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Heterogeneity in Households' Expectations of Housing Prices – Evidence from Micro Data[*]

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Abstract

Expectations about future housing prices are arguably an important determinant of actual housing prices, and an important input in decisions on whether and how to transact in the housing market. Using novel micro-level survey data on Swedish households, we analyse households' expectations of housing prices and how these expectations relate to the characteristics of the respondents. Results show that age is significantly related to housing-price expectations, with the youngest households – whose adulthood largely corresponds to the extended period of rapid housing-price growth in Sweden – having the highest housing-price expectations, thus lending support to the hypothesis that expectations are influenced by personal experiences. Our findings suggest that aggregate measures of expectations might hide important features of the data, which could be of interest to policy makers when choosing regulatory actions or formulating macroprudential policies.

JEL Classification: G41, R20

Keywords: Housing prices, Survey data

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1. Introduction

For most households, the act of buying or selling a house or an apartment constitutes one of the most important financial decisions of their lifetime. Such decisions are clearly affected by individual beliefs regarding future changes in housing prices, and misguided beliefs might lead to large welfare losses for the individual household. At the same time, at an aggregate level, expectations about future housing prices are arguably an important driver of actual future housing prices.[1] Housing-price expectations therefore play an important role for both the decision to transact in the housing market and price formation.

In this paper, we analyse household-level survey responses on expectations about future housing prices and relate these expectations to observable respondent characteristics. Our main purpose is to document potential heterogeneity in the cross-section of individual beliefs. Survey data on housing-price expectations for representative households are rare, and we use a fairly unique data set from the *Economic Tendency Survey* of the National Institute of Economic Research (NIER) in Sweden. In this survey, over a short but recent time period, the respondents were asked to state their expectation of the percentage change to aggregate housing prices in Sweden over the following year.

Our data cover Swedish housing-price expectations between November 2015 and October 2017. Unlike in many other countries, housing prices in Sweden were only marginally affected by the global financial crisis. Prior to the crisis, housing prices had been growing at a rapid pace and, apart from a moderate fall during late 2007 and 2008, prices continued to grow rapidly after the crisis. From 2000 to 2015, nominal housing prices grew by about 170 percent in total. In fact, this housing-price expansion dates back all the way to the trough in 1993, which followed the severe banking crises that hit Sweden in the beginning of the 1990s – see Figure 1. Thus, by the time the survey responses were collected in 2015 to 2017, there had been nearly non-interrupted price increases for more than 20 years, averaging a (geometric) growth rate of around 7 percent.[2] During the same period, other prices typically grew at a moderate pace – the consumer price index on average increased more slowly than the Riksbank's inflation target of two percent – such that real house prices also grew rapidly during this period.

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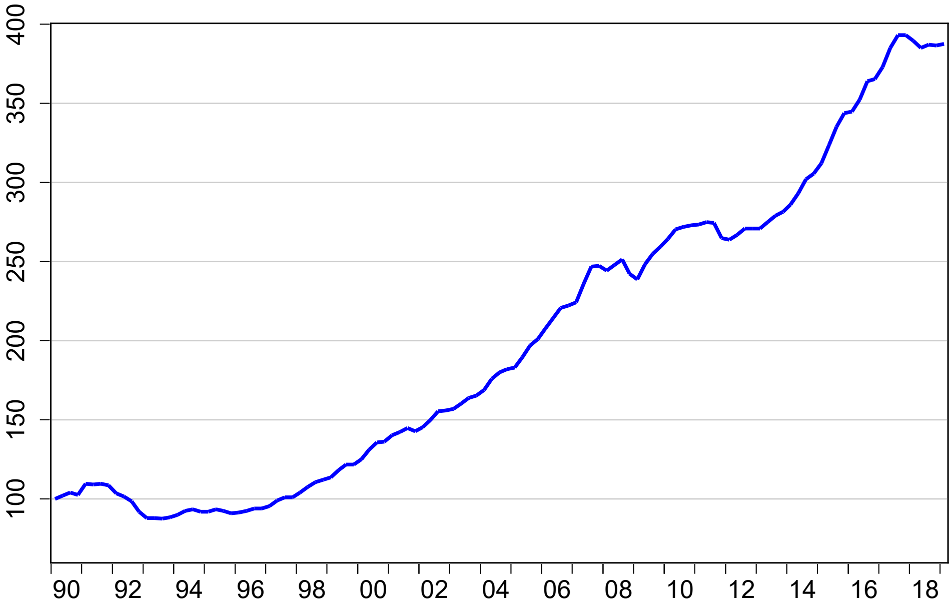
[1] For instance, user-cost-of-capital models imply that one determinant of housing prices is the expected future price; see, for example, Hendershott and Slemrod (1982) and Himmelberg *et al*. (2005). The importance of expectations for housing prices has also been pointed out by Gelain *et al*. (2013), Lambertini *et al*. (2013), and Ling *et al*. (2015).

[2] These numbers are calculated from Statistics Sweden's price index for one- and two-dwelling buildings. The HOX housing price index used in the main analysis only dates back to 2005, but the two indexes are fairly close during the period that they overlap.

Figure 1. Housing-prices.



Note: Housing prices are given by Statistics Sweden's price index for one- and two-dwelling buildings.

Against this background, it is not surprising that there has been an intense debate as to whether the increase in Swedish housing prices can be motivated by fundamentals or whether there is a "bubble" in the housing market; see, for example, Sveriges Riksbank (2011), Dermani *et al.* (2016), European Commission (2016), International Monetary Fund (2016) and Svensson (2019).[3] Since current expectations are arguably a driver of future housing prices, one argument put forth in favour of a bubble is that (some) households may have unrealistic expectations concerning housing-price developments;[4] see, for example, Sveriges Riksbank (2013). It is, of course, difficult to define "unrealistic expectations", especially if there is a feedback loop between expectations and realized price outcomes. Therefore, rather than trying to assess whether the overall level of the forecasts is (un)realistic, our main focus is instead on the cross-sectional heterogeneity in the expectations, measured across observable respondent characteristics.

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[3] The question of bubbles in housing markets is clearly not specific to Sweden; see, for example, International Monetary Fund (2019) for a general discussion and Greenaway-McGrevy and Phillips (2015), Shi *et al.* (2016), Bourassa *et al.* (2019) and Fabozzi and Xiao (2019) for some recent academic contributions.

[4] Overly optimistic households can generate a housing-price boom not driven by fundamentals as shown by Kanik and Xiao (2014). The relevance of deviations from rational expectations for housing-price booms is also discussed by Williams (2011).

The main empirical analysis shows that housing-price expectations do vary considerably across different types of respondent characteristics, such as age, home ownership, and sex.[5] In contrast, income and education appear as weak predictors of differing housing-price expectations.[6]

Of particular interest are the strong results found for age, where young respondents (16- to 24-year olds) on average predict housing-price increases almost one percentage point higher than older respondents (50 years and older). For the 25- to 34-year old group, the corresponding effect is slightly less than half a percentage point. The average housing-price expectations across the entire sample is around five percent, and these effects therefore represent substantial proportional deviations from the mean.

