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**Working Paper**

## How Peer Groups Influence Economic Perceptions

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## WORKING PAPER 227

# How Peer Groups Influence Economic Perceptions

Markus Knell, Helmut Stix

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# Non-Technical Summary

People need accurate information about the natural and the social world in order to make reasonable decisions – both as economic and as political agents. There exist two broad channels how this necessary information can be obtained. On the one hand there exists a “top-down” approach where an established body of knowledge about facts and basic mechanisms about causes and effects is transmitted by trustworthy institutions of society (schools, universities, respected media). On the other hand, there is also a “bottom-up” approach where people base their information on “first-hand knowledge”, i.e. on personal experiences and on observations of their direct environment. Over the recent years one could observe an increasing interest into the latter mechanism that has been invoked to explain the growing influence of fake news and the rise of a “post-factual era”.

In this paper we focus on the second channel and investigate in a systematic manner the role of peer groups for the perception of economic reality. Specifically, we look at the rate of homeownership and the rate of unemployment and we examine whether people’s perceptions of these variables are affected by the rate of homeownership and unemployment among their peers. In order to do so we use unique data from a survey that has been conducted in Austria. In particular, survey respondents have been asked about their assessment of the national homeownership and the national unemployment rate. We perform an regressions analysis with these subjective estimates as dependent variables and peer group measures among the set of explanatory variables. To measure peer groups we use two methods. The first method calculates the averages of specific social subgroups (differentiated by region, age, education or a combination of these variables) and assumes that the average values of these “constructed peer groups” are good approximations of the ownership and unemployment rates of the true peer group. The second method makes use of innovative questions about the homeownership and unemployment rates in the respondents’ social environment to derive measures of “self-assessed peer groups”.

Our results indicate a clear relation between the subjective national homeownership rate and the homeownership rate of the respective peer groups, irrespective of how these peer group variables are measured. We also find a significant correlation between the self-assessed and the constructed peer group measures. This finding supports the conjecture that location, age and (partly) education are important factors for the formation of peer groups. The same analysis is conducted for the perception of unemployment. Again, we find that the subjective assessment of the *national* rate of unemployment is significantly positively related to the self-assessed unemployment among the peer group.

In a next step we test whether the effect of peer groups on subjective perceptions is stronger for people who are ignorant of public (“top-down”) information about an item. In line with this conjecture we find that the total effect of peer groups is smaller (but not zero) for individuals with a higher interest in economic matters. Finally, we provide evidence that (biased) subjective perceptions affect individuals’ investment intentions.

# How Peer Groups Influence Economic Perceptions<sup>\*</sup>

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## Abstract

We use survey data to demonstrate that individuals extrapolate from their peer groups when forming estimates about aggregate economic outcomes (e.g. the aggregate homeownership rate). In a first approach, we follow the previous literature and construct hypothetical peer groups using information on the location, age and education of respondents. We confirm that the observed homeownership rates in these “constructed peer groups” affect respondents’ subjective estimates of national homeownership rates. In a second approach, we extend the previous literature and utilize direct information provided by survey participants about the characteristics of their peer groups. We show that these “self-assessed peer groups” are even better predictors for how survey respondents assess aggregate economic outcomes. We show that the same mechanisms are at work for estimates of the national unemployment rate and exploit variation in respondents’ interest in economic matters to demonstrate that agents rely more on peer group information if they are less knowledgeable. Finally, we provide evidence that (biased) subjective perceptions affect individuals’ investment intentions.

*Keywords:* Reference groups, expectations, perceptions, bias

*JEL-Classification:* D12, D91, D83, C81

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<sup>\*</sup>The views expressed in this paper do not necessarily reflect those of the Oesterreichische Nationalbank.

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# 1 Introduction

In order to make reasonable decisions as an economic agent or as a voter, it is necessary to obtain an accurate view of society. Basic economic models typically assume that individuals have costless access to all available information, that they process it in an effortless and optimal manner and that their resulting view of the world is without any systematic biases. A growing literature has challenged these standard assumptions regarding the formation of perceptions and expectations (Kahneman 2011). The existence of distorted beliefs can have consequences for all kinds of economic decisions, ranging from portfolio choice to the decision about where to live. Distorted views are also likely to have an impact on electoral outcomes (Flynn et al. 2017).

There are three main factors behind biased perceptions and expectations. First, media consumption shapes the perception of reality (e.g., Prat & Strömberg 2013). For example, its influence has been documented for the formation of inflation expectations (Carroll 2003, Pfajfar & Santoro 2013, Dräger 2015). Second, agents’ personal experiences have been shown to affect forecasts of the future (Greenwood & Shleifer 2014, Kuchler & Zafar 2019, Malmendier & Nagel 2015). Third, individuals are also prone to draw overgeneralized conclusions from the situation or behavior of their immediate environment (e.g. friends, colleagues, social networks) which gives rise to false inference (Bailey et al. 2018, Bailey et al. 2019, Cruces et al. 2013, Knell & Stix 2017). In all of these cases the biased outcome can ultimately be traced back to cognitive biases and heuristics (selection bias, salience bias, availability heuristic, etc.), i.e. to individuals’ limited ability to process available information in an efficient way and to acknowledge and deliberately correct for the existence of these biases in the first place.

This paper focuses on the the third of these factors—the role of peer groups for the perception of economic reality. Specifically, we look at the rate of homeownership and the rate of unemployment and we examine whether people’s perceptions of these variables are affected by the rate of homeownership and unemployment among their peers. In order to do so we use unique data from a survey that has been conducted in Austria with which this potential channel of influence can be tested. In particular, survey respondents have been asked about their assessment of the national homeownership rate and the national unemployment rate (with the “correct” answers being 55% and 9.1%, respectively). The answers show a wide variation. For example, only 56% of respondents estimate national homeownership to be in the interval from 40% to 60% which contains the true value.

To explore the connection between respondents’ perception of reality and their peer

groups we employ regressions with the subjective estimates of the national homeownership rate (or the unemployment rate) as the dependent variable and peer group measures among the set of explanatory variables. To measure peer groups we employ two methods. The first method is based on “constructed peer groups” and has been employed in the related literature (cf. Luttmer 2005, Kuchler & Zafar 2019). One calculates the averages of specific social subgroups (differentiated by region, age, education or a combination of these variables) and assumes that the average values of these constructed peer groups are good approximations of the ownership and unemployment rates of the true peer group. The second method makes use of innovative questions that—to the best of our knowledge—have not been used so far in this context. In particular, we have asked respondents about the homeownership and unemployment rate of their social environment (described as “relatives, friends, acquaintances and colleagues at work”) to derive measures of “self-assessed peer groups”.

Our results indicate a clear relation between the subjective (estimated) national homeownership rate and the homeownership rate of the respective peer groups, irrespective of how these peer group variables are measured. For constructed peer groups, e.g., the estimated regression coefficient suggests that an individual from a province with only 20% homeowners (like Vienna) will estimate *national* homeownership to be 10 percentage points (pp) lower than an individual from a region with 80% homeowners. The use of self-assessed peer group measures results in larger effect. A one standard deviation increase in this peer group measure increases the national estimates by 4.7 percentage points (while the increases of the constructed peer group measures for the same experiment are only around 3 percentage points). These results provide a strong indication of peer group influences as their impact should be zero for unbiased estimates (i.e. respondents’ estimates of national averages should be independent of their social environment). We investigate the relation between the self-assessed and the constructed peer group measures and find a significant correlation. The respective results support the conjecture (implicitly underlying the use of constructed peer groups in our and in other papers) that location, age and (partly) education are important factors for the formation of peer groups.

The same analysis is conducted for the perception of unemployment. Again, we find that the subjective assessment of the *national* rate of unemployment is significantly positively related to the self-assessed unemployment among the peer group. As far as the constructed peer group measures are concerned, we now only find significant results for rather fine-grained measures that differentiate by province, age and education or that are based on averages across municipalities. Two reasons might be responsible for the

apparently weaker impact of peer groups for the perception of unemployment than for homeownership. First, one can speculate that unemployment varies less strongly across peer groups than homeownership. Second, the unemployment rate is more extensively and frequently covered in the media than the homeownership rate and this might attenuate the strength of peer group effects. This attenuation, however, will only be present if people actually read and memorize these media reports.

In a next step, we take up the latter point. To test whether the effect of peer groups on subjective perceptions is stronger for people who are ignorant of public information about an item and weaker for knowledgeable persons, we use survey information on respondents' self-stated general interest in economic matters. The results are in line with our conjecture, both for homeownership and for unemployment. We find that the total effect of the self-assessed peer group measures on the estimated national homeownership and unemployment rate is smaller (but not zero) for individuals with an interest in economic matters than for uninformed individuals.

Finally, we investigate whether individual perceptions about the national homeownership rate have actual consequences and affect economic choices. We show that the subjective assessment of homeownership has a positive impact on how attractive respondents regard real estate for investment purposes and take this finding as an indication that biased perceptions could influence portfolio decisions.

As mentioned above, the paper is related to the literature on the formation of expectations and perceptions of macroeconomic variables.<sup>1</sup> A first strand of the literature has looked at the role of media, in particular for the formation of inflation expectations. Dräger (2015), e.g., finds a small but significant impact of media reports on monthly inflation perceptions and forecasts in Sweden. Lamla & Lein (2014) report similar results and they also find an impact for the tone of the news. A second strand of the literature has investigated to which extent individuals' expectations are affected by their own past experiences. Greenwood & Shleifer (2014) have documented that expectations of stock market returns appear to be extrapolative: high after periods of high returns and low after periods of low returns. Malmendier & Nagel (2015) have found that individuals overweight inflation experienced during their lifetimes when forming their expectations about future inflation. Cavallo et al. (2017) have shown that individuals are influenced by the memories of price changes of their supermarket purchases when stating their infla-

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<sup>1</sup>A large literature also deals with the *use* (rather than the formation) of expectations for macroeconomic outcomes. For a recent survey of this literature with a particular emphasis on inflation expectations see Coibion et al. (2018).



tion expectations.<sup>2</sup> A third group of papers has investigated the impact of the behavior of other people on individual expectation formation. It has been shown, e.g., that the perception of inequality is shaped by the own position in the income distribution (Cruces et al. 2013, Gimpelson & Treisman 2018, Knell & Stix 2017) and it has been argued that these misperceptions reflect the influence of reference groups. Das et al. (2019) document that macroeconomic expectations of individuals are influenced by their socio-economic status, e.g. higher income individuals have more positive expectations than low income individuals. These differences could be explained by the “local thinking framework” (Gennaioli & Shleifer 2010, Gennaioli et al. 2012) which assumes that local thinkers neglect some states of the world when forming expectations and consider only states that they regard as representative. This framework could also be adapted to account for the influence of peer groups.

