

IZA DP No. 573

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September 2002

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September 2002

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## ABSTRACT

### Item Non-Response on Income and Wealth Questions\*

After reviewing the literature on item non-response we focus on three issues: First, is there significant heterogeneity in item non-response across financial questions and in the association of covariates with item non-response across outcomes? Second, can the informational value of surveys be improved by matching interviewers and respondents based on their characteristics? Third, how does offering a "don't know" answer option affect respondent behavior? The questions are answered based on detailed survey and interviewer data from the German Socioeconomic Panel, considering a broad set of income and wealth outcomes.

JEL Classification: C81, J30, I32

Keywords: item non-response, survey quality, interviewer effects, income and wealth

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\*We thank Jörg-Peter Schräpler for generous support in particular regarding the interviewer data used in this study and numerous participants of the GSOEP 2002 conference for very helpful comments.

*"... the subject of item nonresponse  
is badly in need of investigation."  
Ferber (1966, p.415)*

## **1. Introduction**

Survey data form the basis of most empirical research on income and wealth. Accordingly its quality and the various determinants thereof, as well as the implications of data deficiencies deserve the attention of researchers.

Within the range of data problems and quality concerns some have garnered more attention in the social sciences than others: The disciplines of sociology and psychology, where interest often focuses on subjective statements, are mainly concerned with whether the desired information might be adulterated by the effects of the interview situation or by interviewer influences:<sup>1</sup> If respondents seek the respect of interviewers, their answers may deviate from the truth. Issues raised frequently in the economic literature are those of unit non-response and sample representativeness (cf. Hill and Willis 2001 or Horowitz and Manski 1998). Also problems of measurement error and recall bias find attention.<sup>2</sup> In contrast, the problem of item non-response is largely neglected. This is astounding as the loss of information due to item non-response may be just as problematic for sample representativeness as complete respondent dropout from a survey.

Given the typically high rates of item non-response on sensitive issues such as income and wealth in surveys it is important to learn about the determinants of nonresponse behavior. An understanding of the mechanisms driving item non-response may on the one hand permit the development of tools and techniques to reduce it and thus to substantively increase the value of interviews and on the other hand it might improve researchers' ability to rigorously deal with non-response in their own analyses. This study investigates such mechanisms and more specifically addresses the following questions:

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<sup>1</sup> For careful discussions of these problems see Esser (1984) or Reinecke (1991).

<sup>2</sup> See the special issues of the Journal of Human Resources (1998.2, 2001.3) and sources cited there.

First, we ask whether the matching of interviewers to respondents affects respondents' willingness to provide information. If this were the case, survey administrators might be able to improve data quality by a conscious pairing of interviewers and respondents. Second, we analyze whether offering the option of "don't know" answers in questionnaires is beneficial in terms of the amount of information provided, and third whether there is measurable heterogeneity in the response propensity for different types of financial questions. Little evidence exists on this last issue. If item non-response propensities differ for different types of financial questions it might be possible to utilize this finding to optimize survey strategies and to improve informational outcomes. One could either avoid the most problematic and challenging questions altogether, or aid the cognitive process involved in providing the information on the part of the respondent e.g. by purposefully sequencing the questions.

This study adds to the literature in at least three ways. First, it provides a summary of theoretical models of non-response behavior and surveys the empirical literature on item non-response. Second, we exploit excellent data from the German Socioeconomic Panel (GSOEP), which contains information not only on respondent and household characteristics including wealth, but also provides data on its interviewers (for details see Schr ppler and Wagner 2001). Thus combining interviewer and respondent information opens up new avenues for research on e.g. the relevance of particular interviewer-respondent matches. Finally, we extend the scarce previous literature which concentrated on income measures, by considering item non-response for a variety of outcomes. This allows us to address questions that have not been looked at before, such as the heterogeneity in item non-response behavior across financial outcomes, or the relevance of offering respondents the option of answering "don't know" for the amount and quality of information gathered.

The main results of the study are first that significant heterogeneity is detected in item non-response across financial questions. Non-response rates vary widely, which shows up in significant question specific fixed effects in models of item non-response behavior, and in

significant differences in the association of covariates with item non-response outcomes. Second, there is not much to be gained for the informational value of surveys from matching interviewers and respondents based on their key characteristics, once age and gender effects are controlled for. Our third key result with respect to "don't know" answer options in the questionnaire is that the characteristics of "don't know" respondents are neither very close to those providing informative answers nor to those refusing to respond. Therefore the "don't know" respondents have to be considered as a separate group, and simple statements as to whether offering the "don't know" answer takes away from valid answers or from non-responses are not feasible.

The paper proceeds by reviewing the theoretical approaches advanced in the social sciences to model item non-responses. After a description of prior item non-response studies, section three discusses our hypotheses regarding item non-response behavior. Section four describes the available data and provides preliminary evidence. The empirical strategy is lined out before section five discusses the finding. Section six concludes.

## **2. Approaches to Item Non-response**

### **2.1 Theoretical Frameworks for the Analysis of Item Non-response**

Respondent behavior in interviews and surveys has been addressed in a wide and interdisciplinary literature. Among various explanations of response behavior in the literature, the cognitive model and the rational choice framework for item non-response are prominent.

After early models developed in cognitive psychology (cf. Lachman et al. 1979) focused on individual thought processes, the cognitive model of respondent behavior extended this framework by also taking social aspects of the survey situation into consideration.<sup>3</sup> This conceptualization of response behavior separates several stages in the process of answering a question: After having heard or read a question, the respondent must interpret the information. The issue addressed by the interviewer has to be recognized, and the respondent must understand

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<sup>3</sup> The by now almost classic reference for the cognitive approach is Sudman et al. (1996).

the content of the question. At this stage of the interview, problems may arise depending on the technicality of the question or the common understanding and definitions used by respondent and interviewer. In this situation face-to-face interviews bear the advantage of allowing for feedback between the interview partners regarding the intended content of the question.

As a second cognitive stage the respondent has to gather the required information. Here the familiarity of the issue matters: Being asked about ones' age imposes less of a cognitive effort than answering, say, about the amount of interest earned on building society accounts during the past calendar year. The more complex the issue the more is required of the respondent's knowledge, cognitive ability, and willingness to recollect the relevant information.

After the respondent successfully gathered the required information, the questionnaire may impose a certain format on the response (e.g. categorical answers, or subjective intensity statements), which may require additional "translation efforts" by the respondent. The final cognitive stage consists of a possible adjustment of the information to consider objectives such as self representation or social desirability. Only after the respondent refiltered the intended answer through these additional "mental screens", the answer is provided.

It is this last stage which is at the focus of rational choice theory. Rational choice theory was early on advanced by Esser (1984), and is still heavily relied upon (e.g. Däubler 2002). Esser (1986) views respondent behavior as the outcome of an evaluation process: In any given situation the respondent evaluates behavioral alternatives based on their expected consequences and chooses the best maximizing subjectively expected utility. Within this framework responding to a question consists of three stages: First a particular question must be understood, then behavioral alternatives are to be evaluated, and finally the preferred behavior is chosen.

The rational choice approach predominates the analysis of survey response: Hill and Willis (2001, p.418) state that an individual answers a survey if "the act of participation is expected to bring rewards that exceed the cost of participation." The *rewards* to participation may include pecuniary and non-pecuniary rewards such as social acknowledgment by being positively

regarded and appreciated by others. The *costs* consist of the length of time it takes to respond, but also of the emotional experience of going through potentially embarrassing, painful or cognitively difficult interviews. These cost considerations allow one to expect different response behaviors based on the perceived privacy of questions. Schräpler (2001) considers the following costs and benefits: *Benefits* of responding consist of supporting a potentially appreciated cause (e.g. scientific value, public interest) and of avoiding the negative effects of a refusal such as breaking social norms generated by the interview situation or violating courtesy towards the interviewer. Key *costs* of answering a survey consist of the potential negative consequence of providing private information (e.g. from tax authorities or through data abuse and breach of privacy) as well as of the necessary effort to recall the facts desired by the questionnaire. The cost of providing income information in particular is hypothesized by Schräpler to show a U-shaped pattern: If income is low, individuals may be too embarrassed to tell the truth, if it is very high, individuals may be reluctant to reveal this information to a stranger.

