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## Respondent behavior in panel studies : a case study for income-nonresponse by means of the German Socio-Economic Panel (GSOEP)

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Discussion Papers

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# Respondent Behavior in Panel Studies - A Case Study for Income-Nonresponse by means of the German Socio-Economic Panel (GSOEP)<sup>1</sup>

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## ABSTRACT

Many validation studies deal with item-nonresponse and measurement error in earnings data. In this paper we explore motives of respondents for the failure to reveal earnings using the German Socio-Economic Panel (GSOEP). GSOEP collects socio-economic information of private households in the Federal Republic of Germany. We explain the evolution of income-nonresponse in the GSOEP and demonstrate the importance of a discrimination between refusing the income-statement or don't know.

*Keywords:* Respondent behavior; Interviewer effects; Item-Nonresponse; Panel analysis; Multilevel modeling

*JEL classification:* C81

## 1. Introduction

Since the survey interview is a major source of research data in the social sciences, it is not surprising that there is a large literature on the quality of survey data focused specifically on respondents and interviewer effects. In the last decade panel studies have become more popular, hence studies in this subject area dealing with longitudinal data have become increasingly important.<sup>2</sup> Many of them are especially focused on unit-nonresponse (cf. Pickery/Loosveldt/Carlton (2001), Campanelli/O'Muircheartaigh 1999; O'Muircheartaigh/Campanelli 1999).

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<sup>2</sup>For example Zouwen/Van Tilburg (2001) or the longitudinal study of marriage by Veroff/Hatchett/Douvan (1992) and the study by Wilson et al. (1989).

This paper focuses on item-nonresponse and unit-nonresponse in the German Socio-Economic Panel (GSOEP). We describe the trends in the data and try to explain why respondents refuse to state their income question on the basis of a cognitive and rational choice theory. The GSOEP is a longitudinal representative survey containing socio-economic information<sup>3</sup> on private households in the Federal Republic of Germany (Wagner/Burkhauser/Behringer 1993; Dunn/Frick/Witte 1998). It is similar to the US Panel Study of Income Dynamics (PSID). DIW Berlin (German Institute for Economic Research) manages the GSOEP study. The first wave of data, collected in 1984 from the old Federal Republic of Germany contains 5,921 households. The original sample was supplemented with a sample of East German residents in 1990 and a refreshment sample of immigrants in 1994/95. All household members aged 16 and older are interviewed. We restrict our study on the original West German sample.

## 2. Explaining respondent effects in surveys

A large body of literature on respondent and interviewer effects shows that both respondents and interviewers contribute to error in surveys. Various respondent and interviewer characteristics have been thought to have an impact on data quality. The interview is recognized as a social process in which the respondent acts to achieve personal goals. The respondent's view of the situation decides whether his answer is factual or serves another goal. Many alternative respondent behaviors occur during interviews (cf. Kahn/Cannel 1957, p. 129ff.). The following are particularly important to individual interviews:

1. The respondent refuses to participate (unit-nonresponse).
2. The respondent agrees to participate but refuses to answer some questions, for example about his income (item-nonresponse).
3. The respondent agrees to participate but withholds facts and answers in a way that systematically pursues personal goals or interests (social desirability, acquiescence, response styles).
4. The respondent agrees to participate and endeavors to answer all questions in accordance with the facts.

These response alternatives are not exhaustive and not distinct from each other. After participating respondents can refuse particular questions as well as use response

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<sup>3</sup>GSOEP provides also a wealth of methodological information about the survey methods utilized and the characteristics of the interviewers (cf., Schräpler/Wagner 2001).

strategies like social desirable or acquiescence behavior in the same questionnaire. Furthermore, as we point out later, refusing a particular answer (item-nonresponse) is partly assumed to be an expression of social desirability.

To understand the respondent's choice of one of these behaviors, it is essential to know the motives of the respondent. Rational Choice theory (RC) (cf., Esser 1993) and cognitive theory (Tourangeau 1984; Tourangeau et al. 2000) provide useful theoretical frameworks to explain respondent behavior. In cognitive theory, several stages of cognitive processing are distinguished: interpreting the question to understand its meaning, retrieving relevant information, integrating that information into judgement, and formatting and "editing" a response. "Editing" is based on considerations of social desirability and self-presentation (Sudman/Bradburn/Schwarz 1996, Tourangeau 1984). The cognitive approach gives insight into the answering process. Nevertheless to understand the last stage of editing we need to conceptualize sensitivity and social desirability. Those concepts relate respondents' behavior to an interaction between the respondent and the interviewer. RC-theory (alternatively, utility theory) provides a useful framework for analyzing sensitivity. The application of utility theory to survey responding has been explored by several researchers (cf. Sirken et al. 1991, Esser 1993). Recent studies use psychological laboratories to validate the utility model as a tool for studying the response to sensitive questions (Willis et al. 1994; Willis et al. 1998).

RC theory implies that respondents to a survey "choose" their answers, and that the choice depends on which of the possible replies appears to be the best choice. The best choice thus depends on what the respondents presume to be the consequences of certain behavior or answers judging from visible or assumed features of their interview situations; on how the respondents assess the situation with regard to these assumed consequences (cf. probability of adverse outcomes); and on how they evaluate these consequences in the face of their own preferences (Esser 1993, p. 293-294). Thus the individual selects a specific action after assessing the situation and evaluating the consequences of possible actions. In rational choice theory individuals chose those alternatives which realize certain goals. It is generally assumed that actors attempt to attain social acceptance or avoid disapproval (cf., Phillips 1971, 1973).

### **3. Item-Nonresponse - a cooperation problem**

Researchers have learned much about earnings and their determinants from data collected in income and labor market surveys such as the German Socio-Economic Panel (GSOEP), the Current Population Survey (CPS) and the Panel Study on Income Dynamics (PSID). Unfortunately the quality of data in these surveys is undermined by the failure of some participants to report their wages and salaries. Missing data create three major problems: 1. Nonrespondents are typically different from the respondent; naive analysis that ignores these differences will be biased; 2. missing data implies

a loss of information. 3. Many standard statistical techniques require rectangular data sets; in the absence of imputation analyses are restricted to the set of complete observations (cf., David et al. 1986, Little/Schenker 1995). Item-nonresponse is often treated by imputing the missing items. There are various techniques, many which are designed especially for income adjustments, that can be used (cf., David et al. 1986, Brownstone/Valetta 1996).

Several causes for item-nonresponse are mentioned in the literature. Loosveldt et al. (1999) assume that item-nonresponse occurs when the answering process fails to proceed smoothly because the respondent lacks motivation or ability. Item-nonresponse also depends on the evaluation by the respondents of the questions asked: the questions are too difficult, not interesting, too embarrassing or too threatening (Loosveldt/Pickery/Billet 1999).

Revealing income is sensitive. Questions, eliciting information about income touch personal and intimate information. In a study on attitudes toward money conducted on a non-representative, Washington DC area convenience sample, van Melis-Wright and Stone (1993) found that the two most frequently endorsed statements were "I think it is impolite to ask others about their financial situation," and "Surveys asking about my finances should be completely anonymous."

Sensitive questions encompass several aspects. Tourangeau et al. (2000) distinguish 1. invasion of privacy, 2. risk of disclosure of answers to third parties and 3. social (un)desirability of the answers. The first relates mainly to the sensitive topic of the questions and not necessary to the answers of such questions. Tourangeau et al. (2000, p. 258) argue that monthly income is clearly not the thing one could ask a neighbor or a casual acquaintance over lunch. Hence, it is not surprising that under certain conditions the respondent may regard the declaration of his income or other intrusive questions as inappropriate and refuse these statements. This behavior relates to the degree of the invaded privacy and reflects aversion to answer questions about particular domains. Concerns about privacy refer to a desire to keep information about oneself out of the hands of others altogether. We suspect, that this aversion depends both on the question and the general topic of the survey. But the circumstances in which the question are asked and the personality of the respondent may also affect the refusal to answer (Tourangeau et al. 2000).

The second aspect refer to concerns about confidentiality. Singer/Mathiowetz/Couper (1993) demonstrate a relationship between concerns about confidentiality and privacy that affect significantly mail returns to the 1990 U.S. census. Concern about confidentiality refer to the desire to keep data already given to one agent out of the hands of others (Singer et al. 1993). People may be unwilling to discuss income because their true income differs from their declarations on income tax forms, loan/credit/scholarship applications, government benefit statements or other income-based records (cf. Smith 1991). Perhaps in some cases there is a risk of data

abuse and a disclosure of answers to third parties.

Thirdly often social costs may arise from admitting to a deviation from a public norm, or from a norm generated by the interview situation. Income is a major component in defining one's social class and standing. As a result, people with low incomes may be afraid that truthful answers reflect badly on them (Smith 1991). A working hypothesis is that persons with low income disproportionality refuse to respond. A large deviation between one's own income and the internalized social norm for income causes the respondent to withhold his response because of social desirability (cf. Wagner/Motel 1996).

Loosveldt et al. (1999) and Bollinger/David (2001) demonstrate that item-nonresponse to sensitive or threatening questions that are strongly related to the substantive topic of the questionnaire will predict unit-nonresponse in the following wave. Item non-respondents remember the interview as a negative or unpleasant experience and are more likely to refuse in the following wave than others. Furthermore Burton/Laurie/Moon (1999) express the idea that one can place all potential respondents to a survey on a cooperation continuum (figure 1). At one end are those who will always take part and will answer any question, on the other end are those respondents who are hard to persuade and will tend to refuse often. Using data of the British Household Panel Study (BHPS), their findings indicate an interaction between unit-nonresponse and item-nonresponse. People who are more reluctant to take part in surveys will also be more reluctant to answer individual questions, and vice versa.

