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Who's asking? Interviewer effects on unit non-response in the Household Finance and Consumption Survey

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Contents

Abstract

This study examines interviewer effects on household non-response in the three waves of the Household Finance and Consumption Survey (HFCS) in Austria. We exploit the rare opportunity to combine this wealth survey data, accompanied by a large set of paradata on all households including non-respondents, with two other sets of data, namely (i) an administrative dataset on income and (ii) a survey on interviewer characteristics. These characteristics include measures of the social background, income and wealth, and personality traits of the interviewers. Our multilevel benchmark model shows that the proportion of the variation in response behaviour that can be explained at the interviewer level has decreased from about one-third in the first wave of the HFCS to about 7% in the third wave. Using further specifications of our multilevel model we find that the following interviewer characteristics are positively related to household response: having a university degree, being married, being a homeowner and having a less open personality. At the same time, we find a highly significant negative relationship between survey participation and mean wage in the household's municipality.

JEL Classification: C21, C83, Y80

Keywords: unit non-response; interviewer effects; interviewer survey; HFCS

Non-technical summary

Interviewers play an important role in the data collection process. On the one hand, they can contribute to data quality. On the other hand, they can also contribute to non-response or measurement error. In face-to-face surveys especially, the interviewer is the key factor influencing the participation of a sample unit. First, the characteristics of the interviewer may determine their commitment to – and success in – finding and contacting the sample unit. Second, the actual interaction between the interviewer and the sample unit once contact is established may play a crucial role in unit non-response, the selectivity of unit non-response and the resulting selection bias.

Survey data are heavily used in economics as a source for descriptive results in social sciences and, increasingly, microeconometric analyses. However, in the majority of cases, the collection and compilation of survey data are mostly done by statisticians and survey practitioners in survey agencies, while the analyses are conducted by economists and social scientists who are (in most cases) not involved and (in many cases) not even familiar with the process of gathering the data.

This paper aims to answer two questions. First, can we find evidence of interviewer effects on non-response in the Austrian part of the Eurosystem Household Finance and Consumption Survey (HFCS)? And second, how much influence do interviewers have on the decision of households to participate in the Austrian part of the HFCS?

On the first question, we find a positive statistically significant correlation between the probability of household participation in the survey and the following interviewer characteristics: having a university degree, being married, being a homeowner and having a less open personality. In addition, at the household municipality level, we also find a statistically significant determinant of household response: there is a negative relationship between household response and mean wage in the household's municipality.

On the second question, we find that the proportion of the variation in response behaviour explained at the interviewer level decreased from one-third in the first wave to 7% in the third wave. Part of this development can be explained by the fact that HFCS interviewers become more experienced over time.

These findings show the importance of taking into account the mechanisms that produce interviewer effects in statistical analyses of survey results. In the Austrian part of the HFCS, this information is incorporated into the weight variable, which is constructed by using information relating to interviewer effects on non-response. These mechanisms are often ignored in other surveys.

1 Introduction

Survey data are heavily used in economics as a source for descriptive results in social sciences and, increasingly, microeconometric analyses. However, in the majority of cases, the collection and compilation of survey data are mostly done by statisticians and survey practitioners in survey agencies, while the analyses are conducted by economists and social scientists who are (in most cases) not involved and (in many cases) not even familiar with the process of gathering the data.

The Household Finance and Consumption Survey (HFCS) is the main source for the analysis of wealth inequality in Europe and is based on Computer Assisted Personal Interviews (CAPI). Data surveys of this kind are very attractive, as they make available a vast number of characteristics of the units of observation. However, such survey data also present various difficulties, such as the problem of non-response. Non-response can mean not responding to a specific question or it can mean not responding to a survey at all. In this analysis we focus on the latter instance, which is known as unit non-response. Non-response is especially problematic if it occurs selectively and might therefore introduce a bias into the resulting estimates. In surveys including sensitive questions such as wealth or income, the selection bias introduced by non-response might be particularly problematic. At the same time, these surveys are mostly conducted via face-to-face interviews. Although this is the most expensive way to conduct interviews, it has several advantages over other interviewing modes. As well as being able to use response cards, visual scales, etc., the interviewer can also explain things better by being physically present, which allows for a broader range of communication and interaction between the interviewer and the respondent. The face-to-face survey mode is therefore reserved for the most complex surveys (de Leeuw et al., 2008), such as the Survey of Consumer Finance (SCF) conducted by the US Federal Reserve System and the Eurosystem HFCS.

In face-to-face surveys, the interviewer is the key factor influencing the participation of a sample unit. First, the characteristics of the interviewer may determine their commitment to and success in finding and contacting the sample unit. Second, the actual interaction between the interviewer and the sample unit once contact is established may play a crucial role in unit non-response, the selectivity of unit non-response and the resulting selection bias.[1] Kreuter (2008) identifies the following four ways in which interviewers can affect respondents' answers: (1) through their mere presence by encouraging respondents to take social norms into account; (2) through their observable characteristics by affecting many stages of the answer process; (3) through their verbal and nonverbal behaviour, which is taken by respondents as reflecting (dis)approval of their answers; and (4) through their possible errors when delivering and recording answers to a question.

[1] Further types of interviewer effects discussed in the literature which are not the focus of this paper are interviewer effects on item non-response and interviewer effects on measurement, both of which can contribute to measurement error (see Blom and Korbmacher, 2013).

Understanding the interplay between interviewers and sample units which successfully leads to the participation of the sample units is therefore crucial to increasing response rates and to decreasing selectivity in non-response (Groves and Couper, 1998). As survey companies are generally confronted with decreasing cooperation on the part of sample units, these issues deserve much more attention. Understanding how interviewers and sample units interact is important not only for interviewer selection and training, for the matching of interviewers with sample units and for the monitoring and rewarding of interviewers (Kennickell, 2006b, Kennickell, 2006a, Kennickell, 2008 and Kreuter, 2008), but also for the statistical analysis of survey results. Such an analysis should take into account the mechanism that produces interviewer effects. In the Austrian part of the HFCS, for example, this information is incorporated into the weight variable, which is constructed by using information about interviewer effects on non-response (see Albacete et al., 2018). Despite the importance of understanding the interplay between interviewers and sample units, little research has been conducted into this crucial part of the data production process in the social sciences.

One strand of literature focuses on the first contact between interviewers and sample units. These studies use interviewer questionnaires and information on this initial contact to identify successful interviewer behaviour and strategies for approaching the sample units. Recent contributions include Durrant et al. (2010) and Hox and de Leeuw (2002). Another strand, which includes the contributions of Beerten (1999) and Jäckle et al. (2013), analyses how observable interviewer characteristics are related to survey response. There are also studies analysing both refusals and non-contacts together. These studies generally find a positive correlation: interviewers who have fewer refusals also have fewer non-contacts (see Pickery and Loosveldt, 2002 and O'Muircheartaigh and Campanelli, 1999).

Schaeffer et al. (2010) give a review of findings in the literature about interviewers and interviewing, including findings about interviewer effects on non-response. In general, the effects of observable interviewer characteristics such as gender or age on response rates are found to be statistically significant: response rates are higher among female interviewers (O'Muircheartaigh and Campanelli, 1999 and Hox and de Leeuw, 2002) and among older interviewers (Kennickell, 1999, O'Muircheartaigh and Campanelli, 1999, Hox and de Leeuw, 2002, Merkle and Edelman, 2002 and Singer et al., 1983). However, the effects of some other observable characteristics are either inconclusive, e.g. in the case of voice (Schaeffer et al., 2010), or insignificant, e.g. in the case of race (Merkle and Edelman, 2002 and Singer et al., 1983).

In addition, the effects of unobservable interviewer characteristics such as experience, knowledge and having positive attitudes towards persuasion strategies are found to be positively related to response rates (see Schaeffer et al., 2010). However, personality measures are found to have no strong effects (see Groves and Couper, 1998).

Finally, some aspects of the interviewer-respondent interaction that takes place during the short time between the interview introduction and the respondent's decision on whether to participate are also found to be important in the literature. For example, allowing the interviewers to improvise during the interview introduction instead of

reading a script increases response rates (see Houtkoop-Steenstra and van den Bergh, 2000 and Morton-Williams, 1993). Further important techniques are found to be “tailoring” and “maintaining interaction” (see Schaeffer et al., 2010), which are defined by Cialdini et al. (1992) as ”the use of different dress, physical behaviours, words and strategies of persuasion for different respondents” and ”specific interviewer behaviours that might reduce the likelihood of respondents ending the discussion prematurely”. Kennickell (1999) finds evidence suggesting that such techniques decrease the probability of a respondent refusing to participate in the SCF. For a more extensive review of the literature, see Schaeffer et al. (2010) and Jäckle et al. (2013).

Our study mainly contributes to the existing literature by drawing on a rare combination of three data sources. The first is a large-scale household survey on a sensitive topic, namely wealth, with selective non-response measured by including a large set of paradata available for all sampled units and not only for respondents. The second source is administrative regional data on income. The third is a detailed interviewer survey including interviewer characteristics and personality traits. The combination of these three datasets allows us to use multilevel modelling to identify the amount of variation in response behaviour explained at the interviewer level. It also allows us to analyse the effect of interviewer characteristics and personality traits on response behaviour while controlling for other important determinants which are neither interviewer nor sample unit characteristics but paradata which proxy the social environment of the sample unit, both for participating and non-participating sample units. The social environment is found to be a major determinant of the decision to participate and is therefore a crucial control in analyses of interviewer effects (see Groves and Couper, 1998 and Beerten, 1999).

We structure the paper as follows. Section 2.1 provides theoretical reasoning on the determinants of non-response and on the hypotheses about the interviewer effects we test. Section 2.2 describes our survey data, interviewer data and other data. It is followed by a description of the empirical estimation strategy in Section 2.3. Section 3 presents the main results, while Section 4 provides a conclusion.

2 Study design

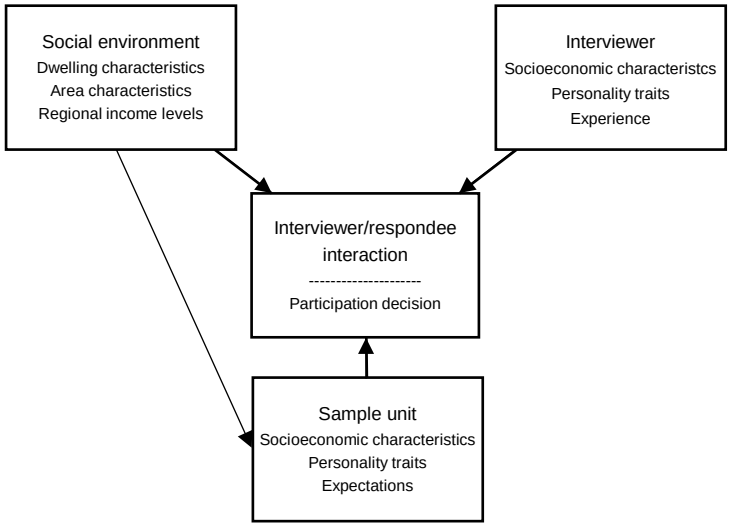
2.1 Theoretical considerations

In this section we lay out some theoretical foundations for the hypotheses that are tested in the empirical section of the paper.

Chart 1 shows a conceptual framework of the decision on whether or not to participate in a survey. The resulting unit non-response is what we analyse. The intention of the work is to provide a better understanding of this decision and its interplay with various factors in order to reach a potential improvement for future surveys. Overall, there are three factors relevant for the sample unit's participation in the survey: the interviewer; the social environment in which the interview with the sample unit is to take place; and the sample unit characteristics, which may themselves be shaped by the social environment. This is depicted in Chart 1, where the boxes depicting these three factors are connected to the box depicting the interviewer/respondee interaction (and in turn the participation decision) by arrows indicating the direction of influence. So, for example, the interviewer cannot select the sample unit and thus cannot influence the characteristics of this sample unit, and accordingly there is no error connection. However, the social environment might influence both the interaction between interviewer and sample unit, on the one hand, and the sample unit itself on the other.

Chart 1

Conceptual framework for survey participation



Source: Adapted from Jäckle et al. (2013).

At the level of the social environment, we look at a whole range of information that might influence the decision to participate. For example, it is well known from the literature that people whose characteristics are similar, for instance those who have similar levels of income, commonly live relatively close together, and more affluent sample units (in terms of income) are less likely to participate in a survey. We therefore

consider various social factors at the level of the dwelling, the area and the region, which might influence – both directly and indirectly – the interaction between the interviewer and the sample unit.

At the interviewer level, it is widely recognised that interviewer characteristics, personality traits and experience influence interviewer skills and behaviour, which have a decisive influence on the interaction between the interviewer and the sample unit. Interviewer selection and training play a crucial role in controlling the factors at the interviewer level (Groves and Couper, 1998). In the field of psychology, five personality traits are defined (see McCrae and John, 1992 for an introduction) which we also consider here to additionally influence the decision to participate. These five qualities – known as "the big five" – are openness to experience, conscientiousness, extraversion, agreeableness and neuroticism.

