The Impact of Unit Nonresponse on Income Nonresponse

Ting Yan
Richard Curtin
Matthew Jans

Survey Research Center, University of Michigan

Abstract

Unit and item nonresponse are pressing issues in survey methodology. This paper examines the trends of unit nonresponse and item nonresponse to income questions in an attempt to explore the relation between these two types of nonresponse. Considering the joint effect of the two types of nonresponse follows the total survey error paradigm to gain a fuller understanding of survey errors. We focused on item nonresponse to income questions as a proxy indicator of survey quality because income data, collected in almost every survey, has been associated with a large amount of missing data. We took a historical approach in studying 20 years of the Survey of Consumer Attitudes (SCA) data and examined the impact of unit nonresponse on item nonresponse to the income questions over time. Analyses indicate that, even though unit nonresponse rates have been on the rise, income item nonresponse has decreased over time. The decline of income item nonresponse is highly correlated with the refusal rate, the refusal conversion rate, and nonresponse to other items in the survey. The results suggest that for questions on household income, there exists a trade-off between unit and item nonresponse.

Introduction

Nonresponse is a significant problem for survey researchers and survey methodologists. Nonresponse threatens sample representativeness, limits the ability to make inference about the target population, and runs the risk of incurring nonresponse bias if sample respondents are consistently different from sample nonrespondents with regard to the key analysis variables (Groves 1989; Lessler and Kalsbeek 1992). The underlying causes of nonresponse, however, are not fully understood. To optimally design surveys, more information is needed on the characteristics and processes that cause one person to reply to a survey request or answer a survey question, and another person to refuse.

The phenomena of nonresponse encompass nonresponse at both the unit and the item level. At the unit level, household surveys have been experiencing a falling response rate over the past few decades (Atrostic, Bates, Burt, and Silberstein 2001; Curtin, Presser, and Singer 2005; de Heer 1999; de Leeuw and de Heer 2002; Hox and de Leeuw 1994). Since nonresponse error is a function of response rates (Groves 1989), survey researchers worry about the magnitude of nonresponse error in the presence of decreasing response rates. The literature on the relationship between response rates and nonresponse error is mixed. Some studies postulate in theory or demonstrate empirically a link between response propensity and nonresponse error (Groves, Caldini, and Couper 1992; Groves, Presser, and Dipko 2004, Groves, Singer, and Corning 2000), but other studies find no correlation between response rates and nonresponse error (Curtin, Presser, and Singer 2000; Keeter, Miller, Kohut, Groves, and Presser 2000; Merkle and Edelman 2002). Groves (under review) further shows that response rates alone are not an adequate marker of survey error. Thus, understanding the link between unit nonresponse and

survey error is important, since efforts to reduce unit nonresponse, including incentives, extra calling, or extended field periods, have proved to be too costly to prevent continued declines.

Item nonresponse is an additional risk to inference, often compounding unit nonresponse. It further reduces the size of available complete cases and, therefore, the statistical power. In the worst case, item nonresponse might produce nonignorable missing data – a missing data pattern correlated with the values of the variable of interest – and exacerbate nonresponse error and survey data quality (Little and Rubin 1987; Groves under review).

Three factors contribute to item nonresponse in surveys — the extent of people's knowledge about the topic, their judgment of the adequacy of what they know relative to what the question seems to require, and their willingness to provide complete reports (Beatty and Herrmann, 2002). The first two factors are cognitive while the third is motivational. By comparison, unit nonresponse is a more complicated phenomenon. According to the multi-level survey participation framework proposed by Groves and Couper (1998), unit nonresponse is affected by factors from the social environment, the household, and the survey design (including the definition of the sampling frame, the questionnaire design, choice of mode, hiring, selection, and training of interviewers, the length of the data collection period, protocols for contacting sample units, callback rules, refusal conversion rules, and so on). These factors either affect sample respondents' contactability or their willingness to agree to the survey request.

Despite what we know about each dimension of nonresponse, the relationship between unit and item nonresponse is seldom investigated in any survey context. Given that respondents' motivation or willingness impacts both unit nonresponse and item nonresponse, there might exist a link between unit and item nonresponse. As a result, unit and item nonresponse should be examined simultaneously rather than separately. Treating item nonresponse as an indicator of

survey data quality, the key research question is whether respondents with different response propensities to agree to a survey request also have different propensities to answer specific questions.

INCOME NONRESPONSE

One survey item that tends to attract a high item nonresponse rate is income. The survey literature shows that the typical item nonresponse to income questions is around 20-40% (Moore, Stinson, and Welniak 1999; Juster and Smith 1997). Table 1 displays the item nonresponse rate to income questions in some household surveys conducted in the United States. The item nonresponse rate is a function of question characteristics, respondent characteristics, interviewer characteristics, and design features, such as mode of data collection, whether the survey is cross-sectional or longitudinal, and so on, and comparisons between any two numbers can not be made without qualifications. It is still quite apparent from the table that the prevalence of item nonresponse to income questions is generally high across surveys and across time, ranging from 14% to 35%. This is somewhat higher than item nonresponse found in other types of survey questions, and presents unique implications for statistical analysis and modeling.[1] If an analyst employs a complete cases analysis involving income with these missing data rates, they may have to omit up to one third of the data, markedly reducing the sample size and the statistical power. Such a high nonresponse rate earns income a reputation for being a difficult and sensitive question to ask.

