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Nicole Watson • Mark Wooden

Re-engaging with Survey Non-respondents: The BHPS, SOEP and HILDA Survey Experience

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Re-engaging with Survey Non-respondents: The BHPS, SOEP and HILDA Survey Experience

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Abstract: Previous research into the correlates and determinants of non-response in longitudinal surveys has focused exclusively on why it is that respondents at one survey wave choose not to participate at future waves. This is very understandable if non-response is always an absorbing state, but in many longitudinal surveys, and certainly most household panels, this is not the case. Indeed, in these surveys it is normal practice to attempt to make contact with many non-respondents at the next wave. This study differs from previous research by examining the process of re-engagement with previous wave non-respondents. Drawing on data from three national household panels it is found that the re-engagement decision is indeed distinctly different from the decision about continued participation. Further, these differences have clear implications for the way panel surveys should be administered given the desire to enhance overall response rates.

Keywords: Household panel surveys, survey response, attrition

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1. Introduction

All sample surveys are subject to the problems that arise due to missing data caused by non-response. These problems, however, are more acute in longitudinal surveys because of: (i) the opportunity for non-response at multiple points in time; and (ii) the tendency for sample size to decline over time due to attrition (i.e., permanent exits from the sample). Administrators of longitudinal surveys thus face pressures both to ensure that they employ design features and fieldwork procedures that will minimise non-response and attrition, and to deliver as much information as possible about non-respondents in order to assist data analysts make inferences in the presence of missing data. One consequence of this has been a growing research literature concerned with identifying the correlates and determinants of non-response to longitudinal surveys (for reviews, see Uhrig, 2008; Watson and Wooden, 2009).

Virtually all of this literature is concerned with understanding why it is that respondents at one survey wave choose not to participate at future waves. This is understandable if non-response at one wave is synonymous with attrition, as would occur if no attempts are made to contact non-respondents at subsequent survey waves. But in many longitudinal surveys, and certainly most household panels, this is not the case. Indeed, in these surveys, with the exception of those non-respondents that make explicit requests not to be contacted again, it is normal practice to attempt to make contact with non-respondents at the next wave. This suggests that analyses of the decision to continue participation need to be complemented with analyses of the decision taken by non-respondents to recommence participation. Yet to the best of our knowledge there have been no published studies that have examined the process of re-engaging with longitudinal survey sample members. It is this which is the main contribution of this paper. Specifically, we draw on data from three major national household panel surveys to estimate logit models predicting the likelihood that non-respondents at one survey wave can be persuaded to respond at the next.

The use of data from three different surveys is another feature of this paper that sets it apart from most preceding work. Research findings based on a single survey are always subject to the criticism that it can be difficult to know to what extent they can be generalised to other surveys covering different populations and employing different design features. We respond to this by estimating like models using data from three separate household panel studies conducted at different times in three different countries (Australia, Britain and Germany).

2. Previous Research

Driven by the desire to both better target scarce survey resources and to produce weights that help reduce the extent of bias arising from non-random response, survey researchers have long been interested in identifying, and quantifying the impact of, variables that explain why sample members elect not to participate in the next wave (or, in many cases, discontinue all further participation in the study). Most commonly this involves estimation of a discrete choice probability model of survey response of the form originally suggested by Hausman and Wise (1979), but often extended to allow for many time periods, rather than the two-period form of the original Hausman-Wise specification. In some instances, proportional hazard models, where the outcome variable is the number of years until attrition, have been estimated (e.g., Becketti *et al*., 1988), but for the most part the models estimated have been of the discrete choice variety.

The models estimated are far from uniform. Some studies assume a normal distribution and thus use a probit model (e.g., Fitzgerald *et al*., 1998; Lillard and Panis, 1998; Zabel, 1998; Hill and Willis, 2001; Nicoletti and Peracchi, 2005; Watson and Wooden, 2009), while

others assume a logistic distribution (Gray *et al*., 1996; Watson, 2003; Behr, Bellgardt and Rendtel, 2005; Hawkes and Plewis, 2006; Vandencasteele and Debels, 2007; Uhrig, forthcoming). Very differently, some studies model response as the occurrence of two sequential events: (i) establishing contact; and (ii) obtaining cooperation conditional on making contact (e.g., Gray *et al*., 1996; Lepkowski and Couper, 2002; Nicoletti and Buck, 2004; Nicoletti and Peracchi, 2005; Watson and Wooden, 2009). Most strikingly of all, the array of covariates that are included is highly variable across studies. Further, most empirical studies have tended to focus on the role of respondent characteristics, and less on the features of the data collection process, even though it is the latter that is most amenable to intervention. Even the specification of the outcome variable can be quite different, with some studies assuming that non-response is an absorbing state (though in some cases, this is a function of survey design), and others allowing for non-respondents to return to the panel at later waves.

One area where there is uniformity is in the definition of the population of interest – respondents to a previous survey wave. This is understandable if non-response is always an absorbing state, and hence survey participation follows one of two patterns – continued participation or monotone attrition. However, as is widely recognised (see Kalton and Brick, 2000; Lynn, 2009), most longitudinal studies are designed to allow a much greater variety of response patterns, both because they permit new entrants into the sample after the initial wave and because attempts are made to contact many non-respondents at the next (and later) waves.

Despite this, only rarely has any explicit consideration been given to the possibility that the magnitude of relationships between response probabilities and hypothesised predictors and correlates might vary with the type of response pattern. This is particularly surprising given it has been well established, especially in cross-section surveys, but also within waves of a longitudinal survey (Burton, Laurie and Lynn, 2006), that the characteristics of persons that cooperate at the initial point of contact can be quite different from those that initially refuse but then are converted at a subsequent contact.

Indeed, we are only able to identify two studies that use data spanning multiple waves from longitudinal surveys to test for such possibility – Burkam and Lee (1998) and Hawkes and Plewis (2006). These studies employ data from markedly different survey samples and use quite different methods. Nevertheless, they share one common feature; they both estimate multinomial logit models that distinguish between two types of non-response: (i) attrition; and (ii) wave non-response, or what Burkam and Lee (1998) describe as non-monotonic attrition. Neither study appears to report sufficiently large differences to suggest that discriminating between attrition and wave non-response is all that important, but then neither study is especially convincing, in large part because they are only able to consider a handful of regressors, none of which describe the data collection process.

Like all other research on non-response to longitudinal surveys, both of these studies also define their population of interest to be the sample of respondents at a point in time. As such, they still do not consider the possibility that variables that influence the decision taken by sample respondents to continue survey participation may have very different effects on the decision taken by non-responding sample members to recommence participation at a later survey wave. Consider, for example, the role of interviewer continuity. It is generally accepted that assigning the same interviewers to individual respondents in successive survey waves is beneficial for response (see Watson and Wooden, 2009, pp. 162-163). The intuition behind this finding is very straightforward. By ensuring interviewers are matched to individual respondents through time enables interviewers to build rapport with these

respondents and to develop a relationship of trust, which in turn enhances the likelihood of ongoing participation (Laurie, Smith and Scott, 1999). Now consider the situation of sample members who have withdrawn their cooperation at the previous wave. In these situations sending back the same interviewer at the next wave may be precisely the wrong thing to do. Indeed, in some instances the respondent may have declined to participate because they were uncomfortable with the interviewer. And even in situations where the respondent-interviewer relationship is not a causal factor, persuading a respondent to reverse the decision they took at the previous wave will often require a different approach from that used last wave, which in many cases will be more likely where the interviewer is different. Further, the notion that interviewer continuity may not always be positive for response is supported by recent evidence from empirical data reported in Lynn, Kaminska and Goldstein (2011).

3. The Household Panels

The research reported on here makes use of data from three national household panel surveys: (i) the Household, Income and Labour Dynamics in Australia (HILDA) Survey; (ii) the British Household Panel Survey (BHPS); and (iii) the German Socio-Economic Panel (SOEP). In what follows we first briefly describe the key common design features and the main areas of contrast of these surveys, and second, present summary data describing the patterns of response over time reported by each. Our analysis is mostly restricted to the experience over the first nine waves, a decision dictated by the age of the youngest of the three – the HILDA Survey – which only commenced fieldwork in 2001.