Finally, at the level of the sample unit, we not only observe the participation decision but also think about other social and personal characteristics that influence readiness to participate in a survey.

Our main goal is to quantify the influence of the interviewer on the participation decision, controlling for the social environment. To this end, it is important to observe both respondents and non-respondents. Our secondary goal is to better understand which interviewer characteristics might play a role in the process and, more specifically, whether experience and personality traits measured by the big five might have an influence.

Overall, this understanding is likely to help improve survey participation in general and to enhance the training and information provided to the interviewer. The ultimate goal is to match the "right" interviewer with a respondent and thus maximise the quality of the interaction between interviewer and sample unit. By doing so, we aim to increase the overall quality of surveys and to address one of the major issues in conducting interviews.

2.2 Data

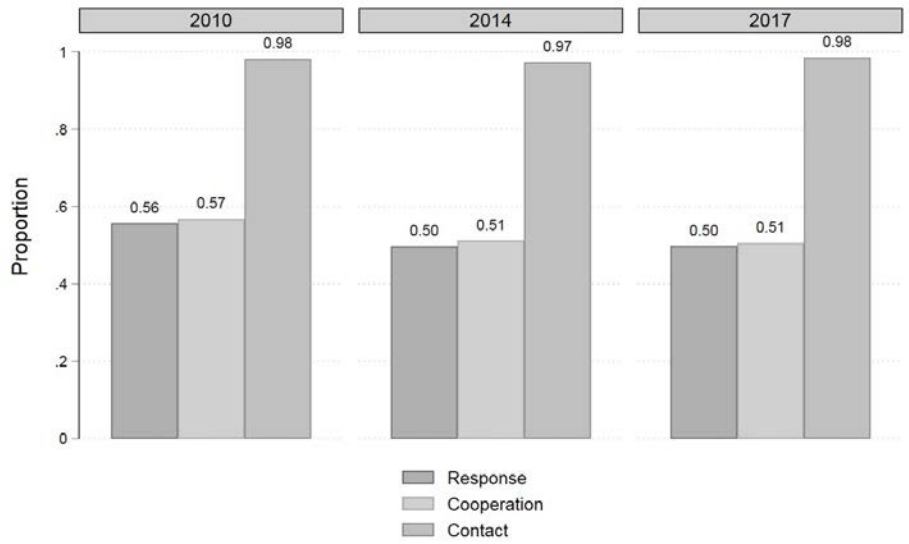
In this section we describe the various sources of data that underlie our investigation. First we introduce each of four different types of data (the survey, the paradata, the administrative data and the interviewer data) and then we provide some descriptive statistics for each. One contribution made by this paper lies in the importance and subject of the underlying data. We use the largest survey in Europe concerning wealth – a sensitive topic. In addition to the information about the household and the interviewer obtained from the survey, we are able to introduce administrative information at the regional level.

2.2.1 Household Finance and Consumption Survey

We use data generated in the Austrian part of the HFCS. To date, three waves of the survey have been carried out: one in 2010 (Albacete et al., 2012 and Fessler et al., 2012), one in 2014 (Albacete et al., 2016 and Fessler et al., 2016) and one in 2017 (Albacete et al., 2018 and Fessler et al., 2018). All three waves are available and are based on repeated cross-sections. The Austrian part of the HFCS uses stratified two-stage cluster sampling. The gross sample size in the first wave is 4,436 with a response rate of around 56%, while in the second wave it is 6,308 with a response rate of around 50%, and in the third wave it is 6,280 with a response rate of around 50% (see Chart 2).[2] The number of interviewers employed in the HFCS has decreased over the waves: 85 were employed during the first wave, 72 during the second wave and 70 during the third wave. All interviewers were specially trained before the start of the fieldwork. The training consisted of an all-day interactive workshop which took place in different Austrian cities but with the same teachers each time.

Chart 2

Response behaviour indicators of households in each wave



Sources: HFCS Austria 2010, 2014 and 2017, Oesterreichische Nationalbank.
Note: This graph shows the proportion of households in the gross sample of each HFCS wave which participated in the survey (response), the proportion of those which were contacted by the interviewer (contact) and the proportion of those which cooperated with the interviewer when contacted (cooperation).

The assignment of households to the interviewers was not random but instead followed mainly regional criteria: households living in a certain federal state (Bundesland) tended to be interviewed by interviewers living in the same region, thus

[2] The response rate is not defined for cases that were classified as ineligible because they were not part of the target population, examples being addresses of companies, empty buildings or second homes of households that could be reached via their main residence address. The number of ineligible cases was 163 in the first wave, 284 in the second wave and 112 in the third wave.

reducing costs by ensuring smaller distances between households and interviewers.[3] Chart 3 plots for each household the Bundesland where the household lives and the region where the interviewer assigned to this household lives.[4] In most cases, both regions coincide or are at least neighbouring regions. This is relevant when choosing the model for estimating interviewer effects (see Section 2.3).

Chart 3

Bundesland of households and their interviewers in each wave

Sources: HFCS Austria 2010, 2014 and 2017, Oesterreichische Nationalbank; Survey of Interviewers 2010, 2014 and 2017, Oesterreichische Nationalbank.
Notes: This graph relates the federal state of each household in the HFCS gross sample to the federal state of the corresponding interviewer assigned to this household. The abbreviations stand for Vorarlberg (V), Tirol (T), Salzburg (Sa), Upper Austria (O), Carinthia (K),Styria (St), Burgenland (B), Lower Austria (N), Vienna (W) and foreign country, i.e. Germany, (F). As the data of this graph are categorical, and many of the points would be on top of each other, making it impossible to tell whether the plotted point represented one or 1,000 observations, spherical random noise has been added to the data in order to produce this graph and to avoid overprinting of the plotted points.

In addition, Chart 4 shows that the distribution of the number of households per interviewer has shifted to the right over the waves, a consequence of the larger gross sample and smaller number of interviewers. While the mean number of households per interviewer was 50 during the first wave, it increased to 84 during the second wave and even further to 88 during the third wave; and while the minimum number of

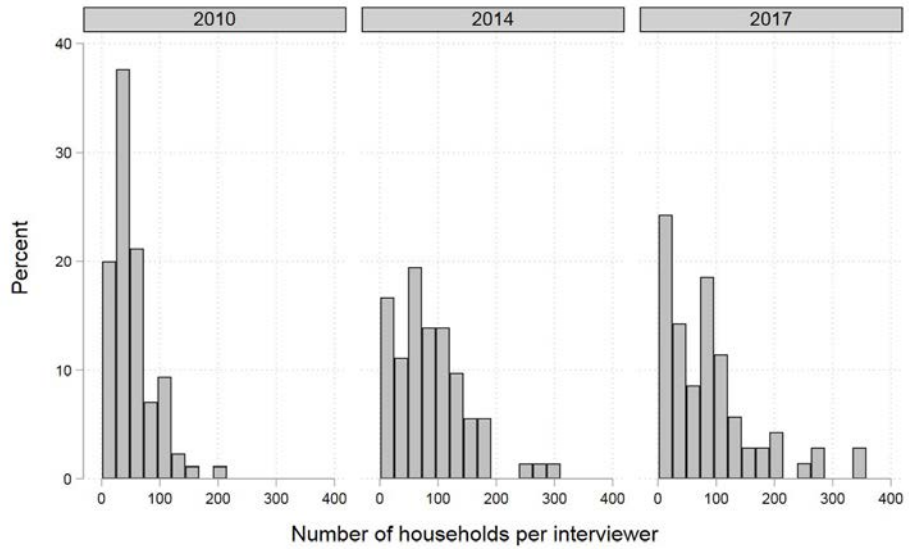
[3] Interviewers were assigned randomly chosen households within a single region. Thus, interviewers had no influence over the characteristics of households apart from the geographical information. In particular, the possibility for the interviewer to select "easy" households was excluded from the outset owing to (1) the decision to exclude subsequent selections (substitute households), thus incentivising interviewers to use the strictly limited address material as efficiently as possible; (2) a performance-related payment system and the relatively high effort that was required from interviewers to participate in the survey in the first place; (3) the advice to area managers to avoid allocating new households to interviewers before they had made a sufficient effort to survey the households they were assigned at the time; and (4) continuous post-interview expert analysis of the datasets for households actually interviewed and of those for households that refused to participate on a case-by-case basis, making it possible to assess and optimise the success of interviewers in convincing households to participate (see Albacete et al., 2018 for more details). There were only a few rare cases (less than 10% of the households) where a household was reassigned to a different interviewer from the original one. The main reasons were unexpected interviewer dropouts due to illness or accident, recontacting of households that were difficult to reach or whose cooperation was difficult to achieve, and redistribution of interviewer workload towards interviewers with free capacity.

[4] There are very few interviewers from the region bordering Germany – denoted as F – who conduct interviews in Austria.

households per interviewer was 1 during the first and third waves and 4 during the second wave, the maximum was 205 during the first wave, 296 during the second wave and 358 during the third wave.[5]

Chart 4

Number of households per interviewer in each wave



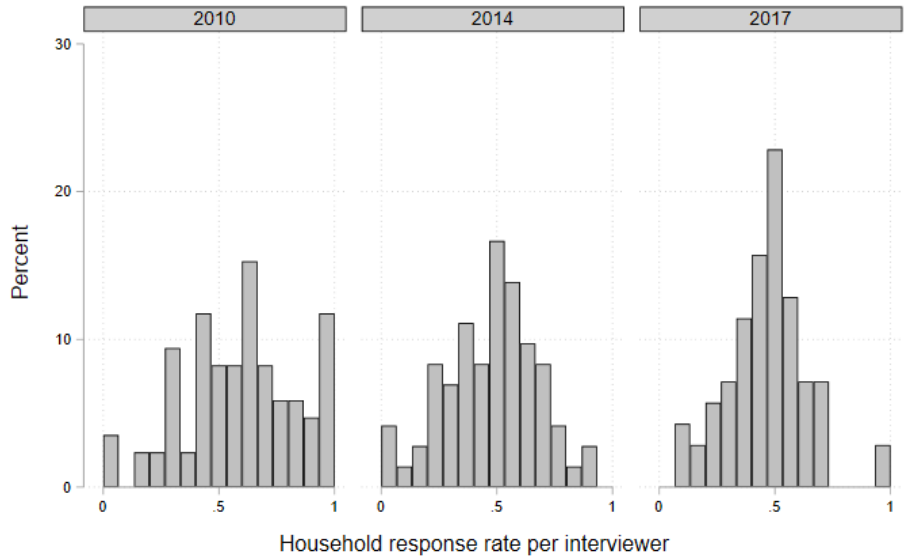
Sources: HFCS Austria 2010, 2014 and 2017, Oesterreichische Nationalbank.
Note: This graph shows the distribution of the number of households per interviewer across HFCS waves.

Finally, Chart 5 shows the distributions of response rates of households per interviewer across waves. The dispersion of response rates seems to have decreased over time. This suggests that performance has become less dependent on the individual interviewer. Interviewers' level of experience, their greater experience with this particular survey and improvements in interviewer training might have had an impact here, with performance in terms of unit non-response becoming less diverse as a result.

[5] There are several possible explanations for an interviewer having a very low number of assigned households. For example, the interviewer may have stopped owing to an unexpected illness or accident, or the interviewer may have been withdrawn by the survey administrators if the quality criteria had not been met.

Chart 5

Response rate of households per interviewer in each wave



Sources: HFCS Austria 2010, 2014 and 2017, Oesterreichische Nationalbank.
Note: This graph shows the distribution of response rates of households per interviewer across HFCS waves.

In addition to the HFCS data, we use the further information available for each HFCS wave, which includes paradata information on both respondents and non-respondents (Section 2.2.2), and match our data with regional administrative data on income (Section 2.2.3).

We also use a detailed interviewer survey available for each HFCS wave. This survey covers the socioeconomic characteristics of the interviewers and the big five personality traits (Section 2.2.4).

2.2.2 Survey paradata

The HFCS Austria includes many different types of paradata (Albacete and Schürz, 2014). Owing to anonymisation requirements, this information is only available internally. Table 1 shows a list of those paradata variables available in each wave for the HFCS gross sample, i.e. for both respondents and non-respondents. The paradata variables include, for instance, those obtained before the interview, when interviewers were required to collect background information about the households to be interviewed – including those households that ultimately did not participate in the survey. This background information consisted of the interviewer's assessment of the building and construction type, the geographical location (urban or rural area), the condition of the building, the residential area and special security measures. It was possible to obtain this information without actually entering a household's residence or completing an interview.