[1] For example, Tourangeau, Rips, and Rasinski (2000) report item nonresponse rates of less than 3% on questions related to sexual behavior (p. 264).

Table 1: Prevalence of Item Nonresponse to Income Questions by Survey

	Survey	Income Nonresponse Rate	Mode of Data Collection	Income Definition
Atrostic and Kalenkoski (2002)	March 1990 Current Population Survey (CPS)	18.4%	In-person & Phone	Ask amount; Multiple income types
Moore et al.(1999)	March 1996 CPS	26.2%	In-person & Phone	Ask amount; Multiple income types
Atrostic and Kalenkoski (2002)	March 2000 CPS	27.2%	In-person & Phone	Ask amount; Multiple income types
Dixon (2005)	CPS (2002-2003)	14.2%	In-person & Phone	Ask amount; Multiple income types
Dixon (2005)	Consumer Expenditure Quarterly Survey (CEQ) (2002-2003)	19.9%	In-person	Ask amount, bracket follow-up
McGrath (2005)	CEQ 2003	35.0%,* 19.0%**	In-person	Ask amount, bracket follow-up
Olson et al. (1999)	National Immunization Survey (NIS) Quarter 4/97-1/98	14.2%	Phone	Ask amount, bracket follow-up
Olson et al. (1999)	NIS Quarter2/98-3/98	17.1%,* 13.8%**	Phone	Ask amount, bracket follow-up
Battaglia et al. (2002)	NIS 2000	27.8%	Phone	Ask amount, bracket follow-up

Note: * Item nonresponse rate to the initial open-ended income question.
** Item nonresponse rate after the pre-coded or bracket question.

What is it about income that makes it vulnerable to such a consistently high item nonresponse? According to Juster and Smith (1997), respondents may not report their income because they do not know their total family income, when they have a rough idea but believe that the question asks for an exact dollar amount, or when they simply do not want to provide their

income information. One method thought to help respondents cope with the first two cognitive problems is the unfolding bracket technique (Heeringa, Hill, and Howell 1993; Juster and Smith 1997). This technique ask item nonrespondents (or, in some cases, all respondents) a series of bracketing questions ("Was the amount more or less than $50,000?", "More or less than $100,000?") that allows the researchers to collect partial information about income from respondents who are unwilling or unable to provide an exact amount. Heeringa, Hill, and Howell (1993) and Juster and Smith (1997) both report that this strategy effectively reduced the amount of missing financial data by 50 percent or more.

The unfolding bracket technique was only successful at obtaining substantive responses for most of the "don't know" responses to the initial income question but not for as many "refusals" (Juster and Smith 1997). It seemed that this technique is more successful with the cognitive causes of income nonresponse, but less effective with the motivational cause. This is because respondents' unwillingness to provide income information is partially driven by the sensitivity of the income question itself. Tourangeau, Rips, and Rasinski (2000) describes three meanings of "sensitivity;" one of them is the intrusiveness of survey questions. That is, questions are sensitive because they are seen as an invasion of privacy. Questions asking about income may fall into this category; respondents may feel that such questions are simply none of the researcher's business. Questions in this category risk offending all respondents, regardless of their status on the variable in question.

This paper examines the inter-relationship between unit nonresponse and item nonresponse to income questions in one survey over a period of 20 years. Specifically, the research questions we propose to address are: 1) Has item nonresponse to income questions increased or decreased over time; 2) What is the relationship between item and unit nonresponse.

The Data

We used for analysis the Survey of Consumer Attitudes (SCA) conducted by the University of Michigan Survey Research Center. The SCA started out as an area-probability in-person survey in the mid 1940s, and was converted to a random digit dial telephone survey in the mid 1970s. The survey is conducted monthly, and is based on a rotating panel design. We restrict our analysis to the newly drawn representative samples which is consistent with published work on the SCA (e.g., Curtin, Presser, and Singer 2000; 2005; Singer, Van Hoewyk, and Mahe, 2000).

The new cases in each monthly survey are random digit dial samples from the coterminous United States, drawn until 1993 using Mitofsky-Waksberg procedures and since then using list-assisted procedures. From each household, one respondent has been randomly selected from among all household residents aged 18 or older. About 300 new interviews are now conducted each month. No formal changes have ever been made to call scheduling. Except for the constraint imposed by the month-long interviewing period, no limit is placed on the number of calls, and attempts are made to convert virtually all initial refusals. For information on the historical trend of unit response rates, see Curtin, Presser, and Singer (2000; 2005).

The income questions are part of the SCA's core questions. Respondents are first asked to report their family total income in dollar amount; for those who do not provide a response, they are followed up with a closed-ended question with income brackets.[2] An example of the exact question wordings for the open-ended income question and the brackets used in the March 2006 survey are displayed in the Appendix. The anchor for the opening closed-ended questions

[2] This question format began in June, 1986 and due to our primary hypotheses, we are only looking at data that use this question format. Prior to June, 1986 income was asked as a closed-ended question with a list of precoded response categories. Our initial analyses, including data back to 1978, showed us that the income nonresponse pattern looks similar prior to June, 1986 as it does after June, 1986. Those data are not presented here.