3.1 Key Features

While the three studies are conducted independently using different survey instruments and different fieldwork procedures, they have many common design features. The key similarities (and differences) are summarized (in the context of the Cross-National Equivalent File) by Frick *et al.* (2007). Of most significance, each of these studies:

i. collects information on a broad range of socio-economic variables, but with a focus on household composition, income, employment, housing, and demographic characteristics;

ii. commenced with a population sample that was clustered by location and was intended to be broadly representative of the national population resident in private households;

iii. conducts survey waves on an annual basis;

iv. follows members of the original sample households and their offspring;

v. interviews all adult members of the household (15 years or older in the HILDA Survey, and 16 years or older in both the BHPS and SOEP);

vi. augments the sample in later waves with persons who join a sample household (though in the case of both the HILDA Survey and the BHPS these persons typically only remain in the sample for as long as they co-reside with a 'permanent' sample member); and

vii. attempts to contact persons who have been non-respondents at previous waves.

These similarities are no accident, and reflect the history and timing of these studies. As noted above, the HILDA Survey is the youngest, conducting its first wave of interviews in 2001, and drew heavily on the experience of both the BHPS and the SOEP. Similarly, the BHPS, which commenced in 1991, drew heavily on the design and experience of the SOEP, which commenced in 1984.

There are, however, important differences in the studies, including in survey design and fieldwork procedures. First, survey modes vary. The HILDA Survey and BHPS are mostly conducted in-person by an interviewer, with additional information obtained through a separate self-completion questionnaire. Both the HILDA Survey and the BHPS also provide for telephone interviews, though in the case of the HILDA Survey the full instrument is administered, whereas in the BHPS a telephone interview is much shorter than the full instrument, and is only delivered as a method of last resort, with the primary aim being the retention of the sample member (see Laurie *et al*., 1999). In contrast, the SOEP collects all information from each respondent using a single mode, but permits much greater flexibility in the choice of mode across respondents. Thus an oral interview is used in some cases and a self-administered instrument in others. Further, the latter can be completed with or without interviewer assistance, and distributed either by the interviewer or by mail. Additionally, the SOEP tends to rely heavily on mailed out questionnaires when dealing with previous wave non-respondents. The majority of these cases are assigned to 'telephone interviewers', but these interviewers do not actually conduct interviews; rather they simply mail out the questionnaires conditional on obtaining an indication of willingness to cooperate.

Second, the SOEP is distinctive in that its original sample is comprised of two sub-samples: a nationally representative sample (sample A), and an immigrant over-sample (sample B) with selection probabilities four times that of the locally born population.

Third, but related to the previous point, the studies differ in the extent to which the original samples have been augmented and refreshed. The SOEP has a long tradition of both over-sampling sub-groups of interest and adding new representative samples (in 1998, 2000 and 2006). In contrast, after nine waves the HILDA Survey was still working with its original sample.

Third, while all three studies provide respondents with small gifts, they vary substantially in the use of cash and cash-like incentives (Laurie and Lynn, 2009). The SOEP only provides respondents with a lottery ticket (valued at around €1.50 in 2005), which is mailed to respondents after interview. The BHPS provides a store gift voucher, the value of which has risen from £5 in 1991 to £10 by 2004, which is provided to sample members in advance of the interview (and hence unconditional on obtaining a response). Finally, the HILDA Survey has provided a direct cash incentive in the form of a cheque mailed after interview. From 2005 the payment was A$25 per person plus an additional A$25 household bonus if all household members responded. In 2009 the payment was increased to A$30 and cheques were replaced with cash handed to respondents by the interviewer at the time of interview.

Fourth, the interviewer workforces are managed quite differently. Most obviously, the HILDA Survey is distinct in breaking its fieldwork into three phases, with the workloads increasingly concentrated on the most successful and experienced interviewers in the later phases. Non-responding cases are thus handled by multiple interviewers during the course of the fieldwork. In contrast, in the BHPS and SOEP all cases are usually handled by the one interviewer. The size of the workloads are also quite different, with the average face-to-face interviewer on the HILDA Survey handling anywhere from 51 to 66 households each survey wave (over the course of waves 2 to 9). This compares with 25 to 30 households for face-to-face interviewers on the BHPS and just 12 to 14 households on the SOEP.

Finally, each study appears to adopt different practices in determining when a refusal to cooperate in one wave constitutes a request to be permanently removed from the sample, and when the benefit of pursuing serial non-responders no longer justifies the cost. This is reflected in the different proportions of the non-responding sample that are issued to field at the next wave. As shown in Figure 1, the SOEP is much more averse to chasing non-

respondents than the other two studies, with the proportion of non-respondents issued to field the next wave falling to below 20% by wave 4, and to less than 10% by wave 7. Further, this experience is common to all SOEP samples, as reflected in the close similarity in the experiences of the original A and B samples and the experience of its relatively recent F sample (the largest of its three nationally representative refreshment samples). The BHPS and HILDA Survey, on the other hand, commenced with very high non-respondent issue rates; in the order of 75 to 78%. These rates then fell quite rapidly over the following waves, before plateauing at around 33% in the BHP and 25% in the HILDA Survey. The lesser rate in the HILDA Survey most likely reflects their protocol that any respondent that calls the dedicated free call telephone number requesting no further contact either needs to be converted at the time (i.e., while the sample member is still on the telephone) or removed from the panel.

3.2 Response Rates and Patterns

Given the differences discussed above, together with the obvious differences in populations and timing, it would only be coincidental if response rates were similar across the three studies. And indeed the initial response rates at wave 1 are quite different, varying from just 66% of all households in the HILDA Survey (measured as the percentage of all in-scope households providing at least one adult respondent) to 74% in the BHPS. In the SOEP, wave 1 response rates of 61% and 68% are reported for their two original samples (the Western German or "A" sample and the foreigner or "B" sample), but these rates are not directly comparable given the SOEP only included households in their wave 1 responding sample if interviews were obtained with all eligible adults in the household. The German experience also suggests that obtaining cooperation from new sample members is becoming increasingly difficult over time, with the initial household response rates (now defined as any household providing at least one person interview) to the nationally representative refreshment samples introduced in 1998 (sample "E"), 2000 (sample "F") and 2006 (sample "H") falling to 54%, 52% and 41%, respectively. Partly for this reason, we include the largest of these samples – sample F – in all of the analyses that follow.

Turning to non-response at later waves, in Figure 2 we report the wave-on-wave response rates (proportion of responding persons from one wave that respond at the next, after excluding deaths and movements out of scope) for the life of the initial samples of all three studies, together with the F sample of the SOEP. As can be seen, with the exception of SOEP F, the annual response rates follow a similar pattern, rising from around 87% in wave 2 to around 95% by wave 8. Thereafter response rates tend to plateau and, after enough years, may even start to decline. The experience of the more recent SOEP F sample appears to be somewhat different, with response rates at all waves much lower when compared with the other surveys and samples. Moreover, response appears to have plateaued much earlier (by wave 4).

Figure 3 provides some indication of what these rates of response mean for sample retention, by reporting the percentage of wave 1 respondents interviewed at each subsequent wave until wave 9. As can be seen, the experiences of the HILDA Survey and the BHPS have been close to identical. Non-response in the SOEP A and B samples also initially followed a similar path to the other two studies, before diverging from wave 5 onwards. The high rates of non-response to the more recent SOEP F sample, however, lead to retention rates for this sample that are lower at all points in time, with less than 50% of the original sample of respondents still participating at wave 9.

Figure 3, however, still tells us little about the pattern of response, and, more specifically, the extent to which non-response is associated with sample attrition or is only a temporary phenomenon. Table 1 thus presents summary data which take respondents from wave 1 and

divides them into four broad groups based on the observed patterns of response over the first eight waves. These four groups are: (i) continuous participation (i.e., persons who responded in all eight waves); (ii) monotone attrition (i.e., persons who withdrew cooperation at one wave and never participated at a subsequent wave); (iii) other response patterns, which can be thought of as comprising two main groups, intermittent responders and returners (persons who withdrew cooperation for a wave or two but were then subsequently persuaded to resume their participation); and (iv) persons that either died or moved abroad during the first eight waves. Note that the observation of response patterns is potentially truncated at wave 8. That is, it is not always obvious when a non-responding case is a case of monotone attrition or not. We have reserved one wave of data (wave 9) to help determine the status. While we could have used the additional waves in the case of the BHPS and the SOEP AB sample, we were constrained to nine waves for the HILDA Survey and the SOEP F sample and preferred to treat all studies in a consistent manner to aid comparison.