Another type of paradata available in each wave for the HFCS gross sample is based on sample design information, such as NUTS-3 region, municipality size class or

enumeration district of the household's main residence. Finally, information on contact attempts is also available, as it was collected by the interviewers for each interview. This information includes, for instance, the date, time, type (e.g. personal or telephone) and outcome (e.g. complete interview or ineligible address) of each contact attempt.

Table 1

Paradata for respondents and non-respondents in the HFCS Austria

Type of paradata	Details
Contact form	Number of contact attempts Type, date, time and outcome of each contact attempt
Sample design variables	NUTS-3 region, municipality size class, enumeration district
Interviewer assessments	Building Construction type of the building Geographical location of the building Condition of the building Condition of the building compared to other buildings in the neighbourhood Residential area Special security measures

Sources: HFCS Austria 2010, 2014 and 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the paradata variables of the HFCS Austria that are available for both respondents and non-respondents.

Descriptive statistics of the paradata variables in each HFCS wave can be found in the appendix (see Tables A.1 to A.6). In general, these statistics also reflect the changes that took place over the waves regarding the oversampling of households in urban areas: while in the first wave oversampling was done just for households living in Vienna, in the second and third waves oversampling was done for all households living in urban areas. Therefore, while only 40% of the households were in a municipality with at least 50,000 inhabitants according to the gross sample in the first wave (see Table A.2, "50 001 to 1m Inhabitants" and "More than 1m Inhabitants"), this proportion increases to 47% in the gross sample for the third wave (see Table A.6).

2.2.3 Administrative data

We also use an income database that is based on wage tax data (Lohnsteuerstatistik) for all Austrian municipalities, including the 23 districts of Vienna for the year 2011. This database includes the mean, median and 90th percentile of income taxpayers' gross wages (leaving out the self-employed), which are defined as all income received in a year including supplementary payments and social security contributions. The dataset can be linked to the HFCS dataset via the municipality ID. See Moser and Schnetzer (2014) for a detailed description of the data.

2.2.4 Interviewer survey

Each wave of the HFCS in Austria also entails the systematic collection of information on the interviewers involved (Albacete and Schürz, 2013). Just as in the case of the survey paradata described above, owing to anonymisation requirements this

information is not included in the user database. Table 2 shows a list of the interviewer data variables. The information provided by the interviewers on a voluntary basis includes socio-economic information (age, gender, education, region), employment status including work experience as an interviewer, personality-related indicators and the interviewer's financial situation. The number of interviewers that participated in the Survey of Interviewers during the first HFCS wave was 72 out of 85, while during the second wave it was 55 out of 72, and during the third wave 70 out of 70.[6] Despite unit non-response in the first and second waves of the Survey of Interviewers, there are still a few core variables provided by the survey company that are observed for all interviewers, including those not participating in the survey. Both the high interviewer response rates and the robustness of the main results to the restriction of interviewer regressors to the set of core variables observed for all interviewers (see Section 3) suggest that interviewer unit non-response had a low impact on the results of the Survey of Interviewers.

Table 2

Interviewer data in the HFCS Austria

Type of interviewer data	Details
Socio-demographic characteristics	Gender, age, region, migration background, marital status, education, parental education
Socio-economic characteristics	Real estate ownership, employment, occupation, experience as an interviewer, experience with similar surveys, income, wealth
Assessments	Trust, big five psychological profile (25-question battery), opinions on redistribution of income and wealth

Sources: Survey of Interviewers 2010, 2014 and 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the interviewer variables of the Survey of Interviewers.

Apart from unit non-response, there is also a degree of item non-response, i.e. some interviewers not answering on certain variables. This has to be taken into account in the further analysis. Therefore, in the regressions we interact each regressor containing missing values with a dummy variable indicating whether or not the observation of the regressor is missing. In the case of the interviewer income and net wealth variables, if information about bounds was provided by the interviewer, we impute the mean between the lower and upper bound (if both bounds were provided) or we impute either the lower or the upper bound (if only one bound was provided). For these reasons, the impact of interviewer item non-response on the results of the Survey of Interviewers should also be limited.

Descriptive statistics of the interviewer variables in each wave can be found in the appendix (Tables A.7 to A.12). A comparison of the interviewer characteristics across waves shows that the average experience of HFCS interviewers ("Int experience in months") has increased over the waves: while the mean number of months working as an interviewer was 83 among interviewers in the first wave (Table A.7), this number increases to 96 among interviewers in the third wave (Table A.11). This is despite a decrease in mean age. In addition, on average, interviewers in the third wave are less open to experience ("Int openness to experience points") but more agreeable ("Int

[6] During the third wave of the HFCS, the strategy for contacting interviewers to take part in the Survey of Interviewers was different from that used in the previous waves: interviewers were no longer asked during the field phase to participate in the survey but were instead asked at the end of the interviewer training workshop. This change of strategy helped to increase the interviewer participation rate.

agreeableness points") and conscientious ("Int conscientiousness points") in terms of the big five personality traits, which means that they are less inventive/curious but more friendly/compassionate and efficient/organised (Gerlitz and Schupp, 2005). Finally, the proportion of female interviewers has significantly increased overall, up from 49% in the first wave (Table A.8) to 64% in the second wave (Table A.10) and 59% in the third wave (Table A.12).

2.3 Estimation strategy

As mentioned before, our main goals are (1) to identify the amount of variation in household response behaviour explained at the interviewer level and (2) to analyse the effect of interviewer characteristics and personality traits on household response behaviour.

In this framework, the use of standard regression models is not appropriate, as the assumption of independence of all observations is violated by the fact that observations from the same interviewer are generally more similar to each other than observations from different interviewers – for example, because of the use of regional criteria in the assignment of households to the interviewers (see Section 2.2). Therefore, we use multilevel regression models (see Hox, 1994 for details; we employ the same notation).

In contrast to the standard logistic regression model we assume that each interviewer j has a different intercept coefficient β_{0j}:[7]

$$Y_{ij}^{*} = \beta_{0j} + \beta_{p} X_{pij} + e_{ij} \tag{1}$$

where $X_{p_{ij}}$ are P explanatory variables $(p = 1 \ldots P)$ at the respondent level and e_{ij} is assumed to have a standard logistic distribution with mean zero and variance $\sigma_e^2 = \frac{\pi^2}{3}$. The binary responses Y_{ij} are determined via the usual threshold model:

$$Y_{ij} = \begin{cases} 1 & if\ Y_{ij}^{*} > 0 \\ 0 & otherwise \end{cases} \tag{2}$$

Furthermore, we explain the variation of the intercept coefficient by:

$$\beta_{0j} = \gamma_{00} + \gamma_{0q} Z_{qj} + u_{0j} \tag{3}$$

where Z_{qj} are Q explanatory variables $(q = 1 \ldots Q)$ at the interviewer level and u_{0j} is assumed to have a normal distribution with mean zero and variance ${\sigma_{u_0}}^2$. After substituting 3 into 1 we obtain a single complex regression equation ("random-intercept model") with a fixed and a random part:

[7] The slope coefficient β_p is assumed to be the same for each interviewer j.

$$Y_{ij}^{*} = \left[\gamma_{00} + \gamma_{0q} Z_{qj} + \beta_{p} X_{pij}\right] + \left[u_{0j} + e_{ij}\right] \quad (4)$$

with u_{0j} being assumed to be independent from e_{ij}.

This model can also be used to produce an estimate to express the extent to which observations depend on interviewers (goal 1 from above). It indicates the proportion of the variance explained by the interviewer grouping structure and is called the intraclass correlation coefficient:

$$p = \frac{\sigma_{u0}^{2}}{\sigma_{u0}^{2} + \frac{\pi^{2}}{3}} \quad (5)$$

3 Results

Some descriptive statistics of the mean response rates of households across interviewer and household characteristics can be found in the appendix (see Tables A.13 to A.18) and are not discussed in this paper.

We estimate a two-level random-intercept logistic regression model (see Section 2.3) to explain household response depending on various specifications for explanatory variables at respondent and interviewer level.[8] We use a total of nine different specifications to investigate different aspects of interviewer effects. These are as follows.

Specification 1: only the constant, no variables

Specification 2: specification 1 plus basic variables at the respondent level (dwelling type, dwelling location, dwelling surrounding, state, municipality size and mean municipality wage)

Specification 3: specification 2 plus basic variables at the interviewer level (gender, age, state, education, experience in months as an interviewer, experience with similar surveys)

Specification 4a: specification 3 plus further variables at the interviewer level describing the labour status

Specification 4b: specification 3 plus further variables at the interviewer level describing the marital status

Specification 4c: specification 3 plus further variables at the interviewer level describing the migration background

Specification 4d: specification 3 plus further variables at the interviewer level describing the homeownership status

Specification 4e: specification 3 plus further variables at the interviewer level describing the personality (trust and big five personality traits)

Specification 4f: specification 3 plus further variables at the interviewer level describing the economic resources (interviewer's household income and net wealth)

Tables A.19 to A.21 in the appendix show the estimation results of these regression models for each wave, while Table 3 shows them for a sample where the three waves have been pooled in order to improve the identifiability of the model. The model also includes wave dummies in order to control for differences in survey vintage. Table 3 shows that some statistically significant interviewer effects exist. For example, homeownership by the interviewer ("Int not homeowner") has a positive effect on

[8] Please note that although one of our explanatory variables (regional income from the income database) is measured at a third level (namely the level of municipality), we employ it in our model as a respondent-level explanatory variable, as we want to focus on the interviewer and respondent levels.

mean household response propensity at the 5% significance level. Similarly, mean response propensity increases at the 5% significance level when interviewers are married ("Int not married"). In addition, having a university degree ("Upper/Post Secondary") results in increased propensity to obtain a household response at the 5% significance level compared with having only a secondary degree. We also find that interviewer personality has a positive effect on household response at the 10% significance level for interviewers who are less open to experience ("Int openness points"). According to McCrae and Costa (1997), these are individuals who are pragmatic, unemotional and conservative. No statistically significant effects at the 10% significance level can be found for interviewer age, gender or experience (at most, such effects may be found in certain waves). However, another experience measure which is a respondent-level variable is found to be statistically significant at the 5% level. This measure is the continuous sequential number of the interview conducted within each interviewer ("Hh interview order"). An interviewer's first completed interview is assigned the value "1", their second completed interview is assigned the value "2", and so on. We find that the higher the experience over the course of the interviewing field period, the higher the response propensities of the households.

The social environment of the household is found to have highly statistically significant effects on the propensity to respond. Table 3 shows that a higher mean wage in the household's municipality ("Mun mean wage") decreases household response propensity at the 1% significance level. Other factors that are negatively related to household response propensity are where the household's dwelling type is an individual house instead of an apartment, or where the household's dwelling is located in a town or city rather than in the countryside (both at the 1% significance level).

Table 3

Random-intercept logistic regression estimation of household response (all waves)