(e.g., $50,000) has been changed a few times to reflect the median household family income over time.

Results

We examined SCA monthly survey from June 1986 (when SCA switched to an open-ended income question followed by a bracket question) to December 2005.

TIME-SERIES ANALYSIS

We first conducted aggregate level analysis on time series data with a dual-purpose to examine the trend of item nonresponse over time on the one hand, and to examine the relationship between unit and item nonresponse on a macro level on the other. For aggregate level analysis, we used two item nonresponse rates. The first item nonresponse rate or "open nonresponse rate" referred to the percentage of respondents who did not answer the open-ended income question while the second rate or "final nonresponse rate" is the percentage of respondents who responded to neither the open-ended nor the bracketed income questions. These are the respondents who remained a nonresponder after the bracket question, and the final nonresponse rate variable can be thought of as the total item nonresponse rate for the income question.

Table 2 displays the univariate distributions of the two item nonresponse rates computed for each monthly survey (n=235). Consistent with the literature on income nonresponse (see Table 1), the income nonresponse ranged from 7% to 33% for the open-ended item. The bracket question trimmed down the item nonresponse to a range of 3% to 20%, producing an average reduction of 56% in item nonresponse to the open-ended income question. The average reduction is comparable to the literature on unfolding brackets technique (Heeringa, Hill, and

Howell, 1993; Juster and Smith, 1997). Compared to nonresponse rates reported in Table 1, the SCA has somewhat lower item nonresponse rates than government-sponsored or other large-scale household surveys.

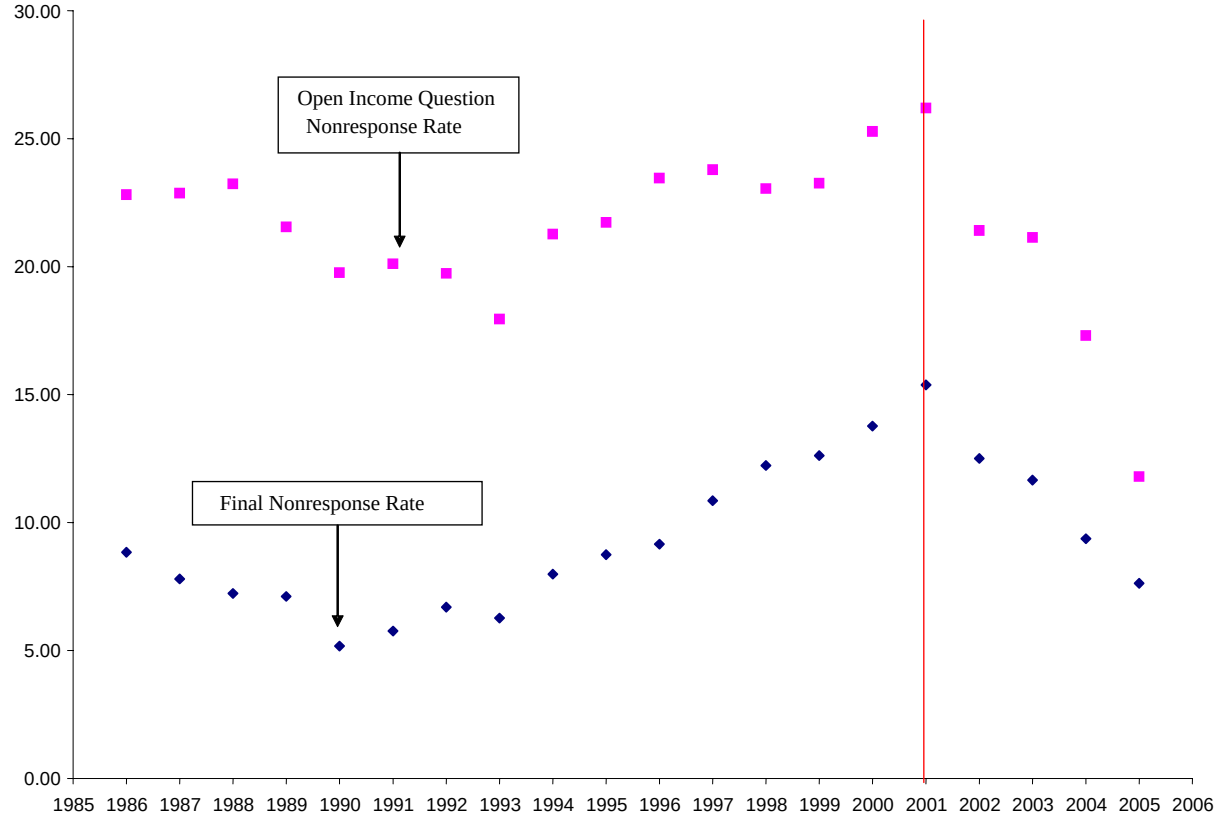
Table 2. Univariate Distribution of Nonresponse Rates to Income Questions in SCA

	Mean	Median	Standard Deviation	Minimum	Maximum
Nonresponse rate to open-ended question	21.4%	21.6%	4.1%	6.4%	33.1%
Final nonresponse rate after bracket question	9.4%	8.8%	3.4%	2.4%	19.6%

We plotted the two item nonresponse rates by year of the interview (see Figure 1) to examine the trend of income item nonresponse over 20 years. For both definitions of income nonresponse, small declines were recorded in the 1980s, followed by much larger increases in the 1990s up until 2001, after which the item nonresponse rates have declined sharply. Furthermore, it seemed that the initial item nonresponse to the open-ended question dropped faster than the final nonresponse after the bracket question. The downward trend after 2001 is quite intriguing, especially given that unit nonresponse rates have been increasing on the SCA (e.g., Curtin, Presser, and Singer, 2005).