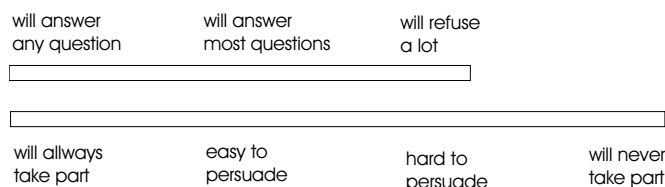


FIG. 1.— *Cooperation continuum (Burton et al. 1999)*

In RC-Theory the respondent is a decision maker who maximizes his utility. The respondent faces four alternatives which are related to the cooperation continuum: 1. He participates in the survey. 2. He participates and answers the income question in the accordance with the truth. 3. He participates, decides to lie, and reports false facts which may be more socially desirable. 4. The respondent participates and refuses to answer or has retrieval problems and does not know the answer. 5. The respondent refuses to participate.

Although false reporting can not be ruled out, detecting false reporting requires a true reference value (see Bollinger/David 2001), which is usually not available. We assume serious false reporting is difficult to realize, because in economic oriented panel studies like the GSOEP many variables are related to income and therefore have also to



be adjusted by the respondent. Moreover, for coherence, in each wave the false values have to be remembered by the respondent for subsequent waves. Hence we assume deliberately true reporting and restrict our analysis to alternatives one, two, four and five.

Table 1 relates to the four alternatives to underlying cognitive problems and respondents assessment and evaluation. The table distinguishes two origins for non-response.

**Cognitive and other limitations to retrieval:** At the first level income nonresponse as well as unit-nonresponse is not a result of unwilling or refusing but the impossibility of participating or difficulty in reporting the labor income. The cognitive work necessary to answer an income question - understanding, retrieval, and response production - implies that response errors can occur at any stage (cf. Sirken et al. 1999; Moore/Stinson/Welniak 2000). Some respondents cannot recall their gross-income. This is clearly a "don't know" response category. Our first hypothesis is that respondents who don't answer a particular question because of cognitive limitations (e.g. don't know) differ from respondents who are not willing to cooperate and refuse their statement.

In addition some problems cause people who would normally take part not to participate, e.g. sickness, work, schedules, change of address or death.

TABLE 1: *Respondent behavior alternatives relating to cognitive or other limitations and respondent's assessment and evaluation*

|                                  | 1. Cognitive and other limitations   | 2. Respondent's assessment and evaluation  |   |
|----------------------------------|--|--|---|
|                                  |  | benefits   | costs   |
| participation                    | <ul style="list-style-type: none"> <li>not possible (moved, sick, dead)</li> </ul>   | <ul style="list-style-type: none"> <li>survey serves a meaningful purpose</li> <li>to endorse a scientific or public sponsor</li> <li>interesting entertainment</li> </ul>     | <ul style="list-style-type: none"> <li>topic too sensitive</li> <li>topic out of interest</li> <li>survey not confidential</li> <li>opportunity costs</li> </ul>              |
| response   participation         | <ul style="list-style-type: none"> <li>cognitive limitations, "don't know" (understanding, retrieval, response production)</li> <li>doesn't apply</li> </ul> | <ul style="list-style-type: none"> <li>question serves a meaningful purpose</li> <li>to endorse a scientific or public sponsor</li> <li>interesting entertainment</li> </ul>   | <ul style="list-style-type: none"> <li>loss due to disclosure to third parties</li> <li>loss due to social (un)desirability</li> <li>loss due to invade of privacy</li> </ul> |
| item-nonresponse   participation |  | <ul style="list-style-type: none"> <li>no fear of social disapproval</li> <li>keep particular information private</li> <li>keep particular information confidential</li> </ul> | <ul style="list-style-type: none"> <li>justification costs (depends on data collection method)</li> </ul>   |
| unit-nonresponse                 |  | <ul style="list-style-type: none"> <li>time for other opportunities</li> <li>keep privacy</li> <li>keep confidentiality</li> </ul>   | <ul style="list-style-type: none"> <li>justification costs (depends on data collection method)</li> </ul>   |

Source: own arrangement

The second level deals with respondent's assessing and evaluation of the interview situation and his own choice to cooperate. As mentioned respondent's fear of disclosure to third parties, the influence of social desirability and the general aversion to report intimate facts, all contribute to non-response. In RC-Theory these aspects can be interpreted as costs of responding a sensitive question. The benefit of responding is apparent if the survey serves a meaningful purpose for the respondent. Often it is useful to emphasize the scientific or a public sponsor of the survey. Surveys conducted under the aegis of the Federal government typically achieve much higher levels of cooperation than non-government surveys (cf. Goyder 1987). After assessing the situation by facing costs and benefits the respondent evaluate the consequences of possible actions (probability of outcomes) and selects a specific action which realize his personal goals.

Measures of these factors are not available in the data, but we can use these concepts to predict respondent's behavior.

**Disclosure to third parties and confidence building:** In RC-theory we can interpret concerns about confidentiality as fear about loss to disclosure to third parties. Individuals appear to vary in the strength of their worries about confidentiality and this degree of concern could have some effect on their willingness to cooperate (Singer/Mathiowetz/Couper, 1993). The degree of concern may also be determined by the characteristics of the interviewer and by the relationship between respondent and interviewer (cf. Sudman/Bradburn 1974, Pickery et al. 2001). As GSOEP is a panel study, the respondent meets the interviewer several times. When they first meet, the tendency to refuse may be stronger than on later occasions, because successive interview contacts build confidence<sup>4</sup>. Subsequent contacts increase trust, encouraging answers to sensitive questions like the income statement, and decreasing fear of negative consequences, including data abuse. We expect that refusing an answer concerning to the fear of disclosure to third parties is primarily a problem in the first contact. Therefore our second hypothesis is that the refusal rate is highest in the first wave and decreases in subsequent waves.

**Social desirability:** Social desirability includes two aspects. First, the respondent may be concerned to have the interviewer's approval. Approval depends on the presence of an interviewer, interviewer attributes, the topic of the question and the facts about the respondent's conduct or attitudes. Second, personality traits may cause respondents to distort their answers because of underlying needs, such as the need for social approval and the need to conform to social standards (cf. Tourangeau et al. 2000, p. 257-258). Fear of disapproval of low earnings by the more accomplished interviewer may create an incentive for low-earning respondents with a need for social

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<sup>4</sup>The change of the interviewer is an exceptional case in the GSOEP. Rendtel (1995) has shown that a change of the interviewer is a strong indicator for unit-nonresponse.

approval to refuse earnings (cf. Smith 1991; Wagner/Motel 1996). These respondents refuse to give answers that reflect badly on them, in all other cases they cooperate. Our third hypothesis is that respondents in low-earning occupational groups have a higher refusal rate than respondents in high-earning occupational groups due to the influence of social desirability.

**Invasion of Privacy:** Some nonrespondents have a general aversion to answer intimate questions and think income questions are an invasion of privacy. These respondents are characterized by less cooperation and several refusals in their questionnaire. Privacy concern goes to the heart of a respondent's willingness to participate in a survey (Singer et al. 1993). We can assume that members of this group are not whole-hearted survey co-operators, and clearly have misgivings about the whole process. They drift to the end of the cooperation continuum and are harder to persuade in the following wave (Burton et al. 1999; Bollinger/David 2001). Our fourth hypothesis is that respondents who refuse their income statement are more likely to drop out of the survey than others. We expect a negative correlation between refusing the income question and survey participation in the following wave.

Respondents near the uncooperative extreme of the cooperation continuum are those respondents who will never take part in surveys of any kind as a matter of principle, either because of concerns about intrusiveness, confidentiality or because they do not want to waste their time (Burton et al. 1999). Meta-analysis of studies on response rates to mail surveys shows, that the topic of a survey has a clear impact on people's willingness to take part in it (Yammarino/Skinner/Childers, 1991; Heberlein/Baumgartner 1978). Both respondent interest in the topic and the topic's sensitivity seem to be important for the willingness to participate.

**Justification costs:** The mode of the interview may also contribute to the difficulty respondents and interviewers experience when talking about income. Groves (1989) and Jordan et al. (1980) find more missing values for income in telephone surveys than in face-to-face interviews. Moore et al. (2000) argue that the telephone may simply lower some of the social barriers against expressing the discomfort about discussing income overtly. Following this idea we suspect the greater the social barriers the higher the justification costs for refusals. These costs may vary with the interview situation. In mail or self-completed questionnaires or in telephone interviews it is much easier for the respondent to refuse an answer than in face-to-face interviews where the interviewer asks the respondent directly. We suppose that uncooperative respondents to choose self-completion or mail modes of response with higher probability than cooperative respondents. Hence we expect in our fifth hypothesis that respondents who choose self completion modes have higher refusal rates than in face-to-face modes.

