Darkness Made Visible: Field Management and Nonresponse in the 2004 SCF[1]

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Nonresponse in field surveys is the joint outcome of the decision of survey staff to apply effort to inform and persuade respondents, and the evaluation of such inputs by respondents. In most such surveys, field staff are under pressure to complete interviews. Thus, as discussed in Kennickell [2004], they have an incentive to apply effort to cases that are most likely, in their view, to be completed with least effort. Insofar as interviewers' perceptions are unbiased, such behavior would tend to amplify latent patterns of nonresponse. When the characteristics of respondents that affect the likelihood of participation are correlated with variables of analytical interest in the survey, bias results, unless a means can be found of discovering and adjusting for the underlying behavioral structures. But, absent constraints on the behavior of interviewers, the observed outcomes are contaminated by the endogeneity of effort, and only strong *a priori* assumptions could disentangle the interviewer effects from the respondent effects. To address the problem of endogenous effort, the 2004 Survey of Consumer Finances (SCF) introduced a phased plan of sample management.

The first section of the paper provides an overview of the SCF and the protocol implemented to manage of field resources. The second section presents models of nonresponse, conditional on both tract-level and case-level data. The final section looks to the future.

I. The SCF and phased sample management

The SCF is a triennial survey of household finances sponsored by the Federal Reserve Board in cooperation with the Statistics of Income Division (SOI) of the Internal Revenue Service.[2] Data for the 2004 survey, the basis the analysis presented here, were collected by NORC at the University of Chicago.

The survey employs a dual-frame sample design. A national area-probability sample is intended to give sufficiently robust coverage to describe characteristics that are widely distributed in the population. Using statistical records derived from tax return as a frame, a list sample employs stratification by a "wealth index" to over-sample wealthy households. By agreement with SOI, list sample respondents were allowed to refuse participation in the survey absolutely by returning a postcard before the start of field work; about 13 percent of list sample cases did so in 2004. About a third of the final interviews derived from the list sample. With the exception of households that did not file a tax return, the area-probability and list samples in principle cover the same population. The important differences in the samples are in terms of stratification and clustering. The area-probability sample is a multi-stage equal-probability design with clustering at the last stage, where the cluster is generally an area equivalent to a census tract. The list sample is selected using the same broad localities selected at the first stage of the area-probability selection, but without controls on location within those areas. Thus, the list sample cases are more likely to be dispersed across a broader area than the area cases.

Nonresponse in the SCF is a serious problem. The overall 2004 response rate was only 51.7 percent overall—68.7 percent in the area probability sample and 34.7 percent in the list sample. The list sample response rate varied strongly by sample stratum; the wealthiest stratum had a response rate of only about 10 percent.

Examination of call records in earlier waves of the SCF (see Kennickell [2003]) indicated that there was a systematic and notably nonuniform application of effort to cases by interviewers. Moreover, there was evidence that this modulation of effort appeared to influence the ultimate patterns of nonresponse.

To address the variations in effort, the 2004 SCF introduced a phased protocol for the application of field effort. Underlying the case management protocol is a threshold model of respondents' behavior. Respondent *i* is assumed to reach an interim decision about participation when the input received from interviewers, mailed material and other sources exceeds $\mathbf{T}_{1i}$. In most social science surveys, respondents who decline initially are re-contacted in an attempt to secure their cooperation. Upon being re-contacted, a respondent faces a second decision threshold, $\mathbf{T}_{2i}$, which yields a second decision either to participate or refuse. The important point in this model is that the first two transitions are, in principle, driven by respondents', not interviewers', characteristics.

The phased contact model for the SCF was designed to have two clear "break points" that mark the progress of a case in the application of effort. In the first phase, interviewers were limited in the number of attempts to contact and persuade a respondent to participate in the survey. Ideally, effort was applied in this phase until either a respondent agreed to participate or the respondent crossed a threshold that caused them to refuse. Respondents who could not be contacted after repeated attempts at this stage are assumed to have taken actions to isolate themselves that make them equivalent to those who directly refused. At this point, a specially designed package of materials was sent by express mail to the remaining respondents. This package was designed to

motivate the project, the role of the respondent, the protections in place for the respondent, the role of NORC and the use of the data at the Federal Reserve Board. Sending the package by express mail was intended to heighten the sense of importance of the respondent and of the material presented. Because interviewers saw this mailing as a powerful persuasion tool, the initial fear was that they might tend to minimize the effort leading up to the mailing. To ensure that interviewers did not jump to this stage without sufficient initial effort, all requests for an express mail package were actually executed by field managers, who were responsible for checking interviewers' efforts to that point. Care was taken to inform the interviewers when the package was transmitted and received. For respondents who had not already agreed to participate, the sending of this package marked the end of Phase 1.

The second phase was intended to be a period of limited follow-up after the express mailing. If the respondent declined participation within the allowed period of follow-up, the case was to be moved a status requiring review by the field manager before additional effort was to be undertaken. This third and final phase was intended to be left to the discretion of the field staff. The various phases were marked using a set of case disposition codes in the electronic call records, which are maintained for every case.

Because the necessary actions of the interviewer are much too complicated to specify in precise detail *a priori* and because effort is inherently difficult to measure unambiguously, the case management protocol was established as a set of monitored guidelines, which managers were allowed to violate in light of the idiosyncracies of individual cases. During the field period, regular reports were generated for the field managers showing cases that appeared to have violated the guidelines, but the managers had the ultimate responsibility for monitoring.

Overall, more than a quarter of all in-scope cases were completed within Phase 1. Although cases coded as final refusals in Phase 1 were supposed to have been moved immediately to Phase 2, information from the field supports the view that some cases refused so strongly that recontact was not a possibility. For further analysis here, the relatively small number of such cases are taken to have passed two threshold points and refused in Phase 3. The much higher final refusal rate recorded in Phase 2 indicates a serious problem with the way the protocol was followed beyond the first phase. By design, all cases that refused in Phase 2 should have been marked immediately for inclusion in Phase 3; such cases might have been treated as final refusals once that assignment was made, but only the most extreme refusals should have been accepted without the assignment of a case disposition code signifying the end of Phase 2.