The papers that are most closely related to our own work are the ones by Bailey et al. (2019) and Kuchler & Zafar (2019). Bailey et al. (2019) use Facebook data to show that recent house price experiences within an individual’s social network have an impact on his or her perception of the attractiveness of investments into the housing market and thereby influences individual decisions on the housing market. Kuchler & Zafar (2019) show that individuals’ expectations about national house prices in the United States depend on the house prices they have personally experienced in the previous years. In a similar vein they show that individuals who were unemployed become more pessimistic about the outlook of national unemployment. Our paper differs from Bailey et al. (2016) and Kuchler & Zafar (2019) in that our focus is not on houses *prices* but rather on house *ownership*. More importantly, our paper extends these articles in that we do not only analyze the impact of social interaction on one’s behavior by using constructed or hypothetical peer groups (as is done in Bailey et al. 2016) but also by employing direct survey information about the characteristics of the self-assessed peers. On the one hand, we are able to show that the self-assessed measures lead to stronger and more robust results. On the other hand, we document that the self-assessed peer group variables are correlated with the constructed peer group variables. This result provides a justification for the common practice to use the latter measures in the absence of direct peer group information or of self-assessed peer group measures. Furthermore, we study whether peer group effects are also present for the national unemployment rate and we employ information on survey

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<sup>2</sup>A number of papers have shown how personal experiences have an effect on subsequent economic decisions without, however, looking specifically at the role of expectations in this process (Kaustia & Knüpfer 2008, Malmendier & Nagel 2011).

respondents' economic knowledge. This allows us to delve deeper into the factors that attenuate or exacerbate the peer group effects.

## 2 Research Questions

This paper is based on a straightforward observation. Individuals move in circles of friends and acquaintances that display a significant degree of homophily (McPherson et al. 2001), i.e. peers typically have similar socio-demographic characteristics with regard to age, income, education and place of residence. If individuals are asked to come up with an estimate of economic variables like the rates of national homeownership or national unemployment and they do not know the correct figures for certain then their answers will—at least partly—be influenced by inferences based on the situation of people they know, i.e. on their peer group. If the “trait” in question (like homeownership) is more commonly represented among their peers than in the population at large then they will tend to overestimate the correct value and vice versa.

We want to note here that in this paper we use the term “peer group” or “reference group” to refer to the group of people about whom individuals are likely to think if they are asked to come up with an estimate for an aggregate variable. This notion of an “inference group” is different from how the term “peer group” or “reference group” typically appears in the economics or psychology literature. There it is used as almost synonymous to “comparisons group” and it refers to the group of people to which individuals compare their own achievements (e.g. income, wealth or labor supply) and which is important for their happiness and life satisfaction. The two concepts of “peer groups” must not coincide since, e.g., individuals might take the properties of specific persons they know into consideration when making an estimation although they do not care about their circumstances for income comparisons. However, the two concepts are likely to be related since the people who are important for bilateral, welfare-related comparisons are often also the ones about whom one has most personal information that is necessary to make an aggregate inference.

The impact of the peer group situation on subjective assessments might depend on various factors. First, on the economic variable on which the respondents are asked to offer their assessment. If the variable is fairly evenly distributed among the population or if the reference groups are roughly representative across sections of the population then the bias will be minuscule. It is only when both conditions are violated—i.e. if

the peer groups are heterogeneous and unrepresentative and if the economic trait is not equally distributed—that a perception bias will appear. Second, a perception bias will only manifest itself if it is not counteracted by public information in the media that people can use to revise the biased inference drawn from the peer group sample.

We summarize these research questions in the following three hypotheses.

**Hypothesis 1** *Individual perceptions about economic issues are influenced by the properties of peer groups.*

**Hypothesis 2** *The extent of the perception bias depends on the specific issue. If the issue is regularly and extensively covered in the media then the bias will on average be less pronounced.*

**Hypothesis 3** *The perception bias will be smaller for well-informed individuals, i.e. individuals who have an interest in economic issues.*

### 3 Homeownership

We start our analysis with the issue of homeownership. We regard this as an interesting topic for various reasons. First, the tenure choice (renting or owning) is one of the most important economic decisions in most people’s lives. Second, due to this importance most people (at least in Austria) also know about the tenure status of their friends and acquaintances. Third, despite this crucial role housing statistics are not frequently discussed in the media and the country-wide values cannot be regarded as common knowledge. Taken together, these factors make homeownership an ideal variable to study the impact of peer groups on the perception of economic reality.

#### 3.1 Subjective homeownership

Our data on the subjective perception of economic variables are derived from a nationally representative survey that has been devised for the purpose of this paper (for details see appendix A). In the survey we have included the following question: “In your opinion, which percentage of Austrian households lives in a dwelling (house or flat) that they themselves own?” where we have allowed 10 answer categories (0%-10%,10%-20% etc.). There is no “correct”, officially announced answer to this question and the available statistics show some variation depending on the data source. Typically, the reported

national homeownership rate ranges between 45% and 55%.<sup>3</sup> What is more, the ownership structure in Austria has been rather constant over recent years and also in a longer perspective one could not observe large shifts. Andrews & Sánchez (2011), e.g., report a homeownership rate of 46% for 1987 and 52% for 2004. At the same time there exists considerable variation in homeownership across regions. In particular, the rate is much lower in large cities. For example, in Vienna—Austria’s capital in which about a quarter of the total population lives—the rate is only 20% while it is 77% in Burgenland and 69% in Lower Austria, two provinces without large urban centers. In Figure 1 we show the distribution of answers to the survey question on homeownership in Austria. On average respondents estimate that about 40% of households own their dwellings, but the range of answers is considerable (and interestingly not significantly different from a normal distribution). 56% think that the homeownership rate is between 40% and 60% (which contains the “objectively true” value, irrespective of the exact definition and data source), but 5% believe it is below 20% and 6% see it as above 60%.

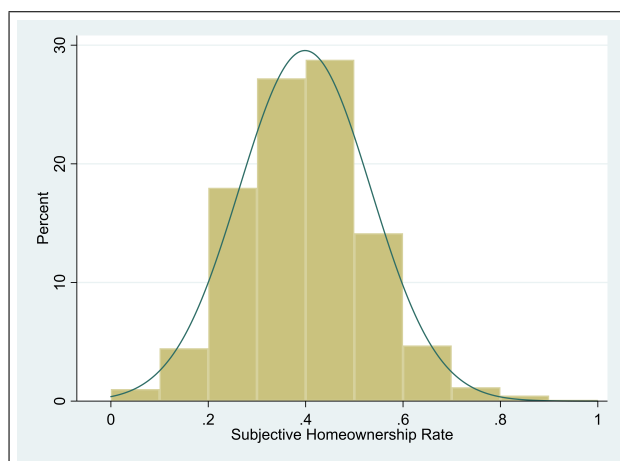


Figure 1: Distribution of subjective homeownership

Following hypothesis 1 our conjecture is that the subjective assessment of the national homeownership rate is at least partly influenced by the ownership structure of individual reference groups. Unfortunately, as is common in this literature, we do not have direct information about the composition of individuals’ social environment. There exist, however, two less direct methods to evaluate the impact of peer groups on the subjective

<sup>3</sup>Eurostat, e.g., reports a value of 55% for 2017 and this is also close to the number contained in census data. According to the Household Finance and Consumption Survey 48% of Austrian households own their main residence (data from 2014/15, European Central Bank, Household Finance and Consumption Survey, Wave 2, Table B1).

assessment. The first approach (see section 3.2) has been regularly used in the related literature (cf. Luttmer 2005, Kuchler & Zafar 2019) and is based on the construction of “plausible” peer groups. In particular, one calculates the average ownership rate of specific social subgroups (differentiated by region, age or education) and then proceeds by assuming that the average values of these constructed peer groups are good approximations of the ownership rate of the true peer group. In the second approach (see section 3.3) we use direct measures of a respondent’s estimation of homeownership among his or her social environment. This approach is, to the best of our knowledge, new and has so far not been used in this context.

### 3.2 Constructed peer group measures

It is reasonable to assume that an individual’s peer group is characterized by “homophily”, i.e., it consists of people of a similar age, income, education and location. Due to the lack of direct information about individual social environments various researchers have used “constructed peer groups” based on a number of assumptions. Luttmer (2005), e.g., uses average earnings in rather small locations of the US (with an average of about 150,000 inhabitants) to study whether higher earnings of neighbors are associated with lower levels of self-reported happiness. Kuchler & Zafar (2019), on the other hand, take house price changes in ZIP codes, metropolitan statistical areas (MSA) and states in the US to investigate whether individuals extrapolate from recent *local* experiences to form expectations about *aggregate* house price developments. Following this strategy we conjecture that also for Austrian respondents the homeownership rate in the own *local* neighborhood influences the individual perceptions of the *national* homeownership rate.

As a first examination of this conjecture we contrast the homeownership rate in each of the nine Austrian provinces (with an average of about 1 million inhabitants) with the average subjectively assessed national homeownership rate of respondents residing in the respective province. The data for these (and for all the following) aggregate measures are drawn from the Austrian microcensus with a large number of observations and high data quality due to mandatory participation in the survey (see appendix A for details). The resulting scatter-plot (without controlling for any other possible co-variates) is shown in figure 2. If people have unbiased perceptions of homeownership then one should observe a flat line—everybody has the same, correct assessment of average homeownership in Austria. The figure, however, shows a clear positive correlation between the averaged subjective and objective homeownership rates that even remains once one removes the

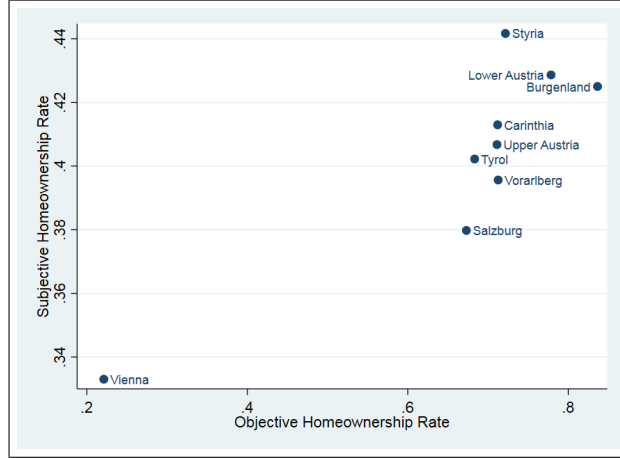


Figure 2: Subjective vs. objective homeownership rates. The horizontal axis shows the average homeownership rate per province as measured in the Austrian microcensus. The vertical axis shows survey respondents average (per province) estimate of the national homeownership rate.

observation for Vienna. This is a first indication of biased perceptions and the influence of peer groups.