Table 1 shows that the incidence of continuous participation over the 8-wave window varies from a low of 45% for the SOEP F sample up to 59% for the BHPS. Of the non-response patterns, monotonic attrition is clearly the most important. Nevertheless, more variable response rates are also reasonably common, especially in the HILDA Survey and the BHPS, where they account for 12.0% and 9.7%, respectively, of all wave 1 respondents. These fractions may not seem large, but it needs to be borne in mind that these levels represent around one in every three sample members who fail to respond to at least one survey wave (after excluding sample members that either died or moved out of scope). In the SOEP such variable response patterns are less common, reflecting the greater tendency in this survey for non-respondents at one wave to be treated as panel attritors.

More direct evidence on the extent to which the different panels have been successful in re-engaging with previous wave non-respondents is provided in Table 2. In this table we again use the sample of persons that responded at wave 1 (after excluding respondents that either died or moved out of scope), but now report the fraction of persons who did not respond at the previous wave but did respond in the current wave. Thus we can see that the HILDA Survey was successful in converting almost 22% of (in-scope) non-respondents in wave 2 to responding status in wave 3. This proportion then tends to gradually decline with each successive wave. Thus by wave 9 the HILDA Survey was converting only 7% of persons who were non-respondents at wave 8. Similar patterns are observed for the other two studies, but with the average levels of success in conversion generally being lower.

The decline in this rate over time is, at least in part, driven by the gradual rise in the number of cases that the survey administrators determine are no longer worth pursuing (and reflected in the declining proportion of cases issued to field documented in Figure 1). Thus when we restrict the denominator to non-responding cases from the previous survey wave that were issued to field in the current wave, the pattern of a decline over time is less obvious.

4. Modelling survey re-engagement

We now move to an examination of factors that explain differences in the success in re-engaging survey respondents, and how these influences vary across the four samples under consideration.

Let p_{it} be the probability that $R_{it} = 1$ given $R_{it-1} = 0$, where R_{it} is a dichotomous variable indicating whether sample member i responds to the current survey wave t or not. The model that we wish to estimate then takes the form:

$$p_{it} = F(\alpha_t + Z_i\delta + X_{it}\beta + \varepsilon_{it}); \; i = 1, \ldots, N; \; t = 3, \ldots, 9 \qquad (1)$$

where $F(z) = e^z / (1 + e^z)$ is the cumulative logistic distribution, Z_i is a vector of fixed individual characteristics and X_{it} is a vector of time varying characteristics.

Since our sample is restricted to respondents at wave 1 that did not respond at a subsequent wave, our observations span a maximum of seven periods beginning with wave 3. Further, since some individuals will be observed in the data at more than one time period, the errors (ε_{it}) are likely to be correlated within *i*. All estimated standard errors are thus robust estimates that assume observations within individuals are not independent. The errors across different individuals, however, continue to be assumed to be independently (and identically) distributed.

A potentially major weakness in our approach is that the four samples used for this analysis are all restricted to non-respondents at *t-1* that are issued to field for the current wave (time *t*), and the decision about which cases to issue to field is non-random. Survey administrators make judgments about the relative benefits and costs of attempting to make contact with non-responding cases, with those cases deemed to be high cost most likely to not be issued to field. This suggests that we should also be modelling the decision about which cases are issued to field. Unfortunately, it is not obvious how we could identify this two-equation system, with the variables that might influence the decision to issue also expected to directly affect response probabilities.

Another weakness with our approach is that while each of the samples analysed here provide considerable detail about its respondents, we do not have data on time varying characteristics for survey waves in which sample members do not respond. We thus simplify the analysis by measuring almost all individual characteristics at wave 1. This, of course, is not a problem for time invariant characteristics, such as sex, but is potentially quite restrictive for variables that vary markedly over time, such as employment status.

A list of the explanatory variables used in our analysis is provided in Table 3 (together with summary descriptive statistics). The choice of respondent characteristics is guided by previous research (especially as summarised in Watson and Wooden, 2009) but restricted by the desire to have broadly comparable measures for all four samples. We thus include controls for sex, age, whether native or foreign born, education (a simple dummy variable indicating whether the respondent had completed a university level qualification), employment status, the presence of work limiting health conditions, household composition (number of adults and number of children in the household), home ownership, equivalised gross annual household income (measured in the relevant local currency, and specified as a quadratic, with the equivalence scale used being the simple 'modified' scale recommended by the OECD), and marital / relationship status.

While we have done our best to obtain like measures, differences in survey instruments mean that not all variables are measured identically across each of the three studies. This is perhaps most obvious with respect to health limitations. In the case of the BHPS this is defined by the presence of a health problem or disability (that is not temporary) that limits the type or amount of work that can be done. In contrast, the most analogous variable available in the SOEP identifies persons with health conditions that prevent completion of everyday tasks. The HILDA Survey provides measures akin to both of these concepts, but for this analysis we have used a variable most aligned with that available in the BHPS. Specifically, the variable from the HILDA Survey identifies persons with long-term health conditions or disabilities that restrict everyday activities, have lasted or are expected to last at least six months, and limit the type or amount of work that can be done.

But even something as seemingly straightforward as employment is measured differently. From the BHPS data we define an employed person as anyone who undertook paid work in the week prior to interview or anyone who had a job but was away from work. The HILDA Survey provides a derived variable which is much more in line with International Labour Organization guidelines, and thus for persons who were not at work during the preceding week, employment status also hinges on the duration of absence from the work, the reason for that absence, and whether the respondent was paid while not at work. In stark contrast, in the SOEP employment status is based on respondents classifying themselves into different categories, with employed persons defined here as anyone reporting being in full-time employment, regular part-time employment, in-company training, marginally or irregularly employed (but not registered as unemployed), or performing military or community service.

All of the respondent characteristics discussed to this point are measured at wave 1. The only time-varying individual characteristic included in our model is whether the respondent had changed address (either to a traced or untraced location) since the previous survey wave. It has been well established that movement is a major risk factor for locating sample members (e.g., Gray *et al.*, 1996; Lepkowski and Couper, 2002; Watson and Wooden, 2009). Less clear is whether mobility will also be detrimental to re-engagement with survey non-respondents. While every move arguably makes the task of locating sample members more difficult, it needs to be borne in mind that we are dealing with a group that have already disengaged with the study, and in some cases this may have been because of previous moves that took them beyond the easy reach of interviewers. Subsequent moves may thus have the opposite effect. In addition, moves are often associated with changes in household composition, which might mean some sample members shifting into environments that are less hostile to survey participation.

Arguably of most interest are the measures we include that describe the interview and fieldwork process. First, we include a dummy variable indicating whether or not another household member had responded at the previous survey wave. We hypothesise that the likelihood of re-engaging with a non-respondent will be greater in households where the study continues to maintain strong links with that household. This will be most evident where other household members continue to participate. Most obviously, the probability of locating and making contact with the non-respondent at the next wave is greatly enhanced if other household sample members continue to respond. The presence of other household members who continue to cooperate with the survey may also have a tendency to favourably influence the non-respondents attitude towards the study, in the same way that non-responders have been found to adversely affect the likelihood that responding sample members will continue to respond (Watson and Wooden, 2009).

Second, we include indicators of the type of non-response from the previous wave. We expect, for example, that refusers at the previous wave to be more difficult to convert than persons with whom contact was not made. It should be noted, however, that the categories of non-response are not directly comparable across the three surveys. The SOEP data, for example, describes many non-responses as the result of 'processing problems'. No such analog exists for the other two studies, and nor is it entirely obvious what this covers. Very differently, the BHPS data includes responses obtained by proxy interview and by telephone interview, which we have treated as 'other' non-responses given so little information is collected when these modes are used.