Examination of the number of attempts recorded in the call records indicates that there was substantial variation in the way the markers of the sample phases were observed by the field managers. Although the great majority of the activity in Phase 1 was contained within the first ten attempts, there are still a fair number of cases with larger numbers of attempts. For Phase 2, the spread in the number of attempts is much broader. Several issues appear to be at the root of this unanticipated deviation from the sample management plan. First, the perception of an "attempt" that was sufficient to count toward progress within a phase has a subjective component and the information stored in the call records is not always sufficient to recapture that judgment directly. Thus, the available measure probably overstates the number of attempts that managers would have counted as meaningful. Second, Phase 2 lacked the compelling incentive present in marking the end of Phase 1—that is, the express mailing package. Second, the protocol was new both for the 2004 SCF and for NORC. For this reason, it is reasonable to assume there might have been some initial confusion about how to proceed. Indeed, from debriefing the field managers, it appeared that some people saw the act of coding the end of Phase 2 as somehow limiting their ability to work further on such cases. In fact, marking the end of Phase 2 only should only have provided a focus for a formal reevaluation of a case for the usefulness of additional work.

Although the available Phase 1 marker may be sufficient for the original purposes of partitioning cases by levels of effort, the Phase 2 marker is clearly inadequate. For further analysis, two alternative markers are used along with the Phase 1 indicator. The point at which the sooner of either the end of Phase 1 had been reached or ten attempts had been undertaken is defined as Phase 1A. Similarly, the point at which the sooner of either the end of Phase 2 had been reached or ten attempts beyond Phase 1A had been undertaken is defined as Phase 2A. Phase3A is defined as the period beyond Phase 2A.

II. Models of nonresponse

A variety of information is available on both respondents and nonrespondents to support a model-based investigation of nonresponse. The census tract for the residence of every area-probability case is known and, in principle, that for the list sample cases may be inferred from a nine-digit ZIP code that is available for all list sample cases. The tract identifier may be used to link the survey cases with tract-level statistics from the 2000 Census of Population. This information may serve as a noisy indicator of respondents' characteristics, or it may reflect structural characteristics of their neighborhoods. The appendix table summarizes the variables extracted. The variables are intended to span a variety of economic, cultural and other factors differences that might reasonably affect the propensity to respond.

Other data are available for the list sample from the tax-based information used in the original sample design.

Table 1: Dependent variables and sample definitions for logit models shows in tables 2, 3 and 4.

	Dependent variable	*Sample*
PHASE1	=1 if case completed before the express mailing	All in-scope cases (additionally for list cases, POSTCARD=1).
PHASE1A	=1 if completed before the express mailing or mailing or 10 attempts, whichever came first	All in-scope cases (additionally for list cases, POSTCARD=1).
PHASE2A	=1 if completed before 10 attempts after express mailing or 20 attempts, whichever came first	All in-scope cases where PHASE1A=0 (additionally for list cases, POSTCARD=1)
PHASE3A	=1 if completed after 10 attempts after the express mailing or 20 attempts, whichever came first	All in-scope cases where PHASE2A=0 (additionally for list cases, POSTCARD=1)
COMP	=1 if cases completed at any point	All in-scope cases
COMPXPC	=1 if completed at any point	All cases in-scope cases where POSTCARD=1
POSTCARD	=1 if refusal postcard not returned	All in-scope cases

Unlike the tract-level variables, this information is specific to each of the sample observations.

Interviewers also recorded some about the sample address. Overall, 890 of the in-scope cases worked by the interviewers had missing information on the key variables describing physical limitations to contacting the respondent directly—presence of a doorman or guard, a locked gate, etc. Almost 60 percent of these cases were ones that received a final disposition code indicating that work had stopped and almost 30 percent were given the final disposition "final refusal." All but 99 of the worked cases with missing data were members of the list sample. In addition, because the 665 list sample cases that returned a refusal postcard were never seen by an interviewer, information about the addresses is not available. Thus, results using these data for the list sample should be interpreted with caution.

The area-probability and list samples are modeled separately here. Although both samples cover very similar populations, the differences in the dispersion of the samples, the stratification of the list sample to obtain more wealthy households, and the approach field managers and interviewers may have taken to the samples argue for not estimating a pooled model. In addition, there are important differences in the data available for the two samples beyond the common tract-level data.

For the dependent variable listed in table 1, six logit models were estimated for the area-probability sample (table 2). The models are structured to show the incremental effects of additional effort in the phases described above and to show the net effect across all phases. The first five models use tract-level data along with the interviewer observations on obstructions to contacting the respondent. An additional model is shown for completion during any phase of the field period, without the interviewer observations in order to show the incremental effect of this information.

The two models of overall response (columns 5 and 6 of the table) are very similar. There are significant regional effects–higher response in the eastern north central region and lower response in the mid-Atlantic region–that may signal characteristics of "typical" residents or differences in field management styles in these areas. Cases in neighborhoods with relatively high proportions of African-Americans, of people under the age of 18 and of workers who had relatively short commutes were more likely to cooperate. The association with commuting time has a natural economic interpretation: those with long commutes have less spare time, and thus should place a higher value on that time than would otherwise be the case. Response tends to be less likely in neighborhoods with higher proportions of people who have less than a high-school education. The access limitation variables included in model 5 indicate that respondents in housing units with a guard or doorman or where a "no trespassing" sign has been posted are less likely to be interviewed; simply living in a unit with a locked gate or lobby door appears to be unrelated to response. The effects of the tract-level variables discussed above do not change substantially when the access limitation effects are omitted, but there are other differences. In model 6, without the effects, population density has a significant negative effect; in the other model the effect is still negative, but not significant. Model 5, with the access effects included, shows additional positive significant effects of residence in the south Atlantic region and the percent of occupied housing units in the census tract, and negative effects from the proportion of households with a telephone and the proportion of townhouses in the tract. Because telephone coverage is so high, it may be best to think of the positive effect on response of low telephone coverage

The overall response patterns are a result of outcomes in the separate phases of the field work. Phase 1 is the least complicated point at which to view the effects of the variables on nonresponse. Unlike the overall response model, it is (in principle) uncontaminated by behavioral variations in the application of effort. In addition, the dividing point for the period is less ambiguous than is the case for the later phases. In the initial phase—according to either the Phase 1 or Phase 1A marker—response is positively associated with residence in the west south central or mountain pacific region, living in

Table 2: Logit models of response for various phases of the field period, area-probability sample.