The age results also provide additional evidence on the more general question of belief formations. Some studies have suggested that heterogeneity or dispersion in expectations is a proxy for uncertainty see, for example, Blomqvist (1983), Zarnowitz and Lambros (1987) and Bachmann *et al*. (2013). Mankiw and Reis (2002) put forward that heterogeneity is consistent with an economy characterized by sticky information. Our results give support to another explanation for heterogeneity in expectations, namely that expectations are affected by the individual experiences of the agents. This idea was discussed already by Jonung (1981) in his work on inflation expectations and extended more recently in Malmendier and Nagel's (2016) study in the same area. Treating age as a proxy for the experiences of the respondent, the finding that age has explanatory power for housing-price expectations is consistent with expectations being affected by individual experiences. Specifically, we note that the youngest respondents – whose adulthood coincides with a period of rapid housing-price growth in Sweden – have the highest housing-price expectations. In fact, the older the respondent, the lower the housing-price expectations, which is fully consistent with a decline in the average (real) housing-price growth as one extends the sample period *backwards* in time. Thus, a monotone relationship between housing-price expectations and age categories is matched by a monotone pattern in the experienced housing-price growth for these age categories.

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[5] This type of heterogeneity is also found in other micro-data analyses of household survey expectations, concerning, among other things, inflation, stock-returns and mortgage rates; see, for example, Jonung (1981), Jonung and Laidler (1988), Bryan and Venkatu (2001a, 2001b), Vissing-Jorgensen (2003), Malmendier and Nagel (2016), Ehrmann *et al.* (2017) and Hjalmarsson and Österholm (2019).

[6] The category of respondents who omit to report income do predict significantly higher housing prices than those who report high incomes. To the extent that a non-reported income signals a low income – the non-income-reporting respondents tend to be younger, lower educated, and more likely to be unemployed, compared to those who report income – there is some indicative evidence of an income, or possibly a broader socio-economic effect. However, the estimates for the actual (reported) income and education categories (or employment status), provide little evidence in favour of such a story.

Heterogeneity of expectations might be problematic if, for instance, the households most likely to engage in the housing market have overly optimistic expectations.[7] In order to further assess the housing-price expectations in the survey, we therefore also conduct some additional analysis. First, we separately analyze respondents who have answered that they are considering buying or building a home in the coming year. Results from this exercise show that prospective buyers tend not to deviate in their expectations from other households. Second, we conduct a forecast evaluation where we check for cross-sectional heterogeneity in the (absolute) forecast errors of the respondents. Since the sample is short, one should not draw far-reaching conclusions from this exercise. However, if the highest expectations also turn out to be those with the highest forecast accuracy, one might be less prone to dismiss high expectations as a deviation from rationality. The results from this analysis are fairly imprecise. However, there is nothing in our results that suggests that the high housing-price expectations of young respondents were more accurate than those of other respondents; if anything, the results indicate the opposite.

The remainder of this paper is organised as follows: In Section 2, we describe the survey data used in our study. We present the empirical analysis in Section 3 and Section 4 concludes.

2. Data

2.1 Overview

We use micro-level data on households' expectations from the *Economic Tendency Survey* of the NIER. This survey – in which a random net sample of 1,500 individuals between 16 and 84 years of age are interviewed via telephone – is conducted monthly and is the most important source of household expectations in Sweden.[8] A new sample is randomly drawn every month. The data are therefore in the form of repeated cross sections and there is no panel dimension to the data. The households are asked questions which relate both to their own economic situation and the aggregate economy. A number of characteristics – such as age, sex, income and education – are also recorded for each respondent, as discussed in more detail below.

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[7] To be clear, heterogeneity of expectations does not necessarily imply fundamental irrationality among some groups. For example, Branch (2004) suggests that agents can be "rationally heterogeneous", defined as having boundedly rational expectations, consistent with optimising behaviour.

The key question concerning aggregate housing-price expectations in Sweden was phrased as follows:

> *Over the last 12 months, average housing prices for apartments and houses in Sweden have increased with [x] percent. Compared to today's prices, how many percent do you think that housing prices will change over the coming 12 months?*

In the actual statement of the question each month, the "*[x] percent*" part was replaced by the annual percentage change over the past 12 months in the national housing-price index HOX. This question was, unfortunately, a temporary feature in the survey. It was introduced in November 2015 and was – due to response burden and cost considerations – dropped from the survey after October 2017. The relevant data thus cover a 24-month period.

In the analysis, we winsorize the housing-price expectation data at the 1st and 99th percentiles in order to avoid undue influence from extreme values. Specifically, values smaller than those of the 1st percentile are set to the value of the 1st percentile and values larger than those of the 99th percentile are set to the value of the 99th percentile. The winsorizing is done across the entire pooled sample, using the percentiles obtained from the pooled data.

Several previous studies – Jonung (1981), Jonung and Laidler (1988), Batchelor and Jonung (1989) and Palmquist and Strömberg (2004) – have used the underlying respondent-level data to analyze heterogeneity in inflation expectations across different groups of the population. Our study is, however, the first to analyze individual housing-price expectations.

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[8] The survey also contains a survey of businesses; see National Institute of Economic Research (2018) for details.

2.2 Summary characteristics

Before turning to any detailed analysis, it is useful to first look at the aggregate time series of housing-price expectations. Figure 2 shows the average housing-price expectations over time, where the average has been taken over all individuals in any given cross-sectional sample.[9] The average survey responses are plotted together with the "reference number" of actual housing-price growth over the previous year, where the latter is read out to the respondents of the survey when the question is asked. As is seen, average household expectations were on a downward trend during the survey period. This holds for the actual growth rates (over the previous year) as well, although it should be stressed that year-on-year changes in the HOX price index were strongly positive throughout the two-year survey period. That is, the "*[x] percent*" past price change was always positive and, in fact, *x* was never smaller than 6.7. The decrease in average expectations was by no means negligible; in December 2015, it peaked at ten percent and at the end of the sample, in October 2017, it was merely 3.3 percent.

Figure 2 also plots the realized outcomes of the year-on-year changes in the HOX index, over the twelve months following each survey round. That is, these twelve-month ahead annual price changes represent the actual outcomes of the price changes that the respondents are asked to predict. In contrast to the previous year-on-year price changes that were read up to the respondents in each survey round, the realized price changes following the latter part of the survey period were all negative. While (aggregate) expectations are quite accurate during the first half of the sample, they completely fail to anticipate this downturn in the second half.