A separate aspect connected to the rational choice framework of participation decision is the relevance of trust in the interview situation. If a respondent distrusts the interviewer he is less ready to expend effort to provide information or even to reveal information at all. Hill and Willis (2001) refer to Dillman (1978) who emphasized the relevance of trust, and describe steps taken in the Health and Retirement Survey to render interviewers more trustworthy. Schräpler (2001) discusses the importance of a process he terms "confidence building" which involves reducing the social distance between the interviewer and the respondent over time to increase trust and to reduce the fear of negative consequences of sensitive statements.

In sum, the main theoretical approaches focus on the cognitive process of providing information as well as on cost-benefit calculations of the individual. The latter may well be influenced by measures of confidence building on the part of the survey administration and the level of trust established in the personal relationship between interviewer and respondent.



## 2.2 Prior Evidence on Item Non-response

Given the focus in the social sciences on social desirability effects and on *unit* non-response, evidence on the determinants of *item* non-response is relatively scarce. Among the earlier studies Lillard et al. (1986), motivated by rising non-response rates, investigate the distribution of item non-response in the United States' Current Population Survey. The authors distinguish between individuals who refused to respond only to the income question and those who did not answer a number of questions. While the latter group represents the lower part of the income distribution, the probability of an exclusive income non-response increases with income. Earnings were more likely to be reported in personal compared to telephone interviews.

Similarly, Sousa-Poza and Henneberger (2000) focus on the income question in Swiss telephone interviews. They find that non-response probabilities are significantly higher for respondents with low education, and among the self-employed and home owners. The authors investigate the relevance of matching the characteristics of interviewers and respondents and show that similarity in age increases the response probability, that education differences do not affect item non-response, and that male interviewers are more successful in eliciting income information than females. Since the share of response behavior that can be explained by characteristics of the interview partners is limited, they conclude that the "observed wage data are not biased by the large (wage) item non-response encountered in telephone interviews." (p. 98)

This finding is basically confirmed by Biewen (2001), who compares alternative methods to address item non-response based on GSOEP data, and shows that non-response of income is highest in the tails of the income distribution. However, he points out that non-response is only weakly associated with personal characteristics and mainly driven by unobservables. An earlier study of Zweimüller (1992) using Austrian data is similar to Biewen (2001). Estimating wage equations for women Zweimüller (2001, p.109) however concludes that "selection due to survey non-response is of larger importance than the usually addressed selectivity bias."

Schräpler (2001) focuses on the longitudinal development of item non-response for gross earnings and measures of individual concerns. Similar to Lillard et al. (1986) and to Biewen (2001) he finds evidence that those in low social positions (also females and the young) tend to withhold income information. Again and just as in the data of Sousa-Poza and Henneberger (2000), respondents seem to be much more uncooperative in front of females than males. Schräpler concludes that the relationship between respondent and interviewer is of key significance, as "with increasing trust the item-nonresponse rate falls off over time." (2001, p.22)

With a focus on improving survey administration Hill and Willis (2001) evaluate the effectiveness of paying respondents for their time and of enhancing the psychic value of participation for unit non-response: Reassigning the same interviewer to a given respondent has powerful effects on the propensity to respond, as trust can be established between the interview partners over time. The authors emphasize the importance of the respondent's engagement and cognitive ease with the interview as predictors of survey participation.

Finally, Loosveldt et al. (1999) used Belgian data to compare the correlation of item non-response behavior for a variety of questions with subsequent unit non-response. The differences in item non-response across questions are interpreted as a consequence of the questions' varying cognitive difficulty and the sensitivity of the relevant issues. The authors find a positive correlation between item and subsequent unit non-response.

### **2.3 Summing Up**

The reported evidence yields four main results: First, item non-response on income questions is concentrated in the tails of the income distribution, certainly in the lower tail. However, second, there seems to be only little systematic variation in item non-response behavior and considerable randomness. Third, among the theoretical approaches outlined above, particularly the predictions based on the "cognitive process" model and the "trust" framework find support: The evidence suggests that interviewer-respondent matching affects survey success

and that certain characteristics, such as a similar age, or having male interviewers may facilitate response behavior. Finally, the cognitive requirement and the sensitivity of an issue seem to affect respondents' willingness to answer. Interpreted within the rational choice framework, the cost of a response seems to be higher when difficult, sensitive, or threatening issues are considered.

One limitation of this literature is that almost all studies of item non-response investigate merely the income question. If there is heterogeneity in the level of cognitive challenges and item-specific sensitivities across financial outcomes this has been neglected in prior analyses.<sup>4</sup> Also the literature does not investigate the role of framing: If individuals show differential response propensities depending on how the question is formulated, this information may be extremely important in devising and administering future surveys.<sup>5</sup> These issues are addressed below.

### **3. Synthesis and Hypotheses**

Before discussing specific hypotheses and test procedures we describe our "synthetic" model of response behavior to guide the interpretation of the empirical findings. In principle we follow a rational choice framework but add factors discussed in other models of item non-response. We assume that individuals respond to a question when the expected benefits of answering exceed the perceived costs, and model the decision to respond.<sup>6, 7</sup>

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<sup>4</sup> Exceptions are Schr ppler (2001) who also investigates subjective concerns and Loosveldt et al. (1999) who look at political preferences.

<sup>5</sup> This issue is much discussed in the literature on attitude surveys. Trometer (1996) summarizes the evidence which suggests that offering respondents who are queried about their opinions the option of a "don't know" answer affects responses in important ways.

<sup>6</sup> We consider the event of the interview, the selection of the respondent, and the fact that the individual is in principle willing to respond to the survey as being exogenously given.

<sup>7</sup> This simple dichotomy can be generalized to a broader set of replies, when individuals have the option of responding that they do not know the answer. In that case answering "don't know" may either reflect that a person is actually uninformed about the desired item, or it may

The response decision is taken by individual  $i$  for question  $j$  posed by interviewer  $m$ . We assume an underlying, latent index indicating the individual propensity to answer, which is determined by the utility difference between responding or not for individual  $i$ . An individual's unobserved propensity to answer question  $j$ ,  $y_{ij}^*$ , may be modeled as follows:

$$y_{ij}^* = c_{ij} \alpha_1 + b_{ij} \alpha_2 + X_i \beta_1 + W_m \beta_2 + (X_i * W_m) \beta_3 + \mu_{ij} \quad (1)$$

where  $c_{ij}$  represents the costs connected to answering question  $j$ ,  $b_{ij}$  are the respective benefits,  $X$  and  $W$  are characteristics of respondent and interviewer,  $\alpha$  and  $\beta$  are coefficients, and  $\mu$  represents random noise.

The costs and benefits individuals consider when deciding on answering were discussed above: The cognitive framework suggests that costs are high when a question requires detailed information, when the issue is sensitive to individual feeling of privacy, potentially embarrassing, or painful. Another consideration may be an item's potential for abuse, e.g. by tax authorities.

With our data the benefits involved in answering are non-pecuniary. They consist first of the experience of being asked for information or opinion. Depending on how the question is posed, individuals may derive utility from participating in a survey e.g. by feeling acknowledged or consulted.<sup>8</sup> If the importance of the cause can be conveyed this might generate positive feelings of contributing to worthy efforts. Finally, the benefit of responding may consist of being courteous and avoiding negative sanctions, or the experience of disappointing an interviewer.

