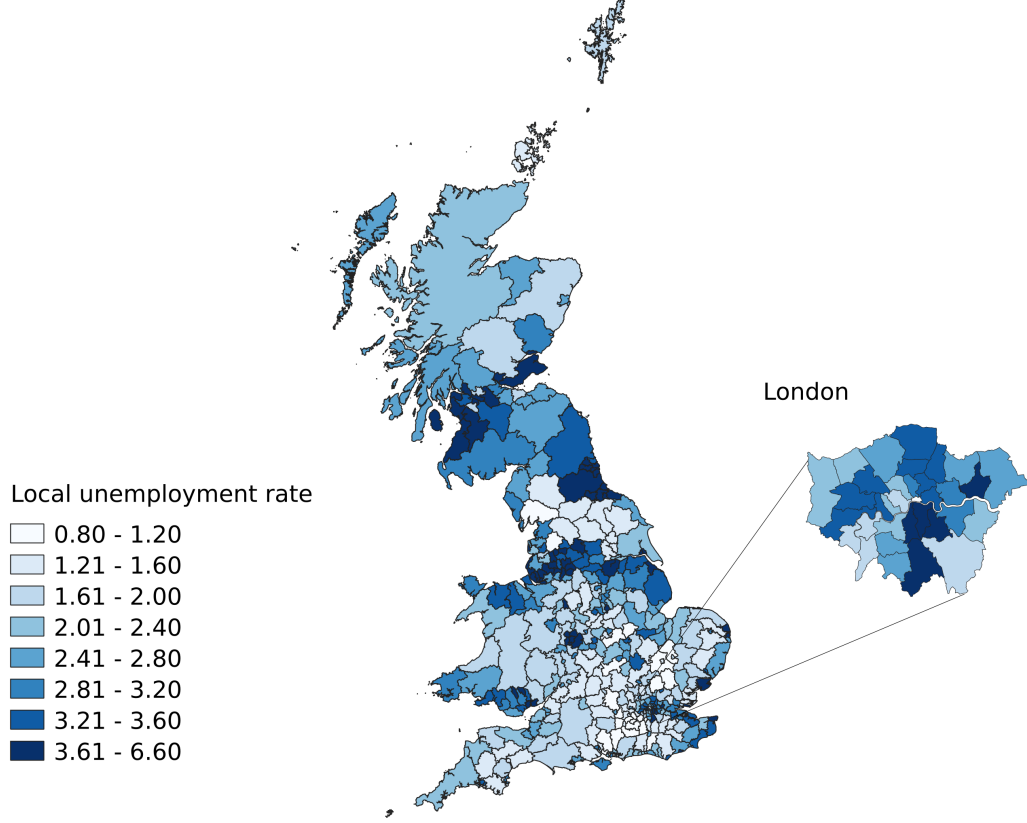
The score aggregates indicators from seven domains, including (i) income, (ii) employment, (iii) education, skills, and training, (iv) health and disability, (v) crime, (vi) barriers to housing and services, and (vii) living environment. Due to methodological differences in their measurement and underlying indicators across the constituent countries of Great Britain, estimates based on this measure of local economic conditions are produced for England only. Online Appendix E shows that both measures are positively correlated with each other and with other measures of local conditions.

2.5 Financial sophistication

In Section 3.3, we will consider heterogeneity in belief formation about future house prices by respondents’ financial sophistication, using the canonical four-item construct of financial literacy covering knowledge of interest rates, interest compounding, inflation, and risk diversification (for measurement details, see Lusardi and Mitchell, 2008). In our sample, 48% of the respondents answer all four questions correctly. We define these as having *high* financial

¹⁴Officially reported unemployment rates are based on self-reports in the Labour Force survey and Annual population survey, whose sample sizes are not sufficient for granular spatial analysis at monthly level. Claimant counts yield systematically lower unemployment rates as they exclude, for example, those searching for a job who have not claimed unemployment or other benefits. E.g., the unemployment rate based on claimant counts across local authorities was on average 2.4% in 2019; in contrast, the model-based estimate of the officially reported unemployment rate across local authorities was 3.6% in 2019 (Office for National Statistics, 2022).

Figure 3: Local unemployment rates



Notes: The map shows the average monthly local unemployment rates for the survey period between August 2019 and February 2020, measured as claimants per resident population aged 16–64. *Claimants* denote those claiming Jobseeker’s Allowance and out-of-work claimants of Universal Credit. *Data Source:* Office for National Statistics (data from Nomis).

literacy; the remaining 52% of the sample are defined as having *low* financial literacy.¹⁵ In Table F3 in Online Appendix F, we show that our results are robust to using an alternative measure of sophistication based on knowledge about interest rates for savings accounts.¹⁶

¹⁵In line with previous research (Lusardi and Mitchell, 2008), we find that women, individuals with low education, and those with low household income are less likely to have high financial literacy. Also, individuals living in regions with higher rates of unemployment are less likely to have high financial literacy (see Table A5 in the Online Appendix).

¹⁶A person’s interest rate knowledge is considered *high* if three concepts related to the riskiness of savings accounts, and ranges of past and expected future interest rates are understood, and *low* otherwise. More precisely, if they (i) know that the interest rate on a savings account was not higher than 2% in the year before interview, (ii) think there is no chance of earning an interest rate of 4.1% or more on money kept in a savings account in the year after interview, and (iii) believe that keeping their money in a savings account over the next 12 months will be less risky than investing in the stock or local housing market. Financial sophistication using this measure is slightly lower with 37% of respondents with high interest rate knowledge.

3 Empirical analysis

The primary goal of this paper is to characterize the role of local economic conditions and past (perceived and realized) local house price changes in shaping the formation of individuals' subjective expectations about future changes in local house prices. Our baseline regression specification is as follows:

$$E(\Delta HPI^{t+12})_{ilt} = \beta LEC_{lt} + \delta \Delta HPI_{ilt}^{t-12} + \gamma X_{ilt} + \eta_t + \epsilon_{ilt} \quad (2)$$

The dependent variable $E(\Delta HPI^{t+12})_{ilt}$ is the subjective expected rate of one-year change in the house price index in individual i 's local area l , relative to the interview month t .¹⁷ LEC_{lt} is a measure of the local economic condition in locality l , e.g., in our baseline specification the monthly unemployment rate in the individual's residential local authority. ΔHPI_{ilt}^{t-12} refers to the perceived past one-year rate of change in the local house price index in local authority l relative to the interview month t . In some regression specifications, we consider *realized* rather than *perceived* past local house price changes; in these cases, the variable simplifies to ΔHPI_{lt}^{t-12} , as it varies only by local authority and interview month. X_{ilt} is a vector of individual-specific controls, and η_t are interview-month fixed effects.¹⁸ Standard errors are clustered at the level of local authorities. The number of observations in the full regression sample drops from 2,799 to 2,731 due to item non-response on covariates.

3.1 Predictors of subjective house price expectations

We estimate equation (2) to study the role of past house price changes and of locally experienced economic conditions in shaping the formation of subjective expectations about one-year-ahead changes in local house prices. In column (1) of Table 3, we include local unemployment rates and *realized* local one-year house price growth as explanatory variables; in column (2), we replace realized local one-year house price growth with *perceived* local one-year house price growth; in column (3), we include all three variables.

¹⁷The subscript refers to the point in time at which expectations are formed and the superscript refers to the period of time over which they are formed.

¹⁸We do not include local-authority fixed effects because there is little within-LA variation in local unemployment rates over the short interview period of the survey.

Table 3: Predictors of subjective expected house price changes

	Expected 1yr HP change (%)		
	(1)	(2)	(3)
Local unemployment rate	−0.159** (0.074)	−0.155** (0.067)	−0.153** (0.067)
Realized 1yr HP change	−0.001 (0.032)		−0.003 (0.030)
Perceived 1yr HP change		0.133*** (0.029)	0.133*** (0.029)
Month Fixed Effects	✓	✓	✓
Socio-demographics	✓	✓	✓
Effect of 1 std in Local unemployment rate (in %)	−0.18 (−4.78)	−0.17 (−4.65)	−0.17 (−4.60)
Effect of 1 std in Realized 1yr HP change (in %)	−0.00 (−0.07)		−0.01 (−0.24)
Effect of 1 std in Perceived 1yr HP change (in %)		0.99 (26.82)	0.99 (26.83)
Mean DepVar	3.70	3.70	3.70
R-squared	0.03	0.08	0.08
N	2,731	2,731	2,731

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

The estimation results show that individuals do not extrapolate from past realized one-year local house price changes when forming subjective expectations about one-year-ahead local house price changes. Instead, they heavily extrapolate from perceived past local house price changes. The estimate of the coefficient of perceived local one-year house price growth is positive and significant at the 1% level. Individuals who perceive the past one-year house price growth in their local area to be higher are also more likely to expect higher local house price growth in the future.

A strong positive association between past perceived and future expected house price changes was also documented in Armona et al. (2019). Yet, our estimates reveal that economic conditions in the local area are an additional important predictor of subjective house price expectations. Individuals who live in local areas with higher unemployment rates expect, on average, lower rates of house price growth: A one standard-deviation increase in local unemployment rates is associated with a decrease in individuals' expected local house price changes

by 0.17 percentage points (which corresponds to 5% of one-year-ahead expected local house price changes).

Comparing the magnitude of the effects on expected local house price growth between local economic conditions and past perceived local house price changes, we find that a one standard-deviation change in local economic conditions is associated with a decrease in subjective price-change beliefs of around 0.17 percentage points—about one sixth the magnitude of a one standard-deviation change in past perceived local house price changes.

3.2 House price perception gaps

The empirical analysis so far revealed that individuals base their subjective house price expectations on perceived rather than realized past house price changes, suggesting a deviation between them, in short: a “perception gap.” Panel D in Table 1 indeed displays a large absolute difference between realized and perceived one-year local house price changes. On average, the absolute perception gap is 5.04 percentage points. Further, it is above 3.5 percentage points for half of the sample; for around 10% of the sample, the absolute perception gap is above 10 percentage points.

In Table 4 (columns 3 and 4), we investigate the correlates of individuals’ perception gaps. First, we find that the gap is larger for women and those living in local authorities that experienced high variability in house price changes in the past, and smaller among homeowners. At the same time, results in columns 1 and 2 show that they do not predict the *level* of perceived house price changes. Hence, while, for example, women’s perceptions tend to be less accurate, they do not systematically over- or underestimate past house price changes. We return to these dimensions of heterogeneity in Section 3.4 below.

Secondly, individuals’ financial sophistication is a key predictor for the perception gap. Table 4 shows that high financial sophistication is associated with lower perception gaps (by about one-fifth compared to the overall average), and is strongly statistically significant. That is, financially sophisticated individuals assess realized past local one-year changes in house prices more accurately than individuals with low financial literacy.¹⁹ In summary, we find that

¹⁹Replacing the main financial sophistication measure with our secondary measure, *interest rate knowledge*, the regression coefficient remains negative and significant at the 0.01 level.