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Response									
Survey Vintage=2014	-.6***	-.561***	-.477***	-.469**	-.439***	-.464***	-.416***	-.477***	-.408***
Survey Vintage=2017	-.669***	-.584***	-.724***	-.758***	-.715***	-.703***	-.67***	-.783***	-.744***
Hh dwelling type (Ref: apartment):									
Individual house		-.225***	-.226***	-.227***	-.226***	-.226***	-.226***	-.226***	-.224***
Semi-detached house		-.145*	-.148**	-.149**	-.148**	-.148**	-.15**	-.149**	-.147**
Other		.283	.277	.276	.276	.277	.278	.266	.279
Hh dwelling location (Ref: countryside):									
Downtown		-.233***	-.228***	-.229***	-.228***	-.229***	-.226***	-.228***	-.23***
In between		.129**	.139**	.139**	.139**	.138**	.142**	.139**	.138**
Town outskirts		-.0085	-.0032	-.0021	-.0012	-.0035	-.0024	-.0029	-.0033
Hh surrounding rating (Ref: Mid-range):									
Luxury		.65***	.656***	.657***	.653***	.656***	.658***	.654***	.653***
Upscale		.298***	.301***	.3***	.3***	.301***	.302***	.302***	.3***
Modest		.0201	.0266	.0274	.026	.0274	.0265	.026	.0292
Low-income		.37**	.372**	.372**	.379**	.373**	.376**	.368**	.374**
Very low-income		-.527	-.537	-.534	-.531	-.538	-.532	-.548	-.545
Hh interview order		9.8e-04**	9.5e-04**	9.6e-04**	9.6e-04**	9.5e-04**	9.6e-04**	9.4e-04**	9.5e-04**
Hh state (Ref: Vienna):									
Vorarlberg		1.33***	1.56***	1.55***	1.57***	1.56***	1.55***	1.53***	1.55***
Tyrol		.718***	.694***	.691***	.7***	.693***	.691***	.691***	.693***
Salzburg		.605***	.534***	.536***	.541***	.538***	.536***	.528***	.541***
Upper Austria		.868***	.85***	.847***	.849***	.853***	.848***	.847***	.856***
Carinthia		1.18***	1.37***	1.37***	1.36***	1.37***	1.36***	1.36***	1.37***
Styria		1.15***	1.17***	1.17***	1.16***	1.17***	1.15***	1.13***	1.16***
Burgenland		1.11***	1.14***	1.15***	1.13***	1.15***	1.12***	1.12***	1.14***
Lower Austria		.977***	1.1***	1.1***	1.09***	1.1***	1.1***	1.1***	1.1***
Hh municipality size (Ref: <2thsd):									
2-3thsd		.0834	.0805	.0814	.0819	.0805	.0794	.0786	.0823
3-5thsd		.0205	.0101	.0118	.0108	.0103	.0102	.0106	.0127
5-10thsd		.0393	.0468	.0485	.0469	.0479	.0459	.0466	.0485
10-20thsd		.27***	.269***	.271***	.272***	.269***	.27***	.269***	.273***
20-50thsd		.425***	.444***	.444***	.44***	.444***	.443***	.427***	.448***
50thsd-1mill		.0106	.0171	.0195	.0144	.0167	.0164	.0227	.0206
>1mill		0	0	0	0	0	0	0	0
Mun mean wage		-2.0e-05***	-2.0e-05***	-2.0e-05***	-2.0e-05***	-2.0e-05***	-2.0e-05***	-2.0e-05***	-2.0e-05***
Int female			-.0916	-.0959	-.0899	-.1	-.0988	-.0961	-.0992
Int age			.013	.0183	.0025	.01	.0107	.0213	.0047
Int age × Int age			-8.1e-05	-8.4e-05	3.2e-05	-5.1e-05	-5.9e-05	-1.3e-04	2.5e-05
Int state (Ref: Vienna):									
Vorarlberg			-.736**	-.691*	-.823**	-.738**	-.784**	-.715*	-.741**
Tyrol			.0075	.0372	-.058	.0634	-.0331	-.0643	.0066
Salzburg			.296	.198	.257	.305	.236	.407	.303
Upper Austria			-.19	-.209	-.199	-.168	-.223	-.28	-.166
Carinthia			-.533*	-.514*	-.581*	-.496	-.607**	-.649**	-.503*
Styria			-.223	-.167	-.3	-.203	-.315	-.326	-.19
Burgenland			-.0667	-.0042	-.116	-.0206	-.132	-.081	4.1e-04
Lower Austria			-.648***	-.603***	-.65***	-.622***	-.717***	-.649***	-.653***

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Foreign country			.624	.736	.708	.674	.558	.57	.721
Int education (Ref: University):									
Primary School			.263	.264	.151	.296	.292	.243	.189
Vocational School/Apprenticeship			-.201	-.205	-.282	-.191	-.199	-.237	-.196
Upper/Post Secondary			-.369**	-.405**	-.388**	-.348*	-.317*	-.311*	-.374**
Missing			-.914***	-.86***	-1.17***	-1.09**	-1.13***	-1.14***	-1.47***
Int experience not miss			.369	.302	.534	.306	.557	.192	.166
Int experience			4.2e-04	2.9e-04	4.9e-04	4.1e-04	2.7e-04	5.9e-04	2.7e-04
Int no exp with similar surveys			.222	.16	.269	.204	.26	.275	.203
Int exp sim surveys miss			0	0	0	0	0	0	0
Int labour status (Ref: Employee):									
Self-employed				-.0976					
Unemployed				.0209					
Retired				-.236					
Other				.713					
Missing				-.111					
Int not married					-.308**				
Int marital stat miss					.0656				
Int not migrant						-.107			
Int migrant stat miss						.108			
Int not homeowner							-.28**		
Int homeowner stat miss							.131		
Int trust								.11	
Int trust miss								.396	
Int neuroticism not miss								-.412	
Int neuroticism points								-.0073	
Int extraversion not miss								.0768	
Int extraversion points								.0156	
Int openness not miss								.946*	
Int openness points								-.0262*	
Int agreeableness not miss								-.172	
Int agreeableness points								.0281	
Int conscientiousness not miss								-.068	
Int conscientiousness points								.0109	
Int hh income not miss									.0158
Int hh income									3.4e-05
Int hh net wealth not miss									-.699**
Int hh net wealth									6.8e-08
Constant	.476***	.0077	-.31	-.413	-.08	-.145	-.364	-.518	.538
/									
var(_cons[ahr1700])	.823***	.736***	.594***	.586***	.571***	.593***	.576***	.549***	.552***
icc2	.2	.183	.153	.151	.148	.153	.149	.143	.144
ll	-10656	-10446	-10426	-10424	-10423	-10426	-10424	-10419	-10420
bic	21350	21203	21347	21392	21361	21366	21362	21450	21374
N	16465	16465	16465	16465	16465	16465	16465	16465	16465

Sources: HFCS Austria 2010, 2014 and 2017, Survey of Interviewers 2010, 2014 and 2017, Oesterreichische Nationalbank (data not publicly available), Lohnsteuerstatistik 2011.
Notes: This table shows the regression and intraclass correlation coefficient estimates of running a random-intercept logistic regression of household response.
* p<0.10, ** p<0.05, *** p<0.01.

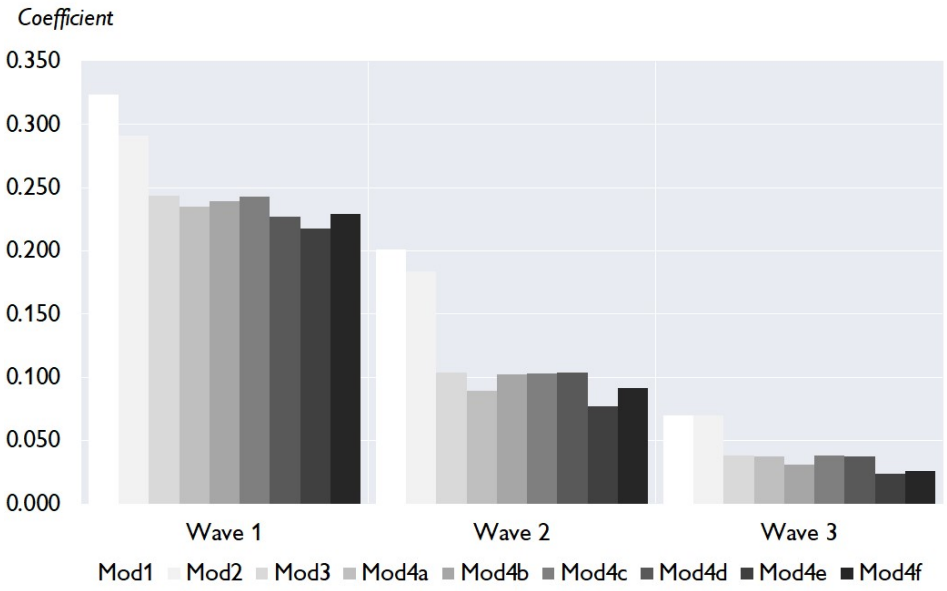
Table 3 also shows the estimates of the intraclass correlation coefficient, a measure of the dependence of household observations on the interviewers (see Section 2.3). It can be estimated with the help of the estimation results of the regression model and explains how much of the variance in household response can be explained by the interviewer grouping structure in the household sample, lying between 0 (no dependence) and 1 (complete dependence). When using the sample where the three waves have been pooled together, this coefficient shows some degree of interviewer

dependence in all specifications (see Table 3). In specification 1, without controlling for any explanatory variables, the interviewer grouping structure explains one-fifth of the variance in household response. The more variables are used to explain household response, the more the intraclass correlation coefficient decreases: for example, when controlling several interviewer variables in specification 4e, the remaining proportion of interviewer variance in household response which is not explained by the model amounts to 0.143.

The intraclass correlation coefficient estimate ("icc2") decreases over the waves, going from 0.324 in the first wave to 0.201 in the second wave and finally to only 0.0696 in the third wave (see Chart 6 and Tables A.19 to A.21 in the appendix). This means that the weight of the interviewer grouping structure in the sample as a factor explaining variance in household response has decreased quite strongly in each wave.

Chart 6

Intraclass correlation coefficient estimate across model specifications in each wave



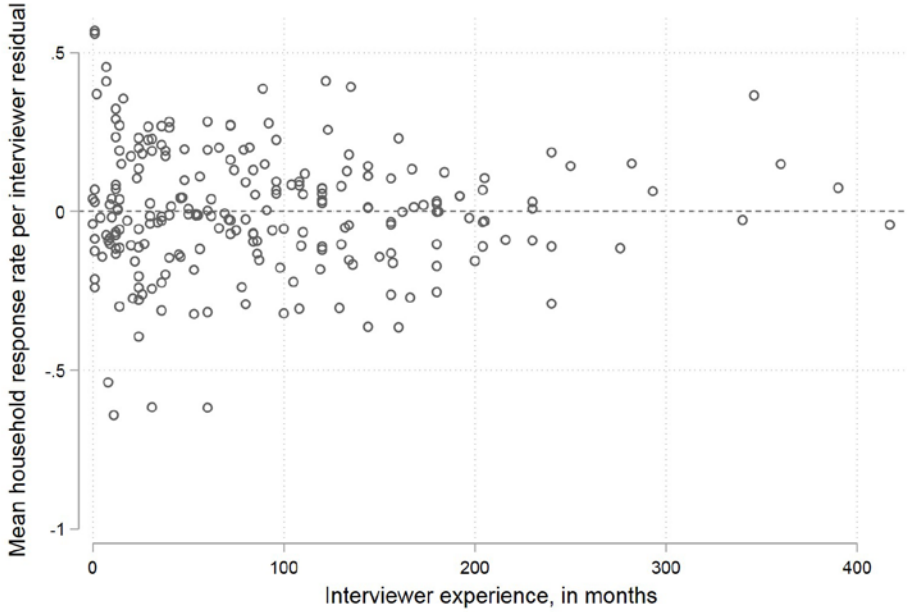
Sources: HFCS Austria 2010, 2014 and 2017, Survey of Interviewers 2010, 2014 and 2017, Oesterreichische Nationalbank (data not publicly available).
Notes: This graph shows the intraclass correlation coefficient estimated with the help of the multilevel regression model for each specification and for each wave. The coefficient explains how much of the variance in household response can be explained by the interviewer grouping structure in the household sample and lies between 0 (no dependence) and 1 (complete dependence).

Given that the survey administration, the interviewer training and even the sample design remained stable over the waves, a possible explanation could be that an increase in the experience of interviewers was observed over the waves as mentioned in Section 2.2. The variance for low-experience interviewers may be greater than that for high-experience interviewers because low-experience interviewers might choose among many more different strategies to obtain the participation of households in the survey, while high-experience interviewers might have a more homogeneous strategy that has stood the test of time to obtain household participation.

We check this hypothesis by fitting a model of mean response rate of households per interviewer on several interviewer level variables over the sample of interviewers using ordinary least squares (OLS) and by plotting the least-squares residuals against the months of experience of the interviewers. This plot is shown by Chart 7 and supports our hypothesis about a relationship between interviewer experience and the residuals: the variance for low-experience interviewers seems to be greater than that for high-experience interviewers. A likelihood ratio test for heteroscedasticity results in a $\chi^2(1)$ statistic of 21.68 and confirms that this relationship is statistically significant.[9]

Chart 7

Least-square residuals versus interviewer experience



Sources: HFCS Austria 2010, 2014 and 2017, Survey of Interviewers 2010, 2014 and 2017, Oesterreichische Nationalbank (data not publicly available).
Notes: This graph shows the least-squares residuals of a model of mean response rate of households per interviewer on several interviewer level variables against the interviewer experience in all waves.

However, there may be other, omitted factors that explain the decline over waves in the estimate of the intraclass correlation. Such an analysis goes beyond the scope of the paper and is left for future research.

[9] Note that this does not contradict the previous regression result showing no impact of experience on response rates. While interviewer experience is not found to have an impact on the mean response rate (Table 3), it is found to have an impact on the variance of the response rate (Chart 7).

4 Conclusion

Our multilevel benchmark model shows that the proportion of the variation in response behaviour that can be explained at the interviewer level decreased from about one-third in the first wave of the wealth survey to about 7% in the third wave. This result seems to be related to the increase in interviewers' level of experience observed over the waves: the variance for low-experience interviewers may be greater than that for high-experience interviewers because low-experience interviewers might choose among many more different strategies to obtain the participation of households in the survey, while high-experience interviewers might have a more homogeneous strategy that has stood the test of time to obtain household participation.

Interviewer characteristics found to be positively related to household response are as follows: having a university degree, being married, being a homeowner and having a less open personality. Neither age, gender nor experience is found to have a statistically significant effect on mean household response. At the same time, regional characteristics and paradata on the dwelling location and neighbourhood are significantly related to survey participation of the sample units. Using random-intercept models, we find a highly significant negative correlation between survey participation and mean wage in the sample unit's municipality. Where a dwelling is located in a town or city (rather than in the countryside), this also decreases response propensity.

