THE SURVEY OF INCOME AND
PROGRAM PARTICIPATION

A COMPARISON OF ATTRITION IN THE PANEL STUDY OF INCOME DYNAMICS AND THE SURVEY OF INCOME AND PROGRAM PARTICIPATION

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A Comparison of Attrition in the Panel Study of Income Dynamics and the Survey of Income and Program Participation

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Abstract

This paper analyzes attrition behavior in two major longitudinal surveys; the Panel Study of Income Dynamics (PSID) and the Survey of Income and Program Participation (SIPP). Attempts to explain attrition include demographic, location, and mobility indicators and variables that correspond to the interviewer and the interview process. The empirical analysis indicates that a number of variables that relate to the interviewer and the interview process have significant impacts on attrition in the PSID and the SIPP. There is evidence that surveys of longer duration and ones with higher frequency interviews have higher per wave attrition rates.

Key Words: Panel Attrition; Survey Design.

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I. Introduction

The increased availability of longitudinal surveys has led to many new theoretical and empirical analyses using panel data. In the survey methodology literature, studies have focused on the effect of re-interviews on response accuracy (see, for example, Kasprzyk, Duncan, Kalton, and Singh 1989). But one aspect of panel data sets that has received relatively little attention is the exit behavior, or attrition, of individuals from these longitudinal surveys. This analysis is important since non-random attrition results in a data set that is no longer representative of the population from which the survey is sampled. Once the attrition process is understood, weights can be developed for use in obtaining sample statistics that are representative of the population (Lepkowski 1989, Lepkowski, Kalton, and Kasprzyk 1989).

A number of important issues need to be resolved in order to get a better understanding of attrition. For example, it is very likely that the interviewer and the interview process can influence the respondent's attachment to the survey but there is little empirical evidence to support this assertion. Knowledge of this relationship can lead to changes in the survey design that will lower attrition rates. This paper analyzes the determinants of attrition to address this and other issues. Attrition equations are estimated that include demographic, location, and mobility indicators and variables that correspond to the interviewer and the interview process.

Two major longitudinal surveys will be analyzed; the Panel Study of Income Dynamics (PSID) and the Survey of Income and Program Participation (SIPP). The PSID is an ongoing panel for which the first annual interview was conducted in 1968. The attrition rate for the full sample in the first year of the panel was 11.9% and by the twenty-first wave, only 48.8% of the original sample was present (self or proxy) for all interviews. The SIPP is a series of thirty-two

month panels. Interviews are conducted every four months and data are recorded on a monthly basis. Both the 1984 and 1990 panels will be used so that comparisons can be made across panels. In the 1984 panel, the attrition rate in the first wave was 5.9% while 71.4% of the original sample was present (self or proxy) for all eight waves. The comparable values for the 1990 panel are 7.6% and 73.4%. The different designs of the PSID and SIPP provide for an interesting comparison of the attrition processes of two popular longitudinal surveys that will result in evidence about how the duration of the survey and the frequency of interviews affect attrition.

A model of attrition is presented in Section 2. Also addressed in this section is the issue of duration dependence, the effect of previous interviews on attrition. The designs of the PSID and SIPP and their attrition rates are compared in Section 3. Attrition processes are estimated for male heads of household and female heads and wives using the PSID and SIPP in Section 4. Concluding remarks are given in Section 5.

The empirical analysis indicates that the characteristics of the interviewer and the interview process have significant impacts on attrition in the PSID and the SIPP. For example, it appears that shorter interviews and maintaining the same interviewer will lower attrition rates. The effect of demographic variables and location indicators on the attrition processes are very similar for the SIPP and the PSID. One important difference between these surveys is the evidence of positive duration dependence in the SIPP and the lack of evidence of duration dependence in the PSID. Also, while the first wave attrition rate is higher for the PSID, the exit rate is higher for the SIPP in subsequent waves. This indicates that surveys of longer duration and ones with higher frequency interviews have higher attrition rates per wave.