Table 4: Correlates of perceived past house price changes and the perception gap

Dependent variable	Perceived 1yr HP change (%)		Absolute perception gap (%-points)	
	(1)	(2)	(3)	(4)
<i>Local area characteristics</i>				
Realized 1yr HP change	-0.065 (0.056)	-0.068 (0.057)		
Realized 1yr HP change (absolute value)			0.148 (0.117)	0.096 (0.128)
Local unemployment rate	-0.089 (0.177)	-0.088 (0.181)	0.083 (0.183)	-0.027 (0.194)
5yr local house price volatility	-0.181 (0.171)	-0.225 (0.172)	0.362** (0.149)	0.385*** (0.143)
Log property sales	0.524 (1.065)	0.161 (1.082)	0.730 (1.081)	0.539 (1.071)
<i>Household (or head) characteristics</i>				
Female		0.399 (0.310)		0.580** (0.274)
Age (ref: 18–44)				
45–64		-0.121 (0.461)		-0.047 (0.386)
65 or older		-0.238 (0.558)		-0.610 (0.485)
Partner in household		-0.213 (0.348)		0.299 (0.318)
Education (ref: Higher)				
Lower or medium		0.621* (0.322)		0.270 (0.300)
None		-0.874 (0.633)		0.006 (0.500)
Info missing		-6.350* (3.472)		6.418** (2.893)
Working		0.484 (0.503)		-0.120 (0.430)
Annual HH income (ref: £70k or more)				
Less than £20k		-0.184 (0.504)		0.227 (0.422)
£20k - <£40k		-0.226 (0.350)		0.390 (0.314)
£40k - <£70k		0.861** (0.333)		0.673** (0.296)
Info missing		0.119 (0.520)		1.030** (0.479)
Risk averse		0.281 (0.325)		0.361 (0.287)
High financial literacy		-0.447 (0.308)		-1.056*** (0.283)
Recent mover		-0.504 (0.430)		-0.604 (0.426)
Homeowner		-0.038 (0.456)		-0.955** (0.402)
Interview finished on same day		0.282 (0.335)		0.375 (0.269)
Constant	1.874 (4.029)	2.810 (4.100)	2.823 (3.933)	3.751 (3.845)
Mean DepVar	3.82	3.84	5.05	5.04
Adj. R-squared	0.01	0.02	0.01	0.05
N	2,516	2,456	2,516	2,456
Month Fixed Effects	✓	✓	✓	✓

Notes: The table shows regression estimates, with *perceived 1yr HP change* (columns 1 and 2) and *absolute perception gaps* (columns 3 and 4) as dependent variables. ‘ref.’ indicates the omitted category. “Log property sales” denotes the logarithm of local residential property sales per 1,000 inhabitants (note that using instead the “logarithm of local residential property sales per 1,000 dwellings,” results remain qualitatively unchanged). Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

individuals’ perceptions about past house prices are far from accurate. We document large heterogeneity in perception gaps which vary with the uncertainty in the local housing market, individuals’ financial sophistication, and other observables.

3.3 Subjective house price expectations and financial sophistication

A large literature documents considerable individual heterogeneity in subjective expectations of aggregate and individual-level economic outcomes. One important dimension of this heterogeneity is related to sophistication, as measured for instance by numeracy or educational attainment, cognitive ability and intelligence (e.g., see D’Acunto et al., 2019 for inflation expectations and Kuchler and Zafar, 2019 and Kuchler et al., 2023 for house price expectations). Our data allow us to study the importance of domain-specific skills, in particular financial sophistication. Table 4 already suggested that the measure of financial literacy, whose construction we described in Section 2.5 above, is a strong predictor of the gap between perceived and realized past house price changes. Indeed, those with high financial literacy exhibit an absolute perception gap of, on average, 4.23 percentage points. The gap is significantly higher (5.77 percentage points) among those with low financial sophistication. Compared to individuals with high financial literacy, those with low financial literacy also expect larger increases in house prices over the next 12 months (4.35% vs. 3%); in addition, we observe substantial heterogeneity in expectations among individuals with low financial literacy. Related, Kuchler and Zafar (2019) show that sophistication lowers the extent to which individuals naively extrapolate from local house price changes when asked about their beliefs regarding future national house price changes.

Next, we study whether the formation of subjective expectations varies by financial sophistication, measured by financial literacy. Results are qualitatively similar (see Online Appendix F) when we use the secondary measure capturing interest rate knowledge. Table 5 shows estimates for the empirical model specified in equation (2), separately for individuals with high and low financial literacy. Past house price changes matter for the formation of expectations in both groups; but as before and irrespective of the level of financial literacy, individuals extrapolate from *perceived* rather than from *realized* one-year house price changes. Yet, individuals with low financial literacy rely much less on perceived past house price changes. Instead,

Table 5: Heterogeneity of subjective expectations: financial literacy

	Expected 1yr HP change (%)					
	Pooled		Financial literacy			
			High		Low	
	(1)	(2)	(3)	(4)	(5)	(6)
Local unemployment rate	-0.159** (0.074)	-0.155** (0.067)	-0.014 (0.077)	0.009 (0.059)	-0.347*** (0.120)	-0.347*** (0.112)
Realized 1yr HP change	-0.001 (0.032)		0.022 (0.032)		-0.008 (0.052)	
Perceived 1yr HP change		0.133*** (0.029)		0.342*** (0.043)		0.086*** (0.028)
Effect of 1 std in Local unemployment rate (in %)	-0.18 (-4.78)	-0.17 (-4.65)	-0.01 (-0.48)	0.01 (0.32)	-0.39 (-9.12)	-0.39 (-9.14)
Effect of 1 std in Realized 1yr HP change (in %)	-0.00 (-0.07)		0.06 (1.95)		-0.02 (-0.47)	
Effect of 1 std in Perceived 1yr HP change (in %)		0.99 (26.82)		1.57 (51.49)		0.81 (18.73)
Mean DepVar	3.70	3.70	3.04	3.04	4.31	4.31
R-squared	0.03	0.08	0.03	0.27	0.03	0.05
N	2,731	2,731	1,309	1,309	1,422	1,422
Month Fixed Effects	✓	✓	✓	✓	✓	✓
Socio-demographics	✓	✓	✓	✓	✓	✓

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview; local deprivation scores from 2019. Financial literacy is *high* if all four standard financial literacy questions are answered correctly, and *low* otherwise. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

individuals use local economic conditions when forming expectations about local house price changes (see columns 5 and 6).²⁰ These results are intuitive once information costs are taken into account. For less financially sophisticated individuals, it may be cognitively less costly to learn about past local economic conditions than about past local house price changes, as local economic conditions are more persistent and less volatile over time, and arguably, also more salient.

3.4 Subjective expectations, information acquisition, and market uncertainty

Information acquisition costs and benefits regarding past house price changes may depend on individual incentives to be informed and on characteristics of local housing markets. First, we consider several individual experiences that may shift the incentives to be informed, such as a recent move and homeownership status, and present estimates of heterogeneity in belief formation with respect to these factors. Second, we explore a set of such local market characteristics: past price volatility and the salience of local price information.

First, we consider whether risk averse individuals are more likely to diversify their information sources and rely on local economic conditions *and* own perceptions in their belief formation. We split our sample into those with higher self-reported risk aversion, measured through a widely used and validated survey question on risk attitudes.²¹ We find that risk averse individuals extrapolate indeed from both perceived past house price changes and local conditions, while individuals who are more tolerant of risk do not rely on local economic conditions (see panel A of Table 6).

Whether home owners have a stronger incentive to monitor house prices in their local area (and other price dynamics) than renters is still subject to debate – with mixed evidence.²²

²⁰Estimates in Table 5, columns 2, 4, and 6, are virtually unchanged if we include realized one-year house price changes as a control variable.

²¹This question has been shown to be a good predictor of risk taking behavior across different domains (e.g., Bonin et al., 2007; Jaeger et al., 2010; Dohmen et al., 2011).

²²Adelino et al. (2018) focus on measuring perceptions of house price risk and show that renters view housing as riskier than owners. In a study of regional house prices in Germany, Kindermann et al. (2021) find that on average, households underpredict local price growth. Yet, renters make on average higher and hence more accurate forecasts than owners, although their forecasts are more dispersed and their mean squared forecast errors are higher. Ahn et al. (2022) find that homeowners are attentive to news on interest rates – driven by changes in mortgage-rates, and adjust their inflation expectations accordingly, but do not investigate

Intuitively, housing is by far the largest asset in their portfolio for the majority of home owners, warranting attention to the dynamic evolution of their wealth. Yet, renters who may aspire to ‘climb onto the housing ladder’²³ or who wish to form expectations of future rents may also have an incentive to monitor local house prices. While we find no evidence that home ownership leads to systematic shifts in perceptions of past house prices, home owners possess more accurate information regarding past house price changes, as evidenced by an about a 1 percentage-point lower perception gap (see Table 4). They also rely more strongly on perceived price changes when forming beliefs about future local house prices, and on local economic conditions, than renters (see panel B of Table 6).

While it is not clear a priori whether home owners or renters have a stronger incentive to be informed about local house prices, individuals who recently moved house may have better information about past house prices than non-movers. Yet, we do not find evidence that a recent moving experience shifts the individuals’ level of house price perceptions, nor that their perceptions are more accurate (see Table 4). The heterogeneity estimates in panel C of Table 6, however, suggest that recent movers rely more strongly on their perceptions of past house prices than non-movers, and the latter rely on both when forming beliefs about future house price changes. A plausible interpretation of this finding is that recent movers overestimate how well they are informed about local prices.

Studies of subjective expectations often find systematic gender differences and more distorted beliefs among women (D’Acunto et al., 2021). In our data, men have lower perception gaps (see Table 4), and rely more strongly on their perceptions of past changes, but we do not find consistent differences in the reliance on local economic conditions between men and women (see Online Appendix F, Table F4).

Next, we turn to investigating the role of local market characteristics, i.e., past price volatility and the salience of local price information, in belief formation. First, perception gaps are higher in local housing markets that display higher price uncertainty where forming accurate

subjective house price expectations. Gohl et al. (2022) find no evidence of house price expectation biases related to individual housing tenure decisions.