In addition, respondent and interviewer characteristics ( $X, W$ ), and their interaction may affect response decisions. Since the propensity to respond,  $y^*$ , is unobservable, we assume that individuals respond if  $y^*$  exceeds a critical threshold level, which we normalize to 0. We observe individuals responding, i.e.  $y_{ij} = 1$  if and only if  $y_{ij}^* > 0$  and  $y_{ij} = 0$  otherwise. Thus

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be a softer way of refusing to answer. These possibilities cannot be distinguished empirically.

<sup>8</sup> Hill and Willis (2001, p. 418) provide examples of how respondents might be flattered into responding: "It is not known what people like yourself think on these important issues, so we are attempting to find out." or "Congress is considering doing  $x$  which might have an important effect on the wellbeing of you and your family. It is important for Congress to learn the views of people like you about the effects of  $x$ ."

$$\begin{aligned}
\Pr ( y_{ij} = 1 ) &= \Pr ( y_{ij}^* > 0 ) = \\
\Pr ( c_{ij} \alpha_1 + b_{ij} \alpha_2 + X_i \beta_1 + W_m \beta_2 + X_i * W_m \beta_3 + \mu_{ij} > 0 ) &= \\
\Pr ( -\mu_{ij} < c_{ij} \alpha_1 + b_{ij} \alpha_2 + X_i \beta_1 + W_m \beta_2 + X_i * W_m \beta_3 ) & \quad (2)
\end{aligned}$$

Assuming a distribution for  $\mu_{ij}$  the coefficients can be estimated by binary choice models.

Within this general framework our investigation focuses on three issues: First we describe whether item non-response rates differ across outcomes, and study whether such differences are associated with observable determinants of item non-response. If e.g. wealth holdings are considered a more private issue than income, the cost of revealing wealth may exceed that of income and we expect higher non-response for wealth. Similarly, if information on wealth is less familiar than on income we expect different costs in terms of required cognitive effort and differences in response based on cognitive ability, possibly measurable through education.

In addition, response probabilities might be affected by the way questions are posed. This has been looked at in social sciences outside economics (cf. Trometer 1996 and sources cited there), however, these studies typically do not focus on measures of income and wealth. Therefore a careful analysis of the effect of alternative answer options for financial questions is missing in the literature. The GSOEP contains questions on wealth which are asked with the explicit option of answering "don't know", and others without this option. We describe item non-response rates for both types of questions, and test whether response processes yielding "don't know" differ in measurable ways from those resulting in informative answers.

Finally, we investigate whether the match between interviewer and respondent affects the estimation results. Many authors have confirmed the relevance of trust and confidence building between interviewer and respondent. The richness of our data on interviewer characteristics allows us to undertake a careful investigation not only of the association of non-response behavior with respondent or interviewer characteristics separately but also of the relevance of matching interviewers and respondents with given characteristics.<sup>9</sup> We hypothesize that

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<sup>9</sup> We agree with Sousa-Poza and Henneberger who state "One potential source of nonresponse is the existence of a mis-match between the characteristics of the interviewer and

individuals feel more confident reporting financial information to someone of their own age, sex, or educational group. – The next section describes the data and provides initial evidence.

#### **4. Data Description and Empirical Strategy**

##### **4.1 The Data: GSOEP and Interviewer Panel**

Our data are taken from the 1988 wave of the German Socioeconomic Panel (GSOEP). The GSOEP has been administered annually since 1984 and gathers information on households and individuals in Germany.<sup>10</sup> Its 1988 survey covered 4,814 households in West Germany with 10,023 individuals. The GSOEP regularly gathers information on the characteristics of respondents and their households, and periodically adds special topical modules to the survey. The 1988 module was devoted to household wealth. Since we are interested in looking at a broad range of financial questions we evaluate item non-response for 1988, when financial issues were extensively covered by the survey.

Our data are taken from three questionnaires. The individual survey was administered to everybody aged 16 or older, whereas the household questionnaire and the wealth modules were answered by the heads of households.<sup>11</sup> We also take advantage of data describing the GSOEP interviewers (cf. Schräpler and Wagner 2001), which can be matched to respondent records.

The GSOEP applies a variety of interview methods: Individuals can answer questions orally, they can fill in the questionnaire themselves with or without interviewer support, some questionnaires are sent out by mail, and some interviews are conducted via the telephone. In general, interviewers are required to perform the oral interview but they may use different formats depending on the situation.

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the characteristics of the respondent." (2000, p.83)

<sup>10</sup> For details on the GSOEP see SOEP Group (2001).

<sup>11</sup> The GSOEP has no strict definition of the "head of household". Instead it surveys a knowledgeable person for every household and tries to re-interview that same person in subsequent surveys. (Hanefeld 1987)

## 4.2 Sample and Variables

*Sample:* Our sample was selected based on the following criteria: First, to circumvent language problems, we select German respondents from the nationally representative subsample "A".<sup>12</sup> Second, we disregard observations where the information was gathered other than by meeting the interviewer in person, because one of our research interests concerns the interaction between interviewer and respondent. Finally, we drop a few observations where information on interviewer characteristics is missing. Table 2 presents the development of the sample sizes for each part of the survey after each selection step. Clearly, conditioning on an interviewer being present is the most stringent sample requirement involving a loss of between 35 and 25 percent of observations. Prior studies provided evidence, that the presence of an interviewer strongly affects item non-response behavior (cf. Lillard et al. 1986, Schr pler 2001).<sup>13, 14</sup>

*Dependent Variables:* The financial variables of interest are taken from the individual, household, and wealth questionnaires. Table 3 describes the measures gathered in the individual survey. Due to filtering mechanisms in the questionnaire the sample sizes vary by question.<sup>15</sup> Generally two types of variables are presented in Table 3: Those referring to average monthly amounts in the past calendar year and those referring to the labor earnings of the past month.

The last column of Table 3 describes the item non-response rate for each of the income measures. The rates vary markedly between 15 percent among those who had indicated income from self-employment and less than 3 percent among those who were asked to provide the

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<sup>12</sup> In addition the GSOEP covers a subsample B containing an oversample of guestworkers.

<sup>13</sup> This was confirmed by our preliminary results (not presented).

<sup>14</sup> A comparison of item non-response rates for the pool of all outcome measures described in the next section yielded a rate of 6.03 percent before selecting on the basis of interviewer presence and of 4.52 percent when conditioning on interviewer presence.

<sup>15</sup> E.g. only those who had indicated employment were asked about labor incomes, or those who were retired could indicate retirement benefits.

amount of their "13. monthly salary", a common employment benefit in Germany. Averaging across all outcomes, we obtain a non-response rate of 5.2 percent for individual income variables.

Based on a cognitive ease argument one might assume that indicating last month's earnings should require less effort than an average monthly figures over the previous calendar year. However, item non-response on last month's earnings (cf. questions 44.01 and 44.02) are about twice those for the past calendar year (cf. question 53.01). If it is the sense of privacy that determines the cost of reporting labor earnings, this outcome may indicate that current earnings are more sensitive than those of the past. The figures also seem to suggest that regulated payments, such as end of year, vacation or retirement transfers involve lower reporting costs - possibly because they are considered as less private information - than those that may entail information on individual labor market success (e.g. unemployment situation, earnings from dependent or self-employment).

Table 4 describes financial indicators from the household questionnaire. It combines measures as to whether a household has incomes or expenditures of a given type at all, with those specifying amounts. Non-response rates are highest at over thirty percent with respect to interest payments, and annuity and interest payments. Non-response rates for measures relevant for larger samples, such as interest and dividend income or net income vary between 14.5 and 3 percent.