	(1)	(2)	(3)	(4)	(5)	(6)
	PHASE1	PHASE1A	PHASE2A	PHASE3A	COMP	COMP
Intercept	2.418	0.413	-2.584	-4.281	-0.216	0.976
	1.982	1.969	2.786	5.322	2.128	2.067
NON_MSA	-0.002	0.092	0.036	-0.210	0.032	0.041
	0.058	0.058	0.081	0.148	0.063	0.061
SM_MSA	0.004	-0.081	-0.067	-0.173	-0.112	-0.087
	0.075	0.075	0.109	0.204	0.081	0.080
NEW_ENGLAND	-0.054	-0.368*	-0.370+	0.735*	-0.274	-0.224
	0.163	0.165	0.226	0.352	0.170	0.168
MID_ATLANTIC	-0.243*	-0.030	-0.287+	-0.236	-0.258*	-0.274#
	0.112	0.110	0.150	0.292	0.115	0.113
S_ATLANTIC	0.094	0.011	0.079	0.589#	0.152+	0.081
	0.086	0.085	0.118	0.219	0.093	0.089
E_S_CENTRAL	-0.184	-0.333*	0.318	0.704+	0.016	-0.039
	0.153	0.154	0.212	0.404	0.166	0.162
W_S_CENTRAL	0.251*	0.416#	0.450#	-1.229#	0.383#	0.412#
	0.112	0.113	0.168	0.460	0.134	0.130
E_N_CENTRAL	-0.066	0.034	0.061	-0.180	0.011	0.010
	0.087	0.086	0.121	0.241	0.094	0.092
W_N_CENTRAL	-0.267*	-0.254*	0.160	0.113	-0.066	-0.066
	0.128	0.127	0.170	0.306	0.134	0.132
MOUNT_PACIFIC	0.286*	0.326#	-0.070	-0.536	0.079	0.144
	0.131	0.132	0.196	0.379	0.145	0.143
POP_DENSITY	0.002	-0.003	-0.006	0.003	-0.004	-0.007*
	0.004	0.004	0.005	0.009	0.004	0.003
P_NATIVE_BORN	0.000	0.001	0.002	0.006	0.002	-0.001
	0.009	0.009	0.013	0.024	0.010	0.010
P_HISP	0.010	0.006	-0.016	-0.014	-0.012	-0.011
	0.015	0.014	0.020	0.037	0.016	0.016
P_AFAM	0.002	0.002	0.007*	-0.005	0.005+	0.004+
	0.002	0.002	0.003	0.007	0.003	0.003
P_ASIA	-0.024#	0.010	-0.001	-0.021	0.005	0.010
	0.008	0.007	0.010	0.021	0.008	0.007
P_RACE_OTH	-0.059#	-0.013	0.002	-0.085	-0.013	-0.015
	0.022	0.020	0.028	0.093	0.022	0.022
P_SPONLY_SPAN	-0.008	-0.004	0.027	0.040	0.026	0.021
	0.018	0.018	0.026	0.047	0.020	0.020
P_SPONLY_OTH	0.016	-0.007	0.006	0.024	0.000	-0.005
	0.011	0.011	0.015	0.029	0.012	0.011
P_AGE_LT18	0.026*	0.045#	-0.024	0.060+	0.028*	0.025*
	0.012	0.012	0.016	0.032	0.013	0.013
P_AGE_GE65	0.001	0.018	-0.027+	0.005	0.001	-0.005
	0.011	0.011	0.016	0.032	0.012	0.012
P_GEBA	0.010	0.009	-0.014	-0.012	-0.005	-0.007
	0.007	0.007	0.009	0.017	0.007	0.007
P_SOMCOLL	-0.011	-0.024#	0.008	0.012	-0.011	-0.009
	0.010	0.010	0.014	0.025	0.010	0.010
P_LTHS	-0.006	-0.007	-0.005	-0.041+	-0.018+	-0.017+
	0.010	0.010	0.014	0.025	0.011	0.010
P_INC_LT10	-0.001	0.006	0.006	0.025	0.013	0.015
	0.010	0.010	0.015	0.029	0.012	0.012
P_INC_75_150	-0.005	-0.009	0.013	-0.012	-0.001	0.000
	0.007	0.007	0.009	0.018	0.007	0.007
P_INC_GE150	-0.031#	-0.015	0.018	0.005	0.000	0.006
	0.010	0.009	0.012	0.024	0.010	0.009
P_WORKERS	0.010	0.036#	-0.015	-0.008	0.014	0.008
	0.011	0.011	0.016	0.032	0.012	0.012
P_UNEMP	-0.003	0.006	-0.001	-0.053	-0.001	-0.007
	0.014	0.014	0.020	0.044	0.015	0.015
P_COMMUT_LT25	0.006	0.011#	0.009	-0.005	0.010*	0.008+
	0.004	0.004	0.006	0.011	0.005	0.005
P_COMMUT_GE45	0.010+	0.022#	0.006	-0.038*	0.010	0.007
	0.006	0.006	0.009	0.017	0.007	0.006
P_OCC_HOU	0.026	0.022	0.014	0.168#	0.051*	0.035
	0.022	0.022	0.034	0.060	0.027	0.025
P_OWNOCC	-0.002	-0.004	-0.007	-0.011	-0.006	-0.008
	0.006	0.006	0.008	0.014	0.006	0.006
P_HOU_1ATT_UNIT	-0.010#	-0.009#	-0.001	0.000	-0.007*	-0.004
	0.004	0.003	0.004	0.008	0.003	0.003
P_HOU_2_4_UNIT	0.009+	0.008+	0.002	-0.006	0.009	0.008
	0.005	0.005	0.008	0.014	0.006	0.006
P_HOU_5_49_UNIT	-0.005	-0.007	-0.005	0.001	-0.007	-0.007
	0.005	0.005	0.007	0.012	0.005	0.005
P_HOU_GE50_UNIT	-0.005	0.000	0.001	0.004	0.002	-0.001
	0.005	0.005	0.007	0.015	0.006	0.005
P_HOU_LE1939	-0.003	-0.003	0.004	0.010	0.002	0.003
	0.004	0.003	0.005	0.009	0.004	0.004
P_HOU_1940_1959	0.001	0.000	-0.003	0.004	0.000	0.000
	0.003	0.003	0.004	0.008	0.003	0.003
P_HOU_1960_1989	-0.001	-0.001	0.000	0.008	0.001	0.001
	0.003	0.003	0.004	0.007	0.003	0.003
L_MED_RENT	-0.424*	-0.368*	0.327	-0.072	-0.025	-0.140
	0.189	0.186	0.250	0.455	0.195	0.190
P_PHONE	-0.038+	-0.038+	-0.004	-0.141#	-0.054*	-0.034
	0.021	0.021	0.032	0.055	0.026	0.025
GUARD	-0.072	0.457+	-1.538#	-1.776+	-0.481*	.
	0.251	0.242	0.493	1.050	0.243	.
LOCKED_LOBBY	-0.193	-0.167	-0.031	-0.661	-0.237	.
	0.165	0.161	0.219	0.435	0.166	.
LOCKED_GATE	-0.311	-0.349+	0.170	0.132	-0.111	.
	0.195	0.195	0.248	0.459	0.205	.
NO_TRESSPASS	-0.500+	-0.589*	-0.630+	-0.526	-0.753#	.
	0.262	0.263	0.347	0.605	0.249	. .
	.					
N	4271	4271	2295	1459	4271	4367