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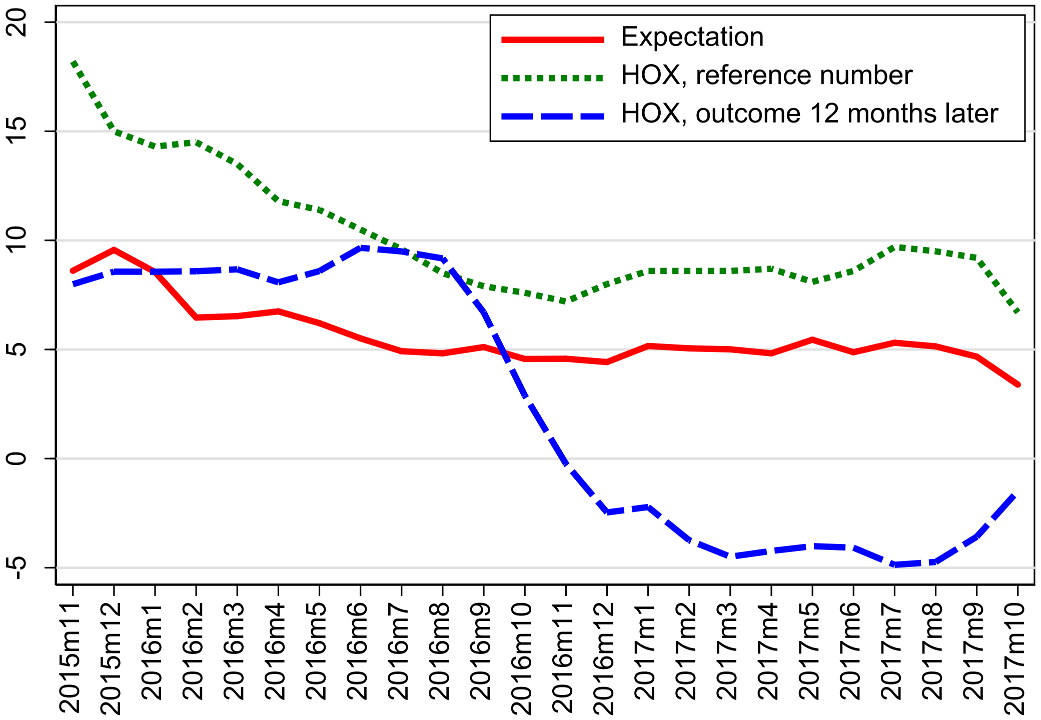
[9] The averages, as well as all subsequent results, are based on the winsorized data.

Figure 2. Housing-price expectations.



Note: "Expectation" is the mean expectation, calculated as the arithmetic average over the winsorized data at each point in time. "HOX, reference number" is the year-on-year change in the HOX index which was read out to respondents at the time of the survey. "HOX, outcome 12 months later" is the actual change in the HOX index twelve months after the date indicated on the horizontal axis; accordingly, the difference between "HOX, outcome twelve months later" and "Expectation" can be interpreted as the forecast error of the mean expectation. All three variables are measured in percent.

Figure 3 illustrates the cross-sectional distribution of expectations at four different points in time. Specifically, histograms of the housing-price expectations in November 2015, July 2016, March 2017, and October 2017, are shown. These graphs show the clear downward shift in the mean of the forecast distribution, from November 2015 to October 2017, which was evident in the time series graph in Figure 1. However, the cross-sectional plots also clearly highlight how the survey responses shift from assigning considerable mass to rather extreme outcomes like 15 and 20 percent increases, to assigning most of the mass to the 0 to 10 percent growth interval.[10] Negative forecasts are also considerably more frequent in the last period.

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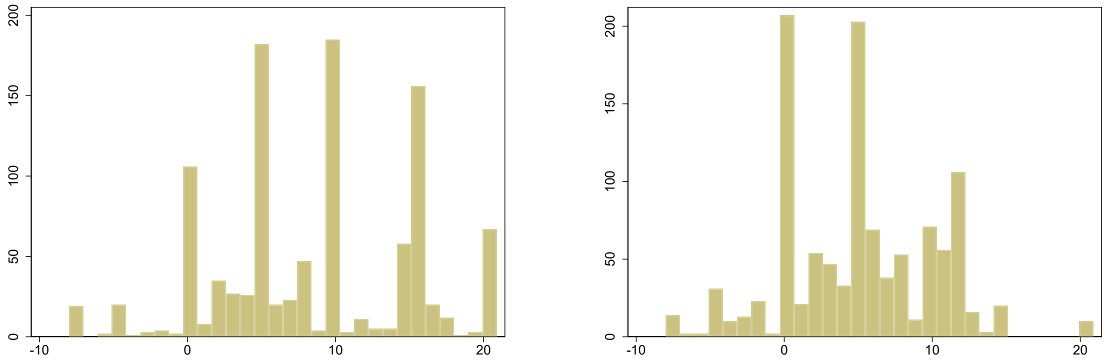
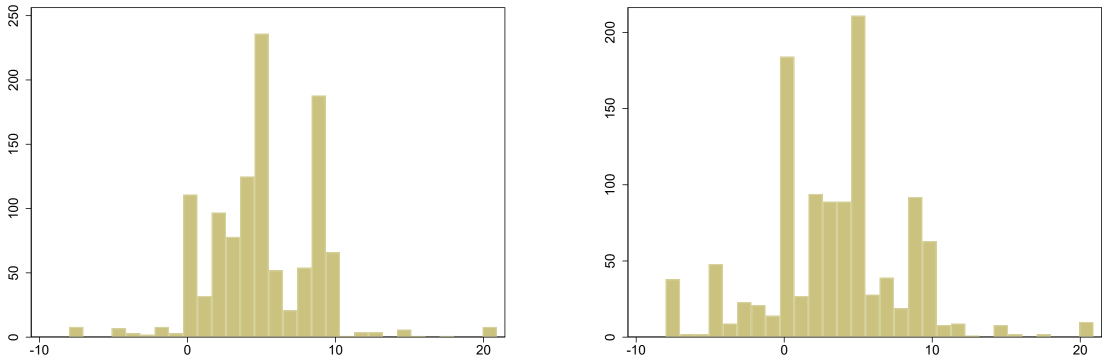
[10] The preference for using certain numbers – such as 0, 5, 10 and 15 – is often referred to as "digit preference" and has been established in several studies; see, for example, Curtain (2010) and Bryan and Palmqvist (2010).

Figure 3. Distribution of housing-price expectations at different points in time.

a) November 2015 b) July 2016



c) March 2017 d) October 2017



Note: Distribution of answers at given dates for the winsorized data. Housing-price expectations in percent on horizontal axis. Number of respondents on vertical axis.

2.3 Respondent characteristics

In the survey, a number of characteristics are collected for each respondent. Specifically, information on the age, income, education, housing type, employment status, sex, family status and geographical region of each respondent is recorded. Table 1 provides the details concerning how these variables are divided in the survey, and how we code these variables in our final data set.

With the exception of "Type of housing", "Income" and "Region" we follow the original classification in the survey. For "Type of housing", we choose to simply distinguish between home owners and renters, whereas the original classification distinguishes between owners of apartments and single-family houses.[11] For the income variable a “missing” category is also created. Income is in many cases not reported, and of the observable characteristics this is the variable that is most often missing. To avoid a severe reduction in the number of observations in the regression analysis, we therefore create a separate category indicating that no income was reported. Finally, with respect to “Region” we do not use the survey’s division (which is restricted to three broad geographical categories, as seen in Table 1) but instead utilize a finer division with respect to geography. In particular, we have data on the zip code of each respondent, which we use to control for potential systematic geographical variations in the survey responses. Since many of the full five-digit zip codes contain just a handful of observations, we use the first two digits of the zip code to create geographical fixed effects, separating Sweden into 86 unique regions.