In a next step we want to analyze this issue in more depth by using a regression framework. We denote the subjective assessment of the national homeownership rate ( $hor$ ) for individual  $i$  by  $hor_i^{national}$ . On the other hand,  $\overline{hor}^p$  denotes the average homeownership rate in one of the nine provinces  $p$ . Figure 2 suggests that the subjective assessment  $hor_i^{national}$  is influenced by individual  $i$ 's local average homeownership rate. The basic idea behind the influence of  $\overline{hor}^p$  is that it captures the properties of the peer group of the individual, i.e. the group of people with whom the individual has close contact and about whom he or she has more and better information than about others. Later we also work with municipalities which we denote by  $m$ . For the question of the tenure status the locality is certainly an important characteristic of these peer groups. It is plausible to assume, however, that locality is not the only dimension of homophily and that people are likely to associate themselves with people of a similar age or a similar education. In a parallel fashion we thus write  $\overline{hor}^a$  and  $\overline{hor}^e$  for the average homeownership rate for age group  $a$  and for education level  $e$ , respectively.<sup>4</sup> In general, we write  $\overline{hor}^j$  for the average homeownership rate in the population subgroup  $j$  where  $j$  corresponds to a set of relevant socio-demographic characteristics of individual  $i$ . Our baseline specification is the OLS

<sup>4</sup>Similarly, one could also look at  $\overline{hor}^y$ , where  $y$  stands for the income level. We focus, however, on education instead of income as the latter is always problematic in household surveys, e.g. due to item-nonresponse and response-biases.

regression of the form:

$$hor_i^{national} = \alpha + \beta \times \overline{hor}^j + X_i \times \gamma + \varepsilon_i, \quad (1)$$

where  $X_i$  is a vector of individual characteristics. If people have unbiased perceptions then the ownership rate in the constructed peer group  $j$  should not play a role for the assessment of the *national* homeownership rate and one should observe  $\beta = 0$ . A value of  $\beta > 0$ , on the other hand, is an indication of biased perceptions. We are rather agnostic about the specific mechanism *how* the measured homeownership rate of the constructed peer group  $j$  influences the subjective assessment. The most plausible mechanism is false inference (i.e. people base their estimates on a biased sample that is not representative for the entire Austrian population). We cannot exclude other possible channels (like systematically biased media consumption and personal communication in echo chambers created by social media, etc). As far as the vector of individual characteristics  $X_i$  is concerned one has to think carefully about which variables to include. For example, a person's location will be correlated with the average tenure status of this location. Adding variables that control for location will thus mainly reflect the peer-group effect. The same applies to many person-specific characteristics like age, education or the employment status.<sup>5</sup> A special case is the own tenure status (*Homeowner*), however. It is quite reasonable to assume that people also extrapolate from their own tenure status to the national average.

In table 1 we report results for specifications both without individual characteristics (columns 1 to 5) and with individual characteristics (columns 6 and 7). For the latter specification we only include characteristics that have not been used to construct the peer group variable  $\overline{hor}^j$ .<sup>6</sup> The results clearly reject the null-hypothesis that the subjective perception of national homeownership is independent of the behavior of the hypothetical peer group. The ownership rate in the province in which a respondent lives has a positive impact on the subjective assessment. In particular, individuals living in a province

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<sup>5</sup>For some of these variables (like age and education) one could argue that they are also a proxy for the degree of information. In this case, however, they should be (negatively) correlated with the estimation *error* but not with the absolute assessment. In other words, for better informed individuals the absolute deviation from the true value might be lower. We have conducted this exercise and do not find supportive evidence for a systematic relation between key socio-demographic variables and the estimation error (results are available upon request).

<sup>6</sup>For column 5 which contains *Owners by prov./age/edu* we thus exclude the variables for province, age and education (and also income which is highly correlated with education) while in column 7 we include all of these variables since  $\overline{hor}^j$  is based on the finer regional categorization of municipalities.

Table 1: Subjective homeownership

Dependent variable	Subjective homeownership ( $hor_i^{national}$ )						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Measures for Peer Group Influence:</i>							
Owners by province ( $\overline{hor}^p$ )	0.166*** (0.016)						
Owners by age ( $\overline{hor}^a$ )		0.137*** (0.044)					
Owners by edu ( $\overline{hor}^e$ )			-0.045 (0.095)				
Owners by prov./age/edu ( $\overline{hor}^{pae}$ )				0.155*** (0.015)		0.103*** (0.018)	
Owners by municipality ( $\overline{hor}^m$ )					0.166*** (0.016)		0.089** (0.036)
Homeowner						0.038*** (0.008)	0.035*** (0.009)
Male						-0.003 (0.007)	-0.001 (0.008)
Unemployed						-0.034** (0.014)	-0.033** (0.016)
Retired						-0.015** (0.008)	-0.017 (0.013)
Married						0.001 (0.007)	-0.006 (0.008)
Village						0.028*** (0.008)	0.008 (0.013)
Household income Q2							0.014 (0.012)
Household income Q3							0.007 (0.012)
Household income Q4							0.022 (0.013)
Age 36-50							0.017 (0.011)
Age 51-65							0.020 (0.013)
Age 66+							0.029* (0.017)
Edu med							-0.019 (0.015)
Edu high							-0.015 (0.016)
Constant	0.295*** (0.011)	0.312*** (0.029)	0.427*** (0.061)	0.299*** (0.010)	0.312*** (0.009)	0.312*** (0.012)	0.314*** (0.020)
Province fixed-effects	no	no	no	no	no	no	yes
Adj. R-squared	0.07	0.01	-0.00	0.07	0.08	0.10	0.10
N	1279	1279	1279	1279	1272	1279	1153

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group homeownership rates on respondents' estimates of the aggregate homeownership rate in Austria. Province fixed-effects control for the 9 provinces of Austria. Municipality fixed-effects control for respondents' municipality. Variable definitions and summary statistics are presented in appendix A and Table A.1. Columns 6 and 7 repeat the analyzes of columns 4 and 5 with socio-demographic variables. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.



with only 20% homeowners (like Vienna) are predicted to perceive the national ownership rate as 10 percentage points (pp) lower than individual living in a region with 80% homeowners. A similar picture emerges if one looks at peer groups by age cohorts. In particular, the homeownership rate increases over the life cycle from 49% (for 18-35), to 63% (36-50), 68% (51-65) and 73% (66+). The coefficient in the regression of column 2 indicates that a move from the youngest to the oldest age category would increase the perceived ownership rate by about 3.3 pp. Column 3 of table 1 shows that peer group differences in education do not have a significant impact. In column 4 we use a finer-grid for computing peer groups. In particular, we take the nine provinces, 4 age groups and 3 education groups and calculate the average homeownership rate for each of the  $9 \times 4 \times 3 = 108$  resulting hypothetical peer groups. The ownership rate now ranges from 7.3% (Vienna/age 36-50/low education) to 96% (Burgenland/age 66+/low education). The coefficient in column 4 indicates that the subjective assessment of moving from the lowest to the highest peer group would differ by more than 13 pp. A closer inspection of the results of table 1 shows that the main impact stems from the regional differentiation of ownership rates. A one standard deviation change in the province-based measure has an effect on perceived national homeownership of 3 pp which is larger than the comparable effect for the age-based (1.5 pp) and education-based (0.2 pp) measures. In order to examine this issue somewhat more deeply we have also employed a finer measure of regional ownership, in particular ownership by municipality.<sup>7</sup> The ownership rate per municipality that is contained in our sample ranges from 11% to 96%. The coefficient of this municipality peer group measure in column 5 is given by 0.166. A move from the lowest to the highest municipalities would increase the perception of ownership by 14 pp.<sup>8</sup> A one standard deviation change in the municipality-based measures increases the estimated homeownership rate by 3.6 pp, almost the same as the size of the effect of  $\overline{hor}^{pe}$ .<sup>9</sup>

The specifications in columns 6 and 7 repeat two of the five regressions but include a set of socio-demographic control variables. As discussed, it is not clear whether this is

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<sup>7</sup>There are more than 2,000 municipalities in Austria with about 4,000 inhabitants, on average. Due to the method of clustered random sampling our sample contains observations of only 150 different municipalities.

<sup>8</sup>Interestingly, the size of the effect (0.166) is very similar to the one in Kuchler & Zafar (2019) who analyze the impact of experienced (local) price increase on estimated (national) price increases in the US: “a one percentage point increase in past local house prices increases expected house price changes by between 0.1 and 0.2 percentage points” (p.16).

<sup>9</sup>Due to lack of data availability we have not been able to construct even finer peer groups based on combinations of municipality, age and education.

a reasonable strategy since one has good reason to think that these socio-demographic variables primarily capture peer group effects. In column 6 we therefore leave out the variables for province, age and education since these are the dimensions that have been used to construct the peer group measure  $\overline{hor}^{pae}$ . In column 7, on the other hand, we have been able to include all control variables since the peer group measure is based only on municipalities. The results show that the coefficient on the peer group measure shrinks but remains highly significant in both cases. Turning to the control variables one sees that most variables are insignificant. Only the own (un)employment status (*Unemployed*) and in particular the own tenure status (*Homeowner*) seem to have significant effects on the ownership perception (negative and positive, respectively). Individuals who own their dwelling regard homeownership to be between 3.5 pp and 3.8 pp higher than renters.

### 3.3 Self-assessed peer group measures

The results of table 1 show that there is a significant correlation between individual assessments of national ownership and various group-specific objective measures of ownership. The results are, however, only suggestive for the *existence* of a peer group effect and not for its ultimate *strength*. The latter cannot be inferred directly from the table due to likely measurement errors. In particular, the method of constructed peer groups entails strong assumptions concerning the composition and weighting of social sub-groups. As can be seen in table 1, the size of the estimated peer group coefficient depends on whether one assumes that location, age, education or a combination of these variables constitutes the basis of social segregation. A small estimated coefficient of  $\beta$  might then, e.g., correspond to a situation where the constructed peer group is a good representation but the “true” peer group effect on the subjective assessment is rather low. Alternatively, it might correspond to a situation where the constructed peer group does *not* accurately capture the true peer group while the effect of the latter on the assessment would in fact turn out to be large (if it were correctly measured).

In order to disentangle these different effects, we have asked survey participants about the ownership rate among their social environment (described as including “relatives, friends, acquaintances and colleagues at work”; see appendix A for the precise question). To the best of our knowledge, this is the first time that such direct information is used to gauge the effect of peer groups on economic perceptions. We denote this subjective estimate of the homeownership rate in the own peer group by  $hor_i^{PG}$  and use it in an OLS

regression of the form:

$$hor_i^{national} = \alpha + \beta \times hor_i^{PG} + X_i \times \gamma + \varepsilon_i, \quad (2)$$

where all other variables are the same as in equation (1).