#### 4. Item- and unit-nonresponse in the GSOEP

As a first step we take a look at the history of the item-nonresponse rate for the gross-income question among employed persons in the GSOEP in Sample A (West-Germans)<sup>5</sup>. The rates are a result of blank, do not know and refused entries. Special

TABLE 2: *Item-Nonresponse-rate for the gross-income question from employed persons in the GSOEP, Sample A (in per cent)*

|         | including self-employed and trainees |          |      | excluding self-employed, trainees and proxies |          |      |
|---------|--------------------------------------|----------|------|---|----------|------|
|         | employed respondents                 | missing* | %    | selected respondents                          | missing* | %    |
| wave 1  | 5017                                 | 640      | 12.8 | 4135  | 437      | 10.5 |
| wave 2  | 4709                                 | 622      | 13.2 | 3845  | 394      | 10.2 |
| wave 3  | 4520                                 | 526      | 11.6 | 3654  | 314      | 8.6  |
| wave 4  | 4525                                 | 499      | 11.0 | 3677  | 294      | 8.0  |
| wave 5  | 4309                                 | 469      | 10.9 | 3512  | 275      | 7.8  |
| wave 6  | 4213                                 | 427      | 10.1 | 3478  | 252      | 7.3  |
| wave 7  | 4128                                 | 446      | 10.8 | 3420  | 281      | 8.2  |
| wave 8  | 4160                                 | 494      | 11.9 | 3462  | 327      | 9.4  |
| wave 9  | 4013                                 | 433      | 10.8 | 3379  | 286      | 8.5  |
| wave 10 | 3952                                 | 371      | 9.4  | 3339  | 227      | 6.8  |
| wave 11 | 3796                                 | 306      | 8.1  | 3225  | 198      | 6.1  |
| wave 12 | 3780                                 | 304      | 8.0  | 3222  | 204      | 6.3  |
| total   | 51122                                | 5537     | 10.8 | 42348   | 3489     | 8.2  |

Source: GSOEP 1984 - 1995 Sample A, employed respondents (own calculation)

\*result of blank, "do not know" or "refused" entries

problems occur in the case of the income question for self-employed respondents. The income question is not designed to elicit estimates of business profits for the monthly reference period. Proxies may be less informed than persons reporting for themselves. Apprentices have unusual arrangements for remuneration. Due to these problems self-employed respondents, trainees and proxies are excluded from our empirical analysis. Table 2 shows a decrease in item-nonresponse from about 10 percent in the first two waves to approximately 6 percent after 12 years. The gross-earnings item-nonresponse rate is quite low in comparison to other international and national surveys (Madow et al. 1983, p. 24).

In the previous section we argued that item-nonresponse and unit-nonresponse can be understood as different locations on a cooperation continuum. Table 3 shows the loss of information due to item- and unit-nonresponse for gross-income. The unit-

<sup>5</sup>The annual question for all employed respondents asks:  
"How high were your earnings last month?"

If you received any additional payments last month, e.g. holiday money or back-pay please do not include these. Also allowance for children do not include. However, do include money earned for overtime."

nonresponse rate is calculated as the percentage of selected employed respondents in wave  $t$ , who don't participate in wave  $t + 1$ . As the starting point of this process we use wave 1. The overall loss of information in each wave is a result of the number of item-nonresponse and lost participants.

TABLE 3: *Loss of information due to item- and unit-nonresponse for gross-income from employed persons in the GSOEP, Sample A (in per cent)*

| wave $t$ | selected<br>employed<br>respondents**<br>in wave $t$ | Item-Nonresponse                  |      | Unit-Nonresponse                                    |      | Total                              |         |      |
|----------|--|-----------------------------------|------|---|------|------------------------------------|---------|------|
|          |  | missing*<br>income<br>in wave $t$ | %    | lost<br>employed<br>participants<br>of wave $t - 1$ | %    | selected<br>+ lost<br>participants | missing | %    |
| wave 1   | 4135   | 437                               | 10.5 | -   | -    | 4135                               | 437     | 10.5 |
| wave 2   | 3845   | 394                               | 10.2 | 415   | 10.0 | 4260                               | 809     | 19.0 |
| wave 3   | 3654   | 314                               | 8.6  | 341   | 8.9  | 3995                               | 655     | 16.3 |
| wave 4   | 3677   | 294                               | 8.0  | 231   | 6.3  | 3908                               | 525     | 13.1 |
| wave 5   | 3512   | 275                               | 7.8  | 285   | 7.8  | 3797                               | 560     | 14.7 |
| wave 6   | 3478   | 252                               | 7.3  | 247   | 7.0  | 3725                               | 499     | 13.4 |
| wave 7   | 3420   | 281                               | 8.2  | 242   | 7.0  | 3662                               | 523     | 14.3 |
| wave 8   | 3462   | 327                               | 9.4  | 172   | 5.0  | 3634                               | 499     | 13.7 |
| wave 9   | 3379   | 286                               | 8.5  | 171   | 4.9  | 3550                               | 457     | 12.9 |
| wave 10  | 3339   | 227                               | 6.8  | 162   | 4.8  | 3501                               | 389     | 11.1 |
| wave 11  | 3225   | 198                               | 6.1  | 183   | 5.5  | 3408                               | 381     | 11.2 |
| wave 12  | 3222   | 204                               | 6.3  | 134   | 4.2  | 3356                               | 338     | 10.1 |
| total    | 42348  | 3489                              | 8.2  | 2583  | 6.6  | 44931                              | 6072    | 13.5 |

Source: GSOEP 1984 - 1995 Sample A, employed respondents, without self-employed, trainees and proxies (own calculation)

\*result of blank, "do not know" or "refused" entries

\*\*old and new employed respondents

Unit-Nonresponse is indicated if respondents are not able (sick, dead, or moved abroad) or unwilling (refusing) to participate on the survey. A few households could not be found during the field work. Table 4 shows the frequencies of these categories for respondents who were employed in the prior wave, from wave 2 to 12. Interviewer classify 80 percent of the attrition as unwilling respondents and refusals. Note that we do not use the first wave in our unit-nonresponse analysis because we restrict analysis on respondents who participate at least one wave.

Although focus is on income-nonresponse, we describe the whole distribution of respondent behavior related to missing values. Table 5 shows the distribution and some overall descriptive statistics for each wave. The number of missing values in the questionnaire is relatively low, but higher in wave 1 than in other waves. The number of questions in the questionnaire varied over years. The 75th percentile is a more comparable measure across years.

The next section examines the distribution of income-nonresponse in detail. Schupp/Wagner (1996) show that item-nonresponse for gross income depends on the mode of data collection method for GSOEP. The GSOEP represents a "method-mix".

TABLE 4: *Reasons for unit-nonresponse in Sample A, employed in the last wave (in per cent)*

|                                       | wave 2-12 |        |
|---------------------------------------|-----------|--------|
|                                       | N         | %      |
| unsuccessful at the time (sick, a.o.) | 199       | 7.7    |
| unwilling                             | 832       | 32.2   |
| final refusal                         | 1222      | 47.3   |
| moved abroad                          | 57        | 2.2    |
| dead                                  | 62        | 2.4    |
| HH not found                          | 145       | 5.6    |
| isol. temporary sample member         | 66        | 2.6    |
| Total Unit-Nonresponse                | 2583      | 100.00 |

Source: GSOEP 1985 - 1995 Sample A, employed respondents (own calcul.)

TABLE 5: *Distribution of the number of missing values (item-nonresponse) in the GSOEP*

| number of missings | waves |      |      |      |      |      |      |      |      |      |      |      |
|--------------------|-------|------|------|------|------|------|------|------|------|------|------|------|
|                    | 1     | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   |
| 0                  | 128   | 1526 | 1261 | 1587 | 1403 | 1318 | 857  | 1143 | 1520 | 1279 | 1600 | 124  |
| 1                  | 346   | 1010 | 969  | 922  | 926  | 807  | 1152 | 946  | 925  | 800  | 868  | 1082 |
| 2 - 5              | 2634  | 1034 | 1165 | 940  | 1002 | 1101 | 1105 | 1078 | 740  | 959  | 595  | 1564 |
| 6 - 10             | 887   | 208  | 209  | 170  | 124  | 163  | 82   | 221  | 135  | 222  | 107  | 297  |
| 11 - 15            | 110   | 36   | 35   | 34   | 39   | 50   | 84   | 44   | 33   | 47   | 27   | 89   |
| 16 - 20            | 20    | 10   | 11   | 10   | 12   | 21   | 108  | 20   | 14   | 20   | 14   | 38   |
| over 20            | 10    | 21   | 4    | 14   | 6    | 18   | 32   | 10   | 12   | 12   | 14   | 28   |
| N                  | 4135  | 3845 | 3654 | 3677 | 3512 | 3478 | 3420 | 3462 | 3379 | 3339 | 3225 | 3222 |
| mean               | 4.28  | 1.74 | 1.81 | 1.60 | 1.56 | 1.91 | 2.53 | 1.94 | 1.46 | 1.93 | 1.31 | 3.26 |
| sd                 | 2.94  | 3.26 | 2.49 | 2.82 | 2.47 | 3.16 | 4.37 | 2.94 | 2.79 | 3.13 | 2.92 | 4.41 |
| median             | 4     | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    |
| 75th percentile    | 5     | 2    | 3    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 1    | 4    |
| min                | 0     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| max                | 40    | 52   | 29   | 43   | 32   | 38   | 52   | 41   | 44   | 44   | 62   | 53   |

Source: GSOEP 1984 - 1995 Sample A, individual questionnaire, employed respondents (own calculation)

The preferred modality for the survey is face-to-face interviews (face). Respondents also may complete the questionnaire by themselves and receive help from the interviewer on demand (self). Sometimes both modalities are combined in an individual interview (not shown in the figure). A few responses are elicited by mail when respondents would otherwise fail to cooperate (mail). Figure 2 shows that face-to-face interviews have the lowest income-nonresponse, and mail questionnaires the highest. A similar pattern can be observed for respondents with unit-nonresponse in the following wave in figure 3. The mode "mail" can be interpreted as a strong indicator for poor cooperation.