These findings show the importance of taking into account the mechanisms that produce interviewer effects in statistical analyses of survey results. In the Austrian part of the HFCS, for example, this information is incorporated into the weight variable, which is constructed by using information about interviewer effects on non-response (see Albacete et al., 2018). However, to the best of our knowledge this has not yet been applied by the other countries taking part in the HFCS. Thus, for future waves of the HFCS, we recommend that the other countries collect information on the interviewers carrying out their survey – either through the implementation of an interviewer survey or by obtaining already available administrative data via the survey company – and that they use this information when constructing the non-response and survey weights to correct for unit non-response bias.

Further possible ways of reducing ex ante interviewer effects are discussed in the literature (see Kreuter, 2008) and are as follows.

1. Interviewers and respondents could be deliberately matched in ways known to reduce bias if the biasing effect of an interaction among observable interviewer characteristics, question content and respondent characteristics is well understood. However, this may not be feasible, either because respondent characteristics may not be known in advance or because legal restrictions may prevent interviewers from being hired exclusively on the basis of observable characteristics. Therefore, random assignment of respondents to interviewers is often a good alternative.

2. Interviewer training can help to reduce the variability in interviewer behaviour (e.g. explaining the question-and-answer process to the respondent, motivating the respondent to provide high-quality answers, to read questions exactly as worded, to probe non-directively and to record answers without interpretation, paraphrasing or any additional inference about the respondent's opinion or behaviour).

3. Organisational parameters can be set in such a way that they reduce the likelihood of interviewer effects (e.g. supervising interviewers and monitoring their behaviour, designing the interviewer reward system to reward not only a high number of cases but also high quality, thus reducing the interviewer workload).

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Appendix

Table A.1

Descriptive statistics of continuous household variables (wave 1)

	Mean	Std. Dev.	Min	Max	Between Std. Dev.	Between Min	Between Max	Within Std. Dev.	Within Min	Within Max
Interview order	39.23286	33.7208	1	205	18.37229	1	103.5594	25.41192	-63.32655	140.6735
N of observations	4273									
N of interviewers	85									
N of hh per int.	50.27059									

Source: HFCS Austria 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous household variables, additionally decomposing them into between (interviewers) and within (interviewers) components.

Table A.2

Descriptive statistics of categorical household variables (wave 1)

		value	Overall Freq	Overall Percent	Between Freq	Between Percent	Within Percent
Response	no	0	1,893	44.30	78	91.76	44.71
	yes	1	2,380	55.70	82	96.47	61.13
	Total		4,273	100.00	160	188.24	53.12
type of dwelling	Individual house	1	1,728	40.44	81	95.29	47.32
	Semi detached house	2	340	7.96	71	83.53	10.41
	Flat apartment	3	2,169	50.76	82	96.47	47.09
	Other kind of dwelling	4	36	0.84	21	24.71	3.20
	Total		4,273	100.00	255	300.00	33.33
dwelling location	Downtown	1	964	22.56	66	77.65	23.46
	In between	2	842	19.71	72	84.71	24.84
	Town outskirts	3	1,018	23.82	76	89.41	24.83
	Isolated area countryside	4	1,449	33.91	76	89.41	43.11
	Total		4,273	100.00	290	341.18	29.31
dwelling - rating of surrounding buildings	Luxury	1	954	22.33	77	90.59	26.64
	Upscale	2	1,903	44.54	83	97.65	45.19
	Mid range	3	1,166	27.29	79	92.94	28.47
	Modest	4	198	4.63	50	58.82	6.61
	Low income	5	43	1.01	21	24.71	4.81
	Very low income	6	9	0.21	5	5.88	3.58
	Total		4,273	100.00	315	370.59	26.98
Household's Bundesland	Vorarlberg	1	164	3.84	6	7.06	76.56
	Tyrol	2	321	7.51	11	12.94	66.77
	Salzburg	3	248	5.80	8	9.41	74.12
	Upper Austria	4	643	15.05	14	16.47	89.32
	Carinthia	5	269	6.30	6	7.06	64.72
	Styria	6	559	13.08	20	23.53	75.82
	Burgenland	7	128	3.00	7	8.24	47.72
	Lower Austria	8	739	17.29	29	34.12	68.31
	Vienna	9	1,202	28.13	16	18.82	77.70
	Total		4,273	100.00	117	137.65	72.65
community size class	Up to 2 000 Inhabitants	2	708	16.57	56	65.88	31.92
	2 001 to 3 000 Inhabitants	3	389	9.10	37	43.53	21.62
	3 001 to 5 000 Inhabitants	4	462	10.81	53	62.35	21.66
	5 001 to 10 000 Inhabitants	5	443	10.37	46	54.12	21.66
	10 001 to 20 000 Inhabitants	6	336	7.86	40	47.06	19.14
	20 001 to 50 000 Inhabitants	7	222	5.20	23	27.06	22.68
	50 001 to 1m Inhabitants	8	511	11.96	35	41.18	35.38
	More than 1m Inhabitants	9	1,202	28.13	16	18.82	77.70
	Total		4,273	100.00	306	360.00	27.78

Source: HFCS Austria 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical household variables and decomposes them into between (interviewers) and within (interviewers) components.

Table A.3

Descriptive statistics of continuous household variables (wave 2)

	Mean	Std. Dev.	Min	Max	Between Std. Dev.	Between Min	Between Max	Within Std. Dev.	Within Min	Within Max
Interview order	65.05551	55.00219	1	206	30.86684	2.5	147.0209	42.4885	-80.96535	214.0346
N of observations	6024									
N of interviewers	72									
N of hh per int.	83.66667									

Source: HFCS Austria 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous household variables, additionally decomposing them into between (interviewers) and within (interviewers) components.

Table A.4

Descriptive statistics of categorical household variables (wave 2)

		value	Overall Freq	Overall Percent	Between Freq	Between Percent	Within Percent
Response	no	0	3,027	50.25	72	100.00	52.59
	yes	1	2,997	49.75	70	97.22	48.77
	Total		6,024	100.00	142	197.22	50.70
type	Individual house	1	1,541	25.58	64	88.89	31.99
of	Semi detached house	2	315	5.23	51	70.83	7.31
dwelling	Flat apartment	3	4,112	68.26	71	98.61	66.78
	Other kind of dwelling	4	56	0.93	14	19.44	2.78
	Total		6,024	100.00	200	277.78	36.00
dwelling	Downtown	1	1,312	21.78	65	90.28	22.73
location	In between	2	1,653	27.44	71	98.61	30.18
	Town outskirts	3	1,514	25.13	67	93.06	26.54
	Isolated area countryside	4	1,545	25.65	50	69.44	36.03
	Total		6,024	100.00	253	351.39	28.46
dwelling	Luxury	1	1,162	19.29	66	91.67	21.40
-	Upscale	2	2,747	45.60	71	98.61	45.64
rating	Mid range	3	1,783	29.60	68	94.44	31.41
of	Modest	4	276	4.58	55	76.39	5.98
surrounding	Low income	5	50	0.83	23	31.94	3.10
buildings	Very low income	6	6	0.10	4	5.56	2.69
	Total		6,024	100.00	287	398.61	25.09
Household's	Vorarlberg	1	201	3.34	5	6.94	71.74
Bundesland	Tyrol	2	440	7.30	10	13.89	63.23
	Salzburg	3	362	6.01	6	8.33	53.26
	Upper Austria	4	888	14.74	12	16.67	64.91
	Carinthia	5	388	6.44	6	8.33	90.00
	Styria	6	798	13.25	13	18.06	73.16
	Burgenland	7	160	2.66	7	9.72	55.25
	Lower Austria	8	923	15.32	21	29.17	68.60
	Vienna	9	1,864	30.94	19	26.39	94.32
	Total		6,024	100.00	99	137.50	72.73
community	Up to 2 000 Inhabitants	2	747	12.40	35	48.61	26.38
size	2 001 to 3 000 Inhabitants	3	541	8.98	31	43.06	20.33
class	3 001 to 5 000 Inhabitants	4	545	9.05	30	41.67	20.14
	5 001 to 10 000 Inhabitants	5	599	9.94	40	55.56	18.32
	10 001 to 20 000 Inhabitants	6	384	6.37	25	34.72	31.94
	20 001 to 50 000 Inhabitants	7	265	4.40	19	26.39	23.30
	50 001 to 1m Inhabitants	8	1,079	17.91	29	40.28	44.00
	More than 1m Inhabitants	9	1,864	30.94	19	26.39	94.32
	Total		6,024	100.00	228	316.67	31.58

Source: HFCS Austria 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical household variables and decomposes them into between (interviewers) and within (interviewers) components.

Table A.5

Descriptive statistics of continuous household variables (wave 3)

	Mean	Std. Dev.	Min	Max	Between Std. Dev.	Between Min	Between Max	Within Std. Dev.	Within Min	Within Max
Interview order	80.04783	72.62872	1	357	39.68846	1	177.9597	53.83522	-96.91183	259.0882
N of observations	6168									
N of interviewers	70									
N of hh per int.	88.11429									

Source: HFCS Austria 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous household variables, additionally decomposing them into between (interviewers) and within (interviewers) components.

Table A.6

Descriptive statistics of categorical household variables (wave 3)

		value	Overall Freq	Overall Percent	Between Freq	Between Percent	Within Percent
Response	no	0	3,096	50.19	68	97.14	55.09
	yes	1	3,072	49.81	70	100.00	46.48
	Total		6,168	100.00	138	197.14	50.72
type of dwelling	Individual house	1	1,956	31.71	57	81.43	35.53
	Semi detached house	2	448	7.26	48	68.57	11.57
	Flat apartment	3	3,733	60.52	70	100.00	62.75
	Other kind of dwelling	4	31	0.50	17	24.29	1.58
	Total		6,168	100.00	192	274.29	36.46
dwelling location	Downtown	1	1,656	26.85	54	77.14	39.82
	In between	2	1,463	23.72	60	85.71	31.62
	Town outskirts	3	1,286	20.85	46	65.71	25.72
	Isolated area countryside	4	1,763	28.58	45	64.29	39.33
	Total		6,168	100.00	205	292.86	34.15
dwelling - rating of surrounding buildings	Upscale to luxury	1	4,301	69.73	70	100.00	73.79
	Mid range to modest	2	1,815	29.43	60	85.71	29.65
	(Very) low income	3	52	0.84	18	25.71	3.11
	Total		6,168	100.00	148	211.43	47.30
Household's Bundesland	Vorarlberg	1	215	3.49	5	7.14	88.73
	Tyrol	2	465	7.54	8	11.43	78.48
	Salzburg	3	359	5.82	3	4.29	61.20
	Upper Austria	4	880	14.27	8	11.43	62.68
	Carinthia	5	372	6.03	5	7.14	81.67
	Styria	6	795	12.89	11	15.71	79.68
	Burgenland	7	172	2.79	4	5.71	47.48
	Lower Austria	8	1,008	16.34	17	24.29	82.66
	Vienna	9	1,902	30.84	26	37.14	90.90
	Total		6,168	100.00	87	124.29	80.46
community size class	Up to 2 000 Inhabitants	2	696	11.28	31	44.29	25.24
	2 001 3 000	3	512	8.30	26	37.14	18.75
	3 001 5 000	4	614	9.95	27	38.57	22.07
	5 001 to 10 000 Inhabitants	5	647	10.49	31	44.29	23.23
	10 001 to 20 000 Inhabitants	6	482	7.81	23	32.86	21.91
	20 001 to 50 000 Inhabitants	7	308	4.99	16	22.86	41.97
	50 001 to 1m Inhabitants	8	1,007	16.33	21	30.00	41.67
	More than 1m Inhabitants	9	1,902	30.84	26	37.14	90.90
	Total		6,168	100.00	201	287.14	34.83

Source: HFCS Austria 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical household variables and decomposes them into between (interviewers) and within (interviewers) components.

Table A.7

Descriptive statistics of continuous interviewer variables (wave 1)

	N	Mean	Std. Dev.	Min	Max
Age	85	50.22	12.52	24	71
Int experience (in months)	83	83.37	74.28	2	346
Int neuroticism points	67	0.79	4.60	-9	11
Int extraversion points	71	1.69	5.47	-14	11
Int openness for experience points	69	26.36	5.25	13	35
Int agreeableness points	68	4.44	5.04	-14	11
Int conscientiousness points	68	13.68	4.94	-2	19
Int hh net income	67	2,491.79	1,136.64	400	7,000
Int hh net wealth	68	141,202.96	146,733.52	-20,000	500,000

Source: Survey of Interviewers 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous interviewer variables.