#: <=1%, *: <=5%, +: <=10%

neighborhoods with higher proportions of people under the age of 18, higher concentrations of buildings with two to four units, and higher proportions of workers with long commutes to work. Response is negatively associated with residence in the west north central region, higher proportions of townhouses, a higher coverage rate for telephones, higher median levels of rent and the presence of a "no trespassing" sign at the sample address. The positive effect of the fraction of workers with long commuting times, particularly contrasted with positive effect of short commuting time in the overall response model, seems strange if it is taken as reflecting respondent characteristics. One possibility is that neighborhoods with high fractions of workers with long commutes also contain people who are disproportionately willing to participate, but this smaller part of the pool of eligible respondents would have been exhausted early. Of the significant effects in these two models, only two positive effects (residence in the west south central region and the proportion of people aged less than 18) and three negative effects (the proportion of townhouses, the telephone coverage rate, and presence of a "no trespassing" sign) are also significant and of the same sign in the overall response model. Several other effects are significant and negative in their influence on response: residence in the mid-Atlantic region, the proportion of residents who are Asian or "other" race and the proportion of households with incomes of $150,000 or more; of these only the mid-Atlantic effect carries through to the final model.

Generally over the course of the remaining phases, fewer variables are significant in the models and none of the initial effects are consistently sustained. In Phase 3A, where the application of effort was largely determined by the judgment of the field staff about where effort would be most likely to yield completed interviews, a largely different pattern of significant estimates emerges, some of wich are the reverse in sign of the corresponding estimates for the first phase.

Overall, the break-out of response propensities over phases of the field period is hard to interpret, though the results do at least indicate that some sort of behaviorally-based selection process took place. Because the tract-level data are neighborhood characteristics, not respondent characteristics, we can only guess at whether the observed effects are driven by neighborhood context or by the degree to which the respondents tend to share

Table 3: Logit models of response for various phases of the field period, list sample.