To show the influence of earning-related institutions and occupation on income-nonresponse we classify occupation into three groups (table 6). The groups are defined on type of position (wage, salary, or civil service) and occupational skills. On average

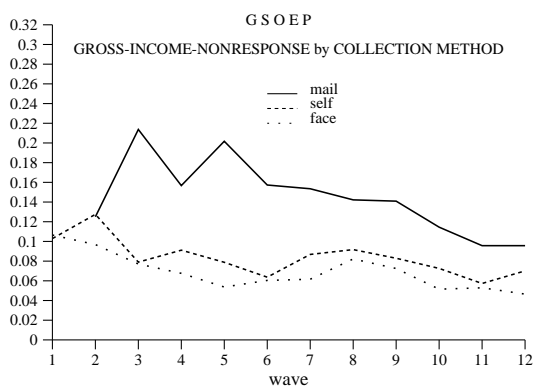


FIG. 2.— *Share of income-nonresponse by data collection methods from 1984 - 1994, Sample A, employed persons.*

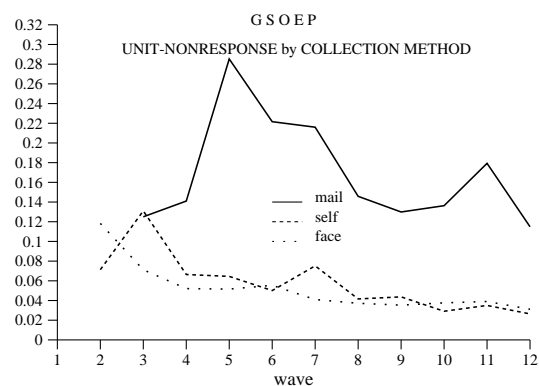


FIG. 3.— *Share of unit-nonresponse by data collection methods in the last wave from 1985 - 1995, Sample A, employed persons.*

TABLE 6: *Classification of the vocational position*

|        | vocational position | occupation   |
|--------|---------------------|--|
| LOW    | worker              | unskilled worker,<br>semiskilled worker  |
| MEDIUM | worker              | skilled worker,<br>foreman, master,  |
|        | salaried employee   | industry- and works foreman,<br>employee with simple activity,<br>qualified activity |
| HIGH   | official            | minor and lower-grade civil service  |
|        | salaried employee   | high qualified activity,<br>executive function                                       |
|        | official            | high and senior service  |

substantial differences in average wage exist between these groups<sup>6</sup>. Figure 4 shows the average income and the standard deviation for each group of income reporting respondents for the early seven waves. Nevertheless, this tri-partite classification can not be used directly as a proxy for earnings, because it encompasses aspects of employment that go beyond current earnings to tenure, fringe benefits that are not paid in cash, prestige, and human capital. The interpretation from using this classification as regressors is that their coefficients reflect an aggregate effect of being in one of three major subdivisions of the employed population. Figure 5 shows the trend in the share of income-nonresponse for each occupational group. The first wave reveals hardly any difference among the three categories. The following waves show a divergence between

<sup>6</sup>Estimates from a random effects panel regression model show that these occupation related dummies explain approximately 15% of the variance of the logarithmic income from income reporting respondents in the GSOEP.

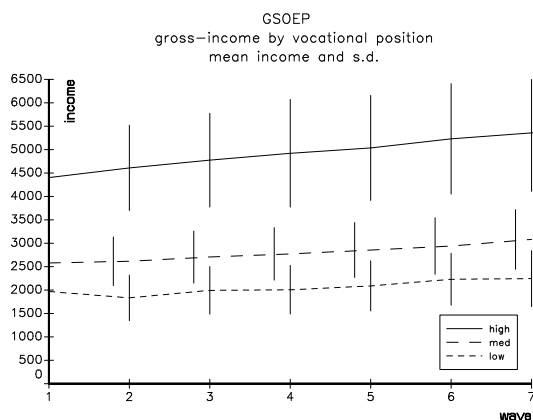


FIG. 4.— Mean gross-income (DM) and standard deviation by occup. status, 1984 - 1991, Sample A, empl. respondents who reported their gross income.

the low vocational position and the other groups. Item-nonresponse rate remains at a high level for unskilled and semi-skilled workers, while the rate for the respondents with better paid occupations falls off rapidly<sup>7</sup>. The pattern appears to support our second and third hypothesis about trust building and (un)social desirability.

Unfortunately the figure 5 is ambiguous, since refusals are not distinguished from 'don't know' or 'blank' for gross-income in the GSOEP. We need to differentiate refusals from other types of missingness. An additional question about the respondent's net-income follows the gross-income question. Respondents who state their net-income reveal that they are not concerned about the sensitivity of the income question. It is reasonable to infer that gross income is unknown or difficult to retrieve. Table 7 shows 46% (3.81% / 8.24%) of all missing values for gross-income correspond to reports of net income. Only 1% (1.08% / 91.76%) of those who report gross income fail to report net income. This is a likely lower bound on the proportion of those with both items missing who have retrieval problems rather than problems associated with the sensitivity of the Questions. An upper bound based on the potentially false assumption that net-income missingness is independent of gross-income is 19.5%. It therefore is reasonable to assume that all employed respondents with missing values for both items intend to refuse their statements (54%). Figure 6 shows the trend for both behaviors. While the share of "refusals" declines slightly, the share of "don't knows" seems to be relatively stable over all waves. Figure 7 and 8 display the distributions by the occupational states. Apparently we find in the aggregate distribution in figure 5 two different subdistributions. Figure 8 shows that respondents in occupation group "HIGH" have the highest refusal rates, followed by the groups MEDIUM and LOW. The share declines for all occupational states. The share for the "don't know" category is shown in

<sup>7</sup>Some previous studies find that those with income missing have lower income (cf., Smith 1991; Kalton/Kasprzyk/Santos 1981).



TABLE 7: *Missing gross- and net-income in percent*( $n = 42,348$ )

| gross-<br>income | net-income |         |        |
|------------------|------------|---------|--------|
|                  | valid      | missing | total  |
| valid            | 90.68      | 1.08    | 91.76  |
| missing          | 3.81       | 4.43    | 8.24   |
| total            | 94.49      | 5.51    | 100.00 |

Source: GSOEP 1984 - 1995

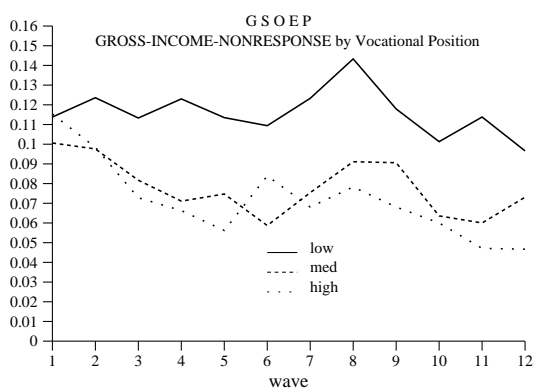
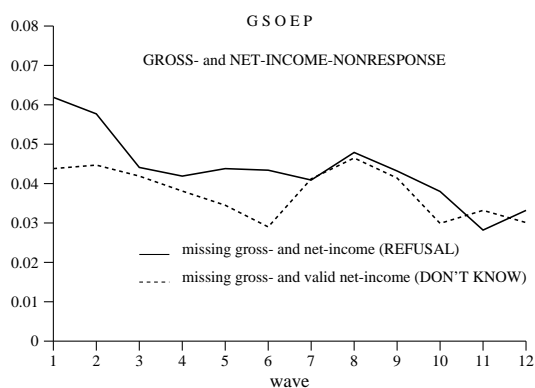
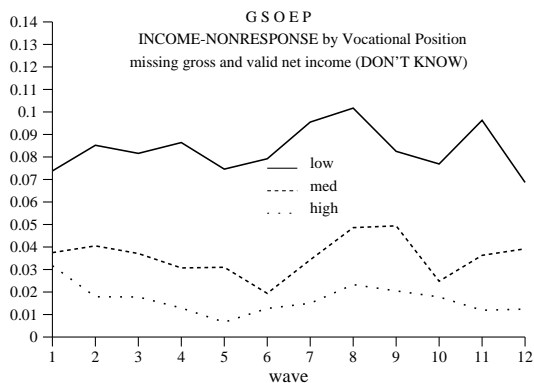
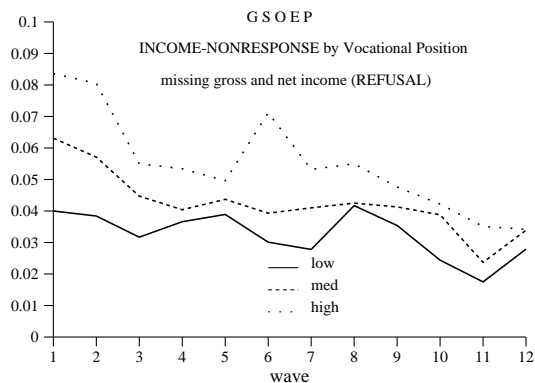
FIG. 5.— *Share of gross-income-nonresponse by occup. status, 1984 - 1994, Sample A, empl. respondents.*FIG. 6.— *Share of gross- and net-income-nonresponse, 1984 - 1995. Sample A, employed respondents.*FIG. 7.— *Share of missing gross- and valid net-income respond by occup. status, 1984 - 1994, Sample A, empl. respondents.*FIG. 8.— *Share of missing gross- and net-income by occupational status, 1984 - 1994, Sample A, employed respondents.*

figure 7. A stable and high proportion of respondents in the low occupational group don't know their gross-income and report valid net-incomes. It might be that their monthly gross-income varies and it is easier for them to recall the net-income. In fig-

ures 9 and 10 we examine possible interactions between the occupational state of the respondent and interviewer's education. Low education includes extended elementary school, high education includes college or university. Often it is assumed that highly educated interviewers provoke socially desirable behavior on the side of the respondent (cf. Sudman/Bradburn 1974). Nevertheless our results show that the "don't knows" are always highest for respondents in low occupational positions with both high and low educated interviewers. Moreover, the "refusals" seems to be independent of interviewer's education: they are always highest for respondents in high occupational positions. These descriptive findings reject our third hypothesis: respondents in low occupational positions don't refuse their income statement due to social (un)desirability but rather due to cognitive limitations.

As noted above, the choice between face-to-face interview (FACE), self completed questionnaires (SELF) as well as partly face-to-face and self completion mode (MIX) is based on the interaction between respondent and interviewer. Non-cooperative respondents may choose an interview method like self completion in the presence of the interviewer or a collection mode by mail to reduce the social pressure to reveal sensitive or threatening answers. Figure 11 shows the share for each collection method and the share of the resulting income response behavior from wave 1 - 12. We can recognize that the refusals are higher in self reporting modes like SELF and MAIL than in face-to-face. Figures 12 and 13 show the development over time. "Don't knows" are slightly higher in face-to-face (FACE) than in the self-completion mode (SELF).