The categories for each characteristic are otherwise fairly standard. For instance, age is grouped into the categories “16-24”, “25-34”, “35-49”, “50-64” and “65-”. Level of education is grouped into “Basic”, “Upper secondary”, and “Tertiary”. Characteristic categories are included as dummy variables in the regression analysis. Table 1 also indicates the excluded dummy category for each characteristic.

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[11] There is also an “Other” category, which is unclear what it entails. It is, however, very small (286 respondents in total), and we simply classify these as non home owners (that is, renters).

Table 1. Respondent characteristics.

Variable	Division in survey	Regression label
Age	16-24	LOW_AGE
	25-34	MED_LOW_AGE
	35-49	MED_AGE
	50-64	MED_HIGH_AGE
	65-	*Excluded category*
Income	0-210 000	LOW_INCOME
	210 001-365 000	MED_LOW_INCOME
	365 001-621 000	MED_HIGH_INCOME
	621 001-	*Excluded category*
		MISSING_INCOME
Education	Basic	LOW_EDUCATION
	Upper secondary	MED_EDUCATION
	Tertiary	*Excluded category*
Type of housing	Owned apartment	*Combined to* OWN_HOUSE_APARTMENT
	Owned house	*Combined to* OWN_HOUSE_APARTMENT
	Rental apartment	*Combined to excluded category*
	Other	*Combined to excluded category*
Employment	Unemployed	UNEMPLOYED
	Employed	*Excluded category*
Sex	Female	FEMALE
	Male	*Excluded category*
Family	Single without children	HH_SINGLE
	Single with children	HH_SINGLE_CHILD
	Married/cohabiting with children	HH_MARRIED_CHILD
	Other	HH_OTHER
	Married/cohabiting without children	*Excluded category*
Region	Big city county	*Replaced by 2-digit zip code dummies*
	Forest county	*Replaced by 2-digit zip code dummies*
	Other	*Replaced by 2-digit zip code dummies*

Note: The category "MISSING_INCOME" consists of the individuals who did not respond to the question regarding income.

3. Empirical analysis

3.1 Econometric specification

As discussed above, our data are in the form of a repeated cross section. To control for potential systematic changes across different time periods (survey months), time fixed effects are included in the general specification. The only exception is when the change in the benchmark index, HOX, is included in the regressions, in which case time dummies cannot be used. To control for potential regional differences in housing-price expectations, perhaps as a result of (perceived) differences in the rate of change in local housing prices, we include geographical dummies in the form of the two-digit zip code fixed effects described previously. In addition, to account for any potential dependence across respondents in a given cross section or a given geographical region, standard errors are two-way clustered on both time and two-digit zip codes. The effects of clustering standard errors, as well as the inclusion of time dummies and zip-code dummies, have only a minimal effect on the results. Qualitatively, the results remain the same without these adjustments, as we illustrate in Table 2.

The general model specification is thus given by

$$\pi_{t+12|t,j} = \alpha + \boldsymbol{\gamma}'\boldsymbol{x}_{t,j} + \boldsymbol{\theta}'\boldsymbol{z}_t + e_{t,j} \tag{1}$$

where $\pi_{t+12|t,j}$ is the expected increase in housing prices over the next year for respondent j at time t, $\boldsymbol{x}_{t,j}$ is a vector of dummy variables with respondent characteristics, $\boldsymbol{z}_t$ is a vector of common control variables, and $e_{t,j}$ is an error term. Specifically, $\boldsymbol{z}_t$ contains time dummies *or* the reference value (that is, the year-on-year change in the HOX index), which is read out to the respondent when the housing-price question is asked. Equation (1) is estimated with OLS, pooling data from all cross-sections.

The respondent characteristics, $\boldsymbol{x}_{t,j}$, contain dummy-category variables for the following characteristics: Age, Income, Education, Type of housing, Employment status, Sex, Family status, and two-digit zip-code.

3.2 Baseline results

Our main econometric specification is given by equation (1), and the results from estimating this regression are shown in Table 2. The first column of results shows the preferred specification with time and zip-code dummies, and the second column shows the specification where the previous year's percentage change in the aggregate price index (HOX) is included. Since the observed aggregate price change variable is common to all individuals in a given cross-section, inclusion of this variable rules out the inclusion of time dummies. The third column simply illustrates that the results are not sensitive to the inclusion of time dummies (while excluding the previous price change) and zip-code dummies. Specifically, the point estimates are mostly unchanged compared to the other two specifications. The fourth column shows the effect of not using clustered standard errors. As can be seen, the standard errors shrink somewhat when clustered standard errors are not used, but the statistical significance remain mostly the same.

Table 2. Results from regressing housing-price expectations on respondent characteristics [equation (1)].

	(1)	(2)	(3)	(4)	(5)	(6)
LOW_AGE	0.931	0.960	0.960	0.931	0.938	0.866
	(0.261)***	(0.262)***	(0.243)***	(0.136)***	(0.273)***	(0.260)***
MED_LOW_AGE	0.541	0.556	0.517	0.541	0.539	0.540
	(0.203)**	(0.198)***	(0.166)***	(0.132)***	(0.206)**	(0.185)***
MED_AGE	0.308	0.301	0.304	0.308	0.300	0.302
	(0.140)**	(0.149)*	(0.138)**	(0.138)**	(0.172)*	(0.138)**
MED_HIGH_AGE	0.093	0.114	0.115	0.093	0.097	0.119
	(0.159)	(0.166)	(0.142)	(0.117)	(0.192)	(0.149)
MISSING_INCOME	0.572	0.569	0.608	0.572	0.557	0.552
	(0.144)***	(0.142)***	(0.150)***	(0.083)***	(0.171)***	(0.128)***
LOW_INCOME	0.372	0.355	0.481	0.372	0.359	0.364
	(0.213)*	(0.212)	(0.191)**	(0.148)**	(0.251)	(0.197)*
MED_LOW_INCOME	0.392	0.403	0.364	0.392	0.385	0.379
	(0.248)	(0.251)	(0.242)	(0.122)***	(0.289)	(0.239)
MED_HIGH_INCOME	0.253	0.244	0.176	0.253	0.247	0.231
	(0.136)*	(0.133)*	(0.122)	(0.089)***	(0.180)	(0.119)*
LOW_EDUCATION	0.165	0.154	0.211	0.165	0.166	0.168
	(0.195)	(0.191)	(0.156)	(0.126)	(0.223)	(0.177)
MED_EDUCATION	0.086	0.084	0.153	0.086	0.076	0.070
	(0.103)	(0.099)	(0.083)*	(0.068)	(0.109)	(0.096)
OWN_HOUSE_APT	-0.476	-0.467	-0.440	-0.476	-0.480	-0.497
	(0.140)***	(0.150)***	(0.142)***	(0.093)***	(0.163)***	(0.121)***
UNEMPLOYED	0.090	0.100	0.053	0.090	0.087	0.093
	(0.102)	(0.105)	(0.082)	(0.098)	(0.114)	(0.094)
FEMALE	0.433	0.442	0.493	0.433	0.435	0.460
	(0.143)***	(0.148)***	(0.126)***	(0.062)***	(0.156)**	(0.116)***
HH_SINGLE	0.168	0.153	0.029	0.168	0.168	0.181
	(0.113)	(0.106)	(0.087)	(0.094)*	(0.113)	(0.082)**
HH_SINGLE_CHILD	0.124	0.170	0.108	0.124	0.140	0.121
	(0.197)	(0.198)	(0.156)	(0.220)	(0.216)	(0.183)
HH_MARRIED_CHILD	0.016	0.039	0.062	0.016	0.021	0.030
	(0.125)	(0.124)	(0.109)	(0.097)	(0.136)	(0.113)
HH_OTHER	0.322	0.305	0.263	0.322	0.320	0.315
	(0.143)**	(0.133)**	(0.111)**	(0.101)***	(0.147)**	(0.128)**
HOX		0.458				
		(0.067)***				
N	26,306	26,306	26,306	26,306	26,306	26,306
Time dummies	YES	NO	NO	YES	YES	NO
Geographical dummies	YES	YES	NO	YES	YES	NO
Geographical trends	NO	NO	NO	NO	YES	NO
Time*Geographical dummies	NO	NO	NO	NO	NO	YES
Clustered S.E.	YES	YES	YES	NO	YES	YES