	(1) POST-CARD	(2) PHSE1	(3) PHA-SE1A	(4) PHA-SE2A	(5) PHA-SE3A	(6) COMPXPC	(7) COMP
Intercept	4.963+	-6.526*	-8.194#	0.171	-5.107	-2.782	-2.490
	2.902	2.932	2.785	3.157	6.041	2.194	2.111
NON_MSA	-0.057	-0.092	-0.087	-0.076	0.525	-0.028	-0.048
	0.157	0.127	0.121	0.149	0.388	0.103	0.099
SM_MSA	0.342	-0.038	0.148	-0.140	-0.822	-0.066	0.022
	0.270	0.206	0.194	0.246	0.718	0.167	0.161
NEW_ENGLAND	-0.120	-0.050	-0.057	0.198	0.312	0.125	0.094
	0.184	0.191	0.182	0.187	0.386	0.140	0.134
MID_ATLANTIC	0.047	-0.031	0.167	-0.130	-0.527	-0.023	-0.002
	0.144	0.144	0.133	0.153	0.353	0.108	0.103
S_ATLANTIC	-0.004	-0.179	-0.006	-0.054	0.305	-0.013	-0.003
	0.132	0.130	0.122	0.134	0.265	0.097	0.092
E_S_CENTRAL	0.588	0.341	0.024	0.128	-0.077	0.051	0.144
	0.409	0.280	0.282	0.336	0.716	0.235	0.227
W_S_CENTRAL	-0.249	-0.608#	-0.103	-0.133	0.082	-0.132	-0.152
	0.168	0.185	0.163	0.181	0.334	0.131	0.124
E_N_CENTRAL	-0.098	-0.001	0.084	0.011	-0.358	-0.015	-0.008
	0.129	0.129	0.124	0.139	0.308	0.101	0.095
W_N_CENTRAL	-0.134	-0.029	-0.529*	0.098	0.566	-0.047	-0.117
	0.199	0.214	0.243	0.214	0.350	0.166	0.158
MOUNT_PACIFIC	0.225	0.408*	0.251	0.019	-0.163	0.079	0.107
	0.241	0.198	0.198	0.228	0.462	0.163	0.157
POP_DENSITY	-0.003	-0.007	-0.006	0.005	0.017#	0.003	0.002
	0.003	0.005	0.004	0.003	0.006	0.003	0.002
P_NATIVE_BORN	0.010	0.008	0.012	-0.015	-0.002	-0.003	-0.002
	0.015	0.015	0.014	0.015	0.028	0.011	0.011
P_HISP	0.037+	0.032	0.012	0.024	0.022	0.018	0.026+
	0.020	0.020	0.020	0.022	0.038	0.016	0.015
P_AFAM	0.005	0.008+	0.009*	0.003	-0.003	0.005	0.006+
	0.005	0.004	0.004	0.006	0.013	0.004	0.004
P_ASIA	-0.004	-0.002	0.004	0.020+	-0.008	0.013+	0.010
	0.010	0.011	0.010	0.011	0.024	0.008	0.007
P_RACE_OTH	0.084	-0.064	0.021	-0.012	0.015	0.003	0.016
	0.066	0.060	0.039	0.055	0.084	0.034	0.033
P_SPONLY_SPAN	-0.026	-0.029	-0.011	-0.029	-0.006	-0.018	-0.025
	0.025	0.026	0.026	0.027	0.045	0.019	0.019
P_SPONLY_OTH	0.020	-0.003	0.000	-0.030+	0.004	-0.017	-0.012
	0.016	0.017	0.015	0.017	0.034	0.012	0.012
P_AGE_LT18	-0.029+	0.025+	0.021	0.014	0.005	0.019+	0.014
	0.016	0.015	0.014	0.016	0.032	0.011	0.011
P_AGE_GE65	-0.011	0.019	0.034#	0.012	0.001	0.025*	0.021*
	0.014	0.014	0.013	0.015	0.030	0.011	0.010
P_GEBA	-0.001	0.030#	0.023*	-0.006	0.018	0.011	0.011
	0.010	0.010	0.009	0.011	0.022	0.008	0.007
P_SOMCOLL	-0.005	0.014	0.008	-0.022	0.048	0.001	0.001
	0.015	0.016	0.015	0.017	0.034	0.012	0.011
P_LTHS	-0.019	0.018	0.019	-0.034+	0.023	-0.003	-0.006
	0.017	0.017	0.016	0.019	0.035	0.013	0.012
P_INC_LT10	-0.007	0.006	-0.003	0.012	0.000	0.006	0.004
	0.016	0.015	0.014	0.017	0.029	0.012	0.011
P_INC_75_150	0.013	-0.019*	-0.009	-0.017+	-0.001	-0.012*	-0.009
	0.008	0.009	0.008	0.009	0.018	0.006	0.006
P_INC_GE150	0.012+	-0.027#	-0.017#	-0.003	0.007	-0.009	-0.005
	0.007	0.008	0.007	0.008	0.016	0.006	0.005
P_WORKERS	-0.022+	0.003	0.004	0.011	0.037	0.014	0.009
	0.013	0.013	0.012	0.013	0.025	0.009	0.009
P_UNEMP	0.004	0.009	0.019	-0.028	0.056+	0.011	0.010
	0.018	0.017	0.015	0.022	0.032	0.013	0.012
P_COMMUT_LT25	-0.003	0.009	0.002	0.013*	0.003	0.007	0.006
	0.006	0.006	0.006	0.007	0.012	0.005	0.004
P_COMMUT_GE45	-0.003	0.009	0.003	0.019*	-0.015	0.008	0.006
	0.008	0.008	0.007	0.008	0.018	0.006	0.006
P_OCC_HOU	0.120*	0.030	0.017	0.064	0.007	0.027	0.047
	0.056	0.043	0.043	0.045	0.090	0.033	0.032
P_OWNOCC	-0.013*	0.012+	-0.008	-0.005	0.007	-0.004	-0.007
	0.007	0.007	0.007	0.007	0.014	0.005	0.005
P_HOU_1ATT_UNIT	0.002	-0.002	-0.006	0.011*	-0.011	0.001	0.002
	0.006	0.005	0.005	0.006	0.015	0.004	0.004
P_HOU_2_4_UNIT	-0.006	0.009	0.004	0.002	-0.010	0.003	0.002
	0.007	0.007	0.007	0.008	0.018	0.006	0.005
P_HOU_5_49_UNIT	-0.004	0.001	-0.011+	-0.007	-0.016	-0.010*	-0.011#
	0.006	0.006	0.006	0.006	0.012	0.004	0.004
P_HOU_GE50_UNIT	-0.002	-0.001	-0.008	-0.008	-0.010	-0.009*	-0.009*