Respondent behavior may vary according to other characteristics of the interview situation. Figures 14 and 15 show the share of income-nonresponse by the age of the interviewer and the respondent. We observe that younger interviewers get more "refusals" as well as "don't know" answers and older respondents refuse more in the first wave.

Figures 16 - 19 examine missingness in relation to interviewer and respondent gender. We recognize that female respondents have higher rates of "don't know". Refusals are not related to gender. Table 8 describe the distribution of the interviewer gender in our sample. About 60% of all interviewers are male. The overall workload from wave 1 - 12 is slightly higher for female interviewer. Figure 19 shows that female interviewers get more "don't knows" and "refusals" than male interviewers in the early waves. It may be that it is easier for respondents to refuse statements to female interviewers. In addition figures 20 and 21 show all possible interactions between respondent's and interviewer's gender. The share of "don't knows" is highest if both respondent and interviewer are female. No interaction effect can be recognized in the case of "refusals" - they are highest in the early waves for female interviewers with both male and female respondents.

The last four figures 22 - 25 refer to unit-nonresponse for survey participants. Figure 22 shows that respondents with many missing values (> 75th percentile) are

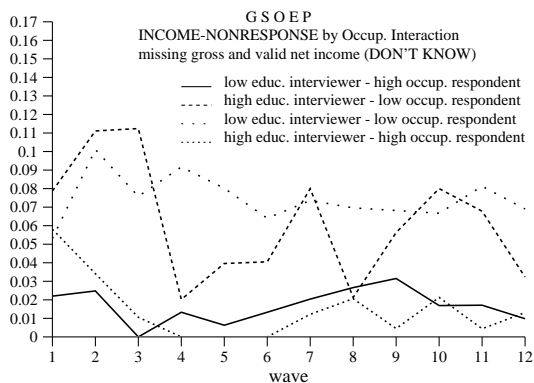


FIG. 9.— *Share of missing gross- and valid net-income by respondent's occup. and interviewer's education interaction, 1984 - 1994, Sample A, employed respondents.*

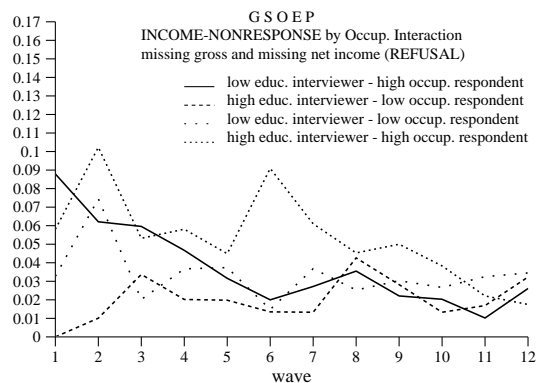


FIG. 10.— *Share of missing gross- and net-income by respondent's occup. and interviewer's education interaction, 1984 - 1994, Sample A, employed respondents.*



FIG. 11.— *Share of selected Collection-Modes and Income Response behavior, 1984 - 1995, Sample A, empl. respondents*

more likely to drop out of the survey than others. This finding confirms with our fourth hypothesis and the concept of a cooperation continuum. The finding is not surprising, but leads to another important point: longitudinal analysis due to item-nonresponse might be affected by selection processes for both item and unit-nonresponse. It suggests

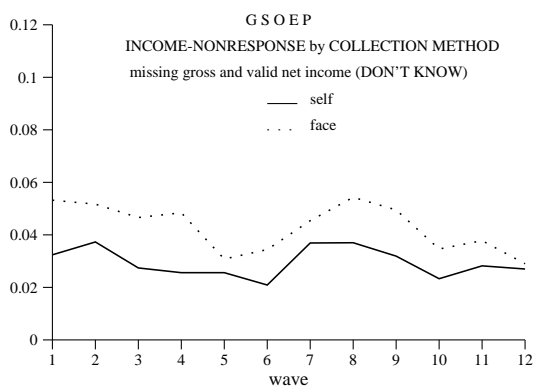


FIG. 12.— Share of missing gross- and valid net-income by collection method, 1984 - 1995, Sample A, empl. respondents without mail interv.

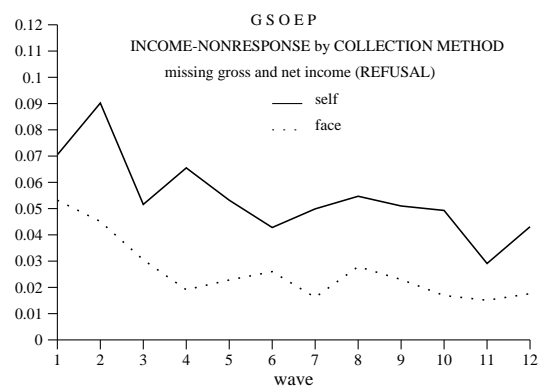


FIG. 13.— Share of missing gross- and net-income by collection method, 1984 - 1995, Sample A, empl. respondents without mail interv.

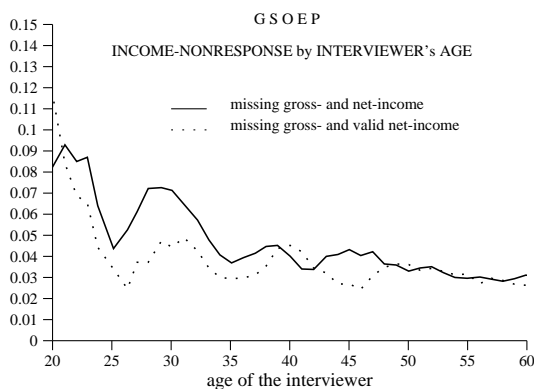


FIG. 14.— Share of income-nonresponse by interviewer's age, 1984 - 1995, Sample A, employed respondents (local estimated).

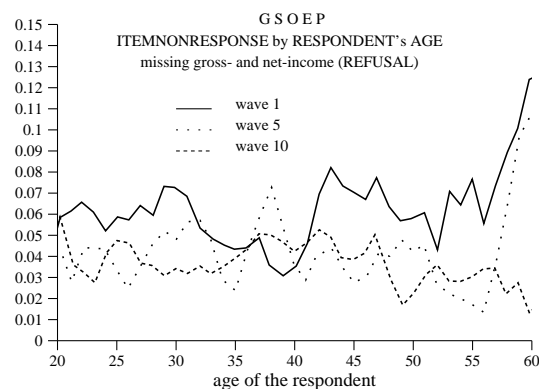


FIG. 15.— Share of missing gross- and net-income by age of the respondent, Sample A, employed respondents (local estimated).

TABLE 8: Distribution of Interviewer Gender

| Interviewer Gender | Number of interviewer | GSOEP wave 1 - 12 |                      |       |          |
|--------------------|-----------------------|-------------------|----------------------|-------|----------|
|                    |                       | %                 | Number of interviews | %     | workload |
| male               | 399                   | 58.2              | 24,453               | 54.2  | 61.3     |
| female             | 287                   | 41.8              | 20,660               | 45.8  | 72.0     |
| total              | 686                   | 100.0             | 45,113               | 100.0 | 65.8     |

Source: GSOEP 1984 - 1995, Sample A, interviews with employed respondents

to control for an attrition bias in statistical models.

Figures 23 and 24 point out that unit-nonresponse is unrelated to interviewer's

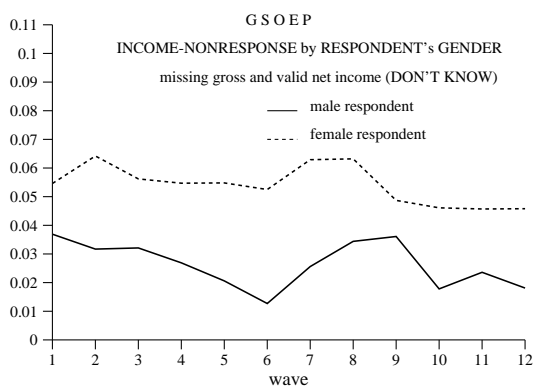


FIG. 16.— *Share of missing gross- and valid net-income by respondent's gender, 1984 - 1994, Sample A, employed respondents.*

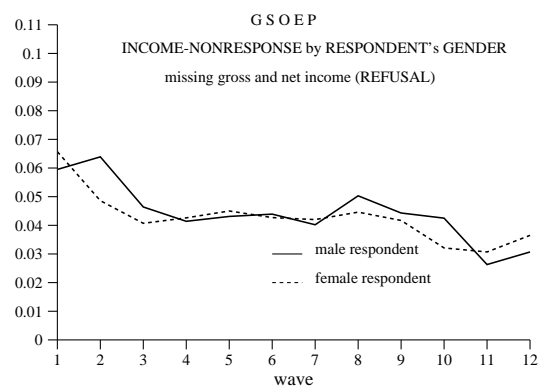


FIG. 17.— *Share of missing gross- and net-income by respondent's gender, 1984 - 1994, Sample A, employed respondents.*

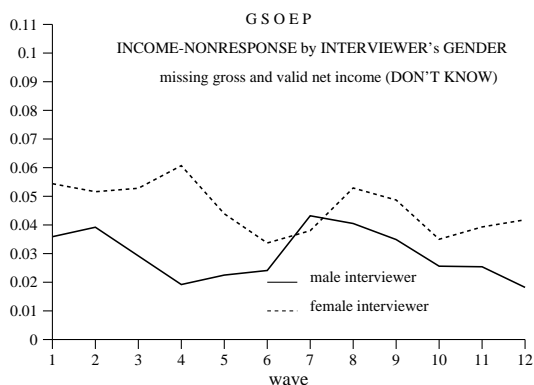


FIG. 18.— *Share of missing gross- and valid net-income by interviewer's gender, 1984 - 1994, Sample A, employed respondents.*

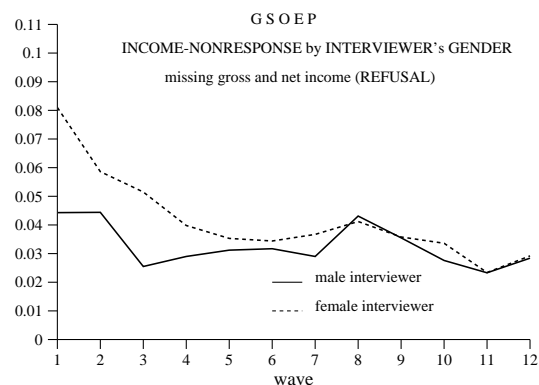


FIG. 19.— *Share of missing gross- and net-income by interviewer's gender, 1984 - 1994, Sample A, employed respondents.*

gender and the vocational position of the respondent. Figure 25 reveals that a change of the interviewer increases the probability of unit-nonresponse. One explanation for this finding is that respondents learn to trust an interviewer. Respondents with a high level of distrust react to a strange interviewer by refusing to be interviewed (cf. Bollinger/David 2001; Rendtel 1990).