Third, we test for mode effects by including variables indicating whether the assigned interviewer was a face-to-face interviewer or a telephone interviewer, and whether survey mode changed since the prior wave. These variables, however, are only relevant for the

HILDA and SOEP samples. As just noted earlier, while the BHPS does use the telephone to conduct interviews, this mode is only used as a last resort, and even then a much shortened version of the survey is conducted (averaging just under 7 minutes in wave 3 – the first year it was introduced – compared with over 40 minutes for the full interview when delivered in person). We have thus treated all telephone responses in the BHPS as non-responses. Further, it needs to be borne in mind that, as described earlier, telephone interviewers in the SOEP generally only mail-out a questionnaire for the sample member to complete; they typically do not conduct interviews.

Fourth, we include a measure of interviewer workload (the number of households allocated to the interviewer at the start of fieldwork). As discussed in Watson and Wooden (2009), a priori the effect of this variable is uncertain. Nicoletti and Buck (2004) argue that large workloads will be synonymous with 'overwork' and thus might be expected to be associated with relatively poor response outcomes. On the other hand, if larger workloads are allocated to better interviewers then the opposite correlation may be observed. We attempt to control for the latter by including interviewer specific dummies. Readers will also observe from Table 3 that average workloads seem very different across the three studies; indeed in the SOEP it appears to average over 400 interviews per wave per interviewer. These very large numbers, however, are a reflection of the high reliance SOEP places on in-office telephone interviewers for dealing with previous wave non-respondents, which in turn is conducive to high volume (but typically with poor returns).

Fifth, we include simple dummy variables that control for both the effect of interviewer continuity and interviewer experience. As briefly discussed in the introduction, there now appears to be broad consensus in the literature that interviewer continuity is beneficial for maintaining high response rates among longitudinal survey sample members. (Less clear is how large these effects are.) These findings, however, are specific to prior wave respondents. Among prior wave non-respondents, it is not at all obvious that sending back the same interviewer who failed to obtain a successful interview at the previous wave is the best thing to do, though often that is exactly what many studies do given interviewer workloads tend to be geographically clustered. We also expect that interviewer experience would be predictive of success in re-engaging non-respondents. For this analysis, however, we do not have measures of general experience (like years employed as an interviewer) but we do know whether the interviewer has worked on the survey in previous waves. We thus include a dummy variable identifying whether an interviewer is new to the survey, as well as interacting that variable with continuity.

Sixth, we expect the probability of success in re-engaging a prior wave non-respondent to be an inverse function of the number of years the sample member has failed to participate. We thus include dummy variables indicating the number of years of successive non-participation. In interpreting the effects of this variable, however, bear in mind that our samples are restricted to prior wave non-respondents that are issued to field. The decision to issue cases is, in turn, a function of how long a sample member has ceased to cooperate. As a result, and as shown in Table 3, we can see that relatively few sample members are identified as having more than three successive waves of non-participation.

Finally, we include wave dummies. These will help control for wave-specific variations in fieldwork procedures as well as any general change in respondent attitudes that evolve over time.

5. Results

5.1 Models of Survey Re-Engagement

Logit estimates for our models of survey re-engagement are presented in Table 4, and at first glance the overall explanatory power seems relatively low, with the simple pseudo R-squared terms ranging from just 0.083 for the SOEP AB sample to 0.19 for the BHPS sample. This is entirely unsurprising and reflects the highly random nature of survey non-response. Indeed, the implied goodness of fit of the models reported here tends to be higher than that reported by most empirical studies that estimate more conventional response models using samples of prior wave respondents. All of the pseudo R-squared terms, however, are considerably increased by the inclusion of interviewer-specific dummies, suggestive of the large importance of interviewer heterogeneity in explaining variations in response outcomes. The value of the pseudo R-squared term increases by 57% for the HILDA Survey sample, by 38% for the BHPS sample, and by 45% for the SOEP AB sample. It is only the SOEP F sample where interviewer differences do not appear to have a major effect on re-engagement probabilities, though even in this case the pseudo R-squared still rose by 13%. Despite this, the inclusion of interviewer dummies appears to have only modest effects on the estimated coefficients on the other variables in the model, suggesting that for the most part these interviewer effects are independent of both respondent characteristics and fieldwork characteristics. As a consequence, and in the interest of brevity, the full results from the re-estimated models with interviewer-specific dummies are not reported here.

Turning now to the estimated coefficients, it is clear that the magnitude and direction of many explanatory variables varies across the four samples. Nevertheless, the more striking feature of Table 4 is how similar the estimated coefficients across the different samples often are, especially given the marked differences in both sample characteristics and survey design. Thus we see that age is negatively associated with the probability of survey re-engagement in all four samples (note that a quadratic form was tested but did not provide a significantly better fit in any of these models). Similarly, university education is positively associated with response probabilities in all samples, with the implied odds ratios varying from a low of 1.19 in the case of the HILDA Survey to a high of 1.53 in the case of the SOEP AB sample. Gender also tends to be significantly associated with re-engagement probabilities, with women more likely to be persuaded to rejoin the study (though no such relationship could be found for the SOEP AB sample). We also find uniform effects with respect to health limitations, though perhaps surprisingly in none of the studies is there evidence of a significant relationship. Further, this result seems invariant to the way health limitations is measured.

With respect to country of birth, there is a clear difference between the HILDA Survey and the BHPS, on the one hand, and the SOEP, on the other. In the case of the HILDA Survey and the BHPS, the probability of re-engaging with prior wave non-respondents is significantly lower for the foreign born, whereas in the SOEP no such relationship is apparent. One possible explanation for these differences is that the SOEP was able to better deal with the language difficulties that arise when dealing with foreign-born populations, both because the foreign-born population in Germany, especially in the mid-1980s, was relatively homogenous (at least compared with Australia and Britain) and because the SOEP B sample was specifically focussed on immigrants and hence more resources were devoted to supporting foreign-language interviewing.

There are also clear differences across the samples with respect to employment status. In the HILDA Survey there are no large differences in re-engagement probabilities between

employed persons and others not in paid work; in both the BHPS and SOEP AB samples employment is a barrier to re-engagement; while in SOEP F employment is a positive factor (though not large enough to achieve statistical significance). The only explanation we could come up with for these differences was differences in the distribution of hours worked. Nevertheless, separating the employed into groups based on hours worked made little difference; only in the BHPS were persons usually working long hours typically found to be less likely to respond than persons working short hours. Of course, it also needs to be borne in mind that the employment status, since it is highly variable over time, is likely to be most affected by our inability to directly observe respondent characteristics at time *t-1*.

With respect to the other time-invariant personal characteristics the estimated coefficients tend to be small (and mostly insignificant), with significant coefficients where they do appear typically restricted to just one of the four samples. Thus marital status seems to bear little or no relationship with re-engagement probabilities; significant relationships with home ownership are restricted to the BHPS sample (with the unexpected result that probabilities of re-engagement are lower for British home owners); and household income, which we specify as a quadratic, mostly exhibits small and weak relationships with re-engagement success in all samples except SOEP AB. In the case of SOEP AB, re-engagement probabilities rise strongly with household income but at a declining rate (the implied turning point occurs close to the very top of the income distribution).

There is also no uniform finding with respect to sample mobility. Among HILDA Survey sample members changing address substantially enhances the probability of future re-engagement (odds-ratio = 1.86), whereas in the SOEP AB samples it is a substantial negative factor (odds-ratio = 0.66). For the other two samples the relationship is positive but statistically insignificant.