	0.005	0.006	0.005	0.006	0.011	0.004	0.004
P_HOU_LE1939	0.003	0.002	-0.003	-0.010*	0.005	-0.006*	-0.005+
	0.004	0.004	0.004	0.004	0.009	0.003	0.003
P_HOU_1940_1959	0.003	-0.003	-0.011#	-0.004	0.008	-0.007#	-0.006*
	0.003	0.004	0.003	0.004	0.008	0.003	0.003
P_HOU_1960_1989	0.004	0.002	-0.003	-0.006+	0.007	-0.004	-0.002
	0.003	0.003	0.003	0.003	0.007	0.002	0.002
L_MED_RENT	0.020	-0.024	0.308+	-0.194	-0.380	-0.006	-0.006
	0.178	0.184	0.172	0.184	0.355	0.135	0.131
P_PHONE	-0.122*	-0.020	0.021	-0.060	-0.021	-0.013	-0.034
	0.055	0.042	0.042	0.044	0.090	0.032	0.031
LS_STRAT7	0.502	-1.195#	-0.602	-0.121	-1.068	-0.425	-0.356
	0.341	0.437	0.380	0.378	0.918	0.280	0.265
LS_STRAT6	0.246	-0.358+	-0.202	0.065	0.877*	0.008	0.054
	0.189	0.213	0.195	0.211	0.439	0.152	0.143
LS_STRAT5	0.130	-0.133	0.062	0.087	0.540+	0.068	0.102
	0.120	0.132	0.118	0.132	0.294	0.094	0.089
LS_STRAT4	0.005	0.231*	0.036	0.044	0.709#	0.070	0.100
	0.113	0.117	0.109	0.125	0.268	0.089	0.084
LS_STRAT3	-0.176	0.450#	0.231	0.114	-0.521	0.118	0.081
	0.150	0.156	0.145	0.171	0.453	0.121	0.114
LS_STRAT2	-0.281	0.447*	0.271	0.192	0.459	0.277+	0.192
	0.206	0.222	0.205	0.243	0.513	0.170	0.158
AGE	-0.031	0.051*	0.044+	0.094#	0.010	0.067#	0.059#
	0.025	0.026	0.024	0.030	0.062	0.020	0.019
AGE_SQ	0.011	-0.042+	-0.034	-0.074#	-0.011	-0.053#	-0.050#
	0.022	0.025	0.023	0.029	0.059	0.019	0.018
L_TOTINC	0.063	-0.196#	-0.248#	-0.131	-0.054	-0.192#	-0.155#
	0.071	0.080	0.075	0.081	0.163	0.059	0.055
D_SALARIES	-0.291	-0.014	-0.189	-0.407	0.978	-0.112	-0.165
	0.326	0.376	0.353	0.375	0.642	0.270	0.256
L_SALARIES	0.033	0.021	0.046	0.039	-0.055	0.029	0.034
	0.028	0.033	0.030	0.031	0.053	0.023	0.022
D_NTAX_INTEREST	0.043	0.258*	0.350#	0.299*	0.135	0.346#	0.340
	0.114	0.123	0.114	0.124	0.239	0.090	0.087
D_TAX_INTEREST	-0.303	0.462+	0.519*	0.592+	0.026	0.620#	0.491*
	0.329	0.267	0.260	0.324	0.715	0.222	0.209
D_DIVIDENDS	0.094	0.439#	0.395#	0.119	0.155	0.292*	0.282*
	0.166	0.165	0.158	0.187	0.376	0.131	0.125
L_FININC	-0.102#	-0.063*	-0.050+	-0.085#	-0.061	-0.075#	-0.092#
	0.032	0.032	0.030	0.034	0.065	0.024	0.023
D_NET_KG_GAIN	-0.151	0.184	0.134	0.033	-0.428	0.037	0.004
	0.120	0.132	0.122	0.138	0.273	0.098	0.093
D_NET_KG_LOSS	0.067	0.227+	0.033	0.126	-0.384	0.038	0.040
	0.123	0.130	0.121	0.122	0.246	0.092	0.088
D_FARM_INC	-0.132	-0.072	-0.027	-0.354	0.479	-0.111	-0.116
	0.196	0.233	0.218	0.251	0.369	0.168	0.161
D_RENT_ROY	-0.097	0.059	-0.134	-0.196*	0.279	-0.133+	-0.146*
	0.095	0.100	0.092	0.101	0.201	0.073	0.070
D_PART_SCORP	0.221+	-0.059	-0.243*	0.144	0.241	-0.036	0.029
	0.123	0.126	0.117	0.141	0.277	0.097	0.093
D_ESTATE_TRUST	0.019	0.018	-0.214	0.222	-0.105	0.007	0.029
	0.149	0.176	0.170	0.155	0.326	0.120	0.116
D_SCH_C_NET_GAIN	0.093	0.191+	0.164	-0.080	0.347	0.072	0.098
	0.107	0.111	0.104	0.116	0.222	0.083	0.079
D_SCH_C_NET_LOSS	0.444#	0.211	0.179	-0.202	0.180	0.004	0.078
	0.156	0.150	0.139	0.158	0.300	0.110	0.107
D_TOT_PENSION	0.159	-0.594+	-0.136	0.197	-0.341	0.002	0.046
	0.288	0.322	0.285	0.306	0.667	0.224	0.213
L_TOT_PENSION	-0.019	0.060+	0.019	-0.022	0.024	-0.001	-0.007
	0.029	0.033	0.030	0.032	0.068	0.023	0.022
D_TOT_SOCSEC	1.092	-2.404	-1.784	-0.591	-9.112	-1.789	-1.578
	1.510	1.839	1.656	1.886	6.084	1.367	1.309
L_TOT_SOCSEC	-0.118	0.275	0.207	0.066	0.902	0.197	0.173
	0.155	0.189	0.170	0.193	0.611	0.140	0.134
D_TOT_DEDUCT	0.171	0.090	0.320	-0.249	-0.958	-0.037	0.019
	0.315	0.301	0.284	0.376	1.109	0.248	0.234
D_MORT_DEDUCT	0.031	-0.001	-0.084	0.064	0.124	0.013	0.016
	0.109	0.124	0.112	0.121	0.242	0.087	0.084
D_CASH_CHARITY	-0.294	-0.523	-0.546+	-0.315	1.139	-0.359	-0.378
	0.353	0.353	0.329	0.414	1.140	0.277	0.264
L_CASH_CHARITY	0.026	0.049	0.039	0.044	0.016	0.044*	0.045*
	0.028	0.032	0.029	0.031	0.059	0.022	0.022
N	4997	4336	4336	3552	2962	4336	4997