To ascertain the importance and significance of respondent and interviewer attributes we estimate multilevel regression models.

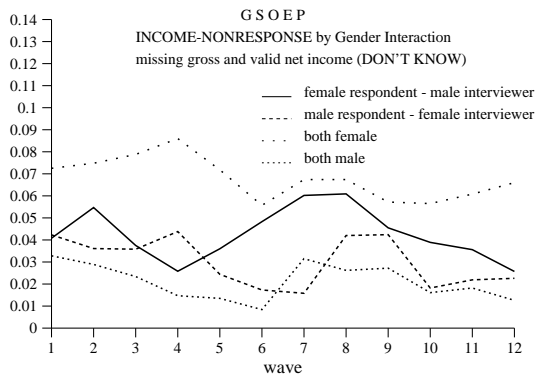


FIG. 20.— *Share of missing gross- and valid net-income by gender interaction, 1984 - 1994, Sample A, employed respondents.*

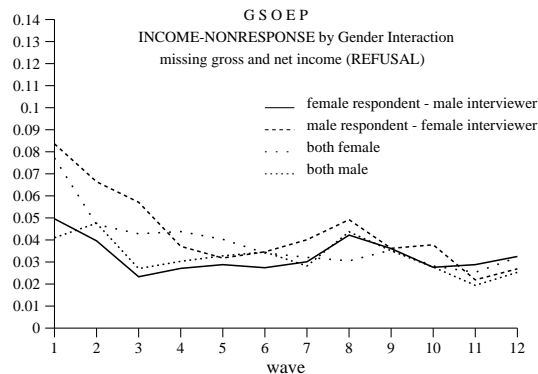


FIG. 21.— *Share of missing gross- and net-income by gender interaction, 1984 - 1994, Sample A, employed respondents.*

#### 4.1. Modeling income-nonresponse

Section 3 refers to RC-Theory and the view respondents chose among three alternatives: reporting income, acknowledging lack of information by don't know, or refusing because of strongly held motives. The conventional model of choice in economics and other social sciences ascribes an unobservable level of utility  $\tilde{U}_{jm}$  to alternative  $m$  for decision maker (respondent)  $j$ . In RC-Theory the decision maker maximizes his utility. Our primary purpose is to determine how various factors influence the attractiveness of the alternatives to different types of individuals, hence we use a regression-like framework (cf. Dubin/Rivers 1989, p.373):

$$\tilde{U}_{jm} = \beta'_1 \tilde{x}_{jm} + \epsilon_{jm} \quad (m = 1, 2)$$

where the vector  $(k \times 1)$   $\tilde{x}_{jm}$  includes the costs of alternative  $m$  and other relevant factors. The difference between the utility of two alternatives is:

$$y_j^* = \tilde{U}_{j1} - \tilde{U}_{j2} = \beta' x_j + u_j \quad (1)$$

where  $x_j = \tilde{x}_{j1} - \tilde{x}_{j2}$  and  $u_j = \epsilon_{j1} - \epsilon_{j2}$ . If  $y_j^* > 0$ , the first alternative (item-nonresponse) yields higher utility and is preferred, otherwise the second one is preferred. We observe two indicator variable,  $y_j$ :

$$y_j = \begin{cases} 1, & \text{if } y_j^* > 0, j = 1 \text{ indicator for refusal} \\ & j = 2 \text{ indicator for don't know} \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

If  $\epsilon_{j1}$  and  $\epsilon_{j2}$  are characterized by a joint normal distribution, with zero means, the nonresponse choices can be analyzed by a bivariate probit model.

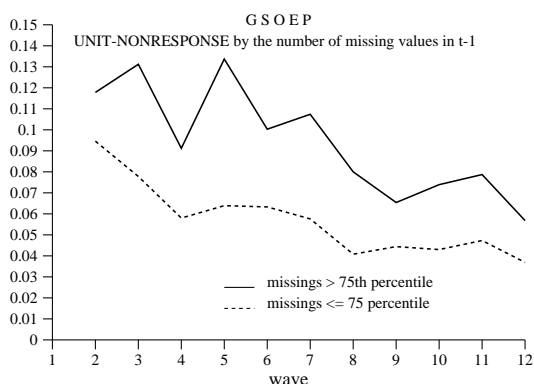


FIG. 22.— *Share of unit-nonresponse by number of missing values, 1984 - 1995, Sample A, resp. who were empl. in the last wave and drop out.*

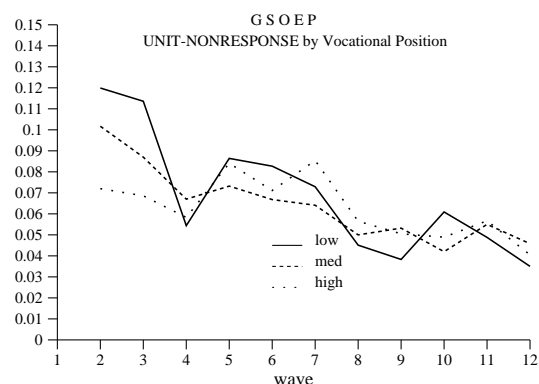


FIG. 23.— *Share of unit-nonresponse by occup. status, 1984 - 1995. Sample A, respondents who were empl. in the last wave and drop out.*

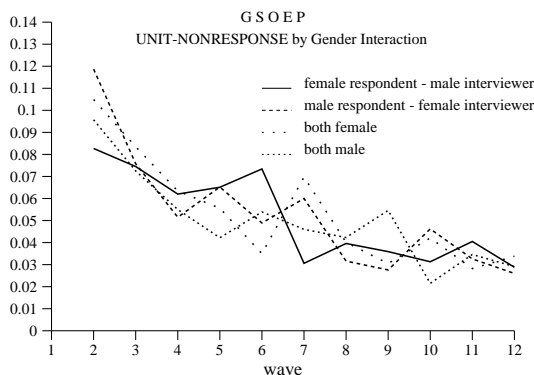


FIG. 24.— *Share of unit-nonresponse by interviewer's and respondent's gender, 1984 - 1994, Sample A, respondents who were employed in the last wave and drop out.*

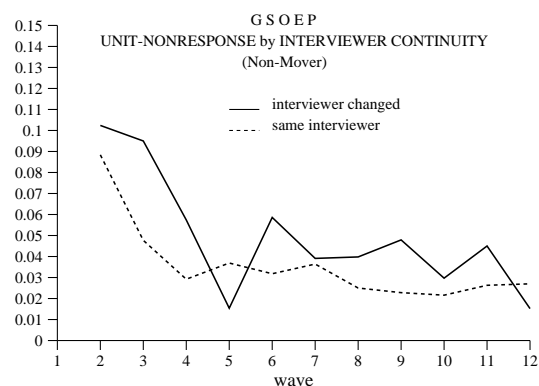


FIG. 25.— *Share of unit-nonresp. by interviewer's continuity, 1984 - 1994, Sample A, resp. who were empl. in the last wave and drop out.*

Studies of respondent and interviewer effects generally combine both respondent and interviewer variables. Typically, interviewer variables are disaggregated to the level of the dependent variable, i.e., the respondent level, and both interviewer and respondent variables are combined in a single regression model. Because the respondents are not usually assigned randomly to interviewers and because each interviewer questions many respondents, the usual regression assumption that errors are independent and identically distributed is violated. Any unmeasured interviewer variation results in apparent correlation of error terms across respondents. Lack of independence leads to underestimate standard errors for regression coefficients and inefficient estimates (cf. Hox 1994, p. 303).

Clearly, survey data have a hierarchical structure: in any year the respondents are nested within interviewers, where the respondent level is said to be the lower and the interviewer level the higher level<sup>8</sup>. The appropriate method of analysis is the use of hierarchical or multilevel models that estimate of both variance and the effects of explanatory variables measured at both the interviewer and the respondent level (cf. Hox 1994; Pannekoek 1991; Hill 1991). A variety of names for this statistical model are used, including: mixed models (Longford 1987), multilevel models (Goldstein 1995), random coefficient models (Longford 1995) and hierarchical models (Bryk/Raudenbush 1992). These models generally involve linear regression in which some parameters other than the residuals are random rather than fixed.

We estimate two probit models, a simple univariate probit model for the indicator "income-nonresponse" and a multivariate probit model with three response variables "refuse", "don't know" and "unit-response in the next wave" (participation).

The hierarchical structure for this applications caused by multiple nesting in the longitudinal data.