²³ *The Economist* describes the notion of the housing ladder as follows: “The ladder is deeply embedded into British thinking. On its most narrow definition, it is usually taken to mean the idea of first-time buyers purchasing a modest dwelling (a flat, say) and then trading up to something larger as their incomes grow and their housing equity increases. More broadly, the metaphor reflects Britons’ general aspiration to residential-property ownership.” (*The Economist*, 13 January 2024, p. 23)

Table 6: Heterogeneity of subjective expectations: risk aversion, homeownership, and recent movers

	Dependent variable: Expected 1yr HP change (%)			
	(1)	(2)	(3)	(4)
A. Risk averse				
	Yes		No	
Local unemployment rate	−0.295** (0.124)	−0.299** (0.117)	−0.081 (0.090)	−0.072 (0.084)
Realized 1yr HP change	−0.034 (0.048)		0.021 (0.041)	
Perceived 1yr HP change		0.121*** (0.044)		0.140*** (0.035)
Mean DepVar	3.72	3.72	3.70	3.70
R-squared	0.03	0.08	0.05	0.10
N	1,142	1,142	1,583	1,583
B. Homeowner				
	Yes		No	
Local unemployment rate	−0.199** (0.077)	−0.200*** (0.069)	−0.121 (0.162)	−0.116 (0.157)
Realized 1yr HP change	0.033 (0.034)		−0.066 (0.079)	
Perceived 1yr HP change		0.173*** (0.048)		0.087*** (0.032)
Mean DepVar	3.54	3.54	4.11	4.11
R-squared	0.02	0.10	0.06	0.08
N	1,966	1,966	765	765
C. Recent mover				
	Yes		No	
Local unemployment rate	−0.213 (0.237)	−0.310 (0.223)	−0.148* (0.076)	−0.138** (0.070)
Realized 1yr HP change	0.008 (0.080)		0.001 (0.033)	
Perceived 1yr HP change		0.216*** (0.054)		0.125*** (0.029)
Mean DepVar	3.61	3.61	3.71	3.71
R-squared	0.19	0.27	0.03	0.07
N	252	252	2,479	2,479

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. In all specifications, we control for socio-demographics and interview-month fixed effects. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Note that estimates in columns 2 and 4 are virtually unchanged if we include realized one-year house price changes as a control variable. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

beliefs about past house price changes is difficult. Some local authorities experienced highly volatile house prices in the past five years. While individuals' perception gaps are higher in

local housing markets with more volatile prices (see columns 3 and 4 in Table 4), they do not lead to systematically higher perceptions (columns 1 and 2). A one standard-deviation rise in local house prices in the last 5 years increases the perception gap by 0.394 percentage points or 8%. Panel A of Table 7 shows that market uncertainty also matters for the belief formation about future house prices. In local authorities where price uncertainty is high, individual perceptions of past price changes remain an important predictor of subjective house price expectations. However, individuals also rely strongly on local economic fundamentals. A one percentage-point increase in the local unemployment rate reduces expected future house price growth by 0.275 percentage points. This is in contrast to individuals who live in areas with less volatile prices where we find no evidence that individuals rely on local economic conditions in their belief formation.

Second, local house price reporting in the media may lower the cost of information acquisition, reduce individuals' perceptions gaps, and change the weight of perceptions in individuals' belief formation. To explore this possibility, we develop a measure of how frequently the topic 'house prices' or 'property prices' is reported in the media in the different local authorities. We compile a list of local newspapers (i.e., newspapers covering only certain local authorities), and focus on the time period from August 2018 to February 2020, which covers the 12-months period before the first survey interview was conducted and the months during which the survey was conducted. Using Google search results extraction, we count, for each local newspaper, the number of articles that contain these search terms. We use this measure as a proxy for the local media coverage of the topic of house prices.

We find that the relation between individuals' perceptions and local house price expectations does not vary with the level of local media salience regarding house prices (see panel B in Table 7). However, there is some indication that local unemployment rates are a stronger predictor of local house price expectations in areas with little coverage of house prices in the media. Yet, our measure of media reporting likely underestimates the variation in salient information on house prices across local areas, as it does not include widely used commercial property search engines.²⁴

²⁴Unfortunately, more granular localized information on the search intensity for house price information was not available from these providers due to their business sensitive nature.

Table 7: Heterogeneity of subjective expectations: local market uncertainty and local information

	Dependent variable: Expected 1yr HP change (%)			
	(1)	(2)	(3)	(4)
A. Volatility of local house prices (past 5 years)				
	Low		High	
Local unemployment rate	−0.149 (0.098)	−0.142 (0.092)	−0.275** (0.130)	−0.275** (0.117)
Realized 1yr HP change	−0.039 (0.049)		0.008 (0.042)	
Perceived 1yr HP change		0.097*** (0.030)		0.176*** (0.049)
Mean DepVar	3.79	3.79	3.61	3.61
R-squared	0.02	0.05	0.05	0.13
N	1,365	1,365	1,366	1,366
B. Local media coverage of house prices				
	Low		High	
Local unemployment rate	−0.213 (0.130)	−0.202* (0.118)	−0.136 (0.090)	−0.130 (0.082)
Realized 1yr HP change	−0.017 (0.038)		0.017 (0.050)	
Perceived 1yr HP change		0.135** (0.056)		0.130*** (0.029)
Mean DepVar	3.70	3.70	3.71	3.71
R-squared	0.06	0.10	0.03	0.08
N	1,108	1,108	1,623	1,623

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. In all specifications, we control for socio-demographics and interview-month fixed effects. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Note that estimates in columns 2 and 4 are virtually unchanged if we include realized one-year house price changes as a control variable. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

In summary, we find that the extent to which individuals rely on their perceptions of past house prices and particularly the weight they attribute to easily observable local economic conditions and perceptions in their belief formation varies with the volatility of local house prices, the intensity of local reporting of price information, and with individual financial sophistication, risk preferences, and incentives to be informed about recent price dynamics.

3.5 Subjective expectations, short-run momentum, and local house price fundamentals

There is widespread evidence that subjective house price expectations may be a source of house price bubbles, and affect outcomes in the housing market. The pandemic shock hit shortly after the completion of our survey, creating idiosyncratic market dynamics such as a sudden high demand for larger properties and those with outside space, and a temporary slump in demand for property in well-connected locations. This precludes us from linking the elicited subjective house price expectations to housing market outcomes in Great Britain in 2020. Instead, we use (historic) panel information on local house price dynamics between 2010 and 2019 to study short-run momentum in the housing market, i.e., provide evidence on the extent to which information on local house prices at t predict house prices a year ahead. Based on Case and Shiller (1989) and Guren (2018), the existence of short-run momentum is seen as a stylized fact of house price dynamics. Yet, this evidence is mostly based on data from housing markets in the US, hence we estimate an AR(1) model²⁵ of short-run house price evolution in Great Britain. We follow Armona et al. (2019) to estimate local AR(1) models:

$$\Delta HPI_{l,t+12} = \alpha_l + \sigma_l \Delta HPI_{l,t} + \epsilon_{l,t} \quad (3)$$

where $\Delta HPI_{l,t}$ is the rate of one-year change in the UK House Price Index in local authority l and month t . The rate of change in house prices is calculated over the horizon of 12 months. σ_l shows whether the local house price change in the past is a useful predictor of the current local house price change.

²⁵We base this on monthly-computed one-year local changes in house prices and their lagged values.

We estimate the autoregressive coefficients σ_l for each of the 364 local authorities by an OLS model with Newey–West standard errors for the time horizon from 7/2010 to 7/2019 (i.e., after the financial crisis occurred, and before the Financial Lives survey was conducted). In Table 8, we report the mean and the standard deviation (in parentheses) of these estimates (column 1), as well as the share of local authorities for which σ_l is positive (negative) and significant at the 5% level (column 2 respectively 3).

For the majority of localities in our sample, the autoregressive coefficient is positive and statistically significant. This short-term momentum in house prices is a frequent phenomenon in local housing markets in Great Britain. The average estimate across the local authorities in our sample is 0.156, indicating that across local areas in our sample, a one percentage-point higher house price growth in month t is followed, on average, by 0.156 percentage-point higher rates of house price growth in the consecutive 12 months. This estimate is very similar to the estimated percentage-point change in subjective house price expectations upon a one percentage-point change in *perceived* local house prices (see our main estimates in Table 3). While individuals do not perfectly recall the realized past local house price change, they appear to extrapolate according to the average short-run momentum in realized house prices.

Table 8: Dependence in realized local house price changes

	7/2010–7/2019		
	Mean (Std) (1)	Percent positive ^a (2)	Percent negative ^b (3)
One-year local HP growth on lagged one-year local HP growth	0.156 (0.226)	44.2	6.9

Notes: The table shows regression estimates of local house price (HP) growth dependence on previous local HP growth. Mean coefficient across local authorities shown in column “mean,” and standard deviation (std) across local authorities shown in parentheses. We exclusively consider local authorities that are covered in our survey sample, $N = 364$. Number of monthly-computed annual house price growth per local authority that estimates are based on: 97 observations. ^a [^b] Indicates percent of estimates statistically significantly positive [negative] at the 5% level, based on Newey–West standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* UK HPI.

However, the average momentum in Table 8 masks strong heterogeneity: we find statistically significant short-run momentum in 44.2% of all local authorities, but also reversal in 6.9% of

areas, and no evidence of autocorrelation in prices for the remainder of areas.²⁶ Local markets with short-run momentum can be found across all regions of Great Britain; they do include most local authorities in London (91%) and more than half of local authorities in the East of England and the West Midlands but also more than a third of local authorities in the South East, the North West, and Yorkshire and Humberside.

Table 9: Heterogeneity of subjective expected house price changes: local short-run momentum

	Dependent variable: Expected 1yr HP change (%)			
	(1)	(2)	(3)	(4)
	Local housing market with short-run momentum			
	Yes		No	
Local unemployment rate	−0.093 (0.096)	−0.125 (0.081)	−0.280** (0.121)	−0.222* (0.116)
Realized 1yr HP change	−0.037 (0.046)		0.052 (0.043)	
Perceived 1yr HP change		0.129*** (0.039)		0.148*** (0.040)
Mean DepVar	3.82	3.82	3.58	3.58
R-squared	0.04	0.09	0.03	0.09
N	1,431	1,431	1,300	1,300

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. In all specifications, we control for socio-demographics and interview-month fixed effects. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Note that estimates in columns 2 and 4 are virtually unchanged if we include realized one-year house price changes as a control variable. Areas with ‘No’ momentum comprise those exhibiting no autocorrelation or reversal. Results are qualitatively unchanged when we exclude areas exhibiting reversal. Standard errors in parentheses are adjusted for clustering at the *local-authority* level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

Do individuals’ subjective expectations reflect the varying informativeness of past local house prices, i.e., do individuals rely on different underlying information depending on the momentum in their area of residence? Our findings imply that individuals’ belief formation models vary with local housing market fundamentals. Table 9 shows that those living in areas with short-run momentum extrapolate strongly from perceived past house price change—and in a manner that is quantitatively similar to our main findings in Table 3. However, those who reside in areas where past prices are not predictive for future prices extrapolate very differently: they rely strongly on local unemployment rates in their belief formation; in fact, similarly to

²⁶We also consider a five-year lag in prices (using *annualized* house price changes) to investigate long run mean reversion, and find predictive power for about 40% of local authorities – but only weak evidence of mean reversion for about half of them. Results available from the authors upon request.

those living in areas with high price volatility. A one percentage-point increase in the local unemployment rate is associated with an 0.28 percentage-point decrease in expected local house price growth. This suggests that individuals may adapt the model which they use to form beliefs to the fundamentals of the local housing markets they find themselves in.

3.6 Stock market return expectations

The analysis so far revealed that individuals use local economic conditions in their mental models of subjective house price expectations. Our interpretation of this finding is that for many individuals, in particular those who are less knowledgeable about past local house prices and those with lower financial sophistication, this makes sense: measures like the local unemployment rate are, arguably, more easily accessible than past house price changes. Similarly sensibly, we find that where local housing markets are more volatile and for which there is no short-run momentum, individuals rely more heavily on a wider set of local fundamentals.

More generally, our findings so far are also in line with a major theme of recent research on subjective expectations: Salient experiences matter. A natural next question to ask is then: Do individuals also use local economic conditions when they form beliefs about national outcomes? For instance, Kuchler and Zafar (2019) study whether individuals extrapolate from local (i.e., zip code-level) experiences in their formation of beliefs about national outcomes, including stock market returns.