In table 2 we report the results of this regression, both alone (column 1) and together with two constructed peer group measures (columns 2 and 3). In columns 4 to 6 we repeat this exercise with the inclusion of a set of socio-demographic variables. The results show that the coefficient of the self-assessed peer group measure is always considerable stronger than the constructed peer group measures, independent of whether the latter are added alone or in combination. The size of the coefficient in column 1 (0.193), e.g., is larger than the comparable estimates for  $\overline{hor}^{pae}$  and  $\overline{hor}^m$  in columns 4 and 5 of table 1 where they have come out as 0.155 and 0.166, respectively. We can further compare their relative importance by looking at the effect on the subjective assessment of a one standard deviation increase in the peer group measure. This shift would increase subjective assessment by 4.7 pp for the self-assessed measure and by 3.3 pp and 3.6 pp for the constructed peer group measures. The inclusion of socio-demographic variables lowers the estimates of the peer group effects, but while the estimate for the self-assessed measures is still the strongest, the coefficient of  $\overline{hor}^m$  is no longer statistically significant. The impact of the socio-demographic variables is now weak across the board, even for the own employment and tenure status. This suggests that the own status along these dimensions is directly reflected in the self-assessed peer group measure, e.g. because homeowners tend to have friends that are homeowners. Finally, column 7 is similar to column 4 but accounts for municipality fixed effects. This does not affect the findings qualitatively, however the coefficient of the self assessed peer group measure  $\overline{hor}_i^{PG}$  is slightly lower once we control for the locality of respondents. This shows that that peer group effects capture more than just locality effects.

Next, we investigate the relation between the self-assessed and the constructed peer groups in more depth. Specifically, we analyze this dependence by running the following regressions:

$$hor_i^{PG} = \alpha + \kappa \times \overline{hor}^j + X_i \times \gamma + \varepsilon_i, \quad (3)$$

for  $j \in \{p, a, e, pae, m\}$ . While in regressions (1) and (2) a perfectly informed individual should not be influenced by the peer group measures when forming his or her expectation of the national homeownership rate (i.e.,  $\beta = 0$ ), regression (3) assesses the accuracy of the constructed peer group measures with respect to the composition of the “true” peer

Table 2: Subjective homeownership and peer group homeownership

Dependent variable	Subjective homeownership ( $hor_i^{national}$ )						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Measures for Peer Group Influence:</i>							
Self-assessed owners ( $hor_i^{PG}$ )	0.193*** (0.016)	0.157*** (0.018)	0.150*** (0.018)	0.136*** (0.021)	0.134*** (0.021)	0.141*** (0.020)	0.104*** (0.024)
Owners by municipality ( $\overline{hor}^m$ )		0.096*** (0.017)	0.066*** (0.021)		0.038 (0.036)	0.039 (0.028)	
Owners by prov./age/edu ( $\overline{hor}^{pae}$ )			0.044** (0.021)			0.052** (0.022)	
Homeowner				0.010 (0.009)	0.010 (0.009)	0.012 (0.008)	0.018* (0.010)
Household income Q2				0.014 (0.012)	0.014 (0.012)		0.012 (0.012)
Household income Q3				0.007 (0.012)	0.007 (0.012)		0.005 (0.012)
Household income Q4				0.019 (0.013)	0.020 (0.013)		0.004 (0.013)
Age 36-50				0.012 (0.011)	0.013 (0.011)		0.019* (0.011)
Age 51-65				0.010 (0.013)	0.011 (0.013)		0.027** (0.012)
Age 66+				0.013 (0.017)	0.014 (0.017)		0.029* (0.016)
Edu med				-0.022 (0.014)	-0.022 (0.014)		-0.018 (0.013)
Edu high				-0.024 (0.015)	-0.023 (0.015)		-0.004 (0.015)
Male				0.002 (0.008)	0.001 (0.008)	0.000 (0.007)	-0.005 (0.007)
Unemployed				-0.031* (0.016)	-0.029* (0.016)	-0.026* (0.015)	-0.026 (0.016)
Retired				-0.013 (0.013)	-0.014 (0.013)	-0.015* (0.008)	-0.013 (0.012)
Married				-0.007 (0.008)	-0.008 (0.008)	-0.003 (0.007)	-0.004 (0.008)
Village				0.020** (0.009)	0.011 (0.012)	0.010 (0.010)	-0.027 (0.098)
Constant	0.318*** (0.008)	0.283*** (0.010)	0.273*** (0.011)	0.311*** (0.018)	0.303*** (0.019)	0.285*** (0.013)	0.307*** (0.027)
Province fixed-effects	no	no	no	yes	yes	no	yes
Municipality fixed-effects	no	no	no	no	no	no	yes
Adj. R-squared	0.12	0.14	0.14	0.14	0.14	0.14	0.29
N	1273	1266	1266	1153	1148	1266	1153

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group homeownership rates on respondents' estimates of the aggregate homeownership rate in Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

group. A high value of  $\kappa$  means that peer groups are in fact formed along the lines of the socio-demographic variable  $j$  on which the peer group measure  $\overline{hor}^j$  has been based.

Table 3 shows the respective results. Note that the first column shows as a benchmark a specification that does not contain a peer-group measure.<sup>10</sup> Location and age are important influences for self-assessed homeownership while the coefficient of the education-based peer group measure is insignificant. A one-standard deviation increase in the province-based measure ( $\overline{hor}^p$ ) increases the self-assessed peer group ownership rate by 3.8 pp, while for the other specifications one gets an effect of 2.8 pp (for  $\overline{hor}^a$ ), 4.8 pp (for  $\overline{hor}^{pae}$ ) and 7.6 pp (for  $\overline{hor}^m$ ). These effects are based on specifications which include socio-demographic variables which might capture parts of the peer group effect. If we omitted the socio-demographic variables, the effects of a one-standard deviation increase are larger: 7.1 pp for  $\overline{hor}^p$ , 6.3 pp for  $\overline{hor}^a$ , 9.2 pp for  $\overline{hor}^{pae}$  and 9.5 pp for  $\overline{hor}^m$ . These are sizable effects and one can thus conclude that age and location are in fact important dimensions along which individuals form their peer groups. Another finding is that the measures of  $R^2$  are rather high for survey data and that the inclusion of peer group variables increases these measures (e.g. column 6 in comparison to column 1).

The estimated effects of individual socio-demographic variables reflect the results for the peer group measures. For example, age (*Age 51-65*, *Age 66+*) has a highly significant influence for the self-assessed homeownership among the peer group. Also the variable *Village* shows a highly significant positive effect for the assessment which indicates that the size of the place of residence is the main driving force behind the significance of the location measures.<sup>11</sup> Above all, however, the regressions shows that the own tenure status has a very important influence on the assessment of homeownership among the peer group. Homeowners state a homeownership rate among their peers that is 20 pp higher than renters. Our data do not allow us to tell whether this is due to biased perceptions or to tenure-specific sorting but it seems reasonable to assume that the latter element plays at least some role.

The close relation between the two peer group measures (as documented in Table 3) is also useful for dealing with two concerns that could be raised with regard to the estimation results of Table 2. First, these results might not unanimously identify the effect of peer groups, e.g. as the peer group effects could also be reflected in the estimates of the

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<sup>10</sup>To ease comparison, all specifications include socio-demographic variables but excluded regional dummies. Including regional dummies or omitting socio-demographic variables would not affect the qualitative pattern of the results.

<sup>11</sup>*Village* is not significant in column 6 where we construct peer groups based on the finer municipality measure that apparently already accounts for the size of the location.

Table 3: Peer group homeownership

<i>Dependent variable</i>	<i>Self-assessed owners in peer group (<math>hor_i^{PG}</math>)</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Measures for Peer Group Influence:</i>						
Owners by province ( $\overline{hor}^p$ )		0.215*** (0.030)				
Owners by age ( $\overline{hor}^a$ )			0.268*** (0.087)			
Owners by edu ( $\overline{hor}^e$ )				-0.160 (0.137)		
Owners by prov./age/edu ( $\overline{hor}^{pae}$ )					0.229*** (0.027)	
Owners by municipality ( $\overline{hor}^m$ )						0.351*** (0.037)
Homeowner	0.209*** (0.014)	0.190*** (0.014)	0.209*** (0.014)	0.211*** (0.013)	0.195*** (0.013)	0.188*** (0.014)
Household income Q2	-0.015 (0.019)	-0.010 (0.019)	-0.013 (0.019)			-0.014 (0.018)
Household income Q3	-0.014 (0.020)	-0.009 (0.020)	-0.013 (0.020)			-0.007 (0.020)
Household income Q4	0.007 (0.023)	0.016 (0.023)	0.006 (0.023)			0.021 (0.022)
Age 36-50	0.009 (0.016)	0.016 (0.016)		0.018 (0.015)		0.020 (0.016)
Age 51-65	0.048** (0.019)	0.055*** (0.019)		0.052*** (0.017)		0.055*** (0.018)
Age 66+	0.110*** (0.027)	0.115*** (0.027)		0.101*** (0.026)		0.107*** (0.027)
Edu med	0.015 (0.022)	0.017 (0.021)	0.013 (0.022)			0.019 (0.021)
Edu high	0.046* (0.024)	0.058** (0.024)	0.046* (0.025)			0.057** (0.024)
Male	-0.011 (0.012)	-0.014 (0.012)	-0.012 (0.012)	-0.017 (0.011)	-0.019* (0.011)	-0.012 (0.011)
Unemployed	-0.061** (0.027)	-0.043 (0.026)	-0.055** (0.027)	-0.074*** (0.023)	-0.043* (0.023)	-0.031 (0.026)
Retired	-0.034 (0.022)	-0.031 (0.022)	0.006 (0.018)	-0.034 (0.021)	0.009 (0.012)	-0.022 (0.022)
Married	0.019 (0.013)	0.022* (0.013)	0.019 (0.013)	0.023** (0.012)	0.027** (0.012)	0.016 (0.013)
Village	0.097*** (0.013)	0.060*** (0.014)	0.097*** (0.013)	0.095*** (0.012)	0.052*** (0.013)	-0.015 (0.018)
Constant	0.235*** (0.024)	0.109*** (0.030)	0.094* (0.054)	0.355*** (0.088)	0.159*** (0.017)	0.095*** (0.027)
Province or municipality fixed-effects	no	no	no	no	no	no
Adj. R-squared	0.32	0.34	0.31	0.31	0.34	0.36
N	1189	1189	1189	1323	1323	1183