Turning to interview and fieldwork characteristics, the results suggest six key findings.

i. As hypothesised, persons that refused to participate at a previous wave are typically less likely to rejoin the survey than other types of non-respondents. This finding is consistent with research on the effectiveness of within-wave conversion (Burton *et al*., 2006).

ii. Also as expected, telephone interviewers are far less successful than face-to-face interviewers in persuading non-respondents to recommence participation. (That said, we admit the possibility that some hard-to-get case may be deliberately assigned to telephone.)

iii. More surprising, changes in interview mode (determined on the basis of initial assignment) have no beneficial effects, and indeed in the case of both the BHPS and the SOEP a change in interview mode is harmful for re-engagement probabilities.

iv. Again as hypothesized, a change in interviewer seems to be mostly beneficial for re-engagement. Indeed, new interviewers tend to do better at re-engaging non-respondents, though this latter effect was only large and robust for the BHPS.

v. In all samples except the HILDA Survey, non-respondents from partially responding households were less likely to respond at future waves. This seems a highly counter-intuitive result which we are not readily able to explain. It is possible that the reason for this result might rest with the decision of who to issue to field. It is almost inevitable that survey administrators would issue households in the current wave if at least one person responded in the last wave, irrespective of the strength of refusals of other household members. Very differently, in households where no-one responded last wave, this decision to issue to field is based on the likelihood of re-interview of at least

one household member. But why would the HILDA Survey experience be different? One possible explanation may lie in the nature of the cash incentive administered to HILDA Survey sample respondents; in addition to a cash payment made to each individual respondent the HILDA Survey is the only one of the three surveys to pay a bonus (to the household reference person) if all members of the household are successfully interviewed.

vi. The likelihood of re-engagement tends to decline with the number of successive waves of non-participation. The greatest impact, however, is felt early on, implying that attempts at re-engagement will be most effective after just one wave of non-response.

5.2 Comparisons with Models of Survey Continuation

The question remains as to whether these results from modeling the decision by survey non-respondents to recommence survey participation are distinct from those obtained from more conventional models of the decision by respondents to continue or discontinue participation. We thus estimated logit models of whether or not survey respondents at time *t-1* are still participating at time *t* using a specification analogous to that reported in Table 4. The model set up is thus the same as in equation (1) with the exception that response ($R_{it} = 1$) is conditional on response at the previous wave ($R_{it-1} = 1$), rather than on non-response. The list of explanatory variables has also bee restricted to be as close as possible to that used in our model of re-engagement. There are, however, three obvious differences. First, there is no need for measures of previous wave outcome in the continuation models (since all sample members were previous respondents). Second, the closest analog to the variable denoting whether an interview was obtained with another household member at the previous wave is one indicating whether at the previous wave any other eligible household members did not participate. Third, for both age and interview workload a quadratic specification was found to be superior to the linear specification.

The results are reported in Table 5, and it is a straightforward matter of comparing the estimated coefficients reported in this table with the relevant coefficients in Table 4. As an example, consider gender. The estimated coefficients are all positive, indicating that women are more likely to continue to participate in panel surveys than are men. The like result was found for survey re-engagement in all samples except SOEP AB. Thus in the main, women are found to be more cooperative with panel surveys, and this is true of both prior wave respondents and prior wave non-respondents. A similar result is found with respect to both university education and whether born overseas or not. Thus regardless of how the outcome variable is specified, university graduates are always more likely to cooperate. Native-born sample members also tend to be more cooperative, though the magnitude and consistency of this relationship is much stronger for continuation models. In contrast, the relationship with respondent age varies depending on which process is being modelled. While the likelihood of a prior wave respondent rejoining the study declines with age in a linear fashion, the decision by prior wave respondents to continue to participate is found to exhibit a quadratic relationship, with response probabilities lowest among both the very young and very old. Other individual characteristics which exhibit markedly different associations depending on how the outcome variable is specified are homeownership and household size. In continuation models homeownership is mostly associated with higher rates of response and household size with lower rates. In contrast, these variables mostly exhibited weak relationships (often with the opposite signs) with survey re-engagement.

However, the respondent characteristic which seems to be most affected by the specification of the outcome variable is changing address. As found in almost all previous research, a change of address is a risk factor for ongoing response. Indeed, the estimated

magnitude of this risk is, in the case of both the BHPS and SOEP AB samples very large (odds ratios of 0.36 and 0.41, respectively). But as noted earlier, when it comes to survey re-engagement, a change of address is not necessarily a negative risk; indeed the HILDA Survey has been significantly more successful re-engaging with movers than those who do not move, other things equal.

Finally we come to fieldwork characteristics, and here the comparison of results presented in Tables 4 and 5 reveals one major point of difference – the very different roles played by interviewer continuity and experience. As expected, both interviewer continuity and experience are beneficial for continuation probabilities. In contrast, we observed very different associations with re-engagement probabilities. Maximising the chances of recruiting a non-respondent back into the panel appears to typically require assigning a different interviewer. Moreover, an interviewer that is new to the study will typically do better than an experienced interviewer returning to the same non-responding household.

6. Discussion

While all panel surveys justifiably focus their resources on encouraging survey respondents to continue to respond at later waves, non-response is both unavoidable and accumulates over time. Maintaining the viability of a panel thus inevitably requires persuading some non-responding sample members to re-engage with the survey. Despite this, we are unaware of any previous research that has modelled the process of re-engaging with survey non-respondents at later survey waves. Instead, research into panel survey non-response and attrition has focused exclusively on survey respondents and the differences between those that respond at future survey waves and those that do not. This perhaps would not be a significant shortcoming if the factors that influence the decision to continue participation were the same factors that influence the decision to re-engage, with effects of broadly similar magnitude. The key insight from this study is that such an assumption is not warranted, and that the re-engagement decision is distinctly different from the decision about continued participation.

Of most significance, our findings have clear implications for survey administration. First, when approaching previous wave non-respondents survey administrators should consider the feasibility of ensuring that interviewers are different to those assigned to these sample members in previous waves. Or at a minimum, they should ensure that the approach adopted in the previous wave that proved unsuccessful is fully documented and that the interviewer when returning to the same household has a tool bag of several fresh approaches that could be used for this wave. Second, efforts at re-engaging with non-respondents need to be initiated as soon as possible (that is, at the very next wave). Third, though somewhat more speculative, consideration could be given to the use of household incentives, rather than relying simply on individual-level incentives. Fourth, efforts are best focused not on the refusers, but on the non-contacts and on persons who gave other reasons for non-response (such as poor health). Finally, though this is hardly news for experienced survey administrators, the benefits from continuing to track movers, even if over quite a long period, may be worth the costs. Many of these persons can be easily recruited back into the panel if they can be found.