The Financial Lives survey data allow us to explore this issue. In addition to the questions on house price changes, we elicited subjective expectations, perceptions of price changes over the last 12 months, and compiled data on realized price changes for an *aggregate* rather than *local* asset – the FTSE-100 UK stock market index.²⁷

In this final part of our empirical analysis, we present estimation results from models that are specified analogously to those reported for local house price expectations. We find that both realized and perceived past stock market returns predict subjective expectations about national stock market returns (see Table 10). However, similar to the analysis on expected house price changes, perceived (rather than realized) past returns have more predictive power

²⁷Again, we follow the non-parametric approach in Hurd et al. (2011) to construct a measure of subjective expected stock market returns; for more detail on the summary statistics, see Online Appendix G.

in explaining expected stock market returns. In contrast, we do not find evidence of local economic conditions predicting subjective expectations about expected returns of the FTSE-100 UK stock market index—an outcome at the aggregate level. Taken together, our results suggest that individuals use local economic conditions as salient characteristic when forming expectations about a local outcome only.

Table 10: Predictors of stock market return expectations

	Expected 1yr stock market return (%)		
	(1)	(2)	(3)
Local unemployment rate	−0.058 (0.078)	−0.035 (0.074)	−0.038 (0.075)
Realized 1yr stock market return	0.098*** (0.029)		0.087*** (0.029)
Perceived 1yr stock market return		0.128*** (0.021)	0.126*** (0.021)
Socio-demographics	✓	✓	✓
Effect of 1 std in Local unemployment rate (in %)	−0.06 (−3.02)	−0.04 (−1.83)	−0.04 (−1.98)
Effect of 1 std in Realized 1yr stock market return (in %)	0.34 (16.16)		0.30 (14.27)
Effect of 1 std in Perceived 1yr stock market return (in %)		1.07 (50.22)	1.06 (49.66)
Mean DepVar	2.13	2.13	2.13
R-squared	0.02	0.06	0.06
N	2,731	2,731	2,731

Notes: The table shows regression estimates, with *expected 1yr stock market return* as the dependent variable. Realized, perceived, and expected 1yr returns refer to the *national* stock market. Local unemployment rates refer to the month of interview. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. Note that interview-month fixed effects are captured in *realized 1yr stock market returns*, which only vary across interview months, but not across local authorities. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

4 Conclusion

In this paper, we study the role of local economic conditions in shaping the formation of subjective expectations about one-year-ahead local house prices. Using survey data from the UK Financial Lives survey, and exploiting considerable variation in house price changes and economic conditions across local authorities in Great Britain, we find that in addition to perceived past local house price changes, local economic conditions have significant power in predicting expectations about local house prices. Interestingly, there is substantial heterogeneity in belief formation by financial sophistication. Individuals with low financial sophistication com-

plement perceptions of past house price growth with a wider set of local economic indicators in their formation of subjective expectations about future house prices. We conclude that agents' belief formation process is not fully captured by models that only include (recent or more distant) past house price changes as predictors. Instead, agents' beliefs about future house prices react to salient local information as well.

We further find that the weight individuals give to their perceptions and to local economic conditions in their belief formation also depends on features of the local housing market they reside in. In local markets with high past price volatility and where there is no short-run momentum in realized prices, i.e., where past prices are not very informative, individuals rely more on local economic conditions than on their perception of past price changes.

Our findings have novel implications for models of the expectation formation process. Survey-based measures of subjective expectations have been repeatedly found to deviate from full-information rational expectations (e.g., Adam et al., 2022; Mankiw et al., 2003). Recent studies highlight the benefits of developing empirically-founded models of beliefs that go beyond rational expectations and take into account empirical evidence on subjective expectations (e.g., Barberis et al., 2015; Coibion et al., 2018; Fuster et al., 2010; Gelain and Lansing, 2014; Kuchler et al., 2023). Andre et al. (2022) provide evidence that even when individuals have access to similar information about macroeconomic fundamentals, there is substantial heterogeneity in their subjective models resulting in different expectations. It is therefore crucial to empirically measure expectations and to better understand their formation. The evidence provided in the present paper highlights the importance of heterogeneity in belief formation: Individuals rely on perceptions and a wider set of economic indicators, and by how much they rely on various predictors varies with local market dynamics, with information that is likely salient to them, and with financial sophistication.

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Appendix

A Survey questions and survey data

Section A of the Online Appendix reports the exact wording of the survey questions on subjective expectations and perceptions about local house price changes and aggregate stock market returns (Figure A1), a description of all variables (Table A1), and sample summary statistics (Tables A2 and A3). It shows that perceived past one-year house price changes differ from realized ones (Figure A2). Table A4 shows the exact wording of the financial literacy questions; financial literacy is *high* if all four standard financial literacy questions are answered correctly, and *low* otherwise. Table A5 shows that the probability of having high financial literacy is lower among women, those with low education and low household income.

Figure A1: Elicitation of subjective expectations and perceptions about local house price changes and aggregate stock market returns in the *Financial Lives* survey

RISK4_INTRO [STATE TO ALL]

Now you've seen the examples of the chances of rain next July in Edinburgh and Barcelona, we want to ask you about the chances of different investments making money.

For the next few questions, imagine you receive an unexpected inheritance of £100,000.

RISK5

Imagine you put the £100,000 towards buying a house in your local area.

What do you think are the percentage chances that the house will have gone up or down in value by the amounts given below in 12 months' time?

Write a percentage chance in each box to reflect how likely you think different outcomes are. Make sure your percentages add up to 100%.

	0%	
	<i>Still to use</i>	
Rise in house value	<input type="text"/>	% chance of 15.1% or more rise in house value
	<input type="text"/>	% chance of 10.1% to 15% rise in house value
	<input type="text"/>	% chance of 5.1% to 10% rise in house value
	<input type="text"/>	% chance of 0.1% to 5% rise in house value
<hr/>		
Fall in house value	<input type="text"/>	% chance of 0% to 4.9% fall in house value
	<input type="text"/>	% chance of 5% to 9.9% fall in house value
	<input type="text"/>	% chance of 10% or more fall in house value
Total		% Note all answers must total to 100%.

RISK6

Imagine instead you invest the £100,000 in the **FTSE 100, which is the main UK stock market index**.

What do you think are the percentage chances that your stock market investment will have gone up or down in value by the amounts given below in 12 months' time?

Write a percentage chance in each box to reflect how likely you think different outcomes are. Make sure your percentages add up to 100%.

	0%	
	<i>Still to use</i>	
Rise in stock market value	<input type="text"/>	% chance of 15.1% or more rise in stock market value
	<input type="text"/>	% chance of 10.1% to 15% rise in stock market value
	<input type="text"/>	% chance of 5.1% to 10% rise in stock market value
	<input type="text"/>	% chance of 0.1% to 5% rise in stock market value
<hr/>		
Fall in stock market value	<input type="text"/>	% chance of 0% to 4.9% fall in stock market value
	<input type="text"/>	% chance of 5% to 9.9% fall in stock market value
	<input type="text"/>	% chance of 10% or more fall in stock market value
Total		% Note all answers must total to 100%.

Figure A1: Elicitation of subjective expectations and perceptions about local house price changes and aggregate stock market returns in the *Financial Lives* survey (cont.)

RISK9b Now let's imagine you actually received the unexpected £100,000 inheritance **12 months ago**.

If you put your £100,000 towards a house **in your local area**, do you think the value of your £100,000 investment would have increased, decreased or stayed the same over the last 12 months?

1. Increased
2. Stayed the same
3. Decreased

IF CODE 1 SELECTED SHOW THE FOLLOWING

By how much do you think it would have increased? %

IF CODE 3 SELECTED SHOW THE FOLLOWING

By how much do you think it would have decreased? %

RISK9c If instead you invested your £100,000 in the main UK stock market index, called the FTSE 100 index, do you think the value of your £100,000 investment would have increased, decreased or stayed the same over the last 12 months?

1. Increased
2. Stayed the same
3. Decreased

IF CODE 1 SELECTED SHOW THE FOLLOWING

By how much do you think it would have increased? %

IF CODE 3 SELECTED SHOW THE FOLLOWING

By how much do you think it would have decreased? %

Data Source: Financial Lives 2020 survey.

Table A1: Description of variables

Label	Description
<i>(a) Socio-demographic characteristics</i>	
	Dummy equal to 1 if . . .
Female	Female, and 0 if male.
Age 44 or younger	Aged between 18 and 44.
Age 45 to 64	Aged between 45 and 64.
Age 65 or older	Aged 65 or older.
Higher education	One of the following qualifications: (1) Higher degree, or (2) Degree or degree equivalent, or (3) Other Higher Education below degree level.
Lower or medium education	One of the following qualifications: (1) A level, vocational level 3 and equivalents, or (2) Trade Apprenticeships, or (3) O level/ GCSE Grades 4-9/A*-C, vocational level 2 and equivalents, or (4) Qualifications at level 1 and below, or (5) Other qualifications including overseas.
No education	No qualifications, or question about qualifications answered with “don’t know.”
Education info missing	No information on respondent’s education.
Partner in household	Married, in a registered civil partnership, or living with someone in the household as a couple.
Working	Employed or self-employed.
Annual HH income: less than £20k	Total annual household income from all sources (including benefits) before taxes and other deductions less than £20,000 a year.
Annual HH income: £20k–<£40k	... £20,000 or more but less than £40,000 a year.
Annual HH income: £40k–<£70k	... £40,000 or more but less than £70,000 a year.
Annual HH income: £70k or more	... £70,000 or more a year.
Annual HH income: info missing	No information on respondents’ total annual household income.
Holding risky asset	Currently having one of the following investments (either in own name or in joint names): (1) Investment fund, e.g. unit trust, OEIC, ETF, or endowment, or (2) Shares/equities, or (3) Corporate bond or gilt / government bond, or (4) Investment-based crowdfunding, or (5) Peer-to-peer lending, or (6) Structured deposit (sometimes referred to as a savings bond) or structured investment, or (7) Stocks and shares ISA, or (8) Lifetime ISA that is invested, or (9) Insurance bonds (investment bonds), or (10) Innovative Finance ISA (IFISA).
Homeowner	Owning the property currently living in (1) outright, or (2) with a mortgage (or a different kind of loan).
Recent mover	Event of moving house experienced in the last 12 months.
Risk averse	Answer to the question “Are you a person who is generally willing to take risks?” (on a scale from 0 to 10, where 0 is “Not at all willing to take risks” and 10 is “Very willing to take risks”) ≤ 5 .
High financial literacy	All four standard financial-literacy questions are answered correctly.
High interest rate knowledge	Understanding three out of three concepts related to past financial developments and future financial expectations.
Interview finished on same day	Survey questionnaire finished on the same day.
<i>(b) Expectations, perceptions, realizations, and perception gaps</i>	
Expected 1yr HP change	Non-parametric estimates of the subjective expected rate of one-year change in the house price (HP) index in the individual’s local authority, relative to the interview month.
Perceived 1yr HP change	Perceived past one-year house price (HP) change in the individual’s local authority, relative to the interview month.
Realized 1yr HP change	Realized past one-year house price (HP) change in the individual’s local authority, relative to the interview month.
Absolute perception gap	Difference in absolute terms between realized and perceived past one-year local house price (HP) changes.
Expected 1yr stock market return	Non-parametric estimates of the subjective expectations about one-year ahead returns in the FTSE-100 UK stock market index, relative to the interview month.
Continued on next page	

Table A1 (*Continued*)

Label	Description
Perceived 1yr stock market return	Perceived past one-year return in the FTSE-100 UK stock market index, relative to the interview month.
Realized 1yr stock market return	Realized past one-year return in the FTSE-100 UK stock market index, relative to the interview month.
<i>(c) Local conditions</i>	
Local unemployment rate	Unemployment rate in the individual's local authority in the interview month; proxied by the number of claimants as a proportion of the resident population of a local area aged 16–64. <i>Claimants</i> are defined as the number of people claiming Jobseeker's Allowance, plus those claiming Universal Credit and being out of work. Data from Nomis.
Local deprivation score	Deprivation score in the individual's local authority, taken from the 2019 Index of Multiple Deprivation (comparable data available for England only).
Log property sales	Logarithm of residential property sales per 1,000 inhabitants in the individual's local authority (comparable data available for England and Wales only). Data from: ONS.
5yr local house price volatility	Standard deviation of monthly-computed one-year local changes in house prices in the individual's local authority over the five years before the interview month; definition of "low" and "high" based on sample median split. Data from: UK HPI / HM Land Registry.
High local media coverage of house prices	Dummy equal to 1 if self-constructed measure of the media coverage of the topic of "house prices" in the individual's local authority above median (computed at local-authority level).