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group homeownership rates on respondents' assessment of the share of owners in their peer groups. Province-fixed effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Columns 6 and 7 repeat the analyses of columns 4 and 5 with socio-demographic variables. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

Table 4: Subjective homeownership and peer group homeownership - IV estimations

<i>Dependent variable</i>	<i>Subjective homeownership (<math>hor_i^{national}</math>)</i>	
	(1)	(2)
<i>Measures for Peer Group Influence:</i>		
Self-assessed owners ( $hor_i^{PG}$ )	0.242** (0.101)	0.224** (0.096)
Household income Q2	0.016 (0.012)	0.015 (0.012)
Household income Q3	0.009 (0.012)	0.009 (0.012)
Household income Q4	0.019 (0.013)	0.019 (0.013)
Age 36-50	0.011 (0.011)	0.011 (0.011)
Age 51-65	0.004 (0.014)	0.005 (0.014)
Age 66+	0.001 (0.020)	0.004 (0.020)
Edu med	-0.025* (0.014)	-0.024* (0.014)
Edu high	-0.030* (0.016)	-0.029* (0.016)
Male	0.003 (0.008)	0.003 (0.008)
Unemployed	-0.025 (0.018)	-0.026 (0.017)
Retired	-0.011 (0.014)	-0.011 (0.013)
Married	-0.009 (0.008)	-0.009 (0.008)
Village	0.014 (0.011)	0.015 (0.011)
Homeowner	-0.012 (0.022)	-0.008 (0.021)
Constant	0.294*** (0.024)	0.297*** (0.023)
Province fixed-effects	yes	yes
Adj. R-squared	0.11	0.12
N	1148	1148
Kleibergen & Paap Wald F	44.44	24.60
Cragg & Donald F	36.05	20.31
Hansen-Sargan $\chi^2$ p-value		0.62

Note: The table shows results from instrumental variable regressions. In column 1, the instrument is *Owners by municipality* ( $\overline{hor}^m$ ). In column 2, the instruments are *Owners by municipality* ( $\overline{hor}^m$ ) and *Owners by prov./age/edu* ( $\overline{hor}^{pae}$ ). Province fixed-effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

socio-demographic variables. Put differently, estimates of socio-demographic variables can either reflect a genuine effect or a peer group effect. Second, the results could eventually reflect a reversed direction of causality, e.g. if respondents used their perception of the national homeownership rate to form perceptions of the homeownership rate among their peer groups.<sup>12</sup> To deal with both issues the close correlation between regional peer group measures and the self-assessed peer group measures (see Table 3) can serve as the basis for an instrumental variable strategy. In particular, the ownership rate per municipality can be used as an instrument for self-assessed peer group homeownership. Importantly, the ownership rate in the respective municipality is exogenous to the respondent.<sup>13</sup> Moreover, it is highly plausible to assume that ownership rates per municipality affect respondents' assessment of the national homeownership rate only through its effect on subjective peer-groups, once we control for socio-demographic variables. These arguments suggest that the variable ownership rates per municipality is a valid instrument. Column 1 of Table 4 shows the respective results. First, the socio-demographic control variables can now be seen as pure confounding variables which no longer reflect any correlated social effects. Accordingly, it makes sense that none of these control variables is significant. Second, the self-assessed peer-groups enter significant and now have an even stronger effect on estimates of the national homeownership rate. Specifically, a one standard deviation increase in *Self-assessed owners* ( $hor_i^{PG}$ ) increases *Subjective homeownership* ( $hor_i^{national}$ ) by 6 pp. In column 2, the peer-group ownership rate by province, age and education is used as an additional instrument. The plausibility of this instrument is less evident than for ownership rates per municipality, e.g. as location decisions might depend on the age structure or the average educational level of a locality. However, we report the results, which are qualitatively similar to those in column 1, as a robustness test.

Summing up, our analysis has shown that when asked to estimate the national homeownership rate, individuals are influenced by the ownership rates of their peer group. This has been confirmed both by using constructed hypothetical peer group measures and by using a self-assessed measure. The latter effect is neither driven by reverse causality nor by confounding effects of the socio-demographic status of respondents. Furthermore, we have documented that the self-assessed homeownership rate is in fact related to the constructed measures which supports the conjecture that peer groups are formed according

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<sup>12</sup>We want to note, however, that the possibility of such an effect was reduced by the construction of the survey. The question about the national homeownership rate was asked at the beginning and the question about the peer group homeownership rate was asked at the end of the survey module.

<sup>13</sup>Unless location decisions of respondents are independent from regional homeownership rates, which seems plausible.



to location, age and (partly) education. The latter result can be viewed as a test of external validity that justifies the practice of previous papers to assume that such a relation exists. As the constructed peer group variables are likely to contain rather large measurement errors, it is probably advisable to use a direct self-assessed peer group measure, if available.

## 4 Unemployment

Our survey also contains additional variables that can be used to test whether subjective perceptions are influenced by the composition of the peer group. In particular, we have asked respondents about their assessment of GDP growth and of unemployment and in this section we focus on the latter variable. Unemployment has in common with the homeownership rate that it is a central economic variable that is furthermore quite easily observable and people typically know whether a friend is unemployed.<sup>14</sup> There exist, however, two crucial differences to the homeownership variable. First, the fluctuations of unemployment with respect to location are smaller than with respect to other dimensions like education or occupation. We would thus conjecture that this is also reflected in the relative strength of the different constructed peer group influences. Second, the rate of unemployment is a prominent macroeconomic variable that is frequently covered in the news. We would thus suspect that the influence of peer group properties on the subjective assessment is less pronounced (hypothesis 2).

### 4.1 Subjective unemployment

The survey included a question about unemployment that was completely parallel to the homeownership question discussed: “In your opinion, what was the rate of unemployment in Austria in the year of 2016 (following the national definition)?” where we have allowed 7 answer categories ranging from  $< 3\%$  to  $> 25\%$  with the third category specified as  $6.1\% - 11\%$ . The reason for this maybe somewhat unusual set of categories has to do with the measurement and communication of unemployment. In particular, there exist two methods to calculate the rate of unemployment and both are common in public discussions. The first method is based on registered unemployed while the second uses (internationally harmonized) labor force surveys. The two methods lead to different results

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<sup>14</sup>Furthermore, the unemployment rate is also used (besides house price developments) by Kuchler & Zafar (2019) to study the impact of personal experiences on economic expectations.

and for 2016 the harmonized unemployment rate in Austria was 6.1% while the registered rate was 9.1%. Furthermore, in February 2017—the time the survey was conducted—the registered rate was 10.1% and thus we defined the third interval such that all possibly correct values fall within its range. For the estimation we have furthermore merged certain (less frequently used) categories and finally arrived at a total number of four categories: < 6% (chosen by 8% of respondents), 6.1% to 11% (containing the correct value, chosen by 49% of respondents), 11.1% to 16% (chosen by 26%) and > 16% (chosen by 7%).

In order to study whether peer groups have an influence on the subjective perception of the national unemployment rate we follow the same steps as in section 3 for homeownership. In particular, we first look at constructed peer groups and then turn to self-assessed peer group measures.

## 4.2 Constructed peer group measures

We start the analysis with an OLS regression of the form:

$$unr_i^{national} = \alpha + \beta \times \overline{unr}^j + X_i \times \gamma + \varepsilon_i, \quad (4)$$

which is completely parallel to equation (1). Now  $unr_i^{exp,AT}$  denotes the perception of individual  $i$  about the national unemployment rate which (as mentioned above) has been merged into four categories. We do not assign an unemployment rate to the four categories but rather put them into the regression with the values 1 to 4. The variable  $\overline{unr}^j$ , on the other hand, stands for the average unemployment rate in the socio-demographic sub-group  $j$  where—as above— $j \in \{p, a, e, pae, m\}$ . An estimated coefficient of  $\beta = 0$  would imply that these constructed peer groups do not have an effect on the subjective perceptions of the unemployment rate.

Table 5 (parallel to table 1 for homeownership) reports the result for various constructed peer group measures. In contrast to the results of homeownership, now it is no longer the case that most peer group measures show a significant relation with the subjective assessment of unemployment. A significant coefficient only arises if one calculates the average unemployment rates for the 108 combinations of province, age and education or if one uses the fine location measures based on municipalities (for the latter case the level of significance is only 10%). A one standard deviation increase in the location/age/education-specific unemployment rate increases the dependent variable by 0.074 which is a rather tiny effect (given that the gap between the different categories

Table 5: Subjective unemployment

Dependent variable	Subjective unemployment ( $unr_i^{national}$ )						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Measures for Peer Group Influence:</i>							
Unemp by province ( $\overline{unr}^p$ )	1.240 (0.896)						
Unemp by age ( $\overline{unr}^a$ )		-0.081 (2.244)					
Unemp by edu ( $\overline{unr}^e$ )			1.222 (0.968)				
Unemp by prov./age/edu ( $\overline{unr}^{pae}$ )				1.668** (0.739)		1.996** (0.812)	
Unemp by municipality ( $\overline{unr}^m$ )					1.063* (0.629)		1.194 (1.525)
Male						-0.132** (0.057)	-0.057 (0.050)
Unemployed						-0.043 (0.106)	-0.008 (0.108)
Retired						-0.141* (0.080)	-0.163* (0.093)
Married						0.013 (0.059)	0.027 (0.055)
Village						0.117* (0.062)	-0.001 (0.060)
Household income Q2							-0.010 (0.074)
Household income Q3							-0.011 (0.082)
Household income Q4							0.022 (0.086)
Age 36-50							-0.031 (0.078)
Age 51-65							0.037 (0.082)
Age 66+							-0.032 (0.116)
Edu med							-0.157* (0.088)
Edu high							-0.358*** (0.099)
Constant	2.446*** (0.057)	2.566*** (0.127)	2.446*** (0.061)	2.466*** (0.049)	2.421*** (0.064)	2.473*** (0.081)	2.633*** (0.269)
Province fixed-effects	no	no	no	no	no	no	yes
Adj. R-squared	0.00	-0.00	0.00	0.01	0.00	0.01	0.04
N	1227	930	1227	930	1227	930	1118

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group unemployment rates on respondents' estimates of aggregate unemployment in Austria (measured in 4 categories: up to 6%, 6.1 to 11%, 11.1 to 16%, more than 16%). Province fixed-effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Columns 6 and 7 repeat the analyses of columns 4 and 5 with socio-demographic variables. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

is 1). This is in line with hypothesis 2 stating that the magnitude of perception biases might depend on the specific issue and that it will be lower for issues that are frequently covered in the media. This is true for the national unemployment rate and it is likely to be the case that the weak effects of Table 5 are due to the fact that media reports provide people with a rough feeling about the correct national unemployment rate and that they downgrade their local or peer-group related measures as a reliable source of information about the aggregate rate. The socio-demographic variables do not show strong and consistent results with the possible exception of high education in column 7 which is (not surprisingly) negatively related to the assessment of unemployment.