The trends in item nonresponse are not due to design changes, since there has been no change in the survey design over this time period. It is also reasonable to assume that the level of knowledge about family income in the target population remained constant over the years. The only factors that could change over time are the interviewed sample that was recruited and the survey respondents' motivation to respond to survey questions. The interviewed sample may have changed to include more cooperative individuals who were more likely to report their income than in previous years. Respondents' motivation or willingness to report income may have also changed over time.

Figure 1. Plot of Item Nonresponse Rates to Income Questions by Year of Interview



To examine the link between respondents' motivation and income reporting, we counted the total number of items for which each respondent did not provide an answer before he or she was asked the open-ended income question. This index was used as a proxy measure of respondents' overall motivation or willingness to answer survey questions. We assume that the lower a respondent's motivation, the higher the number of items with missing data, and the higher the income nonresponse rates.

Figure 2 presents the plot of income item nonresponse rates and the mean number of items with missing data.[3] It is apparent from Figure 2 that, the more questions that have missing

[3] It is important to note that the SCA does not consider an interview to be complete unless 80% of the questions are answered. Therefore our index of average number of survey questions with missing data is inherently conservative. Individuals who broke off early or completed 20% of the questions or less are not considered respondents and not included in this calculation.

data in any given monthly survey, the higher the item nonresponse rate to the income questions. The zero-order correlation between the mean number of missing items and the item nonresponse rate to the open-ended income question is .70 (and the correlation between the same motivation index and final income nonresponse is .20). Thus, a lower motivation or willingness to answer survey questions is linked with a higher item nonresponse rate.

Figure 2. Plot of Income Item Nonresponse Rates, Mean Number of Items With Missing Data, by Year of Interview