#: p<=1%, *: p<=5%, +: p<=10%

the neighborhood characteristics–or both. For example, we cannot tell whether the decline from Phase 1 in the importance of living in a high-income neighborhood as a driver of nonresponse is a result of a filtering through all income levels in such neighborhoods or whether high-income respondents tend to become more cooperative after receiving more information. In essence, we do not know the initial correspondence between respondents and their neighborhood characteristics or how that correlation changes among nonrespondents remaining at various

points in the field period. To discriminate more clearly, we need either reliable interviewer observations on a broad array of characteristics observable for all respondents or external information on all respondents. For the list sample we do have a limited amount of information specific to each selected case.

If we are to apply inferences from the list sample to the area-probability sample as well, it would be helpful if the pattern of association with the tract-level variables were similar in the two samples. A number of factors might limit this possibility. First, the match to tract-level data is somewhat less certain for the list sample than for the area-probability sample. If the likelihood of having a business address is about the same for list sample participants and non-participants, this would only make the estimates noisier. Second, the list sample is differentially sampled by an indicator of wealth. Controlling separately for the sample stratum should diminish distortions from this source, but such conditioning could offset some other effects that have a latent correlation with wealth; excluding the wealthiest cases might be a useful robustness check, but the smaller sample size would diminish the power. Third, the list sample does not include households where no one filed a tax return. Such households tend to be those that have very little labor income. Fourth, the list sample cases were given a chance to refuse participation absolutely by returning a postcard. Clearly this allowance might well influence the phase-specific models, but unless the postcard refusal cases are unlike area-probability cases that persisted in refusals through Phase 3, there should be no effect on an overall model of response. Fifth, although there is some clustering in the list sample, that sample tends to be much more thinly spread than the area-probability sample. Consequently it may have been difficult to work with as great efficiency. If there are aspects of effort not captured in the measures used to define the sample phases, at least the phase-specific models could differ for this reason. Sixth, the contract for the survey specified a minimum number of cases that must be completed in each list sample stratum. These levels, which were chosen based on what had been seen as feasible in earlier surveys, were intended to ensure that every stratum received attention. The data suggest that list sample cases that did not return the refusal postcard were worked slightly harder than the area-probability cases, but it may still be that this difference reflects a higher average level of difficulty for the list sample.

To explore the comparability of the response propensities for the two samples, response models were estimated for the list sample using only the tract-level characteristics. Space constrains do not allow a detailed discussion of the findings here, but the most important result is that the correspondence with the overall response models for the area-probability sample is weak. The data indicate that while some part of the differences in the estimates for the two samples may still be related to the oversampling in the list sample, other factors including differences in the ways the samples were worked seem more likely to be part of the explanation. The absence of strong parallel findings in the two samples for a parallel set of variables limits our ability to draw general conclusions for both sample. Nonetheless, response propensities for the list sample are interesting in their own right and examination of the effects of including observation-level variables in response propensity models may still suggest common latent sources of response bias.

Table 3 provides estimates of a set of response propensity models for the list sample at the postcard stage (column 1), the subsequent three sample phases (columns 2, 3, 4 and 5), the overall period beyond the postcard stage (column 6), and the full overall period including the postcard stage (column 7). The explanatory variables used are the tract-level variables, indicators for the list sample strata, and the case-level variables used in the sample design. Because of the relatively high fraction of missing information on access limitations for this sample, that information is not included in the models.

The overall model (column 7) shows a variety of significant effects involving both the tract-level variables and the case-specific variables. Among the tract-level variables, higher proportions of people who are African-American, Hispanic, aged younger than 18 or aged 65 and older, and residence in neighborhoods with higher proportions of occupied housing units are positively associated with response. Residence in neighborhoods with higher proportions of housing units in buildings with five or more units and residence in buildings built before 1960 are negatively associated with response. There are no significant geographic factors. Comparison of these model estimates with others not shown indicates that the tract-level characteristics are largely independent of the case-specific variables. Response propensity is quadratic in age of the primary taxpayer, increasing until age 59 and then declining–reaching the equivalent effect of age 40 at about age 80. Income characteristics of the unit have strong effects on the response propensity. The amounts of total income and financial income (the sum of dividends and taxable and nontaxable interest incomes) are both negative in their influence, as is receipt of income from rents or royalties. At the same time, receipt of two of the components—nontaxable interest and dividends—have a positive effect; for a person having all three types, the estimated coefficients imply that the positive effect is not offset until the level of financial income reaches $178,000. The level of itemized deductions for charitable contributions also has a positive effect, consistent with a role for altruism in the decision to respond.

To be approached by an interviewer, a list sample case must not have returned the refusal postcard. In such cases, either the respondent never opened the mailing containing the postcard, or having opened it they chose not to return the postcard. That choice could be based on a misunderstanding that the card should only be returned

if they wanted to participate, a belief that return of the postcard might place them at risk, that they felt they had sufficient means of evading an interviewer later, or that they accepted the possibility of contact. In the project debriefing, interviewers reported that many list sample respondents did not recall ever having received the mailing; this suggests that the propensity to open unsolicited mail may be a key driver at the postcard stage. As shown in column 1, only a few systematic factors emerge in the model describing the initial passive agreement (postcard not returned). Neighborhoods that have higher proportions of Hispanics, household incomes of $150,000 or more, and occupied housing units, and households with income from partnerships or s-corporations or losses from self-employment income were more likely not to return the refusal postcard.

There are no characteristics in the models that have a significant effect in all phases of actual (or potential) contact with an interviewer. Even the two measures of Phase 1 highlight many different factors, though a number are consistent. In the first phase, neighborhoods with a higher proportion of people with a bachelor's degree have higher response rates; this accords with reports from interviewers that more educated people are easier to persuade, because they are more likely to understand the importance of the survey. Refusals are more likely in neighborhoods with a higher proportion of households with at least $150,000 of income. At the same time, receipt of taxable and nontaxable interest incomes and age of the primary taxpayer (peaking at about age 60) are positively related to response propensity; and as in the overall model, total income and total financial income have a negative effect.

The model for Phase 2A has no significant tract-level factors in common with the models for Phase 1 response; among the case-specific variables they share the key effects of age and financial income. The model for phase 3A has no significant factors in common other than stratum indicator with any of the models for the earlier phases. Indeed, the Phase 3A model reveals little systematic structure in terms of tract-level variables aside from a correlation of higher population density and higher percentages of unemployed workers with response. None of the case-specific variables beyond the stratum indicators are significant; this suggests that continued effort may do less than usually hoped to alter the composition of the pool of cases remaining after the initial stages of field work.