Finally, Table 5 provides information on household wealth indicators. The questionnaire typically asked the respondent whether the household holds a given asset and if so at which value.<sup>16</sup> If the respondent indicated possession of a given item but could not provide the exact amount, the person was first asked to guess the amount and if that failed in most cases answer categories or a "don't know" reply were offered. Again, every outcome measure is described for a different group of respondents, which is reflected in the varying number of cases in column

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<sup>16</sup> Since 94.4 percent of the households in our sample responded to the wealth survey, the analysis of item non-response is conditional on responding to the questionnaire. The survey non-response cannot simply be added to individual item non-response rates, say by adding 5.6 percent to each rate, because not everybody refusing to answer the questionnaire would have actually possessed each wealth item.



three. Item non-response was coded if the individual refused to provide the value of the asset held by the household and "don't know" if the respondent indicated that the amount is unknown. The last columns in Table 5 describe the frequency of the non-response and don't know outcomes.

The rates of non-response and "don't know" answers vary strongly across items. The highest refusal rates are observed for the questions on stock, bond, and equity ownership. The shares of "don't know" responses are somewhat differently distributed across outcomes. Here the highest rates appear for equity (15 percent) and inheritances since 1960 (16,6%). In both cases it is plausible that determining the value of these assets is indeed difficult. Therefore "don't know" may be a reflection of actual lack of knowledge. This seems less plausible in the case of monthly life insurance payments, where one might assume that the respondent is familiar with a figure showing up regularly on bank statements. Here an 11 percent don't know rate seems high.

While the non-response rates in Table 5 do not differ markedly from those in Tables 3 and 4, the total share of uninformative responses, combining non-response and don't know answers more than doubles this figure at about 13 percent. Two factors might explain this difference: Either, offering an answer option "don't know" induces individuals who may have otherwise provided an answer to indicate ignorance. Alternatively wealth issues are either more sensitive than income indicators or it is more difficult to know the correct answer. Both situations could plausibly prompt high non-response rates.

*Explanatory Variables:* Equation 1 describes individual response behavior as determined by the costs and benefits of providing a valid answer, the characteristics of respondent and interviewer, as well as interactions of these factors. Clearly it is not possible to measure individually perceived costs and benefits involved in answering a given question. Therefore the characteristics of respondents and interviewers are interpreted also in the light of their effect on individual cost and benefit considerations.

In our item non-response model we consider a baseline specification which controls for

the labor market status of interviewer and respondent, and their levels of schooling. We generate indicators which describe whether the two interview participants have equal characteristics in these dimensions. Low schooling is coded for mandatory schooling, medium schooling for the German *Realschule*, and high schooling for degrees preparing for academic studies.

Since the literature strongly suggests that the sex of the interviewer affects response behavior (cf. Sousa-Poza and Henneberger 2000, or Schräpler 2001) we control for the gender combination between interviewer and respondent. Age effects are controlled for by a linear age term for respondents and an indicator of the age difference between interviewer and respondent.

In addition to these demographic controls we consider indicators which proved to be influential in other studies of non-response. Among them is an indicator for whether respondents work in the public sector which is correlated with low non-response. We control for household size, because the larger the household, the more difficult it should be to gather financial information. We take the size of an individual's town of residence as a potential indicator of an attitude of openness and trust. This is based on evidence that individuals refuse to participate in surveys because of fear of crimes and that larger cities often entail a sense of anonymity, which corresponds to guarding the limits of privacy more carefully than in rural areas.<sup>17</sup>

Finally, we control for whether a household's interviewer has changed since the last survey year, based on ample evidence that the personal relationship to an interviewer is important for trust and the provision of information. Also we look at whether a respondent answers a questionnaire partly by him- or herself in written form as opposed to completely responding to an oral interview: Following the rational choice model it is much easier to refuse an answer if this does not have to be communicated to the interviewer. We hypothesize higher non-response rates among those filling in the questionnaire by themselves.<sup>18</sup> – Table 6 describes descriptive statistics

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<sup>17</sup> De Maio (1980) found significantly more survey cooperation among rural people than among urban dwellers.

<sup>18</sup> For three reasons we do not consider the duration of the ongoing or prior interview even though it is much discussed in the non-response literature (Hill and Willis 2001): First, interview

for the full sample of observations covered by the personal and the wealth surveys.

### 4.3 Empirical Strategy

The last section already described the heterogeneity in non-response behavior across outcomes. We first investigate whether these differences in non-response can be explained by the variables in our model, or whether they go back to unobservable and outcome-specific factors. We arbitrarily select some outcome measures, and estimate and compare the determinants of non-response behavior. This also yields evidence as to whether the matching of interviewer and respondent affects item non-response. For a very intuitive indication of outcome-specific heterogeneity we then pool item non-response outcomes across questions and test for the statistical significance of question specific fixed effects as well as of outcome specific differences in covariate effects.

To address the question to what degree don't know answers differ from valid responses and from complete refusals we apply the logic underlying the IIA (independence of irrelevant alternatives) property of the multinomial logit model (Hausman and McFadden 1984): The IIA property states that the outcome alternatives of the multinomial logit model are correctly specified only if the estimation does not depend on the set of outcome options. If splitting up an answer into two separate alternatives affects the results, the alternatives are not truly separable

<sup>19</sup>

We perform a Hausman test of the IIA property after coding the dependent variable "1" for valid responses, "2" for don't know answers, and "3" for non-responses. The test evaluates the null hypothesis that category 2 is a valid independent alternative. If this is rejected, don't know

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duration might be a simple function of non-response behavior. Second, it may not be the same person representing a household in different surveys, and finally it is not obvious which indicator should describe interview duration, as different questionnaires can be considered separately.

<sup>19</sup> The classic illustration of the IIA property looks at alternative means of public transport. While taxi, train, and bus constitute valid alternatives, a split between red and blue buses would violate the IIA assumption. We test whether don't know answers are comparable to a "red bus" alternative as opposed to being an independent alternative, such as the train.

answers are not truly separate and independent outcomes, but instead fundamentally similar to either valid responses or complete non-responses. In that case we provide estimation results to determine, whether don't know answers are more similar to the response or the non-response alternative.<sup>20</sup> Section 5 presents the results.

## **5. Results and Discussion**

### **5.1 Heterogeneity in Item Non-response Behavior and its Determinants**

#### *Covariates of item non-response*

First we investigate the correlates of item non-response. By comparing the results across outcome measures the robustness of the findings can be evaluated, which has not found much attention in prior item non-response research. For individual and household measures (see Tables 3 and 4) we estimate bivariate logit models and calculate the covariates' marginal effects (Table 7a). In the case of the wealth measures the dependent variables contain the additional outcome category "don't know". In order to impose the least restrictive model we estimated multinomial logits for these outcomes.<sup>21</sup> We calculate the covariate marginal effects on the probability of non-response and present these with asymptotic t-statistics of the coefficient estimates in Table 7b.

The estimations yield a small number of statistically significant coefficients. The first group of variables describes the gender combination of respondent and interviewer with two males as the reference category. Notably all marginal effects, which are based on statistically significant coefficients, indicate positive associations between a female interviewer and item non-response. This association is particularly sizeable for self-employed income and stock and bond

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<sup>20</sup> Such estimations could compare alternative groupings of the three outcomes within a binary logit model. One might estimate a model after setting the dependent variable "0" for valid responses and "1" for non-responses and don't know answers. A second model might group the don't know answers with valid responses and a third model might simply drop don't know outcomes. The results may suggest conclusions as to which outcomes are more similar.

<sup>21</sup> We thus avoid clustering the "don't know" outcome with either valid responses or non-responses, we do not impose an order on the outcomes and keep all observations in the sample.

ownership and confirms the findings of Schräpler (2001). If we assume that it is easier to avoid an answer in front of a female the pattern fits the rational choice model's predictions.