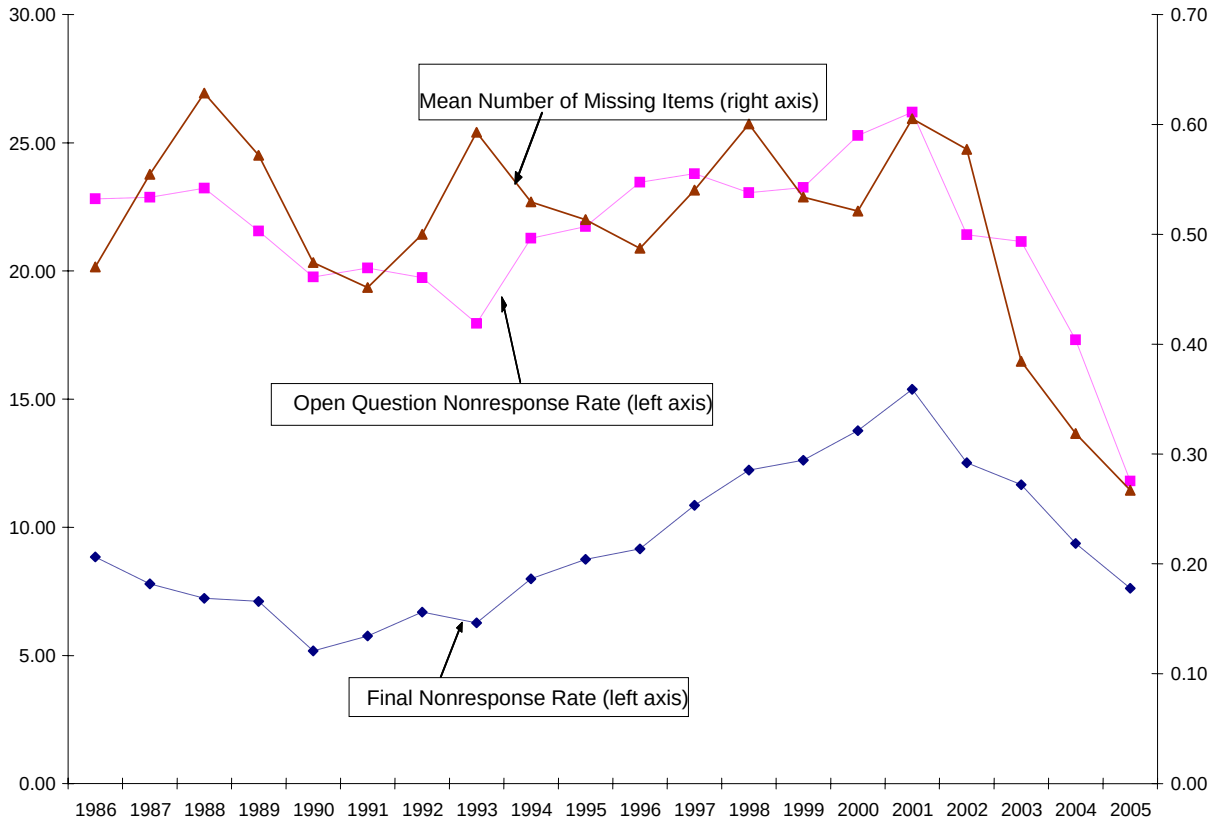
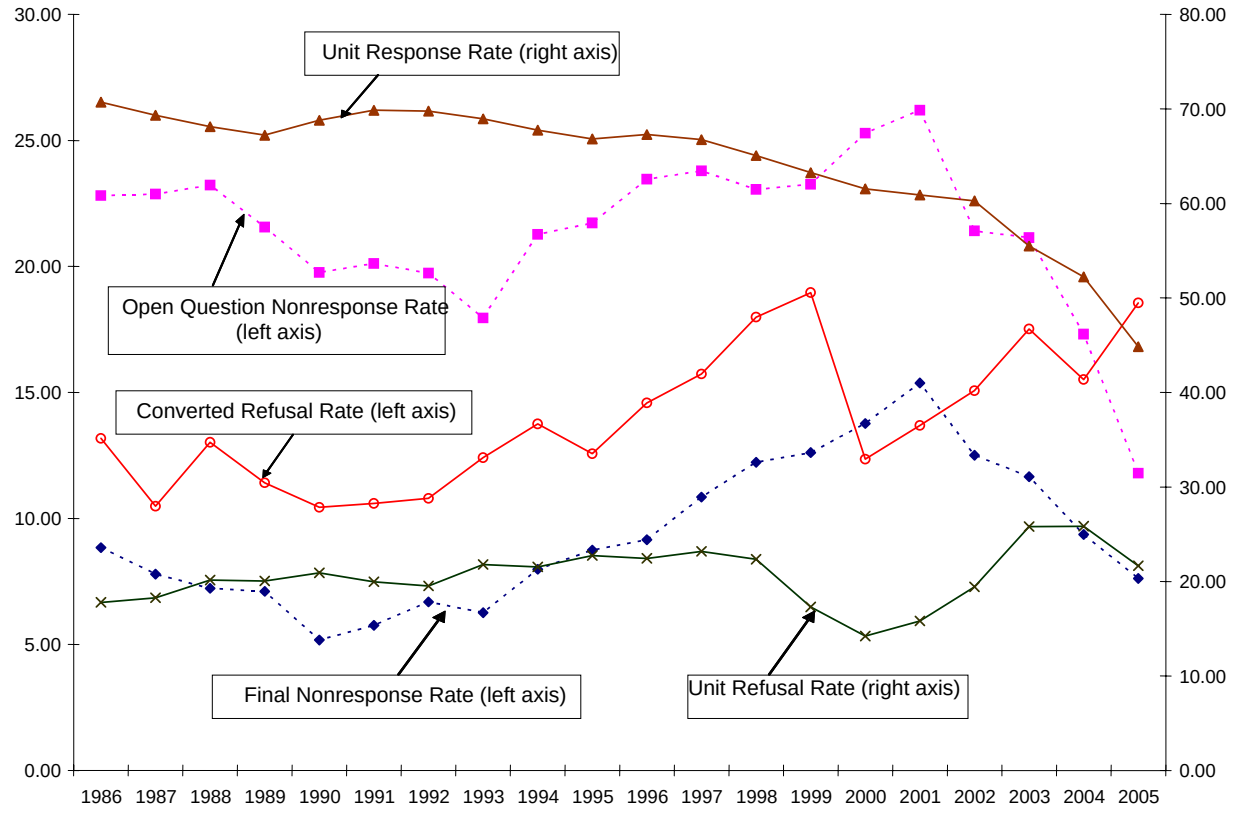


Figure 3 shows the relationship over time of item nonresponse rates, the unit response rate, the unit refusal rate, and the refusal conversion rate by year of interview. The plot indicates a negative relation between the income nonresponse rates and the unit refusal rate. For instance, when the unit refusal rate was decreasing from 1995 to 2001, the final item nonresponse rate

corresponding to the same time period was on the rise. However, from 2001 onwards, the unit refusal rate increased but the final item nonresponse rate dropped. There also exists a similar negative relation between the unit refusal rate and the initial item nonresponse to the open-ended income question, though to a lesser extent.

Figure 3. Plot of Income Item Nonresponse Rates, Unit Response Rates, Refusal Rates, and Converted Refusal Rates by Year of Interview



The relation between income item nonresponse rates and the refusal conversion rate is similar to that between item nonresponse and unit refusal; before 1999, both the item nonresponse and the refusal conversion rates went up. But after 1999, refusal conversion rate first dropped and then went up again after 2001, inversely related to the trend change in item nonresponse.

The unit response rate has been decreasing steadily over the period of 20 years. However, the sharper drop in the unit response rate since 2001 corresponds to a sharper decrease in both types of income item nonresponse. The relationship between the unit response rate and income item nonresponse rates may reflect a shift in sample composition toward more willing respondents at lower rates which were associated with less item missing data.

Regression models with the item nonresponse rate to the income questions as the dependent variable were used to formally test these links.[4] Two separate models were constructed for the initial item nonresponse to the open-ended income question and the final item nonresponse. Table 3 displays the unstandardized regression coefficients from the final models.