### 4.3 Self-assessed peer group measures

The lack of significance for the simple peer group measures might be due to the fact that peer groups with respect to unemployment vary along a variety of dimensions and that in this case it is not sufficient to proxy the true peer groups with these univariate measures. The use of the multivariate measure  $\overline{unr}^{pae}$  is one way to deal with this issue and—as reported in table 5—has shown a significant coefficient. An alternative strategy is to employ again a self-assessed measure of unemployment among the members of the social environment to control for the influence of the peer group. We have again included a question like this. In this case, however, we have not offered a set of precise numeric categories but rather asked the respondents to state “how many people in your personal environment are currently unemployed?” The answer categories have been: none (25%), few (41%), some (29%), many (5%) and very many (1%). For the analysis we have merged the latter two categories. This variable is denoted by  $unr_i^{PG}$  and is used in the following regression (which parallels equation (2) for homeownership):

$$unr_i^{national} = \alpha + \beta \times unr_i^{PG} + X_i \times \gamma + \varepsilon_i. \quad (5)$$

The results are summarized in table 6. Note that the effect of the self-assessed peer group measures on the subjective unemployment perception is rather large. People who report to have many unemployed friends will estimate the national unemployment rate to be almost one category higher than people who have no unemployed friends (the base category). The effect of having some unemployed friends is smaller (around 0.2) but still statistically significant. The effect remains almost unchanged independent of whether one also includes other constructed peer group measures or socio-demographic variables. The

Table 6: Subjective unemployment and peer group unemployment

Dependent variable	Subjective unemployment ( $unr_i^{national}$ )					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Measures for Peer Group Influence:</i>						
Self-assessed unemp ( $unr_i^{PG}$ )						
Unemp: peer group a few	0.037 (0.062)	0.035 (0.062)	-0.004 (0.080)	0.008 (0.065)	0.008 (0.065)	0.021 (0.079)
Unemp: peer group some	0.211*** (0.066)	0.208*** (0.066)	0.169** (0.084)	0.183** (0.072)	0.182** (0.072)	0.211** (0.084)
Unemp: peer group many	0.852*** (0.135)	0.842*** (0.135)	0.771*** (0.150)	0.778*** (0.147)	0.776*** (0.148)	0.855*** (0.156)
Unemp by municipality ( $\overline{unr}^m$ )		0.395 (0.629)	-0.232 (0.883)		0.630 (1.506)	0.790 (0.944)
Unemp by prov./age/edu ( $\overline{unr}^{pae}$ )			0.811 (0.894)			0.886 (0.927)
Homeowner				0.001 (0.057)	0.001 (0.057)	0.040 (0.063)
Household income Q2				0.036 (0.073)	0.036 (0.073)	
Household income Q3				0.044 (0.082)	0.043 (0.082)	
Household income Q4				0.074 (0.086)	0.072 (0.087)	
Age 36-50				-0.002 (0.076)	-0.003 (0.077)	
Age 51-65				0.081 (0.081)	0.083 (0.081)	
Age 66+				0.068 (0.116)	0.069 (0.116)	
Edu med				-0.123 (0.086)	-0.122 (0.086)	
Edu high				-0.275*** (0.098)	-0.274*** (0.098)	
Male				-0.078 (0.050)	-0.078 (0.050)	-0.133** (0.056)
Unemployed				-0.091 (0.107)	-0.092 (0.107)	-0.198* (0.102)
Retired				-0.171* (0.093)	-0.171* (0.094)	-0.138* (0.083)
Married				0.055 (0.055)	0.055 (0.055)	0.053 (0.060)
Village				0.026 (0.057)	0.033 (0.059)	0.146** (0.065)
Constant	2.394*** (0.050)	2.361*** (0.077)	2.433*** (0.096)	2.555*** (0.132)	2.457*** (0.262)	2.289*** (0.129)
Province fixed-effects	no	no	no	yes	yes	no
Adj. R-squared	0.05	0.05	0.05	0.08	0.08	0.06
N	1213	1213	922	1105	1105	922

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group unemployment rates on respondents' estimates of aggregate unemployment in Austria (measured in 4 categories: up to 6%, 6.1 to 11%, 11.1 to 16%, more than 16%). Province fixed-effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

results of table 6 suggest that peer groups with respect to unemployment are probably more heterogeneous and not easily captured by univariate constructed measures. Note that also the coefficient of  $\overline{unr}^{pae}$  loses significance once entered together with the self-assessed peer group measures.

We can elaborate on this relation between constructed and self-assessed peer group measures by performing a regression parallel to equation (3):

$$unr_i^{PG} = \alpha + \kappa \times \overline{unr}^j + X_i \times \gamma + \varepsilon_i. \quad (6)$$

The results are collected in table 7.<sup>15</sup> One can see that the average unemployment rates of all constructed peer groups are positively related to the self-assessed unemployment measure with the exception of the education-based measure. The relation is, however, rather weak. A one standard deviation increase in the measure  $\overline{unr}^{pae}$ , e.g., leads to an effect of 0.08 percentage points. A shift from the sub-group with the lowest unemployment rate (0.5%) to the one with the highest unemployment rate (28.3%) is estimated to lead to a change of half a category in self-assessed unemployment among the peer group. Turning to the socio-demographic variables it is interesting to see that older, richer and highly educated respondents state a lower share of unemployment in their social environment and the same is also true for homeowners. On the other hand, one can see that individuals who themselves are unemployed give a higher estimate where the coefficient (between 0.34 and 0.53) is sizable. Again we cannot tell whether this reflects different reference groups for unemployed persons or the existence of perception biases.

As for the homeownership, we should ideally conduct instrumental variable estimations. However, this was not possible in the case of unemployment as we could not find a suitable instrument, e.g. a variable that is sufficiently correlated with peer group unemployment. We assign these difficulties to the fact that the survey questionnaire recorded peer group unemployment in just a few categories. Moreover, when using IV these ordinal categories have to be combined into a cardinal variable, which is at least questionable. The low measures of  $R^2$  that we obtain in Table 7 express these difficulties.

Summing up, our analysis again supports the conclusion that the assessment of unemployment is influenced by the behavior and the relevant characteristics of the peer groups. The influence, however, is weaker and less glaring than for the case of homeownership. First, it does not appear for all constructed peer group measures and second, the size of

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<sup>15</sup>The regressions use again OLS estimation. The use of ordered probit leads to parallel results (not shown).

Table 7: Peer group unemployment

Dependent variable	Self-assessed unemployment in peer group ( $unr_i^{PG}$ )					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Measures for Peer Group Influence:</i>						
Unemp by province ( $\overline{unr}^P$ )		2.175** (0.964)				
Unemp by age ( $\overline{unr}^a$ )			7.128*** (2.063)			
Unemp by edu ( $\overline{unr}^e$ )				2.381** (0.928)		
Unemp by prov./age/edu ( $\overline{unr}^{pae}$ )					2.688*** (0.632)	
Unemp by municipality ( $\overline{unr}^m$ )						2.065*** (0.722)
Household income Q2	-0.138* (0.071)	-0.143** (0.071)	-0.176** (0.083)			-0.142** (0.071)
Household income Q3	-0.189** (0.077)	-0.194** (0.077)	-0.226** (0.088)			-0.191** (0.077)
Household income Q4	-0.283*** (0.083)	-0.287*** (0.083)	-0.317*** (0.092)			-0.289*** (0.082)
Age 36-50	-0.169** (0.068)	-0.174** (0.068)		-0.202*** (0.065)		-0.177*** (0.068)
Age 51-65	-0.279*** (0.071)	-0.282*** (0.071)		-0.325*** (0.068)		-0.279*** (0.071)
Age 66+	-0.652*** (0.105)	-0.650*** (0.104)		-0.683*** (0.099)		-0.649*** (0.104)
Edu med	-0.039 (0.083)	-0.046 (0.083)	0.021 (0.107)			-0.043 (0.082)
Edu high	-0.301*** (0.094)	-0.319*** (0.094)	-0.275** (0.116)			-0.317*** (0.093)
Male	0.138*** (0.047)	0.141*** (0.047)	0.044 (0.053)	0.136*** (0.045)	0.039 (0.051)	0.141*** (0.047)
Unemployed	0.362*** (0.097)	0.336*** (0.097)	0.390*** (0.104)	0.528*** (0.091)	0.492*** (0.095)	0.333*** (0.096)
Retired	0.014 (0.085)	0.010 (0.085)	-0.068 (0.083)	0.056 (0.081)	-0.089 (0.076)	0.008 (0.084)
Married	-0.024 (0.051)	-0.028 (0.051)	-0.077 (0.059)	-0.099** (0.047)	-0.153*** (0.054)	-0.028 (0.051)
Village	-0.186*** (0.047)	-0.134** (0.053)	-0.202*** (0.055)	-0.180*** (0.045)	-0.119** (0.056)	-0.104* (0.054)
Constant	2.723*** (0.099)	2.590*** (0.116)	2.239*** (0.172)	2.351*** (0.078)	2.219*** (0.075)	2.512*** (0.125)
Province fixed-effects	no	no	no	no	no	no
Adj. R-squared	0.13	0.13	0.11	0.11	0.08	0.14
N	1184	1184	889	1319	992	1184

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group unemployment rates on respondents' assessment of unemployment rates in their peer groups (measured in 4 categories: none, a few, some, many). Variable definitions and summary statistics are presented in appendix A and Table A.1. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

the effect is also smaller in the case where one can ascertain a significant effect (as is the case for the self-assessed measure, e.g.). Two reasons are likely to be responsible for these results. First, the distribution of the trait of homeownership over the various peer groups differs from the distribution of the trait of unemployment. Second, the unemployment rate is more extensively and frequently covered in the media than the homeownership rate and this might attenuate the strength of peer group effects (hypothesis 2). We elaborate on this in the next section.