The next set of indicators describes the employment status of respondent and interviewer. Comparing our results across outcomes there seems to be a weak tendency for respondents who are not full time employed to refuse the answer. The effect is most clearly measured for self-employment income. The finding can be explained within the rational choice model: If the earnings of part-time workers are comparatively low, these respondents are faced with a "social desirability" problem when they prefer to indicate their personal labor market success to an interviewer. As a consequence those who are part time or not employed and have low earnings or wealth may choose non-response. The evidence on the role of the interviewers' employment status is mixed. There is no evidence for matching effects with respect to employment status.

Similarly, the evidence on schooling effects is mixed and does not suggest clear patterns. Having respondents and interviewers with similar schooling does not affect the results. The marginal effects of higher respondent schooling on income are all positive (yet insignificant) except for income from interest and dividends measure. This confirms the findings of Biewen (2001). Higher education on the part of the interviewer does not seem to improve response outcomes. Surprisingly, we find a robust reduction in item non-response when interviewers have medium level schooling, which is difficult to rationalize.

Older respondents seem to be more prone to item non-response than younger individuals. We also find some evidence that having interviewers who are older than the respondents reduces item non-response. Almost all marginal effects of the age difference are negative and some are statistically significant, suggesting that matching interview partners by age might be helpful.

There are only few consistent patterns in the remaining control variables. Despite of the strong evidence in the literature concerning the relevance of long term relations between interviewer and respondent we find a significant increase in non-response after an interviewer change only in one of our outcome measures. A possible explanation could be that change of an

interviewer has very strong effects on respondent behavior and causes complete unit non-response such that item non-response cannot even be observed (cf. Rendtel 1995). Confirming the findings of prior studies (e.g. Biewen 2001), public sector employees seem to be significantly more cooperative and less likely to refuse an answer. However, closer inspection yields that this cooperation seems to be restricted to the income measures.

Evidence as to whether the presence of an interviewer affects non-response is mixed. Based on the rational choice hypotheses one might expect those who respond without the controlling influence of interviewers to come out with more non-response. This, however, is confirmed only for gross earnings and total wealth. The evidence is similarly mixed with respect to the effect of rural residence on non-response where significant effects go in both directions.

The control for household size was considered as an indicator for potential information problems. We expected higher non-response in larger households. The results show significant effects in the opposite direction, which is difficult to explain within the theoretical framework presented above. – Next, we investigate the importance of heterogeneity across outcomes.

#### *Heterogeneity in item non-response across outcomes*

The issue of outcome-specific heterogeneity is addressed in two steps. First, we pool the data on the outcomes described in Tables 3 through 5 and add fixed outcome specific effects to the specification. The joint significance of the fixed effects indicates whether there is heterogeneity in non-response behavior after controlling for covariates.<sup>22</sup>

The estimation results for the pooled sample are presented in the first columns of Table 8. The fixed effect controls are highly statistically significant, reflecting the heterogeneity across outcomes even after controlling for covariates. Adding outcome specific fixed effects to the

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<sup>22</sup> In order to render the bivariate non-response outcome measure of the income variables comparable to the multivariate outcome measure of the wealth indicators we dropped the wealth observations with "don't know" answers from the sample. The results presented in section 5.2 suggest that the don't know answers should not be combined with the other outcome categories.

model increases the pseudo  $R^2$  from about 1.8 (results not presented) to almost 14 percent in the estimation presented in the first columns of Table 8. This result holds in smaller subsamples as well, when we pool outcomes at the individual, household, or wealth level only (not presented).

Since overall non-response rates differ between wealth and income outcomes, we next investigate whether this is simply a level effect or whether the covariate effects differ across the two outcome groups as well. We reestimate the fixed effects model now adding a full set of interaction terms between a variable (I) indicating whether the observation describes a wealth outcome or an income measure.<sup>23</sup> The estimated model is thus:

$$y_{ij}^* = c_{ij} \alpha_1 + b_{ij} \alpha_2 + X_i \beta_1 + W_m \beta_2 + (X_i * W_m) \beta_3 + \\ c_{ij} * I_j \alpha_1' + b_{ij} * I_j \alpha_2' + X_i * I_j \beta_1' + W_m * I_j \beta_2' + (X_i * W_m) * I_j \beta_3' + \mu_{ij}$$

The results are presented in the last columns of Table 8. The explanatory power of the model increased significantly with the full set of interaction terms added, of which a number are statistically significant. The increase in non-response for female interviewers appears to be more pronounced for wealth outcomes, while the full set of sex interaction terms is not statistically significant. The same holds for the employment status indicators.

A surprisingly clear pattern appears in the correlation of schooling indicators and item non-response for the two groups of outcomes, confirming the results described in Table 7 above. Whereas item non-response on income measures increases with higher respondent education, we find the opposite result for wealth outcomes. The differences are statistically significant and difficult to interpret. We observe particularly the well educated answering wealth questions. If education is correlated with the level of information that a respondent has available about household wealth, then the response pattern might be explained based on cognitive ability. Given that the same individuals should also be well informed with respect to their income one can only speculate that they consider income as a more private or sensitive piece of information.

Next the joint effects of age seem to differ between the income and wealth outcomes. The

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<sup>23</sup> In these estimations we treat "income from interest and dividend income" as an indicator of wealth holdings and group it with the outcomes listed in Table 5.

non-response probability regarding income measures increases with respondent age. This effect is significantly weaker when it comes to wealth measures. The negative correlation between the interviewer-respondent age difference and item non-response which we pointed out above seems to be based mostly on wealth outcomes.

Differences in covariate associations with non-response probabilities by outcome are observable also for the remaining control variables. While the change of an interviewer increased non-responses for incomes, it is negatively correlated with non-response for the wealth. The beneficial effect of public sector employment on the propensity to provide financial information seems to be limited to incomes: Since the earnings of public sector workers in Germany typically follow publicly available pay scales, it is possible that these workers are more open about their income, as it may be considered public knowledge anyway. When it comes to wealth, however, privacy protection instincts seem to be same as for anyone else. Living in a small town is correlated with significantly lower non-response on wealth while the effect on income is not precisely estimated. Similarly the negative effect of household size on non-reporting differs significantly for the two outcomes. Thus, non-response differs across outcomes and there are significant differences in the association of covariates with outcome-specific non-response.<sup>24</sup>

## **5.2 A Closer Look at "Don't know" Answers**

In this section we investigate whether answering "don't know" is an independent outcome, or whether this response can be grouped either with valid responses or with non-responses. As described above we apply a Hausman test of the IIA property in a multinomial logit framework. First, we evaluate a dependent variable which pools all of the outcomes presented in Table 5

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<sup>24</sup> Since the combination of outcomes considered in the sample used in Table 8 is somewhat arbitrary, we performed robustness tests of the results by reestimating the same models for alternative outcome subsets. In these results most coefficients have the same sign, but their statistical significance is not robust to modifications of the sample. We find confirmation for significant outcome specific differences on some of the schooling interactions, as well as the age difference effect and its interaction.



combining the 12,613 observations of the "total" row. Next, we consider some of the wealth outcomes separately to determine whether the results for the pooled measures are robust.

The evidence presented in Table 9 seems to be strong and clear: The null hypothesis that the IIA assumption holds cannot be rejected in any of the samples. Therefore "don't know" answers are "relevant" and "independent" alternatives to informative responses and to non-responses in the IIA sense. If the IIA assumption had been rejected we would have had to determine how to interpret "don't know" answers: They might either have to be considered as a subcategory of informative answers, capturing the group of individuals who are not completely certain of the correct answer and – without the option of answering "don't know" – may have guessed the correct answer. Alternatively, one might have to consider "don't know" outcomes as "soft" refusals: If individuals prefer to withhold information, they would refuse an answer in the situation without the option of answering "don't know", but given the option of not violating the rules of courtesy, they prefer to pretend ignorance about the issue at hand.