A time index from 1 to 235 based on the year and month of the interview is a significant predictor for the final income nonresponse rate. Although the year-to-year change is relatively small, over the entire period it accounts for an increase of 8 percentage points. More interestingly, there was no relationship between the time variable and nonresponse to the open end question on income.

The mean number of items with missing data is shown to be a significant predictor for both types of income nonresponse; when the mean number of missing item increases by one (the actual mean in the samples was .51), the initial income nonresponse rate increases by about 11% and the final nonresponse rate increases 9%. The significant regression coefficients suggest that income nonresponse rates are driven by respondent motivation more than their knowledge about their family income. Decreasing motivation produces higher income nonresponse.

[4] We started with a fully specified model based on monthly data that included all variables in the final models in addition to eleven dummy variables representing the month of the interview. None of the month dummy variables had a significant main effect. Thus, we removed the month variables and used yearly averages. The final models, as presented in the paper, were the ones with best theoretical explanations and statistical fit.

Table 3. Regression Coefficients from Regression Models at the Aggregate Level

IVs	**Regression Coefficients**	**Pr > |t|**	**Regression Coefficients**	**Pr > |t|**
	DV=Nonresponse Rate to Open-ended Question		DV=Final Nonresponse Rate (after bracket question)	
Intercept	5.174	0.28	-2.548	0.41
Time index	0.009	0.23	0.034	<.0001
Mean number of items with missing data	10.751	<.0001	9.005	<.0001
Unit response rate	0.158	0.008	0.069	0.081
Refusal rate	-0.031	0.60	-0.188	<.0001
Refusal conversion rate	0.012	0.94	0.204	0.041
Model fit	$F(5, 225)=27.65$ $p<.0001$		$F(5, 225)=56.78$, $p<.0001$	
R^2	.406		.589	

Note: Regression errors are modeled as a moving average process to correct for serial correlation and regressions were fitted by nonlinear least squares.

Unit response rate only significantly affects the initial income nonresponse rate; 1% increase in unit response rate leads to about 16% increase in item nonresponse rate. The equation estimates a smaller impact on final income nonresponse, about half the size as for initial income nonresponse, but the significance of the coefficient drops to the 10% level. The refusal rate and refusal conversion rate, on the other hand, affect the final income nonresponse rate. A 1% increase in refusal rate reduces the final income nonresponse rate by .19%, and a 1% increase in refusal *conversion* rate increases the final income nonresponse rate by .20%.

The macro-level analysis of the time-series data demonstrates that the mix of interviewed sample plays an important role in income nonresponse rates. The monthly sample varies in the proportion of different types of respondents it interviewed and in the level of respondent motivation to answer income questions. Both variations contribute to the trend changes in income item nonresponse, suggesting that there is a trade-off between unit nonresponse and item nonresponse to income questions.

INDIVIDUAL-LEVEL ANALYSIS

The time-series analysis paints a macro picture on the relation between income item nonresponse and unit nonresponse. To avoid an ecological fallacy, we tested whether the same relations between item nonresponse and unit nonresponse observed at the aggregate level would be borne out at the micro level. Using individual-level data, we examined how a respondent's individual propensity to respond to the income questions is related to his/her propensity to agree to the survey request. We modeled the propensity to answer the income questions through logistic regression approach with the dependent variable being whether a sample respondent provided an answer to the open-ended income question or to the series of bracketed questions. We included as predictors variables that are highly correlated with respondents' contactability and willingness to participate in the survey. In particular, the number of calls it took to complete the interview was included as a dummy variable that indicated whether the interview took more than the median number of calls to complete the interview. The number of call attempts is usually associated with a respondent's contactability; a higher number of call attempts signals a lower likelihood to be contacted.

Two other variables acted as proxies for respondents' motivation or willingness towards the survey request. The first is whether the respondent ever refused the interview request but was subsequently convinced to participate. These refusal conversion cases were hypothesize to be less motivated to answer the income questions when converted. Another measure of motivation is the count of the number of items with missing data before respondents were asked the income question. Again, a higher number of items with missing data indicate a lower motivation and a higher likelihood to not response to the income questions. Finally, various demographic covariates were also included.

The regression coefficients are shown in Table 4. Consistent with literature on item nonresponse (de Leeuw, 2001), we found that older people, females, married respondents, less educated respondents, and non-household head respondents are less likely to report income to either the open-ended or the bracket question.

Table 4. Regression Coefficients of Logistic Regression Models at Individual Level

IVs*	**Regression Coefficients**	**Pr > $\|\chi^2\|$**	**Regression Coefficients**	**Pr > $\|\chi^2\|$**
	Propensity to Respond Open-ended Question		Propensity to Respond to Income Questions (both open-ended and bracket)	
Intercept	1.473	<.0001	3.193	<.0001
Time index	0.001	0.0003	-0.004	<.0001
Age	-0.021	<.0001	-0.023	<.0001
West	0.198	<.0001	0.174	<.0001
Married	-0.251	<.0001	-0.216	<.0001
High school or less	-0.148	<.0001	-0.211	<.0001
Male	0.409	<.0001	0.231	<.0001
Household head	1.174	<.0001	1.278	<.0001
Number of items with missing data	-0.311	<.0001	-0.334	<.0001
More than median number of call attempts	-0.115	<.0001	-0.112	0.0002
Ever refused survey request	-0.337	<.0001	-0.399	<.0001
pseudo-R^2	0.065		0.049	

*Except year and month of interview, age, and number of items with missing data, all the other independent variables are dummy coded.