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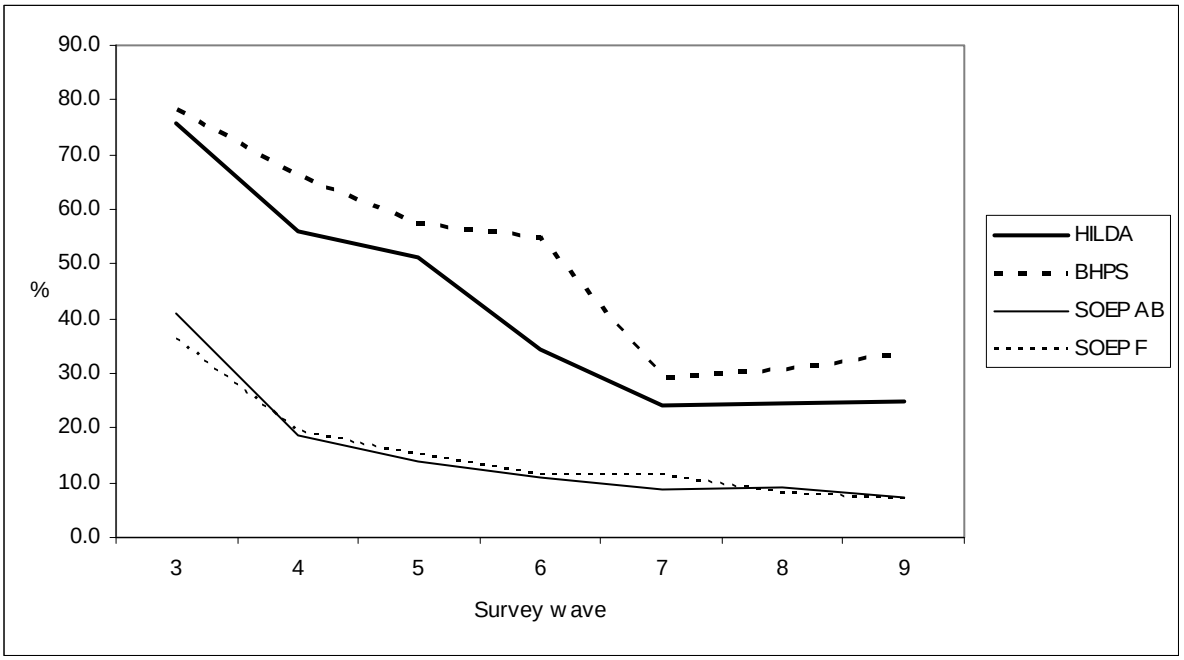
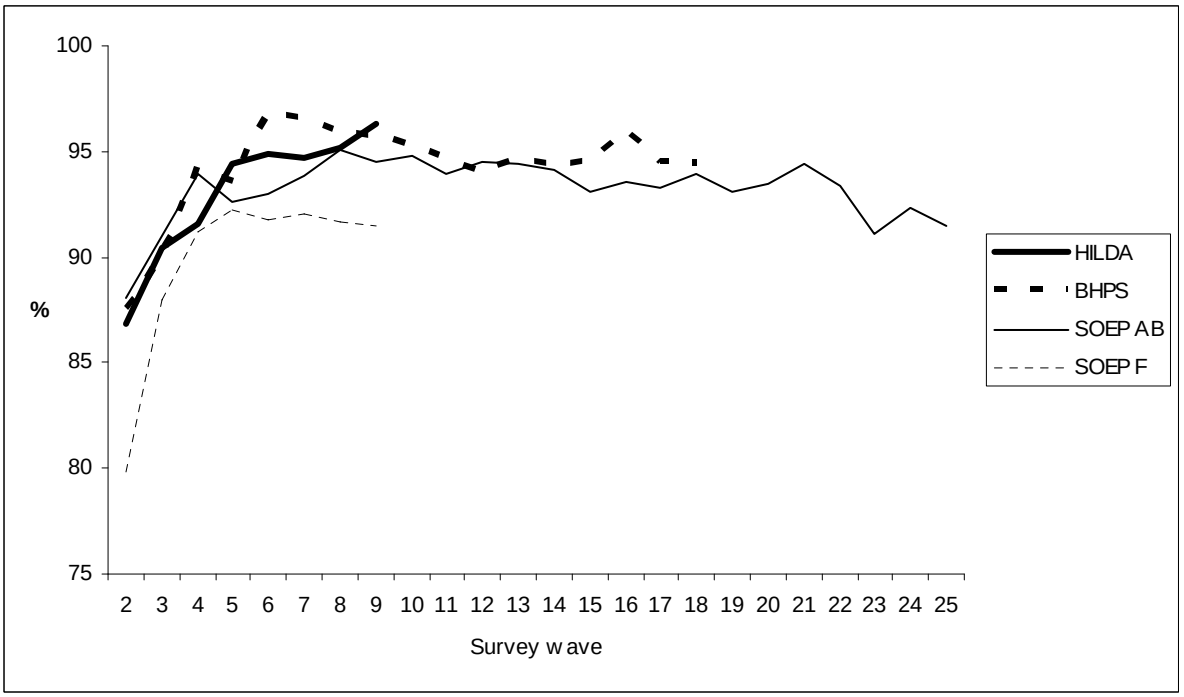
Figure 1. Proportion of previous wave non-respondents issued to field by survey wave: HILDA Survey, BHPS and SOEP compared (wave 1 participants)



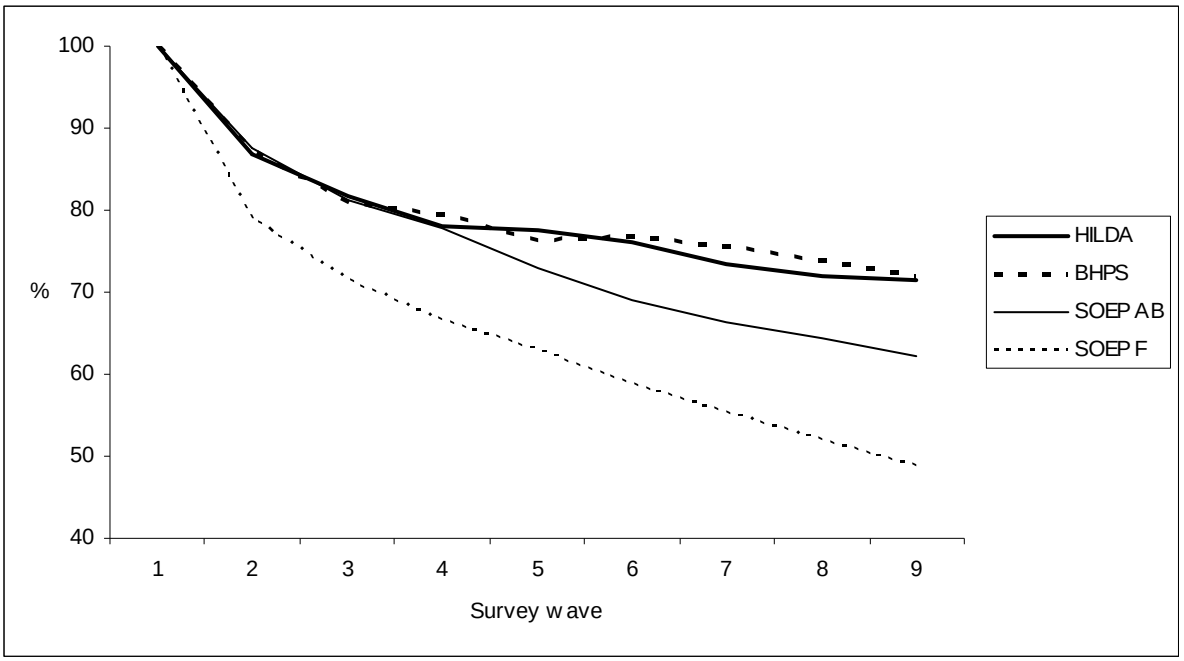
Notes: (1) All samples exclude any respondent who died or moved abroad during the first 9 waves. (2) For reasons of data comparability, responses obtained in the BHPS by proxy and via the short telephone interview have been treated as non-responses.

Figure 2. Percentage of respondents re-interviewed at the next survey wave: HILDA Survey, BHPS and SOEP compared



Notes: (1) The denominator excludes deaths and persons known to have moved out of scope. The latter includes persons who move abroad and temporary sample members who cease co-residing with an permanent sample member. (2) For reasons of data comparability, responses obtained in the BHPS by proxy and via the short telephone interview have been treated as non-responses.

Figure 3. Percentage of wave 1 respondents re-interviewed by survey wave: HILDA Survey, BHPS and SOEP compared



Notes: (1) All samples exclude any respondent who died or moved abroad during the first 9 waves. (2) For reasons of data comparability, responses obtained in the BHPS by proxy and via the short telephone interview have been treated as non-responses.

Table 1. Patterns of response by survey, waves 1 to 8 (wave 1 participants)

Survey	*Continual participation (%)*	*Monotone attrition (%)*	*Other response patterns (%)*	*Deaths and movements out of scope (%)*
HILDA	56.9	21.8	12.0	9.2
BHPS	58.9	20.8	9.7	10.6
SOEP AB	54.1	29.5	6.2	10.2
SOEP F	44.9	42.6	6.8	5.7

Notes: (1) For wave 1 participants, movements out of scope comprise respondents who moved abroad during the next seven waves. (2) For reasons of data comparability, responses obtained in the BHPS by proxy and via the short telephone interview have been treated as non-responses.

Table 2. Proportion of previous wave non-respondents converted: HILDA Survey, BHPS and SOEP compared (wave 1 participants)

Survey	*W3*	*W4*	*W5*	*W6*	*W7*	*W8*	*W9*
% of all non-respondents							
HILDA	21.8	15.3	15.6	8.7	5.1	5.6	7.1
BHPS	17.2	14.7	8.2	11.0	4.3	3.5	3.6
SOEP AB	13.3	7.5	3.0	3.6	3.5	3.2	2.0
SOEP F	10.4	4.2	3.9	2.2	2.2	1.6	1.5
% of all non-responding cases issued to field							
HILDA	28.7	27.2	30.4	25.2	21.0	22.9	28.1
BHPS	21.9	22.2	14.2	20.0	14.7	11.4	10.8
SOEP AB	32.5	39.9	21.9	33.5	40.4	35.3	26.5
SOEP F	28.8	21.8	26.0	19.3	19.5	20.4	22.2

Notes: (1) All samples exclude any respondent who died or moved abroad during the first 9 waves. (2) For reasons of data comparability, responses obtained in the BHPS by proxy and via the short telephone interview have been treated as non-responses.