Neither of these scenarios seems to hold. Instead, the correlation of the covariates with the answer "don't know" differs significantly from that with the alternative outcomes.<sup>25</sup> Given these unambiguous results "don't know" answers must be viewed as independent outcomes in their own right, and the hypothesis that they can be combined with either alternative group has to be rejected. For the correct estimation of models of financial outcomes this implies that a combination of don't know answers with non-responses or the omission of both types of responses from the estimation may lead to inconsistent estimates.

## **6. Conclusions**

Any analysis using survey data on income and wealth is affected by item non-response. Therefore we present a number of findings that are new to the literature on item non-response.

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<sup>25</sup> As an example Table A1 in the Appendix presents the estimates obtained with the pooled wealth measure as the dependent variable, which underlie the test in row 1 of Table 9.

We summarized the literature on theoretical frameworks for item non-response behavior which consists of the cognitive model and the rational choice approach. The empirical literature on item non-response is quite limited and generally focuses on measures of labor income only.

This limitation is addressed here: We evaluate a variety of financial outcomes and compare frequency and determinants of item non-response. We find significant heterogeneity in non-response intensities across financial outcomes. This conclusion from descriptive statistics is confirmed in regressions of non-response behavior where much explanatory power derives from the consideration of outcome-specific fixed effects. We confirm many correlations of respondent and interviewer characteristics with item non-response found in the literature. However, looking at the homogeneity of non-response determinants across outcomes yields new information: Estimating a fully interacted model shows clearly that a number of the established correlates of item non-response depend on the outcome measure under consideration.

We investigate whether the matching of interviewer and respondent characteristics affects the quality of survey outcomes. Here robust findings could be valuable to improve the administration of and information gathered from social surveys. We confirm the general result of the item non-response literature that non-response rates tend to be higher if the interviewer is female in particular if the respondent is female as well. Having a respondent and an interviewer with the same employment status or the same educational level does not significantly affect non-response outcomes. However, our measures of employment and educational attainment may be too rough to reflect the impact of potential matching effects on non-response behavior. With respect to age differences there is some evidence that matching an older interviewer to a younger respondent may increase response propensities particularly with respect to wealth outcomes. Interestingly, the personal acquaintance of the respondent with the interviewer is beneficial for wealth but not for income outcomes.

Our third research question concerns "don't know" answers in questionnaires. Tests on the basis of the independence of irrelevant alternatives assumption of the multinomial logit

estimation framework suggest clearly that "don't know" responses cannot be viewed as a subcategory of valid answers nor as comparable to item non-response. Therefore simple statements as to how "don't know" answer options affect the set of valid answers are not possible.

In the end researchers have to acknowledge that the group of respondents who refuse to answer the survey questions is certainly not a random draw from the population, that the group differs depending on the question they look at, that those answering "don't know" differ from non-respondents and that simply omitting these individuals from the analysis may well bias results.

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Table 1 Distribution of Interview Formats for three Questionnaires of 1988

Interview Format	Individual Questionnaire	Household Questionnaire	Wealth Module Questionnaire
1 Oral Interview	55.1	70.5	64.6
2 Self administered without interviewer	23.3	13.0	14.4
3 Self administered with interviewer	6.1	2.6	3.4
4 Partly oral, partly self	3.7	2.0	1.7
5 By telephone	0.2	0.5	0.4
6 Through mail	9.3	10.0	10.6
7 Proxy interview	0.1	0.0	0.0
8 Information missing	2.3	1.5	5.0
Total (in percent)	100	100	100
Number of interviews conducted	7,360	3,691	3,483

Source: Own calculations based on GSOEP. Only German respondents from subsample A are considered.

Table 2 Criteria for Sample Selection

	Individual Questionnaire	Household Questionnaire	Wealth Module Questionnaire
Full GSOEP data	10,023	4,814	4,606
... thereof in subsample A	7,481	3,743	3,535
... thereof with German respondent	7,360	3,691	3,483
... thereof with non-missing information on interview type	7,194	3,637	3,310
... thereof with interviewer present during interview (formats 1, 3, 4)	4,775	2,769	2,427
... thereof with non-missing interviewer information	4,744	2,769	2,427

Source: Own calculations based on GSOEP.

Table 3 Item Non-response Rates for Individual Income Questions

Number of Question <sup>1)</sup>	Type of Income	Number of cases <sup>2)</sup>	Non-responses	
			N	Share
53.02	Income from self employment <sup>3)</sup>	274	42	15.3%
54.09	Bonus / profit sharing <sup>3)</sup>	106	13	12.3%
54.11	Other benefits <sup>3)</sup>	30	3	10.0%
53.08	General unemployment transfer <sup>3)</sup>	149	14	9.4%
53.09	Means tested unemployment transfer <sup>3)</sup>	47	4	8.5%
44.01	Gross earnings last month	2,546	211	8.3%
53.03	Earnings from other employment <sup>3)</sup>	140	9	6.4%
44.02	Net earnings last month	2,546	135	5.3%
54.03	End of year payment: 14. monthly salary <sup>3)</sup>	52	2	3.8%
53.01	Gross wage <sup>3)</sup>	2,454	91	3.7%
54.01	End of year payment: 13. monthly salary <sup>3)</sup>	676	24	3.6%
54.07	Vacation benefits <sup>3)</sup>	1,501	47	3.1%
54.05	Christmas bonus <sup>3)</sup>	1,149	33	2.9%
53.04	Retirement benefits <sup>3)</sup>	983	26	2.6%
Total all:		12,653	654	5.2%
Total for 53.02, 44.01, 44.02, 53.01, 54.07:		9,321	536	5.6%

Notes:

- 1) Question number in individual questionnaire.
- 2) Number of cases indicating receipt of income.
- 3) Average gross monthly amount in the last calendar year. If the respondent was unable to provide exact figure the questionnaire prompted for an approximation.

Source: Own calculations based on GSOEP

Table 4 Item Non-Response Rates Household Questionnaire

Number of Question <sup>1)</sup>	Type of income / expenditure	Number of cases	Non-response	
			N	Share
39c	Interest payments (amount last year)	342	126	36.8%
39b	Annuity and interest payments (amount last year)	342	110	32.2%
41	Interest and dividend income (last year)	2,149	312	14.5%
39a	Maintenance expenditures on property (amount last year)	342	43	12.6%
33	General welfare benefits (amount)	70	8	11.4%
34	Special welfare benefits (amount)	70	8	11.4%
42	Monthly household net income (amount)	2,769	84	3.0%
37	Rental or lease incomes (yes / no)	2,769	7	0.3%
38	Rental or lease incomes (amount)	342	6	1.8%
36a	Child benefits (yes / no)	1,721	5	0.3%
36c	Child benefits (amount)	1,048	2	0.2%
32	Welfare receipt (yes / no)	2,769	5	0.2%
Total all:		14,733	716	4.9%
Total for 41, 42:		4,918	396	8.1%

Notes:

- 1) Question number in household questionnaire
- 2) Number of cases eligible to respond to the question.