Table A.8

Descriptive statistics of categorical interviewer variables (wave 1)

		Freq.	Percent	Cum.
Gender	Male	43	50.59	50.59
	Female	42	49.41	100.00
	Total	85	100.00	.z
Bundesland	Vorarlberg	5	5.88	5.88
	Tyrol	6	7.06	12.94
	Salzburg	4	4.71	17.65
	Upper Austria	13	15.29	32.94
	Carinthia	6	7.06	40.00
	Styria	18	21.18	61.18
	Burgenland	3	3.53	64.71
	Lower Austria	17	20.00	84.71
	Vienna	13	15.29	100.00
	Total	85	100.00	.z
Education	ISCED 1,2	5	5.88	5.88
	ISCED 3,4	27	31.76	37.65
	ISCED 5	53	62.35	100.00
	Total	85	100.00	.z
Exp with similar surveys	Yes	73	85.88	85.88
	No	12	14.12	100.00
	Total	85	100.00	.z
Employment status	Employee	42	49.41	49.41
	Self-employed	8	9.41	58.82
	Unemployed	4	4.71	63.53
	Retired	17	20.00	83.53
	Other or missing	14	16.47	100.00
	Total	85	100.00	.z
Married	Yes	41	48.24	48.24
	No	31	36.47	84.71
	Missing	13	15.29	100.00
	Total	85	100.00	.z
Migration background	Yes	8	9.41	9.41
	No	64	75.29	84.71
	Missing	13	15.29	100.00
	Total	85	100.00	.z
Homeowner	Yes	51	60.00	60.00
	No	19	22.35	82.35
	Missing	15	17.65	100.00
	Total	85	100.00	.z
Trust	Yes	51	60.00	60.00
	No	21	24.71	84.71
	Missing	13	15.29	100.00
	Total	85	100.00	.z

Source: Survey of Interviewers 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical interviewer variables.

Table A.9

Descriptive statistics of continuous interviewer variables (wave 2)

	N	Mean	Std. Dev.	Min	Max
Age	72	50.24	12.51	24	71
Int experience (in months)	72	93.67	76.62	7	390
Int neuroticism points	55	0.44	4.76	-9	13
Int extraversion points	53	0.96	5.68	-15	11
Int openness for experience points	52	24.40	4.08	18	33
Int agreeableness points	53	5.74	3.53	-5	11
Int conscientiousness points	54	14.70	3.94	2	19
Int hh net income	52	2,708.66	1,344.18	350	8,000
Int hh net wealth	53	182,826.05	563,483.15	-150,000	4,000,000

Source: Survey of Interviewers 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous interviewer variables.

Table A.10

Descriptive statistics of categorical interviewer variables (wave 2)

		Freq.	Percent	Cum.
Gender	Male	26	36.11	36.11
	Female	46	63.89	100.00
	Total	72	100.00	.z
Bundesland	Vorarlberg	4	5.56	5.56
	Tyrol	5	6.94	12.50
	Salzburg	2	2.78	15.28
	Upper Austria	9	12.50	27.78
	Carinthia	6	8.33	36.11
	Styria	9	12.50	48.61
	Burgenland	4	5.56	54.17
	Lower Austria	14	19.44	73.61
	Vienna	18	25.00	98.61
	Foreign country	1	1.39	100.00
	Total	72	100.00	.z
Education	ISCED 1,2	1	1.39	1.39
	ISCED 3,4	16	22.22	23.61
	ISCED 5	23	31.94	55.56
	ISCED 6	15	20.83	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z
Exp with similar surveys	Yes	52	72.22	72.22
	No	3	4.17	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z
Employment status	Employee	11	15.28	15.28
	Self-employed	3	4.17	19.44
	Missing	58	80.56	100.00
	Total	72	100.00	.z
Married	Yes	26	36.11	36.11
	No	29	40.28	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z
Migration background	Yes	16	22.22	22.22
	No	39	54.17	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z
Homeowner	Yes	37	51.39	51.39
	No	18	25.00	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z
Trust	Yes	38	52.78	52.78
	No	17	23.61	76.39
	Missing	17	23.61	100.00
	Total	72	100.00	.z

Source: Survey of Interviewers 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical interviewer variables.

Table A.11

Descriptive statistics of continuous interviewer variables (wave 3)

	N	Mean	Std. Dev.	Min	Max
Age	70	49.14	13.92	19	73
Int experience (in months)	70	95.76	89.79	1	417
Int neuroticism points	66	0.39	4.45	-11	11
Int extraversion points	68	1.91	4.85	-9	10
Int openness for experience points	66	24.95	5.40	14	35
Int agreeableness points	67	5.90	3.93	-5	11
Int conscientiousness points	67	15.30	4.03	0	19
Int hh net income	63	2,931.73	1,700.84	251	10,000
Int hh net wealth	58	195,031.31	260,550.27	400	1,500,000

Source: Survey of Interviewers 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows means, standard deviations, minima and maxima of the continuous interviewer variables.

Table A.12

Descriptive statistics of categorical interviewer variables (wave 3)

		Freq.	Percent	Cum.
Gender	Male	29	41.43	41.43
	Female	41	58.57	100.00
	Total	70	100.00	.z
Bundesland	Vorarlberg	5	7.14	7.14
	Tyrol	5	7.14	14.29
	Salzburg	1	1.43	15.71
	Upper Austria	4	5.71	21.43
	Carinthia	4	5.71	27.14
	Styria	8	11.43	38.57
	Burgenland	1	1.43	40.00
	Lower Austria	16	22.86	62.86
	Vienna	23	32.86	95.71
	Foreign country	3	4.29	100.00
	Total	70	100.00	.z
Education	ISCED 1,2	4	5.71	5.71
	ISCED 3,4	16	22.86	28.57
	ISCED 5	29	41.43	70.00
	ISCED 6	21	30.00	100.00
	Total	70	100.00	.z
Exp with similar surveys	Yes	51	72.86	72.86
	No	19	27.14	100.00
	Total	70	100.00	.z
Employment status	Employee	36	51.43	51.43
	Self-employed	8	11.43	62.86
	Unemployed	2	2.86	65.71
	Retired	14	20.00	85.71
	Other	6	8.57	94.29
	Missing	4	5.71	100.00
	Total	70	100.00	.z
Married	Yes	35	50.00	50.00
	No	35	50.00	100.00
	Total	70	100.00	.z
Migration background	Yes	17	24.29	24.29
	No	53	75.71	100.00
	Total	70	100.00	.z
Homeowner	Yes	44	62.86	62.86
	No	26	37.14	100.00
	Total	70	100.00	.z
Trust	Yes	47	67.14	67.14
	No	21	30.00	97.14
	Missing	2	2.86	100.00
	Total	70	100.00	.z

Source: Survey of Interviewers 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows absolute and relative frequencies of the categorical interviewer variables.

Table A.13

Mean response rate of households per interviewer across interviewer characteristics (wave 1)

		N	Mean	SE Mean
Gender	Male	43	0.5581395	0.0766283
	Female	42	0.5952381	0.0766573
Bundesland	Vorarlberg	5	0.4000000	0.2449490
	Tyrol	6	0.5000000	0.2236068
	Salzburg	4	0.5000000	0.2886751
	Upper Austria	13	0.5384615	0.1439099
	Carinthia	6	1.0000000	0.0000000
	Styria	18	0.7222222	0.1086325
	Burgenland	3	0.6666667	0.3333333
	Lower Austria	17	0.4705882	0.1247835
	Vienna	13	0.4615385	0.1439099
Education	ISCED 1,2	5	0.6000000	0.2449490
	ISCED 3,4	27	0.5925926	0.0963620
	ISCED 5	53	0.5660377	0.0687301
Exp with	Yes	73	0.5753425	0.0582527
similar surveys	No	12	0.5833333	0.1486471
Employment	Employee	42	0.5476190	0.0777319
status	Self-employed	8	0.6250000	0.1829813
	Unemployed	4	0.7500000	0.2500000
	Retired	17	0.5882353	0.1230382
	Other or missing	14	0.5714286	0.1372527
Married	Yes	41	0.5609756	0.0784669
	No	31	0.6129032	0.0889293
	Missing	13	0.5384615	0.1439099
Migration background	Yes	8	0.5000000	0.1889822
	No	64	0.5937500	0.0618769
	Missing	13	0.5384615	0.1439099
Homeowner	Yes	51	0.6470588	0.0675831
	No	19	0.4736842	0.1176878
	Missing	15	0.4666667	0.1333333
Trust	Yes	51	0.5098039	0.0706971
	No	21	0.7619048	0.0952381
	Missing	13	0.5384615	0.1439099

Source: HFCS Austria 2010, Survey of Interviewers 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the distribution of mean response rate of households per interviewer and its standard error across interviewer characteristics.

Table A.14

Mean response rate of households across household characteristics (wave 1)

		N	Mean	SE Mean
type	Individual house	1,728	0.5746528	0.0118968
of	Semi detached house	340	0.6294118	0.0262309
dwelling	Flat apartment	2,169	0.5357308	0.0107110
	Other kind of dwelling	36	0.3055556	0.0778628
dwelling	Downtown	964	0.4056017	0.0158225
location	In between	842	0.6591449	0.0163447
	Town outskirts	1,018	0.5255403	0.0156582
	Isolated area countryside	1,449	0.6204279	0.0127529
dwelling	Luxury	954	0.6844864	0.0150538
-	Upscale	1,903	0.5596427	0.0113829
rating	Mid range	1,166	0.4493997	0.0145738
of	Modest	198	0.5454545	0.0354760
surrounding	Low income	43	0.6279070	0.0745845
buildings	Very low income	9	0.3333333	0.1666667
Bundesland	Vorarlberg	164	0.6341463	0.0377272
	Tyrol	321	0.6604361	0.0264729
	Salzburg	248	0.7177419	0.0286391
	Upper Austria	643	0.6220840	0.0191362
	Carinthia	269	0.6951673	0.0281195
	Styria	559	0.7012522	0.0193764
	Burgenland	128	0.7187500	0.0398964
	Lower Austria	739	0.5196211	0.0183911
	Vienna	1,202	0.3585691	0.0138385
community	Up to 2 000 Inhabitants	708	0.6228814	0.0182277
size	2 001 to 3 000 Inhabitants	389	0.6041131	0.0248273
class	3 001 to 5 000 Inhabitants	462	0.6147186	0.0226661
	5 001 to 10 000 Inhabitants	443	0.6252822	0.0230239
	10 001 to 20 000 Inhabitants	336	0.6785714	0.0255163
	20 001 to 50 000 Inhabitants	222	0.6891892	0.0311330
	50 001 to 1m Inhabitants	511	0.6477495	0.0211517
	More than 1m Inhabitants	1,202	0.3585691	0.0138385

Source: HFCS Austria 2010, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the distribution of mean response rate of households and its standard error across household characteristics.

Table A.15

Mean response rate of households per interviewer across interviewer characteristics (wave 2)

		N	Mean	SE Mean
Gender	Male	26	0.4230769	0.0988095
	Female	46	0.3913043	0.0727530
Interviewer's	Vorarlberg	4	0.7500000	0.2500000
Bundesland	Tyrol	5	0.2000000	0.2000000
	Salzburg	2	1.0000000	0.0000000
	Upper Austria	9	0.3333333	0.1666667
	Carinthia	6	0.6666667	0.2108185
	Styria	9	0.3333333	0.1666667
	Burgenland	4	0.5000000	0.2886751
	Lower Austria	14	0.2857143	0.1252940
	Vienna	18	0.3333333	0.1143324
	Foreign country	1	1.0000000	
Education	ISCED 1,2	1	1.0000000	
	ISCED 3,4	16	0.4375000	0.1280869
	ISCED 5	23	0.3043478	0.0981002
	ISCED 6	15	0.3333333	0.1259882
	Missing	17	0.5294118	0.1247835
Exp with	Yes	52	0.3461538	0.0666173
similar	No	3	0.6666667	0.3333333
surveys	Missing	17	0.5294118	0.1247835
Employment	Employee	11	0.4545455	0.1574592
status	Self-employed	3	0.0000000	0.0000000
	Missing	58	0.4137931	0.0652348
Married	Yes	26	0.3461538	0.0951486
	No	29	0.3793103	0.0916971
	Missing	17	0.5294118	0.1247835
Migration background	Yes	16	0.4375000	0.1280869
	No	39	0.3333333	0.0764719
	Missing	17	0.5294118	0.1247835
Homeowner	Yes	37	0.4054054	0.0818284
	No	18	0.2777778	0.1086325
	Missing	17	0.5294118	0.1247835
Trust	Yes	38	0.3684211	0.0793022
	No	17	0.3529412	0.1194712
	Missing	17	0.5294118	0.1247835

Source: HFCS Austria 2014, Survey of Interviewers 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the distribution of mean response rate of households per interviewer and its standard error across interviewer characteristics.