Note: Standard errors in parentheses (). *** indicates significance at the 1 percent level; ** indicates significance at the 5 percent level; * indicates significance at the 10 percent level.

Turning to the actual coefficient estimates in Table 2, it is seen that several of the respondent characteristics are significantly related to housing-price expectations. The most notable of these characteristics is arguably age. Young respondents, in the age category 16 to 24 years, on average predict housing-price increases almost one percentage point larger than the oldest respondents in the sample (aged 65 or more, the omitted category) and this difference is highly statistically significant. In fact, the relationship between age categories and housing-price expectations is monotone, with expectations steadily decreasing with age. The average expectation difference between the 25-34 year olds and the 50-64 year olds is still almost half a percentage point. We interpret these findings as supportive of Jonung's (1981) and Malmendier and Nagel's (2016) conjecture that expectations are affected by the personal experiences of the respondent. Younger age groups have essentially experienced uninterrupted housing-price growth during their entire adult lives. The older generations on the other hand, would remember the sharp price falls following the Swedish banking crises in the early 1990s.[12] The differences in housing-price changes that different age groups have experienced in their adulthood – defined as the period since they turned 16 years old – are illustrated in Table A1 in the Appendix. The table shows that the mean real return experienced by the different age groups is by far the highest for the youngest age group and lowest for the oldest. And analogous with the regression coefficients for the different age categories in Table 2, the relationship is monotone.[13]

The reported income of the respondent does not appear to be a strong predictor of housing-price expectations, with at most weak significance and non-monotone patterns. Respondents who own their house or apartment have statistically significantly lower expectations (0.4 percentage points) of future housing prices than those who currently rent. Females have higher expectations than males (0.4 percentage points). Similar results are also documented in the literature on inflation expectations, where females tend to expect higher inflation than males; see, for example, Jonung (1981), Bryan and Venkatu (2001a, 2001b), Palmquist and Strömberg (2004), and Ehrmann *et al*. (2017). The coefficients on the education categories, which are clearly correlated with the income categories, are close to zero and not significant.

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[12] Hjalmarsson and Österholm (2019) document analogous age-related results for mortgage rate expectations, with younger respondents having lower expectations, again consistent with the hypothesis that experiences affect expectations.

[13] The mean *nominal* return – which is also displayed in Table A1 – does not show the same monotone pattern. This is due to the dramatic reduction in inflation that took place in the early 1990s, when Sweden adopted inflation targeting as a monetary policy regime. However, it is reasonable to assume that households make the distinction between nominal and real housing-price changes, at least over longer periods and when inflation is high such that the two differ markedly. Table A2 in the Appendix shows the results from regressing the implied *real* housing-price expectation – defined as the respondent's housing-price expectation minus his or her one-year-ahead inflation expectation – on respondent characteristics; that is, we estimate equation (1) with real rather than nominal expectations. With regards to age, the real housing-price expectations show the same pattern as the nominal ones, decreasing in a monotone manner with increasing age. We still prefer to use nominal expectations in our main analysis, however. Specifically, the survey was conducted in stable low-inflation conditions during only two years, and "contaminating" the housing-price expectations with inflation expectations likely does more harm than good.

A strong effect *is* seen for the missing-income category. Although we have no information on why income is not reported for these respondents, simple summary statistics show that, on average, these individuals tend to be younger, lower educated, and more likely to be unemployed, compared to the sample of respondents whom report income. Thus, the missing-income result might be interpreted as a broader socio-economic effect, perhaps acting through a financial literacy channel, with poorer and less educated households tending to have lower financial literacy; see, for example, Calvet *et al*. (2007, 2009), Campbell *et al*. (2011) and Lusardi and Mitchell (2014). In contrast, there are suggestions that home owners, which systematically predict lower price increases, might have higher financial literacy (Gathergood and Weber, 2017). However, the lack of any clear patterns for the actual reported income or education categories makes this financial literacy story highly tentative.

In the second specification (column 2 in Table 2), the change in the housing-price index over the previous 12 months is included as an additional explanatory variable. Inclusion of this regressor replaces the time dummies, and the results for the other characteristics are virtually unchanged between specifications (1) and (2). The coefficient on the lagged price change is equal to 0.46, and highly statistically significant. Broadly speaking, this coefficient can be interpreted as a kind of autoregressive term on lagged price changes. As such, it is quite large, given that price changes to asset-like prices are typically assumed more or less independently distributed. It is, however, consistent with previous findings in Jurgilas and Lansing (2013), which suggest that aggregate household housing-price expectations (in Norway and Sweden) might have a non-negligible backward-looking component. In addition, one should keep in mind that this number is read up to the respondent immediately prior to him or her answering the question. It is perhaps then not surprising that significant weight is given to this information; the lagged price change might act as a focal point for the respondent.[14] In fact, if the respondent’s sole information about housing prices came from this past price change, his/her best estimate would arguably be to simply respond with the same number for next year (the unconditional mean forecast based on a single observation). The fact that a weight of just a half is attributed to the previous price change therefore signals that the average respondent (believes he/she) possesses significant other information to help form his/her forecasts.

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[14] See, for example, Hurd *et al*. (1998) and Kleinjans and van Soest (2014) for further discussions and analyses regarding focal points in surveys.