Table 3. Explanatory variables: Means and standard deviations (in parentheses)

Variable	*HILDA*		*BHPS*		*SOEP AB*		*SOEP F*	
Respondent characteristics at w1								
Female	0.480	(0.500)	0.439	(0.496)	0.476	(0.500)	0.494	(0.500)
Age	39.4	(16.2)	40.2	(16.4)	37.7	(16.5)	41.5	(16.6)
Foreign born	0.298	(0.457)	0.089	(0.285)	0.299	(0.458)	0.123	(0.329)
University graduate	0.126	(0.332)	0.053	(0.224)	0.073	(0.260)	0.159	(0.366)
Employed	0.651	(0.477)	0.676	(0.468)	0.633	(0.482)	0.624	(0.485)
Health limitations	0.144	(0.351)	0.125	(0.331)	0.293	(0.455)	0.276	(0.447)
No. of adults in household	2.7	(1.2)	2.5	(1.0)	2.7	(1.2)	2.4	(0.9)
No. of children in household	0.8	(1.1)	0.7	(1.0)	0.8	(1.0)	0.6	(0.9)
Home owner	0.724	(0.447)	0.743	(0.437)	0.359	(0.480)	0.583	(0.493)
Equivalised annual household income ($/10^5$)	0.356	(0.485)	0.103	(0.066)	0.154	(0.123)	0.259	(0.208)
Equivalised annual household income squared ($/10^{10}$)	0.362	(4.587)	0.015	(0.027)	0.039	(0.133)	0.111	(0.602)
Marital status(base = Married)								
De facto	0.100	(0.300)	0.063	(0.243)	0.032	(0.176)	0.168	(0.374)
Separated / divorced	0.080	(0.272)	0.084	(0.277)	0.087	(0.281)	0.058	(0.234)
Never married	0.281	(0.449)	0.246	(0.431)	0.336	(0.472)	0.188	(0.391)
Time varying respondent characteristics								
Changed address	0.190	(0.393)	0.132	(0.338)	0.178	(0.383)	0.084	(0.277)
Fieldwork / Interviewer characteristics								
Previous wave ivw with other hh member	0.250	(0.433)	0.429	(0.495)	0.213	(0.410)	0.273	(0.446)
Previous wave outcome (base = Refusal)								
Non-contact	0.079	(0.269)	0.070	(0.356)	0.078	(0.268)	0.029	(0.169)
Other non-response	0.123	(0.329)	0.348	(0.476)	0.005	(0.069)	0.007	(0.082)
Lost in tracking	0.029	(0.167)	0.046	(0.208)	0.050	(0.217)	0.029	(0.166)
Processing problems					0.286	(0.452)	0.172	(0.378)
Telephone interviewer	0.121	(0.326)	0.050	(0.219)	0.685	(0.464)	0.710	(0.454)
Unchanged interview mode	0.839	(0.367)	0.878	(0.328)	0.540	(0.499)	0.565	(0.496)
Interviewer workload	71.0	(25.9)	32.6	(17.0)	420.2	(280.2)	431.4	(318.1)
Ivwr experience / continuity (base = Experienced + Same)								
Experienced + Different	0.354	(0.478)	0.264	(0.441)	0.606	(0.489)	0.536	(0.499)
New interviewer	0.214	(0.410)	0.082	(0.274)	0.016	(0.126)	0.011	(0.104)
No. of non-responding waves (base = One)								
Two	0.218	(0.413)	0.198	(0.399)	0.075	(0.263)	0.077	(0.266)
Three	0.093	(0.290)	0.100	(0.300)	0.018	(0.132)	0.042	(0.200)
Four	0.041	(0.199)	0.067	(0.250)	0.009	(0.095)	0.026	(0.160)
Five	0.021	(0.145)	0.044	(0.204)	0.005	(0.072)	0.017	(0.131)
Six	0.012	(0.109)	0.029	(0.169)	0.003	(0.059)	0.009	(0.096)
Seven	0.006	(0.075)	0.015	(0.123)	0.002	(0.042)	0.004	(0.063)
Survey wave (base = W3)								
W4	0.177	(0.382)	0.199	(0.399)	0.151	(0.358)	0.163	(0.370)
W5	0.192	(0.394)	0.164	(0.370)	0.134	(0.340)	0.149	(0.356)
W6	0.131	(0.338)	0.177	(0.382)	0.126	(0.332)	0.123	(0.329)
W7	0.097	(0.296)	0.096	(0.295)	0.120	(0.325)	0.138	(0.345)
W8	0.108	(0.310)	0.093	(0.290)	0.132	(0.339)	0.104	(0.306)
W9	0.121	(0.326)	0.104	(0.306)	0.116	(0.320)	0.096	(0.295)
N (observations)	7,330		4,240		2,311		3,225	
N (individuals)	3,943		2,166		1,875		2,488	

Table 4. Logit estimates: Models of survey re-engagement (standard errors in parentheses)

Variable	*HILDA*		*BHPS*		*SOEP AB*		*SOEP F*	
Respondent characteristics at w1								
Female	0.202	(0.058)	0.250	(0.085)	-0.117	(0.103)	0.294	(0.094)
Age	-0.009	(0.003)	-0.010	(0.004)	-0.022	(0.004)	-0.007	(0.004)
Foreign born	-0.115	(0.066)	-0.301	(0.148)	0.028	(0.125)	-0.101	(0.148)
University graduate	0.170	(0.088)	0.344	(0.184)	0.425	(0.198)	0.365	(0.128)
Employed	0.060	(0.068)	-0.245	(0.103)	-0.220	(0.112)	0.179	(0.108)
Health limitations	0.014	(0.090)	0.010	(0.131)	0.176	(0.117)	0.044	(0.111)
No. of adults in household	-0.045	(0.028)	0.062	(0.048)	-0.036	(0.048)	0.062	(0.056)
No. of children in household	0.047	(0.028)	-0.015	(0.049)	0.004	(0.052)	-0.051	(0.056)
Home owner	-0.020	(0.071)	-0.273	(0.099)	-0.113	(0.121)	-0.095	(0.107)
Equivalised h'hold income	$-0.21e^{-05}$	$(0.14e^{-05})$	$-0.14e^{-05}$	$(1.19e^{-05})$	$2.15e^{-05}$	$(0.92e^{-05})$	$0.53e^{-05}$	$(0.41e^{-05})$
Equivalised h'hold income sq'd	$0.02e^{-10}$	$(0.01e^{-10})$	$1.01e^{-10}$	$(2.07e^{-10})$	$-1.21e^{-10}$	$(0.74e^{-10})$	$-0.15e^{-10}$	$(0.12e^{-10})$
Marital status (base = Married)								
De facto	-0.047	(0.107)	-0.002	(0.175)	0.006	(0.278)	-0.031	(0.147)
Separated / divorced	0.076	(0.111)	-0.205	(0.166)	-0.054	(0.192)	-0.116	(0.189)
Never married	-0.059	(0.095)	-0.104	(0.134)	-0.360	(0.146)	-0.214	(0.163)
Time varying respondent characteristics								
Changed address	0.618	(0.075)	0.190	(0.116)	-0.481	(0.146)	0.280	(0.185)
Fieldwork / Interviewer characteristics								
Previous wave ivw with other hh member	0.153	(0.072)	-0.531	(0.119)	-0.596	(0.162)	-1.097	(0.153)
Previous wave outcome (base = Refusal)								
Non-contact	1.486	(0.100)	0.851	(0.149)	0.463	(0.201)	0.953	(0.252)
Other non-response	0.710	(0.087)	1.519	(0.105)	0.558	(0.784)	0.476	(0.569)
Lost in tracking	0.081	(0.175)	2.067	(0.200)	0.417	(0.242)	-0.591	(0.346)
Processing problems					0.390	(0.121)	-0.200	(0.185)
Telephone interviewer	-0.543	(0.122)			-0.979	(0.570)	-0.966	(0.209)
Unchanged interview mode	0.117	(0.106)	0.745	(0.178)	0.504	(0.174)	0.769	(0.136)
Interviewer workload	-0.0026	(0.001)	0.0004	(0.003)	0.0006	(0.001)	-0.0007	(0.0003)
Ivwr experience / continuity (base = Experienced + Same)								
Experienced + Different	0.271	(0.069)	0.784	(0.111)	0.184	(0.159)	0.458	(0.150)
New interviewer	0.147	(0.083)	0.559	(0.149)	0.367	(0.380)	0.117	(0.461)
No. of non-responding waves (base = One)								
Two	-0.868	(0.078)	-0.644	(0.111)	-0.881	(0.227)	-1.192	(0.265)
Three	-0.972	(0.118)	-1.090	(0.163)	-1.543	(0.587)	-1.838	(0.443)
Four	-1.596	(0.207)	-1.551	(0.207)	-1.824	(0.758)	-1.592	(0.549)
Five	-1.160	(0.250)	-2.071	(0.368)	-0.783	(0.745)		
Six	-1.428	(0.358)	-2.718	(0.598)	-1.428	(1.092)	-0.825	(0.656)
Seven	-1.960	(0.535)	-1.831	(0.624)			-1.325	(1.135)
Survey wave (base = W3)								
W4	0.372	(0.096)	0.350	(0.137)	0.652	(0.169)	-0.357	(0.149)
W5	0.634	(0.095)	0.289	(0.155)	-0.108	(0.215)	-0.046	(0.146)
W6	0.361	(0.107)	0.659	(0.146)	0.230	(0.211)	-0.149	(0.160)
W7	-0.007	(0.123)	0.672	(0.179)	0.681	(0.184)	-0.178	(0.161)
W8	0.208	(0.113)	0.710	(0.193)	0.478	(0.196)	-0.109	(0.173)
W9	0.792	(0.114)	0.345	(0.185)	0.200	(0.250)	-0.031	(0.174)
Constant	-1.039	(0.246)	-2.054	(0.367)	-0.056	(0.425)	-0.606	(0.371)
Log likelihood	-3824		-1877		-1341		-1542	
Pseudo R-squared	.098		0.190		0.083		0.115	
Chi-squared	700.9		618.0		214.1		322.3	
N	7330		4026		2307		3169	