Level 1 represents the different response variables in the multivariate model. We define  $i = 1$  (refuse),  $i = 2$  (don't know) and  $i = 3$  (subsequent unit-response). Level 2 represents the different times of measurement  $j$ . Level 3 consists of  $k$  respondents and level 4 represents the aggregate level, which is formed by  $l$  interviewers.

For person  $k$  and interviewer  $l$  three dichotomous variables  $y_{ijkl}$  are observed at time  $j$ .

$$y_{1jkl} = \begin{cases} 1, & \text{if } y_{1jkl}^* > 0, \text{ refuse} \\ 0, & \text{otherwise} \end{cases} \quad (3)$$

$$y_{2jkl} = \begin{cases} 1, & \text{if } y_{2jkl}^* > 0, \text{ don't know} \\ 0, & \text{otherwise} \end{cases} \quad (4)$$

$$y_{3jkl} = \begin{cases} 1, & \text{if } y_{3jkl}^* > 0, \text{ unit-response (next wave)} \\ 0, & \text{otherwise} \end{cases} \quad (5)$$

We use a multivariate probit model with four levels:

$$y_{ijkl} = \sum_{i=1}^I \pi_{ijkl} + \sum_{i=1}^I u_{ijkl}. \quad (6)$$

---

<sup>8</sup>Of course, we can use other concepts with further levels like an additional household level. Due to our interest in this study and estimation problems that occur in cases of further levels, we restrict on four levels.



When the intercept  $\beta_{0ikl}$  is only allowed to varies by the respondent and interviewer for each response indicator  $i = 1, 2, 3$  and the other coefficients ( $\beta_{ih}$ ) are specified as fixed parameters. The probability  $\pi_{ijkl}$  for each response variable  $i$  estimated from:

$$\pi_{ijkl} = \Phi \left( \beta_{0ikl} + \sum_{h=1}^H \beta_{h,i} x_{h,ijkl} + v_{0,ikl} + f_{0,il} \right) \quad (7)$$

where  $\Phi$  is the cumulative distribution function of the standard normal distribution,  $y_{ijkl}$  is an indicator for a specific respondent behavior  $i$  (e.g. refuse) at time point  $j$  in context of respondent  $k$  and interviewer  $l$ .  $x_{h,ijkl}$  represent values for covariates  $x_h$  ( $h = 1, \dots, H$ ) of person  $k$  and interviewer  $l$  at time  $j$ . The intercept  $\beta_{0ikl}$  is specified as random on level 3 (respondent level) and level 4 (interviewer level) and the variance is estimated as  $v_{0,ikl}$  (matrix  $\Sigma_R$ ) and  $f_{0,il}$  (matrix  $\Sigma_I$ ). The random variation among the time periods on level 2 is estimated as the variance/covariance  $u_{ijkl}$  (matrix  $\Sigma_T$ ). Since these are dependent binomial variables<sup>9</sup>, the residual variances  $\sigma_{u_{ii}}^2$  and covariances  $\sigma_{u_{ii'}}^2$  must be estimated.

Estimation requires three assumptions:

*Assumption 1.:* The variance/covariance matrices on time (matrix  $\Sigma_T$ ), respondent (matrix  $\Sigma_R$ ), and interviewer level (matrix  $\Sigma_I$ ), are

$$\begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix} \sim (0, \Sigma_T) : \Sigma_T = \begin{bmatrix} \sigma_{u_1}^2 & & \\ \sigma_{u_2 u_1} & \sigma_{u_2}^2 & \\ \sigma_{u_3 u_1} & \sigma_{u_3 u_2} & \sigma_{u_3}^2 \end{bmatrix}$$

$$\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} \sim N(0, \Sigma_R) : \Sigma_R = \begin{bmatrix} \sigma_{v_1}^2 & & \\ \sigma_{v_2 v_1} & \sigma_{v_2}^2 & \\ \sigma_{v_3 v_1} & \sigma_{v_3 v_2} & \sigma_{v_3}^2 \end{bmatrix}$$

$$\begin{bmatrix} f_1 \\ f_2 \\ f_3 \end{bmatrix} \sim N(0, \Sigma_I) : \Sigma_I = \begin{bmatrix} \sigma_{f_1}^2 & & \\ \sigma_{f_2 f_1} & \sigma_{f_2}^2 & \\ \sigma_{f_3 f_1} & \sigma_{f_3 f_2} & \sigma_{f_3}^2 \end{bmatrix}$$

*Assumption 2.:* The second, third and fourth level errors are assumed to be independent, so  $cov(u_{ijkl}, v_{ikl}, f_{il}) = 0, \forall i, j, k, l$ .

*Assumption 3.:* The coefficients for the covariates in the multivariate probit model are time invariant.

---

<sup>9</sup>Often binomial distributed residuals on level 1 are assumed. Nevertheless they may be extra-binomial and can be estimated with the program MLwiN (Rasbash et al. 1999).

#### 4.1.1. Regressors of the cooperator model

Regressors can be considered in four groups:

1. *Demographic and household variables for the respondent:* AGE is the age of the respondent in years, AGE2 is age squared, SEX = 1 indicates male respondent, LOW = 1 and HIGH = 1 indicates the corresponding occupational positions, UNSTEADY = 1 indicates if respondent does not regularly work and CHILDREN = 1 indicates presence of children in respondent's household. MOVE = 1 indicates the respondent changed residence in the prior 12 month.
2. *Demographic variables for the interviewer:* ISEX = 1 indicates male interviewer.
3. *Variables that describe the interview situation:* ICHANGE = 1 indicates a change in interviewer, CARE2 = 1 indicates two successful interviews completed for a respondent - interviewer pairing and CARE3 = 1 indicates more than two successful interviews completed for a respondent - interviewer pairing, SELF = 1 indicates a self completion mode of response in the presence of the interviewer.
4. *Time indicators:* WAVE = 1 controls for the year following wave 1, the reference category.

#### 4.1.2. Estimates

Table 9 shows estimates<sup>10</sup> of the univariate (model 1) and the multivariate probit model (model 2) for wave 1 - 7.

The sample contains a total of 23,347 observations on 8,797 respondents from 627 interviewers. The equation in model 1 refer to gross- income-nonresponse and is typical of prior analyses. In model 2 the two probits for "refuse" and "don't know" partition the sample. The estimates in model 1 essentially are the weighted sum of these two probit equations in model 2. The third equation in model 2 refers to unit-response in the following wave.

Estimates of the parameters for respondent variables confirm our first hypothesis, namely different attributes induce "refusal" than "don't know" responses. The esti-

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<sup>10</sup>The analysis is done with MlwiN 1.2 (Rasbash et al. 1999). We used the iterative generalized least squares (IGLS) algorithm with the extra binomial option and the 1nd order marginal quasilielihood (MQL) procedure for the four level model. The 2nd order penalized quasilielihood (PQL) (Goldstein/Rasbash 1996) is used for three level cross sectional models with qualitatively similar results. Those results are available upon request.

mates confirm the results of the descriptive characterizations above: probabilities of refusals rise with increasing position, probabilities of don't know their gross-income decline with increasing vocational position. Significant increases in both, refusals and don't know are induced by the irregular working patterns. Estimates reveal that the impact for "don't know" is double the impact for "refusal". The gender hypothesis is confirmed in the description: Probability of "don't know" increase substantially for females. Presence of children in households increases probability don't know nonresponse and has no effect on refusals. Overall these findings support our first hypothesis: namely the respondent characteristics that induce refusals and don't know differ markedly. Our perception is, that it is important to interpret missing values correctly if we try to reduce item-nonresponse rates.

Our second hypothesis predicts higher refusal rates on the first contact because levels of trust are higher in subsequent waves. The hypothesis is supported by our findings. The variables (CARE two years, and CARE more than two years) indicates the number of successful contacts between respondent and the same interviewer. We can assume that several contacts with the same interviewer will affect the interview situation. The estimates show that continued interviewing by the same interviewer decrease probability of refusals rather than don't knows. Interviewer gender (ISEX) affects both refusals and don't know. Female interviewers have a higher probability of don't know in all seven waves than male. The probability of refusal is also higher for female interviewers, but substantially smaller than in the case of don't know. This suggests that both refusing and don't know depends on the interview situation created by the interviewer. The assumed interaction effect between respondent's and interviewer's gender (both female) is not significant.

Our third hypothesis is that respondents in the low earning occupational group have higher refusal rates than respondents in the high- earning occupational group due to social desirability. This does not appear to be the case. The estimates show that a high percentage of missing values of respondents in the low-occupational group results from don't know responses. In contrast we find a higher probability for refusals in the case of high- and medium- occupational groups. These estimates reveal increasing refusals with increasing respondent income.

Our fourth hypothesis refers to a cooperation continuum and states a negative correlation between refusing the income statement and survey participation in the following wave. The random part of model 2 consists of three covariance matrices  $\Sigma_T$ ,  $\Sigma_R$  and  $\Sigma_I$ .  $\Sigma_R$  describes the random variation among respondents and is estimated as the variance/covariance  $v_{ijkl}$ . The estimates in the table 9 show a small but highly significant negative covariance between the error terms of "Refuse" and "Unit-response in

the following wave”: model 2:  $\sigma_{v_1v_3} = -0.175$  (correlation  $r_{u_1u_3} = -0.092$ )<sup>11</sup>. The covariance among the error term of ”Don’t know” and ”Unit-response” is not significant. Although the value of  $r_{u_1u_3}$  is not high, it supports the idea of a cooperation continuum: employed respondents who refuse to reveal income have a slightly probability of drop out of the survey in the following wave.

Our fifth hypothesis predicts a higher refusal rate in a self reporting mode (SELF) than in face-to-face interviews because of lower social barriers and justification costs. We suppose that it is easier for the respondent to refuse an answer in this mode. The estimates confirm this hypothesis, they show that the probability for ”refusals” is significant higher in the case of a self completion method than in a face-to-face or mixed method. Moreover, respondents who choose the self reporting mode have a lower probability for ”don’t know” responses.