Finally, as a robustness check, we also allow for specifications where we either include *i)* (two-digit) zip-code specific linear trends, or *ii)* zip-code by time (month) fixed-effects. In the former, a separate linear trend is allowed for within each zip code, and in the latter, most general specification, a separate fixed effect is included for each unique zip-code/time-period combination. The zip-code fixed effects control for regional differences in housing-price expectation, which might otherwise bias the estimated coefficients for the included characteristics. In particular, although the elicited survey expectations refer to aggregate housing prices, it is not unlikely that individual expectations might be affected by local housing market conditions. If such local conditions correlate with observable characteristics, like income and age, the estimated characteristic effects will likely be biased.[15] The purpose of the above two specifications is to further strengthen the case that the estimated effects of our observable characteristics are not due to other unobservable effects. In both cases, we allow not only for geographical differences in the *level* of the price-change expectations, but also geographical differences in the *rate-of-change* of these expectations. Since the survey responses concern the change in housing prices over the next year, the rate-of-change of these expectations correspond to the "second derivative" of housing prices with respect to time.

The final two columns (5 and 6) in Table 2 show the results from these specifications. Perhaps unsurprisingly, we find extremely small effects of including either the zip-code specific linear trends, or the zip-code/time fixed-effects. The results are virtually unchanged compared to the previous specifications, and overall the results are very similar across the six different columns in Table 2. In subsequent tables, we therefore only report the results for the specification with time and geographical dummies and (two-way) clustered standard errors.

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[15] Instead of using geographical fixed effects, one might alternatively try to directly control for geographically differing housing-price changes by including measures of these as control variables in the regression. The upside of such an approach is a direct estimate of the impact of local housing prices on expectations of aggregate prices. However, from the perspective of correctly estimating the coefficients on other observable characteristics, the use of geographic fixed effects is more general and will also capture other unobservable local conditions that might otherwise bias the regression estimates. In addition, forming reliable local housing price indexes at such a fine granularity as two-digit zip codes is extremely challenging, given that the number of housing transactions in some of the zip codes might be quite limited.

3.3 Are prospective home buyers different?

In one of the questions in the *Economic Tendency Survey*, it is asked whether the respondent is considering buying or building a home during the coming year. The housing-price expectations of this group are of particular interest for several reasons. First, and most importantly, this is the group of people who is most likely to transact in the housing market, and thereby impound their beliefs into the actual price process. Second, this group might be more informed about the housing market than the average respondent, and such information gathering might result in systematically different beliefs.

In order to provide a simple overview of potential differences in the data, Table 3 tabulates the distribution of housing-price expectations for the prospective home buyers and non-home-buyers. The first column gives the distribution for the entire sample. Of the roughly 26,000 respondents who answer the housing-price expectation question, about 3,000 state that they are considering buying or building a home next year. Comparing the results across columns 2 and 3 in the table, the differences are small. Prospective home buyers (column 2) have a marginally lower average expectation than non-home-buyers, but the difference is small and the medians are identical. Our main conclusion based on Table 3 is that prospective home buyers do not appear to be more optimistic about the market than others; if anything they are somewhat more conservative in their forecasts. This might be interpreted as a form of "market-timing" attitude, but the differences are small enough to be more or less economically insignificant.

Table 3. Housing-price expectations for respondents based on whether they are prospective home buyers or not.

	(1) All	(2) Home-buyers	(3) Non home-buyers
1st percentile	-8.0	-8.0	-7.5
5th percentile	-1.0	-2.0	-0.5
10th percentile	0.0	0.0	0.0
25th percentile	2.0	2.5	2.0
50th percentile	5.0	5.0	5.0
75th percentile	8.6	8.6	8.6
90th percentile	11.4	11.4	11.4
95th percentile	15.0	15.0	15.0
99th percentile	20.0	20.9	20.0
Mean	5.64	5.51	5.66
N	26,098	2,966	23,132

Note: Percentiles are calculated based on the full sample, November 2015 to October 2017. Column 1 gives the expectation over all respondents. Column 2 gives the expectation for respondents who are considering buying or building a home during the coming year. Column 3 gives the expectation for respondents who are not considering buying or building a home during the coming year.

We next re-estimate the main specification (equation (1)), but allow for differing coefficients for prospective home buyers. The regression model is thus given as

$$\pi_{t+12|t,j} = \alpha + \kappa D_{t,j} + \boldsymbol{\gamma}'\boldsymbol{x}_{t,j} + \boldsymbol{\delta}' D_{t,j}\boldsymbol{x}_{t,j} + \boldsymbol{\theta}'\boldsymbol{z}_t + e_{t,j} \tag{2}$$

where $\pi_{t+12|t,j}$, $\boldsymbol{x}_{t,j}$, $\boldsymbol{z}_t$ and $e_{t,j}$ are all defined as above, and $D_{t,j}$ is a dummy variable which takes on the value 1 if respondent *j* at time *t* is a prospective home buyer.

The first column in Table 4 repeats the results for the full sample using equation (1) as a point of reference.[16] Column 2 presents the corresponding coefficient – that is, $\boldsymbol{\gamma}$ – from equation (2). Finally, the coefficient on the home-buyer interaction ($\boldsymbol{\delta}$) and intercept (κ) are shown in column 3. As seen from this column, hardly any of the coefficient estimates for the home-buyer interactions are statistically significant. There is thus little or no evidence that prospective home buyers differ systematically from other survey respondents.

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[16] The sample in Table 4 differs slightly from that used in Table 2 because not all respondents answer the question on whether they are considering purchasing a home over the next year. However, the differences are very small (26,306 observations in Table 2 and 26,098 observations in Table 4). The results in column 1 of Table 4 are virtually identical to those in column 1 of Table 2.

Table 4. Results from regressing housing-price expectations on respondent characteristics, allowing differing coefficients for prospective home buyers [equation (2)].

	(1)	(2)	(3)
	All	Main effect	Home-buyer effect
	[Equation (1)]	[γ from equation (2)]	[δ and $\boldsymbol{\kappa}$ from equation (2)]
LOW_AGE	0.913	1.052	-0.298
	(0.269)***	(0.274)***	(0.637)
MED_LOW_AGE	0.531	0.600	0.068
	(0.202)**	(0.193)***	(0.527)
MED_AGE	0.290	0.249	0.687
	(0.141)*	(0.142)*	(0.551)
MED_HIGH_AGE	0.089	0.058	0.517
	(0.171)	(0.171)	(0.637)
MISSING_INCOME	0.571	0.535	0.227
	(0.167)***	(0.165)***	(0.256)
LOW_INCOME	0.382	0.330	0.296
	(0.239)	(0.232)	(0.534)
MED_LOW_INCOME	0.399	0.346	0.296
	(0.275)	(0.258)	(0.525)
MED_HIGH_INCOME	0.256	0.300	-0.429
	(0.151)	(0.162)*	(0.331)
LOW_EDUCATION	0.192	0.199	-0.100
	(0.211)	(0.213)	(0.527)
MED_EDUCATION	0.098	0.083	0.127
	(0.107)	(0.115)	(0.310)
OWN_HOUSE_APT	-0.480	-0.425	-0.408
	(0.148)***	(0.140)***	(0.251)
UNEMPLOYED	0.066	0.073	-0.222
	(0.107)	(0.104)	(0.379)
FEMALE	0.434	0.444	-0.124
	(0.144)***	(0.141)***	(0.227)
HH_SINGLE	0.167	0.187	-0.117
	(0.115)	(0.128)	(0.376)
HH_SINGLE_CHILD	0.151	0.250	-0.971
	(0.209)	(0.206)	(0.525)*
HH_MARRIED_CHILD	0.018	-0.017	0.199
	(0.126)	(0.135)	(0.285)
HH_OTHER	0.314	0.270	0.362
	(0.147)**	(0.154)*	(0.289)
κ			-0.261
			(0.508)
N	26,098	26,098	26,098
Time dummies	YES	YES	YES
Geographical dummies	YES	YES	YES
Geographical trends	NO	NO	NO
Time*Geographical dummies	NO	NO	NO
Clustered S.E.	YES	YES	YES

Note: Standard errors in parentheses (). Column (1) gives the results from equation (1). Column (2) gives the coefficients in $\boldsymbol{\gamma}$ from equation (2). Column (3) gives the coefficients in $\boldsymbol{\delta}$ and κ from equation (2). *** indicates significance at the 1 percent level; ** indicates significance at the 5 percent level; * indicates significance at the 10 percent level.