In addition, respondents are less likely to respond to the income questions when they have more survey items with missing data, when they require more than the median number of call attempts to complete the survey, and when they ever refused to the survey request. The

logistic regressions suggest that income nonresponse is related to respondents' propensity to agree to the survey request: those who have a lower probability to participate in the survey (evidenced through the higher number of call attempts or by an initial refusal to survey request) are more likely to not report their income to the open-ended or the bracket income questions. Furthermore, those with a low motivation to complete the survey (evidenced by a larger number of missing data) are less likely to report their income. Thus, the micro-level conclusions (Table 4) regarding item nonresponse and unit nonresponse are consistent with the macro-level conclusions (Table 3).

The logistic regressions were repeated for various subperiods, grouping the earliest years (1986 – 1993) when income nonresponse was lower, the middle years (1994 – 2001) when income nonresponse was rising, and the most recent years (2002 – 2005) when sharp declines in income nonresponse were recorded. The basic regression results largely remained the same for all subperiods except the dichotomized call attempt variable, which is not significantly related to individual propensity to answer the income questions for the last subperiod.

Discussion

This paper takes a historical perspective and examines the item nonresponse rate to income questions and unit nonresponse rates over time. We found that item nonresponse rates to questions on household income increased in the 1990s until 2001 and since then they started to fall. This goes against common expectations for nonresponse trends. Our analysis showed that this post-2001 declines can be explained in part by the increasing refusal rate, inclusion of more converted refusals in interviewed sample, and a falling unit response rate. Regression models at the aggregate level confirmed that unit response rates are significantly associated with initial

income nonresponse rates and that refusal rates and refusal conversion rates are significant predictors of final income nonresponse. These results suggest that the mix of respondents interviewed in each monthly survey has a great impact on the income item nonresponse. In addition, we found that less motivation to answer survey items is linked with increased income nonresponse, suggesting that item nonresponse is driven mostly by motivational factors – including perhaps privacy concerns. Individual-level analysis provided further support to the same findings.

These findings have important implications for overall survey quality. First, contrary to common beliefs, the level of item nonresponse to questions which are thought to be sensitive and difficult such as questions on household income may decline with higher unit nonresponse. Income nonresponse rates have been falling since 2001 as unit nonresponse on the SCA rates have risen. Even the open-ended income question produced less item nonresponse in the last five years or so. Its downward trend is sharper than that of final income nonresponse rate, suggesting that while the unfolding brackets technique is as effective, there is less opportunity to reduce item nonresponse. Given that the administration of every survey question takes time and adds costs, survey researchers should continue monitoring the effectiveness of bracket questions and make necessary adjustment. Our analysis showed that the return from having unfolding bracket income questions has diminished due to the changing composition of the interviewed sample. While the bracket questions may be just as effective as in the past, their overall impact has been diminished by the growing absence of relatively less cooperative respondents in the sample.

Our findings also suggest that respondent motivation to answer a survey item is a general characteristic of individual respondents rather than mainly an effect of question content or survey

context. We found that individuals who did not report income tended to refuse other non-sensitive questions as well. Furthermore, individuals who were converted from initial refusals were also more likely to not report income when they finally participated. It seemed that the same motivational factor that affects unit nonresponse could affect item nonresponse as well.

Finally, our findings remind us of the tradeoffs between different facets of survey quality such as unit nonresponse, item nonresponse, and measurement error. Our analysis showed that increases in unit nonresponse actually led to a decrease in item nonresponse. It would seem that the expensive efforts to move non-cooperative respondents from the denominator of the response rate calculation to the numerator do not guarantee that they will stay in the numerator of item response rates. Thus, a blind effort to boost response rate could cause more damage to the data quality.

Treating item nonreseponse as an indicator of measurement error, our finding that the increase of unit response rate results in an increase in the initial income item nonresponse suggests that there is a tradeoff between nonresponse error and measurement error.[5] Similarly, surveys listed in Table 1 generally have a higher unit response rate than the SCA, but they also tend to have a higher item nonresponse rate than the SCA with regard to the income questions. These findings suggest that a higher response rate does not necessarily indicate reduced measurement error. Conversely, a lower response rate is not necessarily associated with worse data quality (Groves, under review). This is consistent with the findings of Curtin et al., (2000), Keeter et al., (2000), and Merkle and Edelman (2002) on the relation between response rates and data quality.

[5] Some survey researchers use item nonresponse to index the amount of effort survey respondents exert in answering survey questions (Krosnick 1991). Respondents are said to satisfice when they fail to put in necessary cognitive effort by either skipping or slacking on certain cognitive processes (cf. Krosnick 1991; 1999); one common manifestation of satisficing behavior is to give "don't know" responses to survey items. Therefore, item nonresponse also reflects measurement error resulting from satisficing behaviors.