Source: Own calculations based on GSOEP



Table 5 Item Non-response Rates for Household Wealth Questions

Number of Question <sup>1)</sup>	Type of Asset <sup>2)</sup>	Number of cases	Non-response		"Don't know"		Total	
			N	Share	N	Share	N	Share
4	Equity in a business	164	43	26.2%	25	15.2%	68	41.5%
5c	Stocks and bonds	636	217	34.1%	27	4.2%	244	38.4%
5b	Home loan savings certificates ( <i>Bausparvertrag</i> )	1,001	150	15.0%	82	8.2%	232	23.2%
11	Inheritances since 1960	392	23	5.9%	65	16.6%	88	22.4%
3	Farm <sup>3)</sup>	62	12	19.4%	-	-	12	19.4%
8d	Life Insurance: Current monthly payment	1,330	34	2.6%	149	11.2%	183	13.8%
8c	Life Insurance: Originally insured amount	1,330	14	1.1%	141	10.6%	155	11.7%
2	Property other than occupied flat or home	306	6	2.0%	20	6.5%	26	8.5%
5a	Savings account	2,064	70	3.4%	97	4.7%	167	8.1%
1	Ownership of occupied flat or home: Market value	1,065	8	0.8%	74	6.9%	82	7.7%
10	Total household wealth	2,427	32	1.3%	124	5.1%	156	6.4%
9	Household debt	771	7	0.9%	25	3.2%	32	4.2%
Total all:		12,613	631	5.0%	1,049	8.3%	1,680	13.3%
Total for 1, 5a, 5b, 5c, 10:		7,193	477	6.6%	404	5.6%	881	12.2%

Notes:

- 1) Question number in wealth questionnaire
- 2) The survey first posed yes / no questions as to whether the household owns a given asset. Then the respondent was prompted for the exact amount held in this type of asset, or for an estimate. If that was not provided, response categories including the "don't know" option were provided. Non-response is coded if the asset type is available, but the amount was not provided. "Don't know" is coded if the first yes / no answer was positive and the respondent replied that the exact amount is unknown.
- 3) The "don't know" category was not offered for this question.

Source: Own calculations based on GSOEP

Table 6 Descriptive Statistics: Explanatory Variables

Variable	Individual Questionnaire		Wealth Module	
	Mean	Std. Dev.	Mean	Std. Dev.
<b>Demographic Indicators</b>				
respondent female interviewer male	0.294	0.456	0.239	0.427
respondent male interviewer female	0.205	0.403	0.232	0.422
respondent female interviewer female	0.232	0.422	0.211	0.408
respondent male interview. male (reference)	0.269	0.443	0.318	0.466
respondent part time employed	0.089	0.285	0.074	0.261
respondent not employed	0.464	0.499	0.451	0.498
interviewer part time employed	0.132	0.338	0.136	0.343
interviewer not employed	0.464	0.499	0.492	0.500
same employment status	0.419	0.493	0.428	0.495
respondent medium level schooling	0.201	0.400	0.187	0.390
respondent high schooling	0.127	0.333	0.149	0.356
interviewer medium level schooling	0.469	0.499	0.464	0.499
interviewer high schooling	0.207	0.405	0.204	0.403
same schooling	0.347	0.476	0.349	0.477
respondent age	46.461	18.579	50.903	17.130
age difference: interviewer - respondent	-3.873	21.484	0.685	20.053
<b>Other indicators</b>				
change of interviewer	0.102	0.303	0.115	0.319
public sector employee	0.134	0.340	0.156	0.363
self administered survey	0.150	0.357	0.073	0.261
lives in small town	0.577	0.494	0.539	0.499
household size	2.828	1.310	2.431	1.264
respondent schooling missing	0.010	0.100	0.009	0.095
Number of observations	4,744		2,427	

Source: Own calculations based on GSOEP

Table 7 (a) Logit Estimates of Item Non-response Across Financial Measures at the Individual and Household level

Variable	Self-employment		Gross earnings		Net earnings		Vacation Benefits		Hh. Interest and Dividend Inc.		Hh. Net Income	
	ME	t	ME	t	ME	t	ME	t	ME	t	ME	t
respondent female interviewer male	0.033	0.53	-0.002	-0.09	-0.014	-1.00	-0.010	-0.68	0.033	1.46	-0.001	-0.10
respondent male interviewer female	0.128	2.19	0.024	1.44	0.002	0.16	-0.007	-0.55	0.062	2.57	0.018	1.80
respondent female interviewer female	0.066	0.91	0.038	2.05	-0.011	-0.71	-0.003	-0.20	0.079	3.34	0.015	1.41
respondent part time employed	-0.033	-0.50	0.063	4.02	0.035	2.53	-0.016	-0.72	0.043	1.43	0.017	1.39
respondent not employed	0.291	3.95	x	x	x	x	-0.061	-1.50	0.089	4.18	-0.004	-0.43
interviewer part time employed	-0.036	-0.44	-0.075	-3.07	-0.030	-1.67	0.046	1.52	0.020	0.84	0.023	2.23
interviewer not employed	-0.049	-0.69	-0.020	-0.97	-0.013	-0.76	0.057	1.77	-0.042	-1.90	0.008	0.81
same employment status	0.012	0.21	-0.007	-0.33	-0.001	-0.06	0.039	1.34	-0.003	-0.18	0.011	1.46
respondent medium level schooling	0.120	2.30	0.019	1.39	0.024	2.16	0.007	0.57	-0.108	-4.53	0.008	0.91
respondent high schooling	0.001	0.01	0.007	0.42	0.029	2.31	0.009	0.68	-0.022	-0.98	0.016	1.82
interviewer medium level schooling	-0.123	-2.43	-0.030	-2.27	-0.003	-0.26	-0.032	-2.51	0.023	1.08	-0.017	-2.02
interviewer high schooling	-0.040	-0.66	-0.003	-0.18	0.010	0.74	0.005	0.44	-0.006	-0.24	-0.002	-0.17
same schooling	-0.020	-0.43	-0.006	-0.49	0.011	1.11	0.008	0.79	0.038	1.87	0.010	1.32
respondent age	0.004	1.23	0.002	3.08	0.002	2.44	-0.000	-0.61	0.000	-0.17	0.000	-0.39
age difference: interviewer - respond.	-0.001	-0.44	-0.001	-1.20	-0.000	-0.48	0.001	1.05	-0.002	-1.95	0.000	1.01
change of interviewer	0.064	1.09	0.022	1.41	0.027	2.23	0.018	1.37	-0.020	-0.82	0.007	0.71
public sector employee	x	x	-0.061	-3.96	-0.045	-3.46	-0.030	-2.42	-0.032	-1.21	-0.031	-2.36
self administered survey	0.001	0.20	0.028	2.13	0.010	0.93	0.004	0.35	0.034	1.11	-0.014	-0.80
lives in small town	-0.032	-0.67	0.021	1.79	0.012	1.22	0.007	0.73	-0.073	-4.74	-0.002	-0.35
household size	0.019	1.09	0.003	0.76	0.002	0.47	-0.009	-2.09	-0.031	-4.36	-0.001	-0.31
respondent schooling missing	0.218	2.07	0.048	1.03	0.058	1.86	x	x	-0.093	-1.04	0.01	0.42
Number of observations	274		2,546		2,546		1,501		2,149		2,769	

Table 7 (b) Multinomial Logit Estimates of Item Non-response Across Wealth Measures at the Household Level