3.4 A forecast evaluation

The results in Section 3.2 indicate that certain groups may have expectations that are overly optimistic. However, higher expectations need not necessarily be "worse" expectations – and could perform well from a forecasting perspective. Since the last survey round of the one-year-ahead housing-price expectations was conducted in October 2017, the corresponding housing-price changes have now been realized. A forecast evaluation of the elicited expectations is therefore possible. While we do not believe that it is reasonable to draw far-reaching conclusions based on such a short sample, we nevertheless think that it is relevant to at least conduct a brief analysis related to this issue.

Specifically, using the realized values for the HOX index up until October 2018, we construct the absolute forecast error implied by each respondent's elicited expectation. Using the same regression specification as in equation (1), but with this absolute forecast error as the dependent variable, we first estimate

$$f_{t+12|t,j} = \alpha + \boldsymbol{\gamma}'\boldsymbol{x}_{t,j} + \boldsymbol{\theta}'\boldsymbol{z}_t + e_{t,j} \tag{3}$$

where $f_{t+12|t,j} = \left|\pi_{t+12|t,j} - \pi_{t+12}\right|$ is the absolute forecast error, defined as the absolute difference between the elicited expectation and the realized change in the HOX index over the following 12 months; $\boldsymbol{x}_{t,j}$, $\boldsymbol{z}_t$ and $e_{t,j}$ are all defined as above.

In addition, we also again assess whether prospective home buyers are different. This is done by estimating the equation

$$f_{t+12|t,j} = \alpha + \kappa D_{t,j} + \boldsymbol{\gamma}'\boldsymbol{x}_{t,j} + \boldsymbol{\delta}' D_{t,j}\boldsymbol{x}_{t,j} + \boldsymbol{\theta}'\boldsymbol{z}_t + e_{t,j} \tag{4}$$

where $f_{t+12|t,j}$, $\boldsymbol{x}_{t,j}$, $\boldsymbol{z}_t$, $D_{t,j}$ and $e_{t,j}$ are all defined as above. In both models, we use our benchmark specification, in which both time dummies and geographical dummies are included. The results are reported in Table 5.

Table 5. Results from regressing absolute forecast errors (actual outcome minus survey forecast) on respondent characteristics [equations (3) and (4)].

	(1) All [Equation (3)]	(2) Main effect [γ from equation (4)]	(3) Home-buyer effect [δ and κ from equation (4)]
LOW_AGE	0.405	0.338	0.353
	(0.222)*	(0.222)	(0.439)
MED_LOW_AGE	0.151	0.176	0.009
	(0.146)	(0.148)	(0.314)
MED_AGE	0.144	0.161	0.093
	(0.117)	(0.126)	(0.361)
MED_HIGH_AGE	0.114	0.124	0.083
	(0.097)	(0.109)	(0.435)
MISSING_INCOME	0.246	0.228	0.152
	(0.108)**	(0.113)*	(0.244)
LOW_INCOME	-0.065	-0.100	0.305
	(0.134)	(0.143)	(0.417)
MED_LOW_INCOME	0.079	0.037	0.437
	(0.141)	(0.133)	(0.371)
MED_HIGH_INCOME	-0.056	-0.072	0.146
	(0.106)	(0.122)	(0.323)
LOW_EDUCATION	0.207	0.199	0.292
	(0.148)	(0.158)	(0.362)
MED_EDUCATION	0.108	0.113	-0.044
	(0.073)	(0.086)	(0.223)
OWN_HOUSE_APT	-0.300	-0.347	0.333
	(0.110)**	(0.112)***	(0.183)*
UNEMPLOYED	0.123	0.126	-0.053
	(0.089)	(0.102)	(0.294)
FEMALE	0.163	0.183	-0.144
	(0.086)*	(0.095)*	(0.145)
HH_SINGLE	0.075	0.105	-0.345
	(0.102)	(0.107)	(0.292)
HH_SINGLE_CHILD	0.182	0.216	-0.352
	(0.146)	(0.170)	(0.511)
HH_MARRIED_CHILD	0.003	-0.042	0.204
	(0.093)	(0.104)	(0.220)
HH_OTHER	0.208	0.137	0.405
	(0.107)*	(0.126)	(0.284)
κ			-0.364
			(0.406)
N	26,306	26,098	26,098
Time dummies	YES	YES	YES
Geographical dummies	YES	YES	YES
Geographical trends	NO	NO	NO
Time*Geographical dummies	NO	NO	NO
Clustered S.E.	YES	YES	YES

Note: Standard errors in parentheses (). Column (1) gives the results from equation (3) where both time dummies and geographical dummies are included. Column (2) gives the coefficients in $\boldsymbol{\gamma}$ from equation (4). Column (3) gives the coefficients in $\boldsymbol{\delta}$ and κ from equation (4). *** indicates significance at the 1 percent level; ** indicates significance at the 5 percent level; * indicates significance at the 10 percent level.

Column 1 shows the results for the main specification in equation (3), and columns 2 and 3 show the results for the specification with separate home-buyer effects (equation (4)). The results in column 1 show that most of the estimates are insignificant, although there is some weak evidence that respondents who are young, female, have missing income or belong to the category "other" with respect to family status tend to have larger absolute forecast errors. The only characteristic that is associated with a lower absolute error is home ownership. Home owners on average have a 0.3 percentage point lower forecast error, a result which is significant at the five percent level. As seen from columns 2 and 3, potential home-buyers do not differ much in their forecast errors from non home-buyers (almost all coefficients in column 3 are statistically insignificant).

To the extent that one is willing to put any weight on such a short-sample forecast evaluation, the overall message of Table 5 is that the respondents with the most optimistic expectations also have the largest forecast errors. While we are reluctant to say that these respondents have been *overly* optimistic, their expectations were not supported *ex post*.

4. Conclusion

We analyse micro-level data on Swedish households' expectations regarding housing prices in order to assess whether there is heterogeneity in beliefs with respect to household characteristics. The strongest and most interesting effect pertains to age: Younger respondents expect considerably larger price increases than older respondents. This result is both statistically strong and of large economic magnitude.