Table A.16

Mean response rate of households across household characteristics (wave 2)

		N	Mean	SE Mean
type	Individual house	1,541	0.5781960	0.0125844
of	Semi detached house	315	0.6000000	0.0276465
dwelling	Flat apartment	4,112	0.4540370	0.0077652
	Other kind of dwelling	56	0.8928571	0.0417053
dwelling	Downtown	1,312	0.4146341	0.0136065
location	In between	1,653	0.5027223	0.0123015
	Town outskirts	1,514	0.5184941	0.0128456
	Isolated area countryside	1,545	0.5417476	0.0126802
dwelling	Luxury	1,162	0.5043029	0.0146736
-	Upscale	2,747	0.5020022	0.0095415
rating	Mid range	1,783	0.5030847	0.0118443
of	Modest	276	0.4057971	0.0296112
surrounding	Low income	50	0.4000000	0.0699854
buildings	Very low income	6	0.5000000	0.2236068
Bundesland	Vorarlberg	201	0.6467662	0.0337979
	Tyrol	440	0.5318182	0.0238153
	Salzburg	362	0.5939227	0.0258473
	Upper Austria	888	0.5382883	0.0167391
	Carinthia	388	0.4896907	0.0254110
	Styria	798	0.5200501	0.0176967
	Burgenland	160	0.6000000	0.0388514
	Lower Austria	923	0.5395450	0.0164150
	Vienna	1,864	0.3975322	0.0113383
community	Up to 2 000 Inhabitants	747	0.5354752	0.0182602
size	2 001 to 3 000 Inhabitants	541	0.5508318	0.0214051
class	3 001 to 5 000 Inhabitants	545	0.5467890	0.0213433
	5 001 to 10 000 Inhabitants	599	0.5208681	0.0204287
	10 001 to 20 000 Inhabitants	384	0.6276042	0.0247028
	20 001 to 50 000 Inhabitants	265	0.6905660	0.0284502
	50 001 to 1m Inhabitants	1,079	0.4856348	0.0152223
	More than 1m Inhabitants	1,864	0.3975322	0.0113383

Source: HFCS Austria 2014, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the distribution of mean response rate of households and its standard error across household characteristics.

Table A.17

Mean response rate of households per interviewer across interviewer characteristics (wave 3)

		N	Mean	SE Mean
Gender	Male	29	0.4482759	0.0939842
	Female	41	0.5609756	0.0784669
Interviewer's	Vorarlberg	5	0.8000000	0.2000000
Bundesland	Tyrol	5	0.6000000	0.2449490
	Salzburg	1	0.0000000	
	Upper Austria	4	0.5000000	0.2886751
	Carinthia	4	0.7500000	0.2500000
	Styria	8	0.3750000	0.1829813
	Burgenland	1	1.0000000	
	Lower Austria	16	0.5000000	0.1290994
	Vienna	23	0.4347826	0.1056897
	Foreign country	3	0.6666667	0.3333333
Education	ISCED 1,2	4	0.2500000	0.2500000
	ISCED 3,4	16	0.7500000	0.1118034
	ISCED 5	29	0.4482759	0.0939842
	ISCED 6	21	0.4761905	0.1116766
Exp with	Yes	51	0.5294118	0.0705882
similar surveys	No	19	0.4736842	0.1176878
Employment	Employee	36	0.4444444	0.0839921
status	Self-employed	8	0.5000000	0.1889822
	Unemployed	2	0.0000000	0.0000000
	Retired	14	0.7142857	0.1252940
	Other	6	0.6666667	0.2108185
	Missing	4	0.5000000	0.2886751
Married	Yes	35	0.4857143	0.0857143
	No	35	0.5428571	0.0854337
Migration background	Yes	17	0.3529412	0.1194712
	No	53	0.5660377	0.0687301
Homeowner	Yes	44	0.5454545	0.0759336
	No	26	0.4615385	0.0997037
Trust	Yes	47	0.4893617	0.0737043
	No	21	0.5714286	0.1106567
	Missing	2	0.5000000	0.5000000

Sources: HFCS Austria 2017, Survey of Interviewers 2017, Oesterreichische Nationalbank (data not publicly available).
Note: This table shows the distribution of mean response rate of households per interviewer and its standard error across interviewer characteristics.

Table A.18

Mean response rate of households across household characteristics (wave 3)

		N	Mean	SE Mean
type	Individual house	1,956	0.4892638	0.0113057
of	Semi detached house	448	0.4553571	0.0235547
dwelling	Flat apartment	3,733	0.5070988	0.0081838
	Other kind of dwelling	31	0.5806452	0.0900919
dwelling	Downtown	1,656	0.4510870	0.0122316
location	In between	1,463	0.4832536	0.0130693
	Town outskirts	1,286	0.4906687	0.0139458
	Isolated area countryside	1,763	0.5598412	0.0118259
dwelling rating	Upscale to luxury	4,301	0.5166240	0.0076207
of surrounding	Mid range to modest	1,815	0.4534435	0.0116885
buildings	(Very) low income	52	0.5192308	0.0699622
Bundesland	Vorarlberg	215	0.5209302	0.0341493
	Tyrol	465	0.5032258	0.0232114
	Salzburg	359	0.6406685	0.0253585
	Upper Austria	880	0.5727273	0.0166852
	Carinthia	372	0.4731183	0.0259212
	Styria	795	0.5257862	0.0177207
	Burgenland	172	0.5406977	0.0381091
	Lower Austria	1,008	0.4990079	0.0157563
	Vienna	1,902	0.4216614	0.0113261
community	Up to 2 000 Inhabitants	696	0.5301724	0.0189315
size	2 001 to 3 000 Inhabitants	512	0.5566406	0.0219763
class	3 001 to 5 000 Inhabitants	614	0.5602606	0.0200476
	5 001 to 10 000 Inhabitants	647	0.5316847	0.0196327
	10 001 to 20 000 Inhabitants	482	0.5248963	0.0227698
	20 001 to 50 000 Inhabitants	308	0.5259740	0.0284980
	50 001 to 1m Inhabitants	1,007	0.5094340	0.0157614
	More than 1m Inhabitants	1,902	0.4216614	0.0113261

Source: HFCS Austria 2017, Oesterreichische Nationalbank (data not publicly available).
Notes: This table shows the distribution of mean response rate of households and its standard error across household characteristics.

Table A.19

Random-intercept logistic regression estimation of household response (wave 1)

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Primary School			.549	.511	.421	.508	.532	.814	.502
Vocational School/Apprenticeship			-.117	-.171	-.235	-.133	-.225	-.0147	-.111
Int experience not miss			-.191	-.565	.037	-.316	.249	-.313	-.723
Int experience			.0017	.0016	.0019	.0017	.0012	.0028	.0022
Int no exp with similar surveys			-.327	-.411	-.236	-.373	-.159	-.263	-.289
Int labour status (Ref: Employee):									
Self-employed				-.487					
Unemployed				.183					
Retired				-.294					
Other/Missing				.465					
Int not married					-.37				
Int marital stat miss					.161				
Int not migrant						-.0242			
Int migrant stat miss						.316			
Int not homeowner							-.655*		
Int homeowner stat miss							.247		
Int trust								.306	
Int trust miss								-.169	
Int neuroticism not miss								-1.64**	
Int neuroticism points								-.0564	
Int extraversion not miss								-.892	
Int extraversion points								.029	
Int openness not miss								.924	
Int openness points								-.0103	
Int agreeableness not miss								.798	
Int agreeableness points								.0479	
Int conscientiousness not miss								.699	
Int conscientiousness points								-.0413	
Int hh income not miss									.612
Int hh income									8.5e-05
Int hh net wealth not miss									-1.17**
Int hh net wealth									-1.2e-06
Constant	.519***	2	5.02*	5.25*	5.36*	4.91*	4.63*	6.46**	4.95*
/									
var(_cons[ahr1700])	1.58***	1.35***	1.06***	1.01***	1.03***	1.05***	.968***	.919***	.975***
icc2	.324	.291	.244	.235	.239	.243	.227	.218	.229
ll	-2618	-2455	-2446	-2445	-2446	-2446	-2444	-2441	-2443
bic	5253	5152	5269	5299	5284	5285	5281	5359	5296
N	4273	4273	4273	4273	4273	4273	4273	4273	4273

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Response									
Hh dwelling type (Ref: Flat/apartment):									
Individual house		.384***	.384***	.383***	.383***	.385***	.384***	.388***	.385***
Semi-detached house		.398***	.394***	.398***	.395***	.395***	.395***	.398***	.394***
Other		2.15***	2.15***	2.15***	2.14***	2.15***	2.15***	2.12***	2.14***
Hh dwelling location (Ref: countryside):									
Downtown		.261**	.25**	.256**	.249**	.252**	.251**	.237*	.249**
In between		.404***	.405***	.406***	.405***	.407***	.406***	.397***	.398***
Town outskirts		.16	.151	.144	.15	.152	.15	.149	.149
Hh surrounding rating (Ref: mid-range):									
Luxury		.2**	.221**	.223**	.22**	.221**	.222**	.22**	.213**
Upscale		.138*	.141**	.143**	.141**	.141**	.142**	.141**	.137*
Modest		-.403***	-.412***	-.407***	-.414***	-.413***	-.412***	-.418***	-.413***
Low-income		-.177	-.193	-.189	-.185	-.194	-.191	-.189	-.19
Very low-income		.308	.262	.253	.282	.261	.27	.26	.265
Hh interview order		.0048***	.0046***	.0047***	.0046***	.0046***	.0046***	.0046***	.0045***
Hh state (Ref: Vienna):									
Vorarlberg		1.01***	.815*	.809*	.821*	.807*	.806*	.841*	.828*
Tyrol		.358	.123	.138	.118	.125	.118	.161	.156
Salzburg		-.0659	-.407	-.39	-.421	-.415	-.414	-.354	-.294
Upper Austria		.201	-.0717	-.076	-.106	-.0732	-.0832	-.0133	.0285
Carinthia		.315	.428	.394	.373	.424	.396	.829	.937
Styria		.901***	1.09***	1.07***	1.06***	1.08***	1.06***	1.44***	1.54***
Burgenland		.536	.83**	.799*	.8*	.824**	.8*	1.21***	1.24***
Lower Austria		.815***	.853***	.844***	.809***	.842***	.841***	.958***	.961***
Hh municipality size (Ref: <2thsd):									
2-3thsd		.268**	.274**	.282**	.278**	.275**	.274**	.27**	.285**
3-5thsd		.0135	.0168	.0189	.0154	.0143	.0171	.0223	.0226
5-10thsd		.156	.183	.176	.188	.182	.181	.201	.209
10-20thsd		.791***	.807***	.773***	.81***	.805***	.809***	.823***	.838***
20-50thsd		.982***	1.02***	.988***	1.02***	1.02***	1.01***	1.03***	1.03***
50thsd-1mill		.315*	.348**	.344**	.347**	.344**	.349**	.391**	.37**
>1mill		0	0	0	0	0	0	0	0
Mun mean wage		-1.7e-04**	-1.7e-04**	-1.6e-04**	-1.7e-04**	-1.7e-04**	-1.7e-04**	-1.6e-04**	-1.7e-04**
Mun mean wage × Mun mean wage		2.4e-09**	2.4e-09**	2.3e-09**	2.3e-09**	2.3e-09**	2.4e-09**	2.3e-09**	2.4e-09**
Int female			-.348*	-.236	-.355*	-.326	-.353*	-.402**	-.43**
Int age			.0766	.0391	.0722	.0841	.0758	.0371	.0659
Int age × Int age			-5.6e-04	-1.3e-04	-5.1e-04	-6.2e-04	-5.5e-04	-1.3e-04	-4.2e-04
Int state (Ref: Vienna):									
Vorarlberg			.269	.222	.178	.316	.264	.601	.142
Tyrol			.43	.297	.431	.378	.429	.592	.42
Salzburg			1.39**	1.67***	1.45**	1.42**	1.36**	2.35***	1.06*
Upper Austria			.385	.54	.434	.397	.387	.457	.273
Carinthia			.345	.448	.41	.313	.339	.205	-.24
Styria			-.517	-.331	-.492	-.554	-.531	-.943*	-1.21**
Burgenland			-.45	-.256	-.513	-.493	-.46	-.938	-.924
Lower Austria			-.358	-.283	-.302	-.376	-.379	-.51	-.738**
Foreign country			2.36***	2.95***	2.46***	2.26***	2.31***	1.92***	2.11***

Sources: HFCS Austria 2010, Survey of Interviewers 2010, Oesterreichische Nationalbank (data not publicly available), Lohnsteuerstatistik 2011.
Notes: This table shows the regression and intraclass correlation coefficient estimates of running a random-intercept logistic regression of household response. * p<0.10, ** p<0.05, *** p<0.01.