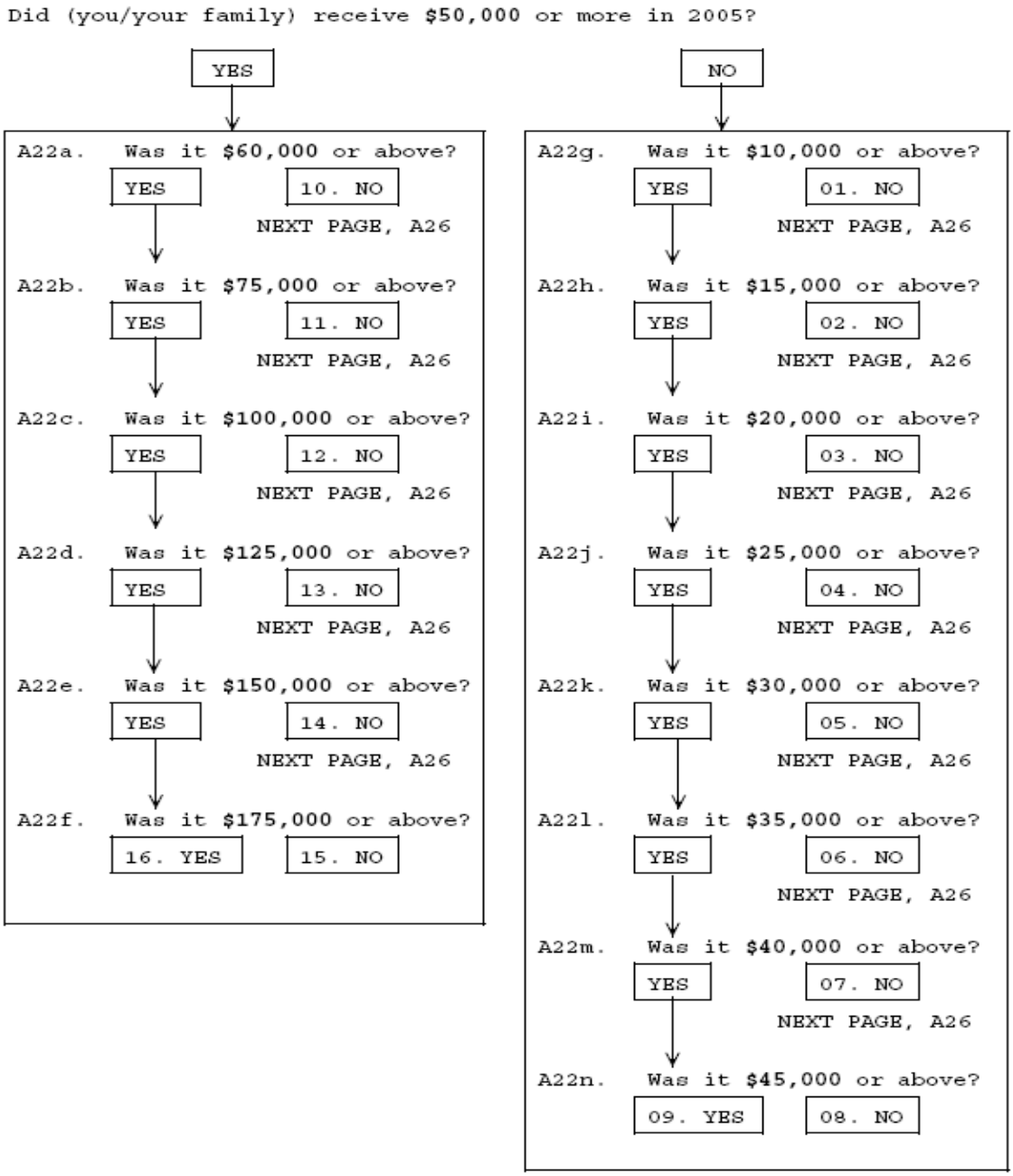
Our findings also speak to the classical trade-off between survey cost and survey error. The aggregate level regression models showed that the expensive efforts in improving unit response rate, reducing refusal rate, and converting initial refused respondents may not be cost effective because these costly efforts lead to an increase in item nonresponse. Therefore, given a limited resource, a survey designer has to balance the impact of the trade-off between unit nonresponse and item nonresponse on the overall quality of the collected data.

The findings presented here offer another piece of the puzzle of nonresponse. Item nonresponse rates vary considerably over time, and these broad fluctuations suggest that more dynamic theories are needed to adequately understand trends in item nonresponse. Moreover, studies on item nonresponse should not be limited to specific question items per se but modeled more generally as a characteristic of the respondent and the interaction between the respondent and the interviewer. Part of the dynamic that produces the fluctuations in item nonresponse may be due to the composition of the interviewing staff in terms of training, experience, and their ability to motivate respondents. High data quality is the product of numerous decisions on survey design, ranging from the sample design and recruitment protocols to question wording and probing techniques. This paper underscores the need to take a more comprehensive approach to the assessment of the tradeoff between item and unit nonresponse.

Appendix: An example of the open-ended income question and the series of brackets used in the March 2006 SCA

Open-ended Question:
To get a picture of people's financial situation we need to know the general range of income of all people we interview. Now, thinking about (your/your family's) total income from all sources (including your job), how much did (your/your family) receive in 2005?

Bracketed Questions:



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