One potential explanation for our age findings is the hypothesis that expectations are influenced by personal experiences. While we do not conduct an explicit test, our empirical results are consistent with this hypothesis. In a world where experiences do affect expectations, it would not be surprising that the younger respondents – whose adult lives have largely been associated with rapid housing-price growth and an absence of substantial price falls – have higher expectations. Older respondents, on the other hand, would recall the sharp price falls that Sweden experienced in the early 1990s.

Our results also have policy implications. Previous literature has pointed out that heterogeneity in expectations – due to, for instance, differences across households' rationality and/or financial literacy – can matter for economic policy; see, for example, Andrade *et al*. (2019) and Hommes *et al*. (2018), for discussions on monetary and fiscal policy, respectively. We argue that the heterogeneity observed here should matter for financial market regulations and macroprudential policies. First, it appears to be relevant when it comes to monitoring. Often only aggregate numbers are followed over time since they are the only ones that are readily available to policymakers and analysts. Our results indicate that aggregated survey expectations – such as averages over all respondents – might not be sufficient to get a proper view of the risks associated with the housing market. Such numbers might hide important information and a policy maker interested in financial stability may therefore need to look at more detailed (less aggregated) data. Second, it might affect the choice of regulatory actions. Young people often face a decision of first-time entry into the owner-occupied housing market. Such decisions are considerably more risky than a shift from one owner-occupied property to another. From a financial stability perspective, it would therefore seem better if young people exhibited more conservative (that is, lower) expectations for housing prices, to avoid over-exposure to the housing market. To the extent that it is difficult to affect how expectations are formed, this might suggest that policy actions directed towards agents' behaviour is necessary. The recent stricter rules and requirements imposed on new mortgages in Sweden could be seen a step in this direction. These new rules were not motivated by considerations of excessively optimistic expectations, but are in line with actions that might be considered given our findings.

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Appendix

Table A1. Mean housing-price change experienced by the different age groups since they became 16 years old.

Age group	Time period	Nominal return	Real return
16-24	2012-2016	7.4	7.2
25-34	2002-2016	6.3	5.2
35-49	1990-2016	4.9	3.3
50-64	1975-2016	6.2	2.0
65-	1957-2016	6.3	1.9

Note: Mean changes are calculated as the geometric mean and given in percent. Nominal housing prices are given by Statistics Sweden's price index for one- and two-dwelling buildings between 1981 and 2016. Between 1957 and 1980, they are given by the housing prices of Söderberg *et al*. (2014). Real housing prices are calculated by deflating nominal housing prices with the consumer price index. The five different age groups are represented by an individual in the middle of the range; we use a 20-year old for 16-24, a 30-year-old for 25-35, a 42-year old for 35-49, a 57-year old for 50-64 and a 75-year old for 65- (since 65- is supposed to represent people between the ages of 65 and 84).

Table A2. Results from regressing implied real housing-price expectations on respondent characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)
LOW_AGE	1.252	1.290	1.385	1.252	1.275	1.221
	(0.288)***	(0.299)***	(0.276)***	(0.197)***	(0.373)***	(0.289)***
MED_LOW_AGE	0.828	0.838	0.941	0.828	0.841	0.837
	(0.290)***	(0.307)**	(0.265)***	(0.188)***	(0.323)**	(0.296)***
MED_AGE	0.598	0.592	0.712	0.598	0.592	0.592
	(0.216)**	(0.222)**	(0.218)***	(0.198)***	(0.299)*	(0.215)**
MED_HIGH_AGE	0.248	0.295	0.385	0.248	0.251	0.273
	(0.183)	(0.193)	(0.174)**	(0.168)	(0.182)	(0.176)
MISSING_INCOME	0.365	0.370	0.463	0.365	0.338	0.250
	(0.192)*	(0.189)*	(0.180)**	(0.116)***	(0.199)	(0.172)
LOW_INCOME	0.231	0.226	0.403	0.231	0.202	0.041
	(0.304)	(0.313)	(0.349)	(0.209)	(0.335)	(0.295)
MED_LOW_INCOME	0.109	0.133	0.157	0.109	0.101	0.102
	(0.282)	(0.277)	(0.250)	(0.171)	(0.303)	(0.263)
MED_HIGH_INCOME	0.043	0.049	0.025	0.043	0.032	-0.008
	(0.184)	(0.180)	(0.153)	(0.120)	(0.202)	(0.176)
LOW_EDUCATION	-0.555	-0.577	-0.535	-0.555	-0.545	-0.581
	(0.208)**	(0.203)***	(0.193)**	(0.185)***	(0.268)*	(0.227)**
MED_EDUCATION	-0.440	-0.444	-0.384	-0.440	-0.454	-0.444
	(0.103)***	(0.093)***	(0.071)***	(0.095)***	(0.135)***	(0.090)***
OWN_HOUSE_APT	-0.001	0.007	0.020	-0.001	-0.008	-0.056
	(0.188)	(0.188)	(0.146)	(0.136)	(0.188)	(0.176)
UNEMPLOYED	-0.183	-0.178	-0.203	-0.183	-0.183	-0.163
	(0.177)	(0.175)	(0.156)	(0.142)	(0.242)	(0.165)
FEMALE	0.019	0.030	0.093	0.019	0.019	0.077
	(0.144)	(0.142)	(0.136)	(0.088)	(0.171)	(0.132)
HH_SINGLE	-0.079	-0.110	-0.241	-0.079	-0.077	0.010
	(0.209)	(0.203)	(0.175)	(0.135)	(0.270)	(0.179)
HH_SINGLE_CHILD	-0.706	-0.688	-0.726	-0.706	-0.688	-0.636
	(0.381)*	(0.382)*	(0.376)*	(0.328)**	(0.391)*	(0.352)*
HH_MARRIED_CHILD	-0.228	-0.192	-0.131	-0.228	-0.224	-0.210
	(0.177)	(0.168)	(0.155)	(0.135)*	(0.201)	(0.155)
HH_OTHER	0.003	-0.009	-0.115	0.003	0.002	-0.001
	(0.168)	(0.162)	(0.129)	(0.139)	(0.219)	(0.157)
HOX		0.560				
		(0.071)***				
N	17,705	17,705	17,705	17,705	17,705	17,705
Time dummies	YES	NO	NO	YES	YES	NO
Geographical dummies	YES	YES	NO	YES	YES	NO
Geographical trends	NO	NO	NO	NO	YES	NO
Time*Geographical dummies	NO	NO	NO	NO	NO	YES
Clustered S.E.	YES	YES	YES	NO	YES	YES

Note: The estimated equation is $r_{t+12|t,j} = \alpha + \boldsymbol{\gamma}'\boldsymbol{x}_{t,j} + \boldsymbol{\theta}'\boldsymbol{z}_t + e_{t,j}$, where $r_{t+12|t,j}$ is the implied real housing-price expectation; $\boldsymbol{x}_{t,j}$ and $\boldsymbol{z}_t$ are defined as in equation (1). Standard errors in parentheses (). *** indicates significance at the 1 percent level; ** indicates significance at the 5 percent level; * indicates significance at the 10 percent level.

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