Notes: The table shows a detailed description of the variables used in the analyses.

Table A2: Summary statistics

	<i>N</i>	Mean	Std Dev
<i>(a) Socio-demographic characteristics</i>			
Female	2,774	0.47	0.50
Age 44 or younger	2,799	0.43	0.49
Age 45 to 64	2,799	0.34	0.48
Age 65 or older	2,799	0.23	0.42
Higher education	2,799	0.63	0.48
Lower or medium education	2,799	0.30	0.46
No education	2,799	0.05	0.22
Education info missing	2,799	0.03	0.16
Partner in household	2,744	0.71	0.45
Working	2,799	0.62	0.49
Annual HH income: less than £20k	2,799	0.15	0.36
Annual HH income: £20k - <£40k	2,799	0.23	0.42
Annual HH income: £40k - <£70k	2,799	0.23	0.42
Annual HH income: £70k+	2,799	0.20	0.40
Annual HH income: info missing	2,799	0.18	0.39
Holding risky asset	2,799	0.42	0.49
Homeowner	2,799	0.72	0.45
Recent mover	2,799	0.09	0.29
Risk averse	2,789	0.42	0.49
High financial literacy	2,799	0.48	0.50
High interest rate knowledge	2,799	0.40	0.49
Interview finished on same day	2,799	0.91	0.28
<i>(b) Expectations, perceptions, realizations, and perception gaps</i>			
Expected 1yr HP change (%)	2,799	3.71	4.45
Perceived 1yr HP change (%)	2,799	3.79	7.52
Realized 1yr HP change (%)	2,799	1.11	2.68
Realized 1yr HP change (absolute value)	2,799	2.28	1.80
Absolute perception gap (%-points)	2,799	5.04	6.73

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Table A2 (*Continued*)

	<i>N</i>	Mean	Std Dev
Expected 1yr stock market return (%)	2,799	2.13	4.94
Perceived 1yr stock market return	2,799	2.58	8.34
Realized 1yr stock market return	2,799	3.30	3.52
<i>(c) Local conditions</i>			
Local unemployment rate	2,799	2.73	1.11
Local deprivation score	2,375	20.55	8.12
Log property sales	2,516	2.63	0.23
5yr local house price volatility	2,799	3.53	1.65
High local media coverage of house prices	2,799	0.59	0.49

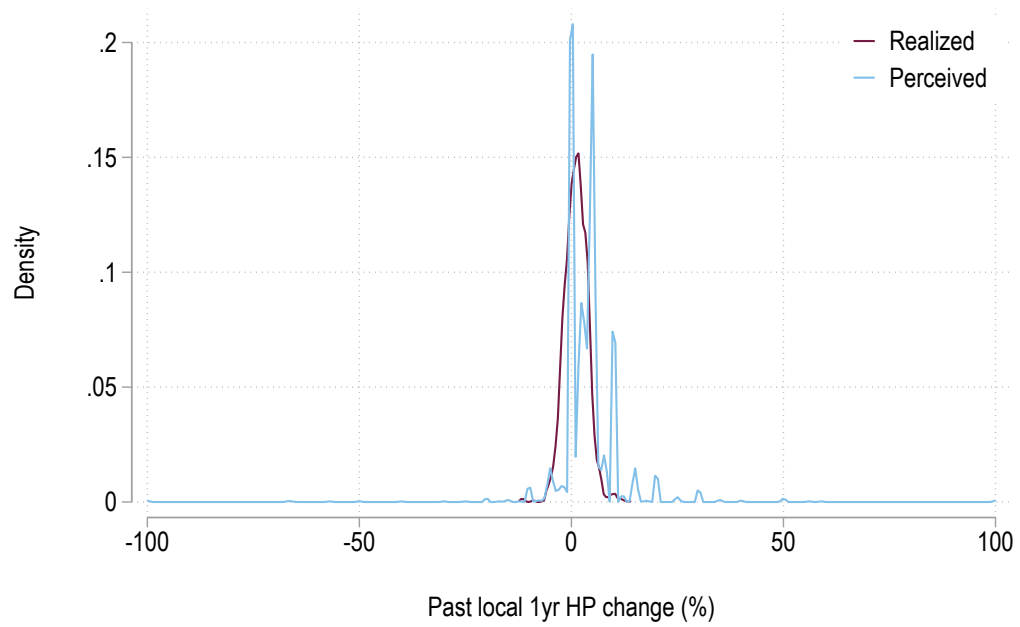
Notes: The table shows summary statistics. *Data Source:* Financial Lives 2020 survey, Office for National Statistics, Ministry of Housing, Communities & Local Government, and historical values from the UK HPI and the FTSE-100 Index.

Table A3: Summary statistics of subjective expected one-year local house price changes

	<i>N</i>	Mean	Std Dev	P10	P25	P50	P75	P90
B1: -10% or less	2,799	2.65	8.87	0	0	0	1	10
B2: -9.9% to -5%	2,799	4.07	8.29	0	0	0	5	10
B3: -4.9% to 0%	2,799	16.13	19.67	0	0	10	25	50
B4: 0.1% to 5%	2,799	45.51	31.69	0	20	49	70	95
B5: 5.1% to 10%	2,799	18.57	22.54	0	0	10	25	50
B6: 10.1% to 15%	2,799	7.48	14.42	0	0	0	10	20
B7: 15.1% or more	2,799	5.59	15.64	0	0	0	5	12

Notes: The table shows summary statistics of the raw subjective probabilities for one-year-ahead expected local house price changes. *Data Source:* Financial Lives 2020 survey.

Figure A2: Realized and perceived past local one-year house price changes



Notes: The figure shows kernel densities of realized and perceived past local one-year house price (HP) changes in our survey sample. *Data Source:* Financial Lives 2020 survey and UK HPI. $N=2,799$.

Table A4: Elicitation of financial literacy in the *Financial Lives* Survey

Concept	Survey question
Interest rate	Suppose you put £100 into a savings account with a guaranteed interest rate of 2% per year. There are no fees or tax to pay. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made? Please type in your answer to the nearest pound.
Interest compound	And how much would be in the account at the end of five years (remembering that there are no fees or tax deductions)? <ol style="list-style-type: none"> 1. More than £110 2. Exactly £110 3. Less than £110 4. It is impossible to tell from the information given 5. Do not know
Inflation	If the inflation rate is 5% and the interest rate you get on your savings is 3%, will your savings have more, less or the same amount of buying power in a year's time? <ol style="list-style-type: none"> 1. More 2. The same 3. Less 4. Do not know
Risk diversification	Is the following statement true or false? Buying shares in a single company usually provides a safer return than buying shares in a range of companies. <ol style="list-style-type: none"> 1. True 2. False 3. Do not know

Notes: The table shows the financial-literacy questions on interest rates, interest compound, inflation, and risk diversification included in the Financial Lives 2020 survey.

Table A5: Correlates of financial literacy

Dependent variable	High financial literacy
Female	-0.188*** (0.018)
Age (ref: 18–44)	
45–64	0.207*** (0.020)
65 or older	0.206*** (0.028)
Partner in household	0.025 (0.021)
Education (ref: Higher)	
Lower or medium	-0.156*** (0.018)
None	-0.211*** (0.041)
Info missing	-0.296*** (0.054)
Working	0.001 (0.024)
Annual HH income (ref: £70k or more)	
Less than £20k	-0.248*** (0.032)
£20k - <£40k	-0.137*** (0.028)
£40k - <£70k	-0.087*** (0.025)
Info missing	-0.201*** (0.031)
Local unemployment rate	-0.027*** (0.008)
Constant	0.599*** (0.070)
Mean DepVar	0.48
R-squared	0.18
N	2,731
Month Fixed Effects	✓

Notes: The table shows estimates from a linear probability model. The dependent variable is equal to 1 if an individual has high financial literacy (i.e., answers all four standard financial literacy questions, as shown in Table A4, correctly), and 0 otherwise. ‘ref.’ indicates the omitted category. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

B Non-parametric estimation of subjective expected one-year house price changes

In this section, we provide a detailed description of how we construct our measure of subjective expected one-year house price changes. We adopt the non-parametric estimation approach suggested in Hurd et al. (2011). They construct non-parametric estimates of the mean of the expected rate of return distribution for stock market investments. The model is given by

$$E(\pi) = \sum_j P(\pi \in B_j) E(\pi | \pi \in B_j) \quad (4)$$

where, $P(\pi \in B_j)$, is an individual's subjective probability assigned to bracket j , and, $E(\pi | \pi \in B_j)$, is the historical average of one-year rates of return conditional on the return being in bracket j . The number and thresholds of the brackets are pre-determined by the respective survey questions.

Table B1: Averages of historical year-on-year house price changes in bracket j , $E(r | r \in B_j)$

Average of historical UK-wide house price changes (1/2002–7/2019)	
<i>Brackets:</i>	
B1: -10% or less	−14.21
B2: -9.9% to -5%	−8.36
B3: -4.9% to 0%	−1.54
B4: 0.1% to 5%	2.64
B5: 5.1% to 10%	7.33
B6: 10.1% to 15%	11.95
B7: 15.1% or more	21.77
N	211

Notes: The table shows bracket-specific averages of monthly computed historical year-on-year house price changes, computed at the UK level. *Data Source:* UK HPI.