## 5 The attenuating role of economic knowledge

As described in section 2 the impact of the peer group situation on subjective assessment will depend—among other things—also on the availability and use of public information about this item (hypothesis 2). We have already stressed that statistics about unemployment are much more frequently mentioned in the media than statistics about homeownership. This might be the main reason why the impact of peer groups on subjective assessments was larger for the latter. Only if the true data are unknown, people have to use their private sample of peer group member in order to make an inference about an aggregate variable. Hence, one would assume that people who have an interest in economic issues will be more likely to know the aggregate numbers and less likely to rely on subjective inferences based on peer groups (see hypothesis 3).<sup>16</sup>

To analyze this point in more depth, we use a proxy variable for the individual extent of economic knowledge and estimate interaction effects in order to see whether more knowledgeable individuals are less prone of being (erroneously) influenced by their reference group. The proxy variable is *Economic interest* which is defined as 1 if respondents state to have (very high, high or medium) interest in economic issues *and* if they consume any media in order to stay informed about these matters, and 0 otherwise.<sup>17</sup>

Table 8 shows the results for homeownership and for unemployment. In both cases we use the self-assessed peer group measure as the explanatory variable since it was shown

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<sup>16</sup>This was also emphasized and studied by Kuchler & Zafar (2019) in their context about the relation between personal experience and aggregate expectations: “A college degree and higher numeracy can be viewed as proxies for the respondent’s sophistication. If respondents extrapolated from own experiences to aggregate outcomes because of cognitive biases, we would expect sophisticated individuals to be less prone to rely on their own experience (either locally experienced house prices or own employment status) when reporting expectations for nationwide outcomes” (p.26).

<sup>17</sup>There are a some respondents who state that they are interested in economic issues but do not consume any media, not even infrequently. We consider these answers implausible and the definition of *economic interest* reflects this.



(in tables 2 and 6) to have the strongest and most robust effect.<sup>18</sup> The results are largely in line with our conjecture. In column 1 of table 2 we have estimated the coefficient for the peer group measure  $hor_i^{PG}$  as 0.193 without differentiating the respondents by their degree of economic information. Column 1 of table 8 shows that the effect is larger (0.21) for individuals with no interest in economic matters while it is weaker (only 0.12=0.21-0.09)—though still significantly different from zero—for people who claim to be informed. The regressions on perceived unemployment produce the same pattern of results with very similar interaction terms (column 2).

Table 8: The effect of economic information

<i>Dependent variable</i>	<i>Subjective homeownership</i>	<i>Subjective unemployment</i>
	(1)	(2)
<i>Peer Group Influence:</i>		
Self-assessed owners ( $hor_i^{PG}$ )	0.207*** (0.034)	
Self-assessed unemp ( $unr_i^{PG}$ )		0.261*** (0.051)
<i>Interaction effects:</i>		
Self-assessed owners ( $hor_i^{PG}$ ) × Economic interest	-0.088** (0.038)	
Self-assessed unemp ( $unr_i^{PG}$ ) × Economic interest		-0.147** (0.065)
Economic interest	0.015 (0.018)	0.311** (0.152)
Constant	0.288*** (0.021)	2.118*** (0.172)
Household controls	yes	yes
Province fixed-effects	yes	yes
Adj. R-squared	0.14	0.07
N	1153	1105

Note: The table shows ordinary least squares regression estimates of the effect of different measures of peer group influence on respondents' estimates of the aggregate homeownership rate (column 1) and of the aggregate unemployment rate (column 2). Province-fixed effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

<sup>18</sup>Due to our aim of identifying (linear) interaction effects, the regressions do not contain the individual categories of *Self-assessed unemployment in peer group* ( $unr_i^{PG}$ ) but the ordinal variable (with categories from 1 to 4).

## 6 Perceptions and choices

We have documented that peer groups have an influence on economic perceptions and we have tested hypotheses related to the role of public information and the degree of individual knowledge. In this section we take the existence of peer group influences as given and rather investigate the consequences of the biases for economic decisions. In particular, we show that the perceived attractiveness of real estate investments is significantly (positively) affected by the rate of homeowners among their peers even after controlling for a wide range of other factors that might influence this perception. Subject to the presumption that the perceived attractiveness affects actual purchase investment decisions, this finding shows that individual perceptions are not inconsequential aberrations of mind but can have rather concrete and long-reaching implications for people's lives. The results also complement the findings of the related literature. Bailey et al. (2016), e.g., document that individuals with friends that experienced higher house price increases are more likely to buy a house, to buy larger houses and are willing to pay more for a given house. Similarly, Kuchler & Zafar (2019) show that respondents who expect increasing house prices see real estate as a more attractive investment. Das et al. (2019) analyze the effect of macroeconomic perceptions on the intentions to invest in stocks and intentions to purchase homes, cars or durables goods.

As our survey provides information on the attractiveness of real estate investments we can test whether the results of Kuchler & Zafar (2019) for the US can be replicated with Austrian data. Specifically, we only consider the sub-sample of people who are not already homeowners. Column 1 of table 9 confirms that a higher estimate of the aggregate homeownership rate results in a higher attractiveness of real estate investments. This finding is robust to the inclusion of (i) variables that affect saving decisions, like time preference, risk preference and budget self-control, and (ii) information on the financial portfolio of agents.

The data do not allow us to delve deeper into the underlying channel which makes agents think that housing is a better investment if they perceive that a higher share of Austrians own a house. However, we can exclude that this result is driven by mere peer group pressure (i.e., one aims for a house because all peers own a house already). In column 3 and 4 we add the peer group measures and find that these variables are insignificant while the subjective homeownership rate remains significant. Overall, the results are thus in line with the findings of Kuchler & Zafar (2019).

Table 9: Attractiveness of real estate investment

<i>Dependent variable</i>	<i>Real estate attractive investment</i>			
	(1)	(2)	(3)	(4)
<i>Measures for Peer Group Influence:</i>				
Subj. homeownership	2.246** (1.066)	2.266** (1.103)	2.281** (1.148)	2.455** (1.109)
Self-assessed owners ( $hor_i^{PG}$ )			-0.034 (0.765)	
Owners by municipality ( $\overline{hor}^m$ )				-1.875 (1.494)
Household income Q2	0.173 (0.413)	0.318 (0.418)	0.275 (0.419)	0.292 (0.421)
Household income Q3	0.506 (0.430)	0.624 (0.443)	0.596 (0.442)	0.629 (0.446)
Household income Q4	0.275 (0.492)	0.344 (0.507)	0.318 (0.506)	0.299 (0.510)
Age 36-50	0.316 (0.336)	0.138 (0.337)	0.173 (0.338)	0.098 (0.338)
Age 51-65	0.031 (0.399)	0.019 (0.397)	0.018 (0.402)	0.001 (0.397)
Age 66+	0.068 (0.620)	-0.108 (0.625)	-0.103 (0.627)	-0.098 (0.622)
Edu med	0.950** (0.469)	1.119** (0.475)	1.142** (0.476)	1.100** (0.475)
Edu high	1.636*** (0.499)	1.735*** (0.507)	1.765*** (0.510)	1.712*** (0.508)
Male	-0.355 (0.257)	-0.221 (0.261)	-0.220 (0.261)	-0.214 (0.261)
Unemployed	1.112** (0.506)	1.117** (0.519)	1.086** (0.520)	1.021* (0.533)
Retired	-0.052 (0.513)	-0.098 (0.513)	-0.104 (0.515)	-0.116 (0.514)
Married	0.584** (0.283)	0.523* (0.285)	0.522* (0.286)	0.555* (0.285)
Village	-0.608* (0.345)	-0.607* (0.345)	-0.620* (0.349)	-0.159 (0.471)
Risk averse		0.051 (0.050)	0.052 (0.050)	0.045 (0.050)
High time preference		0.017 (0.051)	0.020 (0.051)	0.015 (0.051)
Budget control		0.210*** (0.054)	0.215*** (0.054)	0.209*** (0.054)
Bank savings		-0.238 (0.329)	-0.265 (0.330)	-0.252 (0.331)
Risky assets		0.337 (0.380)	0.340 (0.381)	0.386 (0.391)
Non-risky assets		-0.242 (0.457)	-0.253 (0.463)	-0.272 (0.455)
Has loan		0.805*** (0.307)	0.801** (0.313)	0.809*** (0.307)
Constant	5.278*** (0.657)	3.216*** (0.929)	3.167*** (0.933)	3.612*** (1.006)
Province fixed-effects	yes	yes	yes	yes
Adj. R-squared	0.10	0.12	0.12	0.12
N	628	616	613	614

Note: The table shows ordinary least squares regression estimates of the effect of subjective homeownership and peer group homeownership rates on the perceived attractiveness of housing investments. Province fixed-effects control for the 9 provinces of Austria. Variable definitions and summary statistics are presented in appendix A and Table A.1. Robust standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 0.01, 0.05 and 0.10-level.

## 7 Conclusions

The literature has shown various channels through which perceptions and expectations of economic agents are biased and deluted (crisis memories, media, etc.). In this paper, we provide strong evidence for another channel: people are not only extrapolating from their own experience but are also using their peer group for their assessments. Economic outcomes (like the tenure status or unemployment) among one’s social environment are used to form subjective estimates about aggregate economic outcomes, e.g. at the national level. The influence of peer groups does not only manifest itself for “less prominent” variables, like homeownership rates, but also for unemployment rates which are a frequent subject of news reports, although our analysis shows that the effect of peer groups is weaker for the latter variable. Moreover, we show that economic knowledge attenuates, but does not eliminate, the effect of peer groups.

A major contribution of this paper is that we employ direct survey information to measure the peer group influence. We show that the peer group effect is larger when measures of “self-assessed peer groups” are used in the estimation than when “constructed (hypothetical) peer groups” are used. Our results demonstrate that this difference is not inconsequential. For example, for the perception of the national unemployment rate, the constructed peer group effects are mostly insignificant while the self-assessed peer group effect is significantly different from zero. If the latter variable was not available, one might hence arrive at the wrong conclusion that peer groups do not matter. Moreover, our results are informative for future studies which rely on hypothetical peer groups as we identify the (combination of) variables that can be used to construct peer group proxies.

The existence of peer group effects documented in this paper give rise to a number of additional questions. First, does it matter that people have biased perceptions and expectations? We have provided some evidence that perception errors do matter for economic decisions. However, due to data limitations, we cannot provide more evidence and we consider this as an important undertaking for future studies. Second, are peer group effects also important for the perception of other variables like inflation or political assessments? As we have argued above, the importance of peer groups for the perception and expectation of economic and political variables will depend on a number of factors, e.g. on their interpersonal observability and on their media coverage. Homeownership rates and unemployment rates among peers are easily observable. This is not the case for other variables like individual prices or inflation rates. Hence, one would not expect to find a strong peer group effect for inflation expectations. Political attitudes, on the other

hand, are likely to be at least partly shaped by the influence of one's peers. Finally, our results about the existence of the peer group channel do not provide us with information about the underlying mechanism. It seems plausible to assume that it has to do with the influence of psychological biases (e.g. arising from the predominant use of salient information).