III. Future research

For the future, tightening the field application of the phased sample management protocol is a high priority. A clearer division of the field period would offer several possibilities. First, a model indicating the types of cases that tend to be under-represented up through the end of Phase 2 could be used to give guidance to field staff in the final phase of the survey that would be better informed by benefits and costs (e.g., see Heeringa and Groves [2004]). Second, a better understanding of how different cases respond over the field period could lead to improvements in the approach taken to persuade people to participate. Third, clearer modeling could lead to better nonresponse adjustments at the weighting stage. Finally, the trajectory of effects of various factors over the field period could lead to deeper insights into the nonignorable nonresponse that nearly all surveys fear.

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Endnotes

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2. See Aizcorbe, Kennickell and Moore [2003] for an overview of the survey and the 2001 data and Kennickell [1999] for a summary of the survey methodology.

Appendix table: Variable definitions for tables 2 and 3.

2000 Census data available for area-probability and list sample cases:

NON_MSA: =1 if sample area not an MSA.
SM_MSA: =1 is sample area not self-representing.
NEW_ENGLAND: =1 if sample area in New England.
MID_ATLANTIC: =1 if sample area in mid-Atlantic.
S_ATLANTIC: =1 if sample area south Atlantic.
E_S_CENTRAL: =1 if sample area east south central.
W_S_CENTRAL: =1 if sample area west south central.
E_N_CENTRAL: =1 if sample area east north central.
W_N_CENTRAL: =1 if sample area west north central
MOUNT_PACIFIC: =1 if sample area mountain Pacific.
PACIFIC: omitted category: Pacific coast
POP_DENSITY: number of people in census tract divided by area of tract in square meters.
P_NATIVE_BORN: % native born in tract.
P_HISP: %a Hispanic in tract.
P_AFAM: % African American in tract.
P_ASIA: %a Asian American in tract.
P_RACE_OTH: % other nonwhite race in tract.
P_SPONLY_SPAN: % in tract speaking only Spanish.
P_SPONLY_OTH: % in tract speaking only language other than Spanish or English.
P_AGE_LT18: % in tract aged less than 18.
P_AGE_GE65: % in tract aged 65 or older.
P_GEBA: % of adults in tract with a bachelor's degree or higher education.
P_SOMCOLL: % of adults in tract with some college but less than a bachelor's degree.
P_LTHS: % of adults in tract with less than a high school diploma.
P_INC_LT10: % of households in tract with income less than 10,000.
P_INC_75_150: % of households in tract with income 75,000 to 150,000.
P_INC_GE150: % of households in tract with income of 150,000 or more.
P_WORKERS: % of people in tract in labor force.
P_UNEMP: % of people in tract unemployed.
P_COMMUT_LT25: % of workers in tract commuting to work 25 minutes or less.
P_COMMUT_GE45: % of workers in tract commuting to work 45 minutes of more.
P_OCC_HOU: % of occupied housing units in tract.
P_OWNOCC: % of housing units in tract owner-occupied.
P_HOU_1_ATT_UNIT: % of housing units in tract attached single-family homes.
P_HOU_2_4_UNIT: % of housing units in tract in buildings with 2 to 4 units.
P_HOU_5_49_UNIT: % of housing units in tract in buildings with 5 to 49 units.
P_HOU_GE50_UNIT: % of housing units in tract in buildings with 50 or more units.
P_HOU_LE1939: % of housing units in tract built in 1939 or earlier.
P_HOU_1940_1959: % of housing units in tract built between 1940 and 1959.
P_HOU_1960_1989: percet of housing units in tract built between 1960 and 1989.
L_MED_RENT: natural logarithm of median value of residential rent in tract.
P_PHONE: % of residences with a telephone.
GUARD: =1 if doorman or guard at gate at residence of respondent.
LOCKED_LOBBY: =1 if residence of respondent in a building with a locked lobby.
LOCKED_GATE: =1 if resident of respondent behind a locked gate.
NO_TRESPASS: =1 if "no trespassing" sign posted at residence of respondent.
LS_STRAT7: =1 if list sample stratum 7.
LS_STRAT6: =1 if list sample stratum 6.
LS_STRAT5: =1 if list sample stratum 5.
LS_STRAT4: =1 if list sample stratum 4.
LS_STRAT3: =1 if list sample stratum 3.
LS_STRAT2: =1 if list sample stratum 2.
LS_STRAT1: omitted category: list sample stratum 1.

Variables available for list sample cases only:

AGE: age of primary taxpayer.
AGE_SQ: square of age of primary taxpayer.
L_TOTINC: ln(total 2002 income).
D_SALARIES: =1 if had 2002 wages.
L_SALARIES: ln(max(1,2002 wages)).
D_NTAX_INTEREST: =1 if had 2002 nontaxable interest income.
D_TAX_INTEREST: =1 if had 2002 taxable interest income.
D_DIVIDENDS: =1 if had 2002 dividends.
L_FININC: ln(max(1,2002 income from nontaxable interest, taxable interest and dividends)).
D_NET_KG_GAIN: =1 if had 2002 positive capital gains.
D_NET_KG_LOSS: =1 if had 2002 capital losses.
D_FARM_INC: =1 if had 2002 farm income.
D_RENT_ROY: =1 if had 2002 income from rents or royalties.
D_PART_SCORP: =1 if had 2002 income from partnerships or subchapter s corporations.
D_ESTATE_TRUST: =1 it had 2002 income from estates or trusts.
D_SCH_C_NET_GAIN: =1 if had 2002 positive self-employment income.
D_SCH_C_NET_LOSS: =1 if had 2002 losses from self-employment income.
D_TOT_PENSION: =1 if had 2002 pension income.
L_TOT_PENSION: ln(max(1,2002 pension income)).
D_TOT_SOCSEC: =1 if had 2002 social security income.
L_TOT_SOCSEC: ln(max(1,2002 social security income.)).
D_TOT_DEDUCT: =1 if had 2002 itemized deductions.
D_MORT_DEDUCT: =1 if had 2002 deduction for mortgage interest.
D_CASH_CHARITY: =1 if had 2002 deduction for charitable contributions.
L_CASH_CHARITY: ln(max(1,2002 deduction for charitable contributions.