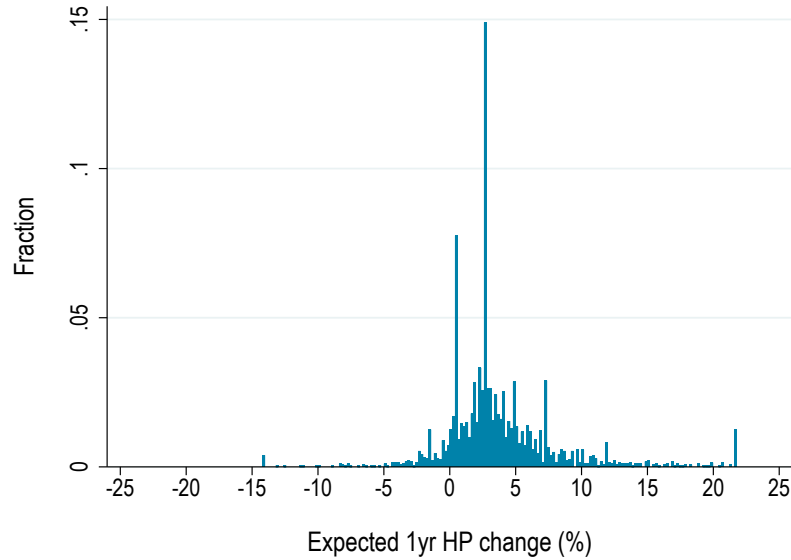
We use the same methodology to construct a measure of the subjective expected house price change from the probabilities corresponding to the seven brackets B_j in our survey question on expected house price changes, where $B_1 = (-\infty, -10\%]$, $B_2 = (-10\%, -5\%]$, $B_3 = (-5\%, 0\%]$, $B_4 = (0\%, 5\%]$, $B_5 = (5\%, 10\%]$, $B_6 = (10\%, 15\%]$, and $B_7 = (15\%, \infty)$.

We compute $E(r | r \in B_j)$ based on historical UK-wide year-on-year house price changes r for each month from the UK House Price Index for the time between January 2002 and July 2019 (the period corresponds to the period before the survey was conducted, and for

which annual historical house price changes are available on a monthly basis). We then assign these historical house price changes to the brackets B_j to get bracket-specific average house price changes $E(r|r \in B_j)$. Table B1 shows the resulting bracket-specific averages of the historical year-on-year house price changes.

Following equation (4), we use the bracket-specific averages of the historical year-on-year house price changes, $E(r|r \in B_j)$, and weight them with the respondents' probabilities assigned to the seven different brackets, $P(r \in B_j)$, to estimate the subjective expected house price change. In Figure B1, we show the corresponding sample distribution.²⁸

Figure B1: Distribution of the expected 1yr HP change, $E(r)$



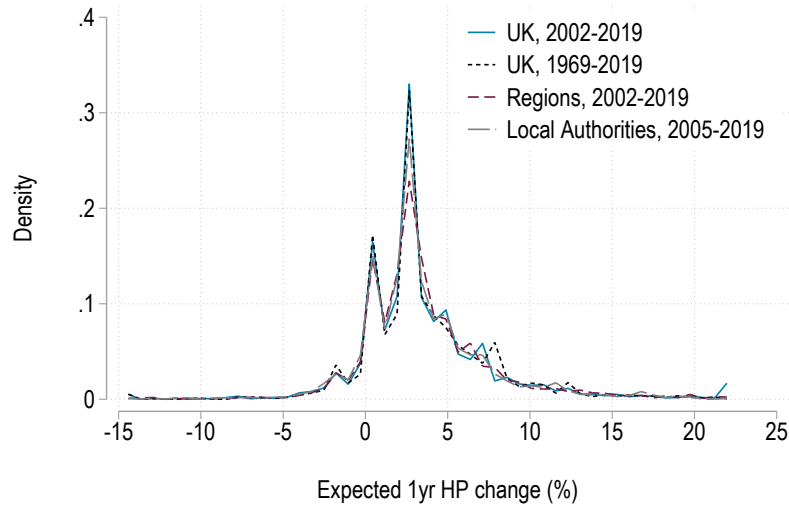
Notes: Computation of expectations is based on the non-parametric estimation approach by Hurd et al. (2011).

Data Source: UK HPI and Financial Lives 2020 survey, $N=2,799$.

²⁸There are two outliers; the first outlier is driven by respondents assigning a probability of 50% to the bracket “between -4.9% and 0% ,” and another 50% to the bracket “between 0.1% and 5% ,” the second outlier is driven by respondents assigning a probability of 100% to the bracket “between 0.1% and 5% .”

Figure B2 shows that relying on different specifications of geographic localities (the individual’s government office region or local authority instead of the whole UK) and time horizons (1969–2019 instead of 2002–2019) in the computation of $E(r|r \in B_j)$, resulting estimates of subjective expected house price changes are qualitatively unchanged.

Figure B2: Kernel-density plot of the expected one-year house price change, $E(r)$



Notes: The figure shows kernel densities for the expected 1yr house price (HP) change resulting from different specifications of geographic localities and time horizons in the non-parametric estimation approach by Hurd et al. (2011). *Data Source:* UK HPI and Financial Lives 2020 survey, $N=2,799$.

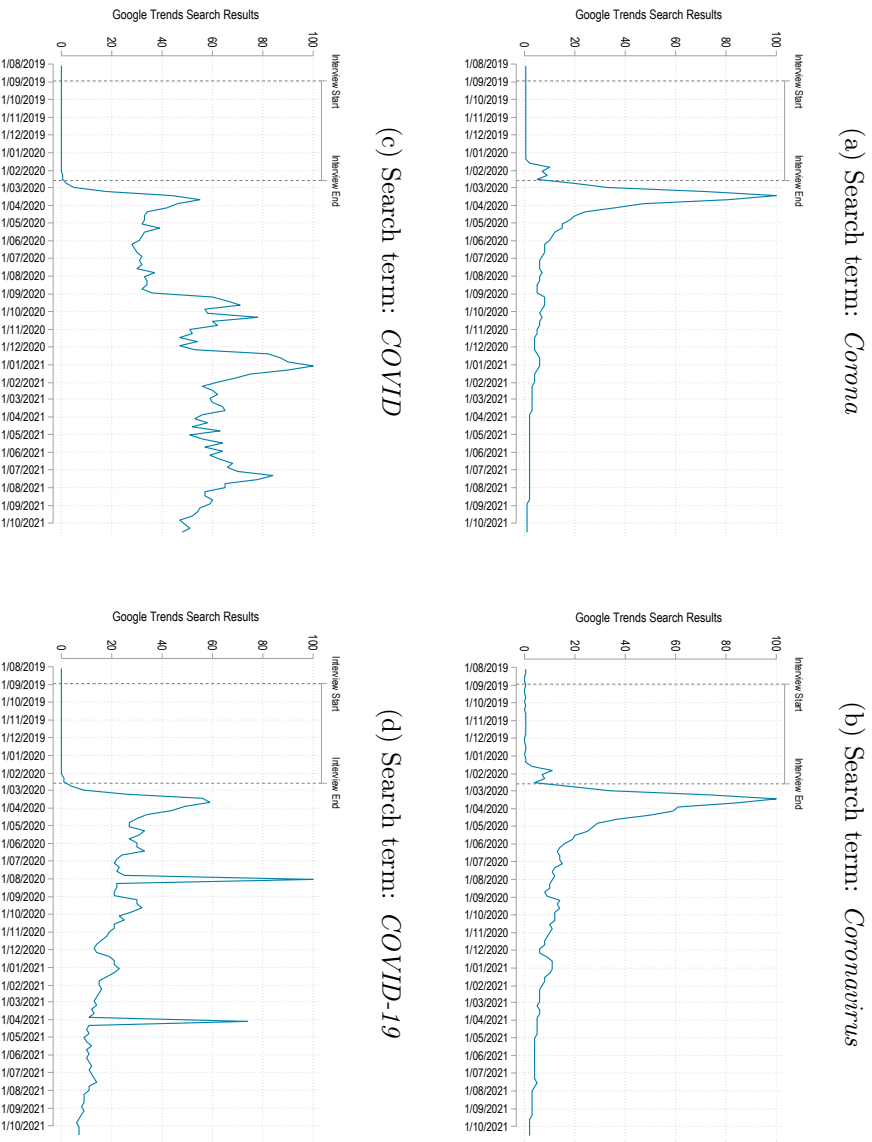
C Survey fielding and pandemic onset

As of February 2020, which constitutes the end of our survey period, there were no more than 47 registered cases in the UK; while the first case in the UK was registered in January 2020, the first COVID-19 related death was registered only on March 2, 2020. The first lockdown in the UK started on March 23, 2020 (<https://coronavirus.data.gov.uk/details>).

In Figure C1, we report *Google Trends* search results for various search terms related to COVID for the time period after and during which the FCA Financial Lives 2020 survey was conducted. Searches of related terms such as “Corona,” “Coronavirus,” “COVID,” or “COVID-19” increased rapidly only in March 2020, i.e., after the survey was conducted. In contrast, search intensity was close to zero during the time of the survey. Hence, it is unlikely that

individuals' beliefs and expectations about future house price changes in our sample were distorted by the upcoming pandemic.

Figure C1: Google Trends search results for COVID-related search terms



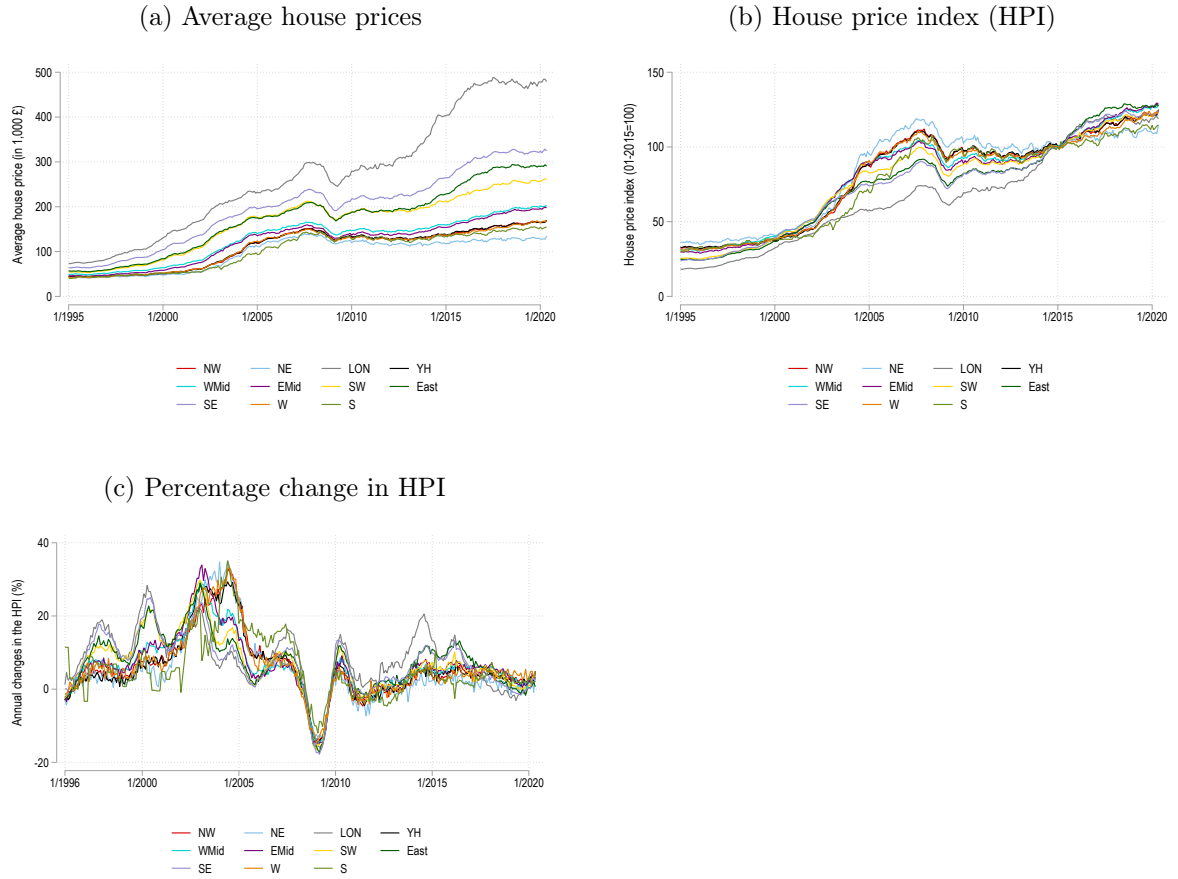
Data Source: <https://trends.google.com/trends/?geo=GB>, data retrieved at October 20, 2021.