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# Appendices

## A Data and descriptive statistics

### A.1 Data description

The data are derived from a survey commissioned by the Oesterreichische Nationalbank and conducted by IFES, a market research institute. The survey is undertaken semi-annually and mainly focuses on economic sentiments and expectations regarding inflation, the state of the economy and the financial situation of survey respondents. The questionnaire used in this paper has been devised by the authors and appended as a special module to the normal survey conducted in March 2017. In total about 1,400 people in Austria were interviewed face-to-face. The survey results are representative for the Austrian population aged 15 and over with respect to region, age, gender, however for the purpose of this study we will not use sampling weights. We restrict the sample to persons aged 18 or older and we have omitted persons who are in education. Descriptive statistics are summarized in Tables A.1 and a definition of variables is provided in appendix A.1.

### A.2 Description subjective estimates

The original questions regarding the perception of the economy have been posed at the beginning of the part of the survey pertaining to this paper. The questions have been posed in the following order:

*Subjective homeownership* ( $hor_i^{national}$ ): “In your opinion, which percentage of Austrian households own their residence, ie their apartment or house.?” Answers comprise 10 categories: “0 to 10 percent”, ..., “91 to 100 percent”. The categories are directly used in the estimation, coding the variable with the mid-point of the respective intervals.

*Subjective unemployment* ( $unr_i^{national}$ ): In your view, what was the rate of unemployment in Austria in 2016 according to the national definition. Answers comprise 7 categories: “Up to 3 percent”, “3.1 to 6 percent”, “6.1 to 11 percent”, “11.1 to 16 percent”, “16.1 to 20 percent”, “20.1 to 25 percent”, “more than 25 percent”. In order to avoid that outliers drive our results (there are only a few observations for

the lowest and highest categories), we recode this variable to 4 categories (“up to 6%”, “6.1 to 11 percent”, “11.1 to 16 percent”, “more than 16 percent”).

### A.3 Description peer group variables

#### Survey

*Self-assessed owners* ( $hor_i^{PG}$ ): Based on “And now to your personal environment, ie people with whom you are in contact like relatives, friends, acquaintances, colleagues at work. Which share of these people own their residence, ie the house or the apartment in which the live.” Answers comprise 10 categories: “0 to 10 percent”, ..., “91 to 100 percent”. The categories are directly used in the estimation, coding the variable with the mid-point of the respective intervals.

*Self-assessed unemp* ( $unr_i^{PG}$ ): “And how many people in your personal surroundings are currently unemployed?” “None, a few, some, many, a lot”. In order to avoid that outliers drive our results (there are only a few observations for the highest category), we recode this variable to 4 categories (“none”, “a few”, “some”, “many or a lot”). In some occasions, we use the dummy variables constructed from these 4 categories, e.g. “Self-assessed unemp: none”, “Self-assessed unemp: few”. The last category is labeled “Self-assessed unemp: many”.

**Homeownership** Homeownership rates per municipality (*Owners by municipality* ( $\overline{hor}^m$ )) are computed from a census conducted by Statistics Austria which records the ownership status of all buildings and appartments per October 2011. With this data set we can calculate the share of owner occupied housing per Austrian municipality which is then matched with municipality information in our survey data. The matching was performed using the official Austrian municipality identification number.

Homeownership rates for socio-demographic groups (*Owners by province* ( $\overline{hor}^p$ ), *Owners by age* ( $\overline{hor}^a$ ), *Owners by edu* ( $\overline{hor}^e$ ) and *Owners by prov./age/edu* ( $\overline{hor}^{pae}$ )) are computed from the Micro Census from 2016/Q1 to 2016/Q4. The Micro Census is an official survey of Statistics Austria to compute unemployment rates and educational statistics. Participation is mandatory by law. It contains information on the legal status of the main residence. The variable on which we base our calculation is “wrecht” which is recoded (“recode wrecht (1/2=1) (3/5=0) (6/7=1) (else=.), gen(*Homeowner*)”). In total, we use information on 177,375 individuals.

**Unemployment** The Micro Census is also used for group-specific unemployment rates (e.g. *Unemp by prov./age/edu* ( $\overline{unr}^{pae}$ )). As this survey is used to compute official unemployment rates, we can compute group-specific unemployment rates that are based on the official definition of unemployment. This implies that a person is only counted as unemployed if the person is in the labor force. Therefore, we cannot compute unemployment rates for retired persons, which limits the number of observations in our estimations. The variable on which we base our calculation is “xerwstat” which is recoded (“recode xerwstatt (1=0) (2=1) (else=.), gen(*Unemployed*)”).

Regional unemployment rates reflect the official unemployment rates of the year 2016 for the finest geographical division that is available. Specifically, AMS Austria (ie., the Austrian labor market agency) divisions Austria into 97 labor market districts (“AMS Bezirke”) and *Unemp by municipality* ( $\overline{unr}^m$ ) reflects the district unemployment rate to which a survey respondent’s municipality belongs to.

## A.4 Description other variables

### Household-level control variables:

*Homeowner*: Dummy variable = 1 if the place of residence of a survey respondents is owner-occupied, 0 otherwise.

*Real estate attractive investment*: “Which of the following investments is currently attractive? Real estate” Answers range from 0 (“not at all attractive”) to 10 (“very attractive”).

*Unemployed, Retired*: Dummy variables = 1 if a person is unemployed (or retired). The omitted categorie is “*Employed*.”

*Education*: “Edu high”=1 if high school or university, “Edu med”=1 if apprenticeship or middle school, “Edu low”=1 if only mandatory schooling (omitted), 0 otherwise.

*Household income*: The quartile of equivalized household income. *Household income Q4* = 1 if a person is in the highest quartile, 0 otherwise.

*Village*: Dummy variable = 1 if a survey respondents lives in a municipality with up to 10,000 inhabitants, 0 otherwise.

*Economic interest*: Based on two survey instruments. First, on media consumption (see *Quality media*). Second, respondents were asked “How would you assess your interest for economic questions? (very high/high/middle/low/very low/no interest)”. *Economic interest* = 1 if respondents state that they have a very high, high or middle interest in economics and if they use at least one of the 13 different information sources very often or often. *Economic interest* = 0 if respondents state that they have a low or no interest or if they consult the above mentioned information sources not more often than sometimes.

*Bank savings*: Dummy variable = 1 if respondent owns a savings deposit account, 0 otherwise.

*Risky assets*: Dummy variable = 1 if respondent holds equity or an investment funds, 0 otherwise.

*Non-risky assets*: Dummy variable = 1 if respondent holds bonds or other valuables, 0 otherwise.

*Has loan*: Dummy variable = 1 if respondent pays off a loan, 0 otherwise.

*Risk averse, High time preference, Budget control*: Based on “Please indicate how much you agree to the following statements”. Answers range from “not at all (0)” to “completely (10)”. *Risk averse*: “In principle, I am willing to invest in risky assets even though I might suffer a loss”. *High time preference*: “I find it more satisfactory to spend money now than to save it for the distant future”. *Budget control*: “Before I buy something, I think carefully whether I can afford to make this purchase”.

## A.5 Descriptive statistics

Table A.1: Descriptive statistics

	N	mean	sd	min	max
Panel A. Homeownership: Subjective and objective variables					
Subj. homeownership ( $hor_i^{national}$ )	1279	0.40	0.14	0.05	0.95
Self-assessed owners ( $hor^{PG}$ )	1323	0.42	0.24	0.05	0.95
Homeowner	1337	0.41	0.49	0.00	1.00
Owners by municipality ( $\overline{hor}^m$ )	1329	0.52	0.23	0.11	0.96
Owners by province ( $\overline{hor}^p$ )	1337	0.63	0.21	0.22	0.84
Owners by age ( $\overline{hor}^a$ )	1337	0.64	0.09	0.49	0.73
Owners by edu ( $\overline{hor}^e$ )	1337	0.63	0.04	0.56	0.67
Owners by prov./age/edu ( $\overline{hor}^{pae}$ )	1337	0.65	0.23	0.07	0.96
Real estate attractive investment	1302	6.90	3.19	0.00	10.00
Panel B. Unemployment: Subjective and objective variables					
Subj. unemp rate ( $unr_i^{national}$ )	1227	2.52	0.86	1.00	4.00
Self-assessed unemp ( $unr^{PG}$ )	1319	2.15	0.86	1.00	4.00
Self-assessed unemp none	1319	0.25	0.43	0.00	1.00
Self-assessed unemp a few	1319	0.41	0.49	0.00	1.00
Self-assessed unemp some	1319	0.29	0.45	0.00	1.00
Self-assessed unemp many	1319	0.06	0.23	0.00	1.00
Unemployed	1337	0.07	0.26	0.00	1.00
Unemp by municipality ( $\overline{unr}^m$ )	1337	0.09	0.04	0.03	0.20
Unemp by province ( $\overline{unr}^p$ )	1337	0.06	0.03	0.03	0.11
Unemp by age ( $\overline{unr}^a$ )	1001	0.06	0.01	0.05	0.08
Unemp by edu ( $\overline{unr}^e$ )	1337	0.06	0.03	0.05	0.13
Unemp by prov./age/edu ( $\overline{unr}^{pae}$ )	1001	0.06	0.04	0.01	0.28

Table A.1: Descriptive statistics (con't)

	N	mean	sd	min	max
Panel D. Household-level control variables					
Houehold income Q1	1200	0.25	0.43	0.00	1.00
Household income Q2	1200	0.28	0.45	0.00	1.00
Household income Q3	1200	0.25	0.43	0.00	1.00
Household income Q4	1200	0.23	0.42	0.00	1.00
Age 18-35	1337	0.22	0.41	0.00	1.00
Age 36-50	1337	0.25	0.43	0.00	1.00
Age 51-65	1337	0.28	0.45	0.00	1.00
Age 66+	1337	0.25	0.43	0.00	1.00
Edu low	1337	0.13	0.34	0.00	1.00
Edu med	1337	0.62	0.48	0.00	1.00
Edu high	1337	0.24	0.43	0.00	1.00
Male	1337	0.45	0.50	0.00	1.00
Unemployed	1337	0.07	0.26	0.00	1.00
Retired	1337	0.36	0.48	0.00	1.00
Married	1337	0.60	0.49	0.00	1.00
Village	1337	0.47	0.50	0.00	1.00
Bank savings	1321	0.80	0.40	0.00	1.00
Risky assets	1321	0.15	0.35	0.00	1.00
Non-risky assets	1321	0.05	0.23	0.00	1.00
Has loan	1337	0.18	0.38	0.00	1.00
Risk averse	1333	7.77	2.84	0.00	10.00
High time preference	1330	4.97	2.98	0.00	10.00
Budget control	1336	6.94	2.54	0.00	10.00
Panel D. Economic knowledge					
Economic interest	1337	0.65	0.48	0.00	1.00

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