Table A.20

Random-intercept logistic regression estimation of household response (wave 2)

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Response									
Hh dwelling type (Ref: Flat/apartment):									
Individual house		.384***	.384***	.383***	.383***	.385***	.384***	.388***	.385***
Semi-detached house		.398***	.394***	.398***	.395***	.395***	.395***	.398***	.394***
Other		2.15***	2.15***	2.15***	2.14***	2.15***	2.15***	2.12***	2.14***
Hh dwelling location (Ref: countryside):									
Downtown		.261**	.25**	.256**	.249**	.252**	.251**	.237*	.249**
In between		.404***	.405***	.406***	.405***	.407***	.406***	.397***	.398***
Town outskirts		.16	.151	.144	.15	.152	.15	.149	.149
Hh surrounding rating (Ref: mid-range):									
Luxury		.2**	.221**	.223**	.22**	.221**	.222**	.22**	.213**
Upscale		.138*	.141**	.143**	.141**	.141**	.142**	.141**	.137*
Modest		-.403***	-.412***	-.407***	-.414***	-.413***	-.412***	-.418***	-.413***
Low-income		-.177	-.193	-.189	-.185	-.194	-.191	-.189	-.19
Very low-income		.308	.262	.253	.282	.261	.27	.26	.265
Hh interview order		.0048***	.0046***	.0047***	.0046***	.0046***	.0046***	.0046***	.0045***
Hh state (Ref: Vienna):									
Vorarlberg		1.01***	.815*	.809*	.821*	.807*	.806*	.841*	.828*
Tyrol		.358	.123	.138	.118	.125	.118	.161	.156
Salzburg		-.0659	-.407	-.39	-.421	-.415	-.414	-.354	-.294
Upper Austria		.201	-.0717	-.076	-.106	-.0732	-.0832	-.0133	.0285
Carinthia		.315	.428	.394	.373	.424	.396	.829	.937
Styria		.901***	1.09***	1.07***	1.06***	1.08***	1.06***	1.44***	1.54***
Burgenland		.536	.83**	.799*	.8*	.824**	.8*	1.21***	1.24***
Lower Austria		.815***	.853***	.844***	.809***	.842***	.841***	.958***	.961***
Hh municipality size (Ref: <2thsd):									
2-3thsd		.268**	.274**	.282**	.278**	.275**	.274**	.27**	.285**
3-5thsd		.0135	.0168	.0189	.0154	.0143	.0171	.0223	.0226
5-10thsd		.156	.183	.176	.188	.182	.181	.201	.209
10-20thsd		.791***	.807***	.773***	.81***	.805***	.809***	.823***	.838***
20-50thsd		.982***	1.02***	.988***	1.02***	1.02***	1.01***	1.03***	1.03***
50thsd-1mill		.315*	.348**	.344**	.347**	.344**	.349**	.391**	.37**
>1mill		0	0	0	0	0	0	0	0
Mun mean wage		-1.7e-04**	-1.7e-04**	-1.6e-04**	-1.7e-04**	-1.7e-04**	-1.7e-04**	-1.6e-04**	-1.7e-04**
Mun mean wage × Mun mean wage		2.4e-09**	2.4e-09**	2.3e-09**	2.3e-09**	2.3e-09**	2.4e-09**	2.3e-09**	2.4e-09**
Int female			-.348*	-.236	-.355*	-.326	-.353*	-.402**	-.43**
Int age			.0766	.0391	.0722	.0841	.0758	.0371	.0659
Int age × Int age			-5.6e-04	-1.3e-04	-5.1e-04	-6.2e-04	-5.5e-04	-1.3e-04	-4.2e-04
Int state (Ref: Vienna):									
Vorarlberg			.269	.222	.178	.316	.264	.601	.142
Tyrol			.43	.297	.431	.378	.429	.592	.42
Salzburg			1.39**	1.67***	1.45**	1.42**	1.36**	2.35***	1.06*
Upper Austria			.385	.54	.434	.397	.387	.457	.273
Carinthia			.345	.448	.41	.313	.339	.205	-.24
Styria			-.517	-.331	-.492	-.554	-.531	-.943*	-1.21**
Burgenland			-.45	-.256	-.513	-.493	-.46	-.938	-.924
Lower Austria			-.358	-.283	-.302	-.376	-.379	-.51	-.738**
Foreign country			2.36***	2.95***	2.46***	2.26***	2.31***	1.92***	2.11***

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Int education (Ref: Other):									
Primary School			.531	.504	.385	.511	.51	.551	.905
Vocational School/Apprenticeship			.434	.332	.366	.447*	.398	.151	.404
University			.271	-.0548	.274	.329	.256	.331	.378
Missing			-.25	-.143	-.402	-.112	-.301	1	-.973*
Int experience			2.1e-04	4.7e-04	2.4e-04	1.6e-04	2.2e-04	-2.2e-04	-4.4e-04
Int no exp with similar surveys			1.58***	1.66***	1.53***	1.64***	1.57***	1.84***	1.37***
Int exp sim surveys miss			0	0	0	0	0	0	0
Int labour status (Ref: Employee):									
Self-employed				.675					
Missing				-.589**					
Int not married					-.242				
Int marital stat miss					0				
Int not migrant						.167			
Int migrant stat miss						0			
Int not homeowner							-.0894		
Int homeowner stat miss							0		
Int trust								.284	
Int trust miss								0	
Int neuroticism not miss								0	
Int neuroticism points								.0451*	
Int extraversion not miss								-.958	
Int extraversion points								.0267	
Int openness not miss								2.25**	
Int openness points								-.055**	
Int agreeableness not miss								-1.05*	
Int agreeableness points								.0972**	
Int conscientiousness not miss								2.41*	
Int conscientiousness points								-.0429	
Int hh income not miss									-1.93**
Int hh income									1.0e-04
Int hh net wealth not miss									.903
Int hh net wealth									1.7e-07
Constant	-.125	1.38	-.979	.104	-.743	-1.32	-.881	-1.52	.101
/									
var(_cons[ahr1700])	.826***	.744***	.384***	.322***	.374***	.379***	.382***	.274***	.331***
icc2	.201	.184	.104	.0891	.102	.103	.104	.0768	.0915
ll	-3858	-3730	-3708	-3704	-3708	-3708	-3708	-3700	-3705
bic	7734	7713	7826	7835	7833	7834	7834	7895	7854
N	6024	6024	6024	6024	6024	6024	6024	6024	6024

Sources: HFCS Austria 2014, Survey of Interviewers 2014, Oesterreichische Nationalbank (data not publicly available), Lohnsteuerstatistik 2011.
Notes: This table shows the regression and intraclass correlation coefficient estimates of running a random-intercept logistic regression of household response. * p<0.10, ** p<0.05, *** p<0.01.

Table A.21

Random-intercept logistic regression estimation of household response (wave 3)

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Response									
Hh dwelling type (Ref: apartment):									
Individual house		-.631***	-.638***	-.637***	-.641***	-.638***	-.637***	-.631***	-.639***
Semi-detached house		-.676***	-.682***	-.682***	-.685***	-.682***	-.68***	-.691***	-.678***
Other		-.246	-.232	-.231	-.218	-.232	-.232	-.215	-.219
Hh dwelling location (Ref: countryside):									
Downtown		-.269**	-.28**	-.277**	-.302**	-.28**	-.281**	-.269**	-.273**
In between		-.135	-.106	-.106	-.12	-.106	-.11	-.0996	-.0968
Town outskirts		-.0325	-.0104	-.0146	-.0104	-.0106	-.0099	-.014	-.0152
Hh surrounding rating (Ref: low-income):									
Luxury/Upscale		-.0172	-.0302	-.0311	-.0573	-.0301	-.0346	-.0277	-.0296
Mid-range/Modest		-.444	-.464	-.466	-.489*	-.464	-.467	-.475	-.464
Hh interview order		-6.3e-05	-1.3e-04	-1.6e-04	-1.1e-04	-1.3e-04	-1.5e-04	-3.8e-04	-1.6e-04
Hh state (Ref: Vienna):									
Vorarlberg		1.22***	1.84***	1.84***	1.94***	1.85***	1.83***	1.81***	1.9***
Tyrol		.835***	1.05***	1.05***	1.12***	1.05***	1.05***	.998***	1.09***
Salzburg		.912***	.693**	.696**	.78**	.693**	.68**	.609*	.728**
Upper Austria		.881***	.666**	.665**	.731***	.666**	.654**	.558**	.694**
Carinthia		.755**	.812	.801	.776	.813	.811	.519	.855
Styria		.982***	.904**	.889**	.916***	.904**	.908**	.69*	.89**
Burgenland		1.19***	1.15***	1.12***	1.13***	1.15***	1.15***	.916***	1.13***
Lower Austria		1.17***	1.22***	1.21***	1.21***	1.22***	1.21***	1.08***	1.21***
Hh municipality size (Ref: <2thsd):									
2-3thsd		-.0422	-.0707	-.0711	-.0726	-.0707	-.0697	-.0666	-.0859
3-5thsd		-.126	-.13	-.13	-.126	-.131	-.13	-.109	-.142
5-10thsd		-.173	-.186	-.185	-.198	-.186	-.188	-.174	-.197
10-20thsd		-.145	-.149	-.149	-.136	-.149	-.148	-.158	-.174
20-50thsd		-.287	-.266	-.271	-.28	-.266	-.268	-.287	-.287
50thsd-1mill		-.226	-.239	-.241	-.247*	-.24	-.241	-.235	-.231
>1mill		0	0	0	0	0	0	0	0
Mun mean wage		-2.8e-05***	-2.8e-05***	-2.8e-05***	-2.7e-05***	-2.8e-05***	-2.8e-05***	-2.7e-05***	-3.1e-05***
Int female			-.011	-.0123	-.0229	-.0121	-.0085	-.0112	-.104
Int age			-.0112	-.0281	-.0218	-.0115	-.011	.0103	-.0177
Int age × Int age			1.4e-04	3.1e-04	2.8e-04	1.5e-04	1.4e-04	-4.3e-05	2.4e-04
Int state (Ref: Vienna):									
Vorarlberg			-.816*	-.841*	-1.07**	-.816*	-.744	-.25	-.705
Tyrol			-.397	-.421	-.624*	-.394	-.345	-.465	-.436
Salzburg			.673	1.01	.661	.678	.641	.752*	.841*
Upper Austria			.471	.486	.284	.472	.57	.361	.336
Carinthia			-.277	-.244	-.339	-.274	-.238	-.0747	-.144
Styria			-.0473	-.0048	-.103	-.0455	2.8e-04	-.0383	.13
Burgenland			.392	.463	.143	.394	.477	.359	.378
Lower Austria			-.599**	-.574**	-.554**	-.597**	-.549**	-.36	-.529**
Foreign country			.414	.443	.393	.417	.476	.552	.505
Int education (Ref: Secondary):									
Primary School			.456	.447	.455	.458	.449	.735**	.178
Vocational School/Apprenticeship			-.0589	-.0572	.021	-.0587	-.0677	-.103	-.0524
University			.45***	.417**	.508***	.45***	.486***	.477***	.455***

	mod1	mod2	mod3	mod4a	mod4b	mod4c	mod4d	mod4e	mod4f
Int experience			-.0018*	-.0017	-.0017*	-.0018*	-.0017*	-.0013	-.0018*
Int no exp with similar surveys			-.562***	-.545**	-.438**	-.562***	-.591***	-.555**	-.55***
Int labour status (Ref: Employee):									
Self-employed				.0622					
Unemployed				.0113					
Retired				-.0418					
Other				-.331					
Missing				.0314					
Int not married					-.351***				
Int not migrant						-.0058			
Int not homeowner							.112		
Int trust								-.0259	
Int trust miss								.585	
Int neuroticism not miss								.153	
Int neuroticism points								-.0293	
Int extraversion not miss								.455	
Int extraversion points								-.0321*	
Int openness not miss								.0687	
Int openness points								.0025	
Int agreeableness not miss								.262	
Int agreeableness points								-.0067	
Int conscientiousness not miss								-1.13***	
Int conscientiousness points								.0516***	
Int hh income not miss									-.463
Int hh income									-5.2e-05
Int hh net wealth not miss									-.143
Int hh net wealth									2.6e-07
Constant	-.16**	.625	1.14	1.54	1.46*	1.15	1.06	-.0522	1.95**
/									
var(_cons[ahr1700])	.246***	.247***	.13***	.128***	.105***	.13***	.129***	.0792***	.0872***
icc2	.0696	.0698	.0379	.0375	.031	.0379	.0376	.0235	.0258
ll	-4162	-4081	-4063	-4063	-4060	-4063	-4063	-4054	-4057
bic	8342	8389	8501	8544	8503	8510	8510	8588	8523
N	6168	6168	6168	6168	6168	6168	6168	6168	6168

Sources: HFCS Austria 2017, Survey of Interviewers 2017, Oesterreichische Nationalbank (data not publicly available), Lohnsteuerstatistik 2011.
Notes: This table shows the regression and intraclass correlation coefficient estimates of running a random-intercept logistic regression of household response. * p<0.10, ** p<0.05, *** p<0.01.

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