D House price dynamics in Great Britain, 1995 to 2019

Section D of the Online Appendix reports house price dynamics in Great Britain. Figure D1 reports at the government-office-regional level the development of average house prices and the annual changes in the HPI since 1995. Figure D2a shows the spatial variation in the annual change in house prices across local areas as of January 2020, the survey month in which the majority of interviews were conducted; annual house price changes vary between -13.6% in the *City of London* and +12.3% in *Burnley*. Given that respondents of the Financial Lives survey (who live in different areas) were interviewed at different points in time over a period

of seven months, our measure of past local house price changes varies not only across different local authorities but also over time. Figure D2b shows that for the survey period, the average local-authority-level annual house price changes ranges between 0.6% in August 2019 and 1.4% in February 2020.

Figure D1: Regional house price dynamics in Great Britain

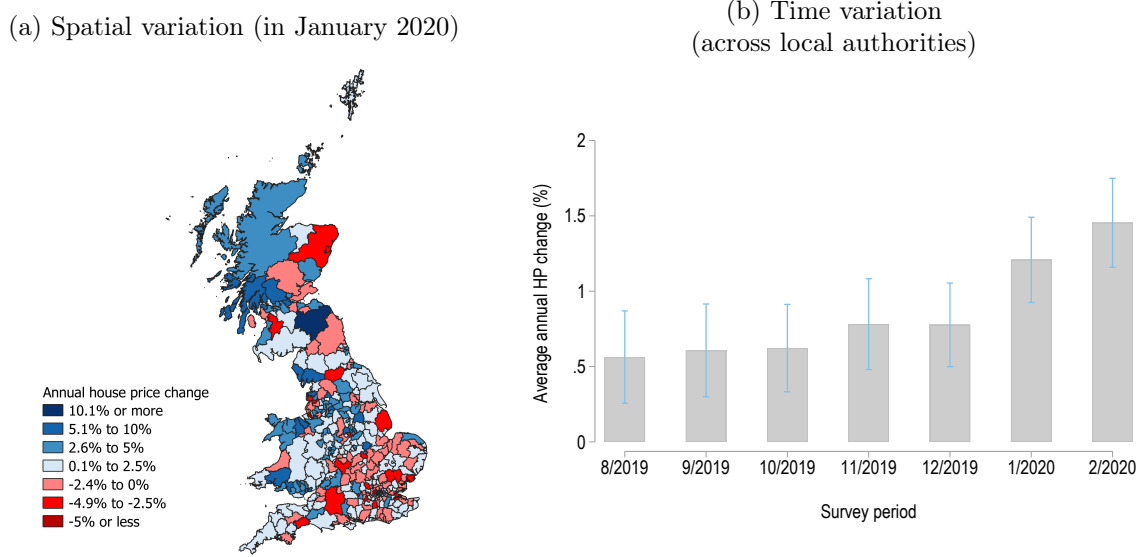


Notes: The figure at the top left shows the development of the average house prices (including all property types) in Wales, Scotland, and the regions in England from 1995. The figure at the top right shows the (quality and composition adjusted) *UK House Price Index (HPI)* (January 2015=100). The figure at the bottom left shows the percentage change in the HPI compared to the same period twelve months earlier. *Data Source:* UK HPI.

E Local economic conditions

Section E of the Online Appendix shows that different measures of local economic conditions are strongly positively correlated. Figure E1a shows that local unemployment rate, our main

Figure D2: Variation in annual house price changes across local authorities and across the survey period



Notes: The figure at the left shows the spatial variation in annual house price changes across the local authorities in Great Britain in January 2020. The figure at the right shows the average and the 95% confidence interval of the annual house price (HP) changes across local authorities for the survey period (between August 2019 and February 2020); we treat all local authorities identical (i.e., we compute *unweighted* averages) and we exclusively consider local authorities that are covered in our survey sample, $N = 364$. *Data Source:* UK HPI.

measure of local economic conditions, is highly positively correlated with the local deprivation score measure. In addition, we investigate the relationship with a different measure—local monetary losses from welfare reforms. After the General Election 2010, the Conservative-Liberal-Democrat coalition government implemented far-reaching welfare cuts via the Welfare Reform Act 2012 and followup reforms. We draw on estimates from Beatty and Fothergill (2016) who provide local-authority-level estimates of the total annual financial benefit loss per working-age adult, separately for pre-2015 and post-2015 welfare reforms. The authors base their estimates on official statistics from the HM Treasury, the Department for Work and Pensions, and the HM Revenue and Customs department, including data on benefit claimants, statistics on welfare-related financial savings, and government’s Impact Assessment. Figure E1b shows that these losses from welfare reforms are strongly positively associated with the unemployment rates in a given local authority.

Figure E1: Relationship between different measures of local economic conditions

(a) Local unemployment and local deprivation in England



(b) Local unemployment and local monetary loss from welfare cuts in Great Britain



Notes: The figures show the relationship between different measures of local economic conditions. *Data Source:* Office for National Statistics (data from Nomis), Ministry of Housing, Communities & Local Government, and Beatty and Fothergill (2016). Panel (a), N=312 local authorities (information on the index-of-multiple-deprivation score is restricted to LAs in England); panel (b), N=364 local authorities.

F Sensitivity analysis

Section F of the Online Appendix reports a series of sensitivity analyses, using (i) alternative measures of past house price changes, (ii) alternative measures of local economic conditions, and (iii) alternative measures of financial sophistication.

Alternative measures of past house price changes

As outlined in Section 2.3, we follow the approach by Malmendier and Nagel (2011) in robustness checks, considering different time horizons in the past and allowing different returns in the past to carry different weights. Malmendier and Nagel (2011) define the concept of *weighted average annual returns* of individual i in year t , A_{it} , as a weighted sum of individually experienced annual returns, $R_{i,t-s}$, at time, $t - s$, over an individual's lifetime, S_i :

$$A_{it} = \sum_{s=0}^{S_i-1} w_{i,s}(\lambda) R_{i,t-s}, \quad (5)$$

where

$$w_{i,s}(\lambda) = \frac{(S_i - s)^\lambda}{\sum_{s=0}^{S_i-1} (S_i - s)^\lambda}. \quad (6)$$

The weights, $w_{i,s}$, depend on (i) the time horizon of the individual's experience, S_i (short: *look-back period*), (ii) how much time ago, s , the return was realized, and (iii) the weighting parameter, λ . The weighting parameter, λ , allows experiences that have been made at different points in the past to carry different weights. If $\lambda < 0$, more distant returns get higher weights than more recent returns. Conversely, if $\lambda > 0$, more recent returns get higher weights than more distant returns (the weighting function is linear if $\lambda = 1$, concave if $\lambda < 1$, and convex if $\lambda > 1$). If $\lambda = 0$, weights are constant, and, A_{it} , refers to the simple (unweighted) average annual return.

Kuchler and Zafar (2019) apply this concept to house price changes but instead assume a constant lookback period, S , leading to common weights, w_s , across individuals. They determine, S , and, λ , via simulation to maximize their goodness-of-fit in predicting subjective house price expectations. They use zipcode-level annual house price changes to construct a measure of personally experienced returns. We aim to capture local experience and thus

construct weighted average annual local house price changes based on past returns at the local-authority level.

We compute the weighted average annual local housing return (where annual returns are computed monthly) as outlined in equation (5) for different time horizons S (12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, and 168 months);²⁹ we perform return calculations for a series of different weights λ , ranging from -2 to 30 , considering steps of 0.1 (i.e., $-2, -1.9, \dots, 29.9, 30$). We then select the weighted average annual local housing return (and the underlying combination of S and λ) that yields the highest fit of our model (see equation (2)), as measured by the R-squared.

Figure F1a illustrates the R-squared for each combination of time horizon S and weighting parameter λ when predicting subjective house price expectations. The longer the time horizon, the higher the weighting parameter λ at which R-squared is maximized, indicating that respondents' recent experiences matter more for their future local house price expectations than experiences that lie further in the past. A similar pattern has been identified by Kuchler and Zafar (2019) for the US local housing market. We achieve the best goodness-of-fit for $S = 60$ (months, i.e., a 5-year lookback period) and $\lambda = 0.5$, implying slowly decreasing return weights across the lookback period (see Figure F1b).

For this specification, the weighted average annual local housing return in the sample is equal to 3.7% (with a standard deviation of 1.5 percentage points).³⁰ In a different regression specification, we consider realized (annualized) local house price changes over the past five years, similar to Armona et al. (2019).³¹

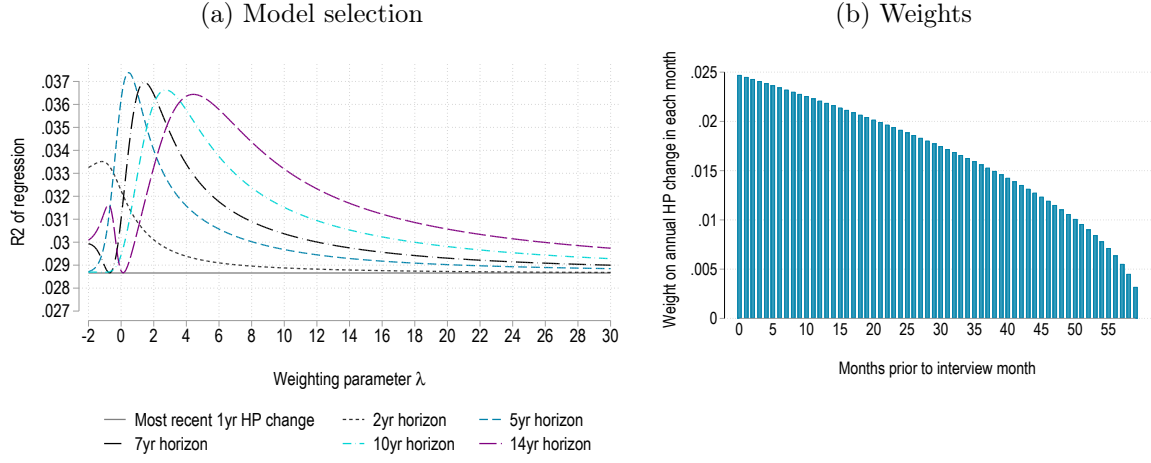
Table F1 shows that both the coefficients on the weighted average of local house price changes over the past 60 months (column 1) and on the annualized house price change over the past five years (column 2) are positive and statistically significant at the 1% level. It is not implausible that respondents' one-year local house price expectations are positively correlated with realized

²⁹Housing return data from the UK HPI are available since 2005 for all local authorities, i.e., for 14 years (168 months) prior interview. We can therefore not consider longer time horizons, e.g., the time horizon since a respondent's birth. $S = 12$ refers to the *most recent available* annual local housing return.