Table 5. Logit estimates: Models of survey continuation (standard errors in parentheses)

Variable	*HILDA*		*BHPS*		*SOEP AB*		*SOEP F*	
Respondent characteristics at w1								
Female	0.150	(0.030)	0.262	(0.040)	0.075	(0.036)	0.050	(0.035)
Age	0.036	(0.006)	0.027	(0.007)	0.036	(0.007)	0.064	(0.007)
Age squared	-0.0004	($5.87e^{-05}$)	-0.0004	($7.56e^{-05}$)	-0.0005	($7.19e^{-05}$)	-0.0007	($6.73e^{-05}$)
Foreign born	-0.299	(0.034)	-0.400	(0.072)	-0.201	(0.043)	-0.456	(0.054)
University graduate	0.376	(0.046)	0.356	(0.084)	0.139	(0.070)	0.231	(0.050)
Employed	0.014	(0.037)	-0.007	(0.050)	-0.023	(0.041)	-0.057	(0.042)
Health limitations	-0.038	(0.043)	-0.061	(0.055)	0.045	(0.038)	-0.157	(0.038)
No. of adults in household	-0.150	(0.016)	0.032	(0.023)	-0.056	(0.016)	-0.057	(0.021)
No. of children in household	-0.048	(0.015)	-0.050	(0.024)	0.012	(0.019)	-0.046	(0.021)
Home owner	0.101	(0.035)	0.146	(0.045)	0.172	(0.039)	-0.058	(0.038)
Equivalised h'hold income	$0.13e^{-05}$	($0.08e^{-05}$)	$1.95e^{-05}$	($0.68e^{-05}$)	$-0.31e^{-05}$	($0.34e^{-05}$)	$-0.35e^{-05}$	($0.15e^{-05}$)
Equivalised h'hold income sq'd	$-0.04e^{-10}$	($0.009e^{-10}$)	$-2.74e^{-10}$	($1.40e^{-10}$)	$-0.03e^{-10}$	($0.32e^{-10}$)	$-0.009e^{-10}$	($0.037e^{-10}$)
Marital status (base = Married)								
De facto	-0.062	(0.054)	-0.098	(0.085)	-0.079	(0.095)	-0.078	(0.060)
Separated / divorced	-0.041	(0.052)	0.028	(0.068)	-0.083	(0.064)	0.024	(0.067)
Never married	-0.032	(0.054)	-0.149	(0.066)	-0.256	(0.057)	-0.020	(0.068)
Time varying respondent characteristics								
Changed address	-0.293	(0.038)	-1.023	(0.053)	-0.903	(0.052)	-0.368	(0.067)
Fieldwork / Interviewer characteristics								
Previous wave partial hh response	-1.169	(0.043)	-0.977	(0.053)	-0.579	(0.078)	-0.538	(0.061)
Telephone interviewer	-0.518	(0.084)			-0.985	(0.168)	-3.052	(0.167)
Unchanged interview mode	0.579	(0.075)			0.880	(0.086)	2.049	(0.108)
Interviewer workload	0.005	(0.003)	0.008	(0.003)	0.003	(0.0008)	0.006	(0.0005)
Interviewer workload squared	$-3.00e^{-05}$	($1.69e^{-05}$)	$-4.05e^{-05}$	($2.13e^{-05}$)	$-4.92e^{-06}$	($9.56e^{-07}$)	$-3.72e^{-06}$	($3.73e^{-07}$)
Ivwr experience / continuity (base = Experienced + Same)								
Experienced + Different	-0.206	(0.040)	-0.154	(0.055)	-0.636	(0.042)	-0.738	(0.058)
New interviewer	-0.184	(0.044)	-0.167	(0.062)	-0.613	(0.088)	-0.356	(0.095)
No. of non-responding waves (base = One)								
Two	0.342	(0.119)	0.474	(0.169)	0.661	(0.176)	0.490	(0.178)
Three	0.899	(0.108)	1.110	(0.155)	0.938	(0.160)	0.784	(0.147)
Four	1.152	(0.121)	1.125	(0.152)	1.300	(0.150)	0.903	(0.158)
Five	1.135	(0.122)	1.148	(0.194)	0.678	(0.183)	1.020	(0.176)
Six	1.413	(0.130)	1.708	(0.179)	1.566	(0.169)	1.186	(0.181)
Seven	1.287	(0.143)	2.034	(0.195)	1.362	(0.193)	0.499	(0.226)
Eight	1.277	(0.153)	2.246	(0.182)	1.006	(0.186)	0.778	(0.222)
Survey wave (base = W2)								
W3	-0.029	(0.129)	-0.177	(0.178)	-0.242	(0.184)	0.344	(0.184)
W4	-0.362	(0.113)	-0.023	(0.160)	0.018	(0.163)	0.464	(0.148)
W5	-0.099	(0.121)	-0.122	(0.152)	-0.412	(0.151)	0.472	(0.159)
W6	0.143	(0.117)	0.657	(0.191)	0.207	(0.185)	0.425	(0.173)
W7	-0.238	(0.122)	0.131	(0.162)	-0.457	(0.166)	0.305	(0.176)
W8	0.023	(0.134)	-0.266	(0.177)	0.027	(0.184)	1.020	(0.220)
W9	0.216	(0.139)	-0.623	(0.165)	0.440	(0.184)	0.800	(0.215)
Constant	1.000	(0.198)	1.396	(0.201)	1.094	(0.193)	-1.330	(0.224)
Log likelihood	-18384		-10733		-14463		-13162	
Pseudo R-squared	0.098		0.104		0.124		0.270	
Chi-squared	3711		2489		3958		6481	
N	81722		56764		63739		52912	