Variable	Stocks / Bonds		Owned home		Home loan		Savings		Total wealth	
	ME	t	ME	t	ME	t	ME	t	ME	t
respondent female interviewer male	0.074	0.50	-0.009	-0.93	0.004	0.01	-0.014	-0.99	0.002	0.19
respondent male interviewer female	-0.050	-0.41	-0.008	-0.68	0.034	0.62	0.017	1.21	0.010	1.21
respondent female interviewer female	0.264	1.64	-0.008	-0.72	0.123	2.09	0.002	0.10	0.017	2.12
respondent part time employed	0.213	1.24	0.021	1.45	-0.097	-1.10	0.044	2.47	-0.003	-0.21
respondent not employed	0.123	0.97	0.177	4.96	0.007	0.13	0.014	0.98	0.005	0.66
interviewer part time employed	-0.638	-3.36	-0.007	-0.75	-0.051	-0.90	-0.012	-0.72	-0.019	-1.31
interviewer not employed	-0.192	-1.49	0.000	-0.09	0.026	0.33	0.007	0.50	-0.003	-0.65
same employment status	-0.033	-0.30	0.000	0.04	0.025	0.55	0.002	0.24	-0.009	-1.49
respondent medium level schooling	-0.296	-2.63	-0.004	-0.42	0.003	-0.04	-0.004	-0.38	0.000	0.04
respondent high schooling	-0.703	-5.27	-0.275	0.00	-0.146	-2.50	-0.034	-1.87	-0.022	-1.53
interviewer medium level schooling	-0.092	-0.88	0.002	0.17	-0.006	-0.15	-0.022	-2.01	-0.003	-0.41
interviewer high schooling	0.127	0.76	0.003	0.28	0.031	0.51	-0.025	-1.72	-0.012	-1.16
same schooling	0.094	1.08	0.002	0.20	-0.071	-1.54	0.003	0.23	0.002	0.38
respondent age	0.007	1.27	-0.001	-1.62	0.004	1.57	-0.001	-0.88	0.001	1.52
age difference: interviewer - respondent	-0.015	-2.82	0.000	0.95	0.000	-0.29	0.001	0.95	0.000	-1.60
change of interviewer	-0.213	-1.42	0.000	0.03	-0.167	-2.40	0.016	1.26	0.006	0.86
public sector employee	0.004	0.11	0.172	5.29	-0.005	-0.06	0.009	0.67	-0.011	-1.01
self administered survey	-0.318	-1.73	-0.267	0.00	-0.109	-1.37	0.009	0.52	0.017	2.26
lives in small town	0.063	0.52	-0.020	-2.87	-0.066	-1.96	0.015	1.37	0.008	1.37
household size	-0.083	-1.93	-0.002	-0.47	-0.080	-4.69	-0.013	-2.82	-0.003	-1.21
respondent schooling missing	-16.166	0.00	-0.272	0.00	-5.828	0.00	-1.112	0.00	-0.010	1.04
Number of observations	636		1,065		1,001		2,064		2,427	

Notes:

- 1) The columns labeled ME present marginal effects, which were calculated in Table 7(a) on the basis of logit estimates for item non-response for each outcome separately, and in Table 7(b) on the basis of multinomial logit estimates for each outcome separately. Here the dependent variable was coded to indicate response, don't know, and non-response. In Table 7(b) the marginal effects describe the impact of the indicator on the probability of item non-response.
- 2) The columns labeled t present the asymptotic t statistics for the coefficient estimates on the relevant variables in the estimations.
- 3) Cells containing an x do not indicate coefficient or marginal effects, because the variables had to be dropped from the model estimation due to collinearity.
- 4) All estimations controlled for constants which are not presented to save space.

Source: Own calculations based on GSOEP

Table 8 Logit Estimates on Pooled Outcomes

Variable	Fixed Effects		Fixed Effects with Wealth Interactions			
	Coeff.	t	Main Effects		Interaction	
			Coeff.	t	Coeff.	t
respondent female interviewer male	-0.007	-0.08	-0.010	-0.08	0.000	0.00
respondent male interviewer female	0.140	1.72	0.149	1.30	0.004	0.02
respondent female interviewer female	0.357	4.16	0.196	1.51	0.291	1.67
respondent part time employed	0.422	4.59	0.520	4.34	-0.230	-1.19
respondent not employed	0.353	4.19	0.405	2.54	0.020	0.10
interviewer part time employed	-0.215	-2.20	-0.242	-1.68	0.036	0.18
interviewer not employed	-0.071	-0.92	-0.001	-0.01	-0.137	-0.85
same employment status	-0.054	-0.91	-0.035	-0.36	-0.035	-0.28
respondent medium level schooling	-0.126	-1.79	0.261	2.68	-0.754	-5.29
respondent high schooling	-0.192	-2.33	0.259	2.25	-0.880	-5.32
interviewer medium level schooling	-0.235	-3.45	-0.411	-4.34	0.331	2.42
interviewer high schooling	-0.041	-0.50	-0.056	-0.49	0.018	0.11
same schooling	0.094	1.47	0.086	0.98	0.045	0.35
respondent age	0.009	2.30	0.016	3.00	-0.013	-1.77
age difference: interviewer - respond.	-0.004	-1.30	-0.000	-0.05	-0.008	-1.33
change of interviewer	0.068	0.82	0.302	2.68	-0.457	-2.75
public sector employee	-0.341	-4.20	-0.632	-5.47	0.582	3.53
self administered survey	0.109	1.32	0.137	1.33	-0.037	-0.21
lives in small town	-0.081	-1.45	0.099	1.20	-0.365	-3.22
household size	-0.126	-5.16	-0.016	-0.46	-0.240	-4.87
respondent schooling missing	-0.036	-0.13	0.659	2.10	-1.958	-2.85
Test on significance of fixed effects	90.75	0.00	53.54	0.00		
Log Likelihood		-5,444.8		-5,376.8		
Number of observations		28,531		28,531		

Notes:

- 1) The estimations combine the following outcome measures: All income categories listed in Table 3, the outcome measures No. 41 and 42 from Table 4, and all measures from Table 5 except for farm value.
- 2) Since income from interest and dividends (reported at the household level) is an indicator of wealth we considered this outcome as a wealth outcome.
- 3) Fixed effect coefficients are not presented to save space.
- 4) The figures in the row on fixed effect significance tests provide the test statistic of a  $\chi^2$  test with 26 degrees of freedom. The p-value is given behind the test statistics.

Table 9 Summary of Hausman Test Results

Dependent Variable	Number of Obs.	Test-Statistic	p-value
Pooled wealth measures	12,613	0.20	1.00
Stocks and Bonds	636	0.00	1.00 <sup>1)</sup>
Home Loan Savings	1,001	0.00	
Savings Account	2,064	0.00	1.00
Ownership of occupied flat or home: Market value	1,065	0.00	1.00 <sup>1)</sup>
Total household wealth	2,427	-3.23	

Note:

- 1) The test statistic takes on a negative value, which can be interpreted as strong evidence against rejecting the null hypothesis that the IIA assumption holds (Hausman and McFadden 1984, p. 1226 footnote 4, or Stata 7 Manual volume 2 p.13).

Source: Own calculations based on GSOEP

## Appendix

Table A1      Multinomial logit estimation results for the pooled wealth measure

Dep. Variable =      Pooled wealth outcomes, valid answer is the reference category.  
 LR chi2(42) =      347.90  
 Prob > chi2 =      0.0000  
 Pseudo R2 =      0.0287

Independent Variable	Don't Know		Non-Response	
	Coeff.	t	Coeff.	t
respondent female interviewer male	0.642	6.410	-0.056	-0.430
respondent male interviewer female	0.105	1.010	-0.018	-0.140
respondent female interviewer female	0.476	4.300	0.456	3.550
respondent part time employed	0.185	1.520	0.272	1.640
respondent not employed	-0.028	-0.290	0.079	0.660
interviewer part time employed	0.490	4.260	-0.359	-2.190
interviewer not employed	0.583	6.110	0.029	0.250
same employment status	0.000	-0.010	0.022	0.250
respondent medium level schooling	0.160	1.920	-0.131	-1.200
respondent high schooling	-0.057	-0.570	-0.406	-3.020
interviewer medium level schooling	0.074	0.900	-0.136	-1.270
interviewer high schooling	0.024	0.230	-0.003	-0.020
same schooling	-0.050	-0.630	0.055	0.540
respondent age	-0.005	-1.180	0.006	1.100
age difference: interviewer - respond.	0.007	1.810	-0.006	-1.220
change of interviewer	0.228	2.440	-0.192	-1.390
public sector employee	-0.251	-2.520	-0.051	-0.420
self administered survey	0.114	0.960	0.151	1.000
lives in small town	0.561	7.530	-0.063	-0.730
household size	0.043	1.550	-0.199	-5.140
respondent schooling missing	0.081	0.250	-1.734	-1.720
constant	-3.282	-12.210	-2.612	-7.81
Log Likelihood	-5887.54			
Number of observations	12,613			

Source:              Own calculation based on GSOEP.



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