³⁰We also construct weighted average annual local house price changes taking into account only those past annual returns that refer to the month of a year in which a respondent was interviewed. Here, the best fit is achieved for $S = 5$ years and $\lambda = 0.1$. Using this measure of past local house price experiences, results are qualitatively similar.

³¹Note that in the survey, we elicit respondents' *perception* of local house price changes over the past one-year horizon, but not over the past five-year horizon.

Figure F1: Model selection and weights on house price changes



Notes: Panel (a) shows the R-squared of the regression estimates for local house price changes for each combination of time horizon S and weighting parameter λ . Panel (b) shows weights on the monthly-calculated annual local house price changes for the combination of S and λ that achieves the best goodness-of-fit in predicting subjective house price expectations, that is $S = 60$ (5yr horizon) and $\lambda = 0.5$. *Data Source:* Financial Lives 2020 survey.

house price changes over the past five years, but not with realized house price changes over the past one year. Information on how house prices have changed over the past 12 months might not be publicly available that easily and therefore less salient than information on how house prices have evolved on average over the past five years.³²

Table F1 also shows that for the different specifications of past local house price changes, the effect of the locally experienced unemployment rates on expected local house price changes remains negative and statistically significant. Repeating the regression analyses with the alternative measures of past local house price experiences for the subgroups of individuals with high and low financial literacy, regression results remain qualitatively unchanged (not shown). While individuals with high financial literacy rely more heavily on past returns (here, over the past 5 years) in the expectation formation process, those with low financial literacy rely more heavily on locally experienced economic conditions.

³²Also, since the UK HPI is based on completed sales, it is publicly available only with a delay of three months. For instance, if a respondent is interviewed in January 2020, the last housing return available to the public is from October 2019.

Table F1: Alternative measures of past house price changes

	Expected 1yr HP change (%)	
	(1)	(2)
Local unemployment rate	−0.190*** (0.069)	−0.185*** (0.070)
Weighted average of local HP change ^a	0.276*** (0.050)	
Realized 5yr HP change		0.233*** (0.046)
Month Fixed Effects	✓	✓
Socio-demographics	✓	✓
Effect of 1 std in Local unemployment rate (in %)	−0.21 (−5.72)	−0.21 (−5.58)
Effect of 1 std in Weighted average of local HP change ^a (in %)	0.42 (11.31)	
Effect of 1 std in Realized 5yr HP change (in %)		0.40 (10.77)
Mean DepVar	3.70	3.70
R-squared	0.04	0.04
N	2,731	2,731

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized and expected changes in prices refer to the *local* housing market. Realized 5yr HP change is annualized. ^aCalculation of weighted average of past local house price changes with best fit (see Malmendier and Nagel, 2011) for $S = 60$ and $\lambda = 0.5$. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

Alternative measures of local economic conditions

Our results are robust to using local deprivation scores as an alternative measure of local economic conditions (see Table F2). Individuals use local economic conditions as salient characteristics when forming expectations about local house price changes, in particular those with low financial literacy. Since deprivation can only be consistently measured for the subsample residing in England, estimates are less precisely estimated. Similar to our baseline results, individuals extrapolate from past perceived one-year house price changes, and not from realized ones.

Alternative measures of financial sophistication

In robustness checks, we split the sample along a different dimension of financial sophistication—interest rate knowledge. A person’s interest rate knowledge is considered *high* if three concepts related to past financial developments and future financial expectations are understood, and

Table F2: Deprivation score as alternative measure of local economic conditions

	Expected 1yr HP change (%)					
	Pooled		Financial literacy			
			High		Low	
	(1)	(2)	(3)	(4)	(5)	(6)
Local deprivation score	−0.015 (0.011)	−0.018* (0.010)	0.011 (0.011)	0.009 (0.009)	−0.045** (0.019)	−0.047** (0.018)
Realized 1yr HP change	−0.019 (0.038)		−0.022 (0.036)		0.001 (0.066)	
Perceived 1yr HP change		0.139*** (0.031)		0.345*** (0.048)		0.092*** (0.030)
Effect of 1 std in Local deprivation score (in %)	−0.12 (−3.19)	−0.14 (−3.85)	0.09 (2.85)	0.07 (2.27)	−0.37 (−8.45)	−0.38 (−8.71)
Effect of 1 std in Realized 1yr HP change (in %)	−0.05 (−1.21)		−0.05 (−1.74)		0.00 (0.03)	
Effect of 1 std in Perceived 1yr HP change (in %)		1.05 (27.98)		1.60 (52.37)		0.87 (19.77)
Mean DepVar	3.75	3.75	3.06	3.06	4.41	4.41
R-squared	0.03	0.09	0.05	0.29	0.03	0.06
N	2,324	2,324	1,122	1,122	1,202	1,202
Month Fixed Effects	✓	✓	✓	✓	✓	✓
Socio-demographics	✓	✓	✓	✓	✓	✓

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

low otherwise. Using a different measure for financial sophistication, we find that results are qualitatively similar to our baseline results (see Table F3). While individuals with high interest rate knowledge draw more heavily on past house price changes when forming subjective expectations about year-ahead local house prices, individuals with low interest rate knowledge draw less heavily on past house price changes, but instead also take into account local economic conditions.

Heterogeneity of subjective expectations: gender-specific estimates

We also test for systematic gender differences in beliefs. We find that men have lower perception gaps (see Table F4) and rely more strongly on their perceptions of past changes, but we do not find consistently that men and women differ in their reliance on local economic conditions.

Table F3: Interest rate knowledge as alternative measure of financial sophistication

	Expected 1yr HP change (%)					
	Pooled		IR Knowledge			
			High		Low	
	(1)	(2)	(3)	(4)	(5)	(6)
Local unemployment rate	-0.159** (0.074)	-0.155** (0.067)	-0.156 (0.096)	-0.147* (0.084)	-0.214** (0.107)	-0.211** (0.100)
Realized 1yr HP change	-0.001 (0.032)		0.011 (0.046)		-0.004 (0.047)	
Perceived 1yr HP change		0.133*** (0.029)		0.379*** (0.029)		0.092*** (0.027)
Month Fixed Effects	✓	✓	✓	✓	✓	✓
Socio-demographics	✓	✓	✓	✓	✓	✓
Effect of 1 std in Local unemployment rate (in %)	-0.18 (-4.78)	-0.17 (-4.65)	-0.17 (-5.50)	-0.16 (-5.19)	-0.24 (-5.86)	-0.24 (-5.76)
Effect of 1 std in Realized 1yr HP change (in %)	-0.00 (-0.07)		0.03 (0.99)		-0.01 (-0.26)	
Effect of 1 std in Perceived 1yr HP change (in %)		0.99 (26.82)		1.67 (53.92)		0.83 (20.17)
Mean DepVar	3.70	3.70	3.10	3.10	4.11	4.11
R-squared	0.03	0.08	0.03	0.24	0.04	0.06
N	2,731	2,731	1,097	1,097	1,634	1,634

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. Interest rate (IR) knowledge is *high* if all three concepts related to past financial developments and future financial expectations are answered correctly, and *low* otherwise. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

Table F4: Heterogeneous estimates of subjective expectations: gender

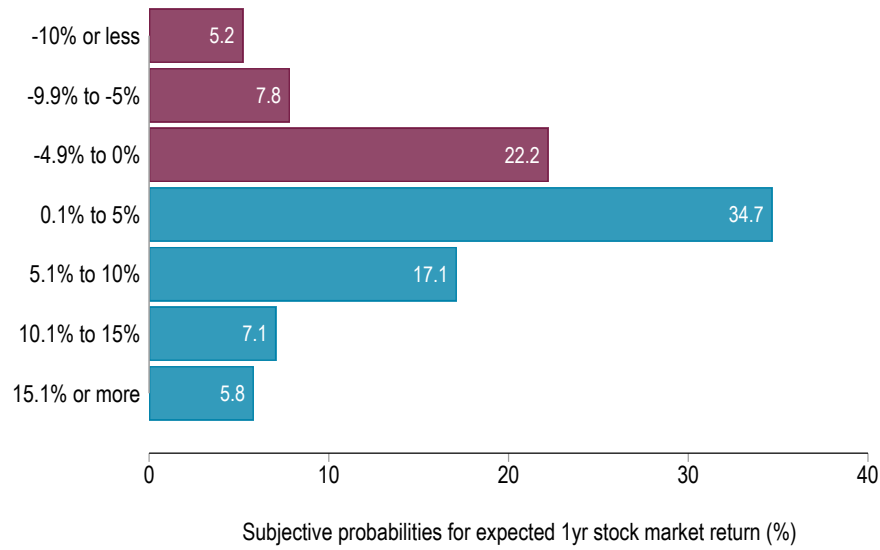
	Dependent variable: Expected 1yr HP change (%)			
	(1)	(2)	(3)	(4)
	Female		Male	
Local unemployment rate	-0.175 (0.111)	-0.218** (0.110)	-0.163* (0.095)	-0.107 (0.085)
Realized 1yr HP change	-0.056 (0.051)		0.052 (0.046)	
Perceived 1yr HP change		0.107*** (0.033)		0.186*** (0.051)
Mean DepVar	3.81	3.81	3.61	3.61
R-squared	0.02	0.06	0.06	0.12
N	1,274	1,274	1,457	1,457

Notes: The table shows regression estimates, with *expected 1yr house price (HP) change* as the dependent variable. Realized, perceived, and expected 1yr changes in prices refer to the *local* housing market. Local unemployment rates refer to the month of interview. In all specifications, we control for socio-demographics and interview-month fixed effects. *Socio-demographics* include indicators for age categories, education categories, household-income categories, whether respondents are female, married, or working, and whether they finished the interview during one day. Note that estimates in columns 2 and 4 are virtually unchanged if we include realized one-year house price changes as a control variable. Standard errors in parentheses are adjusted for clustering at the *local-authority* level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Data Source:* Financial Lives 2020 survey.

G Stock market return expectations, perceptions, realizations, and perception gaps

Section G of the Online Appendix reports summary statistics for stock market return expectations, perceptions, realizations, and perception gaps.

Figure G1: Subjective expected one-year stock market return



Notes: The figure shows the distribution of one-year-ahead expected stock market returns, $N=2,799$. For detailed summary statistics, see Table G1. *Data Source:* Financial Lives 2020 survey.

Table G1: Summary statistics: stock market return expectations, perceptions, and realizations

	Mean	Std Dev	P10	P50	P90
<i>Panel A: Expectations</i>					
Expected 1yr stock market return (%)	2.13	4.94	-1.99	1.76	7.50
<i>Panel B: Perceptions</i>					
Perceived 1yr stock market return (%)	2.58	8.34	-3.00	2.50	10.00
<i>Panel C: Realizations</i>					
Realized 1yr stock market return (%)	3.30	3.52	-1.36	4.55	5.25
<i>Panel D: Perception gap</i>					
Absolute perception gap (%-points)	5.39	7.12	0.45	4.55	10.98
N	2,799				

Notes: The table shows summary statistics. The absolute perception gap denotes the difference between realized and perceived past one-year stock market returns in absolute terms. Computation of expectations is based on the non-parametric estimation approach by Hurd et al. (2011); for details, see Online Appendix B. *Data Source:* Financial Lives 2020 survey and historical values from the FTSE-100 Index.