Model 2 also shows that probability of non-participation is larger for male respondents, younger respondents, respondents who move and unskilled and semi-skilled worker (LOW).

Next we examine the random variation of the intercept  $\beta_{0,il}$  on level 4 (interviewer level). The interviewer variability is significant in all equations. We can calculate its share of the entire error variance, often called intraclass correlation or interviewer effect, with

$$\rho_{iint} = \frac{\sigma_{v_i}^2}{\sigma_{u_i}^2 + \sigma_{v_i}^2 + \sigma_{f_i}^2}$$

and get the following values

| Intraclass correlation |            |               |
|------------------------|------------|---------------|
|                        | don't know | Unit-response |
| refusal                | 0.106      | 0.097         |

These correlations indicate a significant interviewer influence (and/or a significant area effect) for all three response behaviors but the intraclass correlation is especially large for don't know. Interviewer and area cluster effects can not be separately identified because the interviewers are not assigned randomly to the sample areas.

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<sup>11</sup>The correlation result from

$$r_{i,i'} = \frac{\sigma_{u_{ii'}}}{\sqrt{\sigma_{u_i}^2} \times \sqrt{\sigma_{u_{i'}}^2}}$$

TABLE 9: *Multivariate Multilevel Probit-model for income-nonresponse, wave 1-7*

|                          | Model 1                           |       | Refuse          |       | Model 2                       |       | Unit-Response ( $t + 1$ ) |       |
|--------------------------|-----------------------------------|-------|-----------------|-------|-------------------------------|-------|---------------------------|-------|
|                          | Item-Nonresponse<br>$\hat{\beta}$ | s.e.  | $\hat{\beta}_1$ | s.e.  | Don't Know<br>$\hat{\beta}_2$ | s.e.  | $\hat{\beta}_3$           | s.e.  |
| Intercept                | -0.790***                         | 0.164 | -1.488***       | 0.201 | -1.100***                     | 0.190 | 1.177***                  | 0.151 |
| <i>respondent</i>        |                                   |       |                 |       |                               |       |                           |       |
| sex (1 - men)            | -0.119***                         | 0.041 | -0.012          | 0.052 | -0.210***                     | 0.047 | -0.066**                  | 0.032 |
| age (year)               | -0.024***                         | 0.008 | -0.007          | 0.010 | -0.028***                     | 0.009 | 0.018**                   | 0.008 |
| age squared              | 0.000                             | 0.000 | 0.000           | 0.000 | 0.000                         | 0.000 | 0.000                     | 0.000 |
| medium position (ref.)   |                                   |       |                 |       |                               |       |                           |       |
| low position             | 0.139***                          | 0.033 | -0.110**        | 0.040 | 0.306***                      | 0.038 | -0.094***                 | 0.027 |
| high position            | 0.048                             | 0.037 | 0.086**         | 0.042 | -0.131***                     | 0.051 | 0.055                     | 0.031 |
| dep. children in HH      | 0.010                             | 0.029 | -0.038          | 0.034 | 0.097***                      | 0.036 | -0.007                    | 0.025 |
| unsteady working         | 0.500***                          | 0.052 | 0.256***        | 0.063 | 0.663***                      | 0.058 |                           |       |
| move                     |                                   |       |                 |       |                               |       | -0.327***                 | 0.025 |
| <i>interviewer</i>       |                                   |       |                 |       |                               |       |                           |       |
| isex (1 - men)           | -0.211***                         | 0.069 | -0.167***       | 0.072 | -0.225***                     | 0.092 | 0.051                     | 0.054 |
| <i>interaction</i>       |                                   |       |                 |       |                               |       |                           |       |
| both female              | 0.021                             | 0.059 | -0.033          | 0.076 | 0.028                         | 0.065 |                           |       |
| <i>situation</i>         |                                   |       |                 |       |                               |       |                           |       |
| change of interviewer    |                                   |       |                 |       |                               |       | -0.140***                 | 0.025 |
| care 2 years             | -0.105***                         | 0.030 | -0.112***       | 0.032 | -0.048                        | 0.047 |                           |       |
| care more than 2 years   | -0.133***                         | 0.037 | -0.126***       | 0.041 | -0.065                        | 0.052 |                           |       |
| self completion          | 0.054**                           | 0.026 | 0.203***        | 0.028 | -0.210***                     | 0.039 |                           |       |
| wave 1 (ref.)            |                                   |       |                 |       |                               |       |                           |       |
| wave 2                   | 0.042                             | 0.037 | 0.057           | 0.040 | 0.021                         | 0.057 | -0.168***                 | 0.025 |
| wave 3                   | -0.059                            | 0.043 | -0.061          | 0.047 | -0.045                        | 0.064 | -0.286***                 | 0.025 |
| wave 4                   | 0.092*                            | 0.047 | -0.054          | 0.051 | -0.102                        | 0.069 | -0.389***                 | 0.026 |
| wave 5                   | -0.099*                           | 0.050 | -0.053          | 0.054 | -0.115                        | 0.072 | -0.502***                 | 0.026 |
| wave 6                   | -0.119**                          | 0.051 | -0.056          | 0.056 | -0.168**                      | 0.074 | -0.542***                 | 0.027 |
| wave 7                   | 0.040                             | 0.054 | -0.085          | 0.060 | 0.012                         | 0.075 | -0.539***                 | 0.028 |
| <i>period level</i>      |                                   |       |                 |       |                               |       |                           |       |
| $u$                      |                                   |       | $u_1$           |       | $u_2$                         |       | $u_3$                     |       |
| $u_1$                    | 0.478***                          | 0.006 | 0.357***        | 0.004 |                               |       |                           |       |
| $u_2$                    |                                   |       | -0.045***       | 0.004 | 0.742***                      | 0.008 |                           |       |
| $u_3$                    |                                   |       | 0.000           | 0.003 | 0.001                         | 0.004 | 0.257***                  | 0.003 |
| <i>respondent level</i>  |                                   |       |                 |       |                               |       |                           |       |
| $v$                      |                                   |       | $v_1$           |       | $v_2$                         |       | $v_3$                     |       |
| $v_1$                    | 1.081***                          | 0.029 | 2.143***        | 0.047 |                               |       |                           |       |
| $v_2$                    |                                   |       | -0.001          | 0.029 | 0.438***                      | 0.033 |                           |       |
| $v_3$                    |                                   |       | -0.175***       | 0.028 | 0.005                         | 0.024 | 1,714***                  | 0.033 |
| <i>interviewer level</i> |                                   |       |                 |       |                               |       |                           |       |
| $f$                      |                                   |       | $f_1$           |       | $f_2$                         |       | $f_3$                     |       |
| $f_1$                    | 0.376***                          | 0.033 | 0.295***        | 0.033 |                               |       |                           |       |
| $f_2$                    |                                   |       | 0.061**         | 0.032 | 0.770***                      | 0.062 |                           |       |
| $f_3$                    |                                   |       | 0.008           | 0.020 | -0.006                        | 0.027 | 0.211***                  | 0.023 |
| Interviewer cluster      | 627                               |       |                 |       | 627                           |       |                           |       |
| persons                  | 8797                              |       |                 |       | 8797                          |       |                           |       |
| N                        | 23347                             |       |                 |       | 23347                         |       |                           |       |
| -2 * LogLikelih.         | -2,716.62                         |       |                 |       | -39,121.9                     |       |                           |       |

NOTE: Asymptotic standard errors in parentheses; Significance: \*10%; \*\* 5%; \*\*\*1%

Source: GSOEP 1984-1989, Sample A, empl. resp., without self-empl. and trainees, without mail interv. (own calc.)

## 5. Conclusion

Item-nonresponse for gross-income in the German Socio-economic Panel (GSOEP) is factored into two components: refusals and don't know. We investigate why respon-

dents do not reveal their income. The study uses information from German persons in 6000 households, information about interviewers, and the mode of data collection. GSOEP permits investigating the behavior of respondents over a decade.

A conceptual framework for the failure to reveal earnings analysis is drawn from rational choice theory and cognitive theory. The statistical method uses multi-variate probit in a hierarchical specification.

A primary finding in this analysis is that refusals and don't knows relate to different characteristics. The description in section 4 and the estimates in the multivariate analysis in section 4.1 presents evidence for our first hypothesis, that the respondent characteristics for refusal and don't know responses differ markedly. Respondents who refuse their answer are mainly in high occupational positions. Respondents who do not know their incomes are mainly females, respondents in low occupational states and respondents who work irregularly. This finding is important for the interpretation and reduction of item-nonresponse. Many studies try to predict item-nonresponse with respondent characteristics but fail to use response categories such as refuse and don't know. The resultant conclusions are ambiguous and hard to interpret, which may be the reason for the inconsistency in this area.

The second relevant finding is that survey respondents fall on a cooperation continuum (Bollinger/David 2001; Burton et al. 1999; Loosveldt 1999b). Respondents who refuse to answer the sensitive questions (e.g. income) because of privacy concerns are often not whole-hearted survey co-operators and have misgivings about the whole process. They drift to the end of the cooperation continuum and are harder to persuade to participate in the following wave. The estimates of our multivariate probit model support this hypothesis, as we find a small negative but significant correlation between refusing the income question and survey participation in the following wave. As expected, the correlation in the case of don't know is not significant.

The third relevant finding is that interviewer/area has a strong effect on a respondent's propensity to give refusals and don't know responses. The identifiable systematic effect: female interviewers get noticeably more don't knows and refusals than males. One possible explanation is that it may be easier for an uncooperative respondent to refuse to answer a female than a male. It may also be that female interviewers accept a don't know statement more readily than males when the respondent has retrieval problems. In the GSOEP are more male interviewer engaged than female but also it can't be ruled out, that female interviewer are used to interview in difficult areas.

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