2. A model of attrition

Consider a longitudinal survey that includes T waves. Attrition occurs for individual i if he/she leaves the survey in period $T_i \leq T$. If information for individual i is not observed for any wave greater than T_i, attrition is an absorbing state. Attrition is non-absorbing if an individual can return to the sample after exiting. Attrition is considered to be absorbing for this analysis. Thus the attrition process is specified as

$$a_{it}^{*} = Z_{it}\alpha_1 + D_{it}\alpha_2 + \epsilon_i + u_{it} \qquad i=1,\ldots,N \quad t=1,\ldots,T_i \tag{1}$$

where

individual i leaves in period t ($a_{it}=1$) if $a_{it}^{*}>0$,

individual i remains in sample in period t ($a_{it}=0$) if $a_{it}^{*}\leq 0$,

Z_{it} is a 1xM vector of regressors, D_{it} is a $1xT_i$ vector of wave dummies, ϵ_i is an unobservable individual effect, and $T_i=T$ if individual i remains in the sample for all T waves. It is assumed that u_{it} is an independently and identically distributed (i.i.d.) normal random variable with mean zero and variance σ^2 that is independent of ϵ_i and Z_{it}. Note that a_{it}^{*} is the propensity to leave the survey, but only whether the individual leaves or stays, a_{it}, is observed.

Since attrition is absorbing in this analysis, duration dependence can be modeled by including wave dummies, D_{it}. The presence of duration dependence is revealed by a monotonic change in the coefficients for the D_{it}'s. Negative duration dependence occurs (monotonically increasing coefficients) if the participant becomes tired of being interviewed and hence is more likely to attrit. Positive duration dependence can arise (monotonically decreasing coefficients) if the interview process becomes less time consuming as the

respondent becomes more familiar with the interview process, the individual develops a sense of loyalty to the survey and hence feels more inclined to continue through time, or the interviewer develops a rapport with the respondent (Waterton and Lievesley 1989). Thus, it is unclear, a priori, whether positive or negative duration dependence will arise.

It is important to control for the individual effect, ϵ_i, when testing for duration dependence. All things equal, individuals with relatively large values of ϵ_i will be more likely to exit from the survey while those with smaller values remain and are less apt to leave the survey in future waves. This lower probability of attrition in the sample can be mistaken for positive duration dependence (see Heckman (1981) for a general discussion of individual heterogeneity and duration dependence). In this study, the first period values of the time-varying variables are included in the attrition equation as a means of controlling for ϵ_i so that a test of duration dependence can be undertaken.

3. A comparison of the designs of the PSID and SIPP

The data sets used in this study are Waves I-XXI (1968-1988) of the PSID and the 1984 and 1990 panels of the SIPP (hereafter SIPP84 and SIPP90). 4,802 families were first interviewed for the PSID in 1968 and were re-interviewed on an annual basis. This includes 1,872 low-income families from the Survey of Economic Opportunity (SEO). The remaining 2,930 families were drawn from the Survey Research Center (SRC) master sampling frame and were representative of the U.S. population in 1968.

The design of the SIPP is different than that of the PSID in a number of ways. First, interviews are conducted three times a year and information for each of the four months prior to the interview is recorded. Second, only eight interviews are conducted so the length of the panel for a given individual is

thirty-two months (data from a ninth interview for half of the sample from the 1984 panel is not used so that the results for the 1984 and 1990 panels will be more compatible). New panels are started each year resulting in a series of overlapping panels. This allows for a comparison of results across panels. Third, the sample size for the SIPP is much larger. The 1984 panel of the SIPP began with 19,878 families though this number was randomly reduced by 3,400 in wave 5 for budgetary reasons. The 1990 panel began with 21,900 families. This includes some carryovers from the 1989 panel that are not included in the sample used in this analysis.

A fourth difference between the surveys is that respondents in the SIPP are not paid for their participation while those in the PSID were paid ten dollars starting with the second interview and also received five dollars for mailing in their address verification form each year. This may have caused the attrition rates in the PSID to be lower than if the respondents received no compensation.

Hill (1992) lists eight strategies that are pursued to lower attrition rates in the PSID. Besides the payment strategy, the other one that is not followed for the SIPP is the use of certified mail as a means for obtaining forwarding addresses. This strategy is not used because of the shorter time between waves in the SIPP.

Given these important differences between the PSID and the SIPP, a comparison of the results should provide useful information about the relationship between attrition and the frequency of interviews and the duration of surveys.

Attrition rates are given in Table 1. Individuals are included if they were interviewed (self or proxy) in the first wave of the survey. Attrition is considered to be an absorbing state for this analysis, thus the small number of respondents who come back to the survey after exiting are not added to the

sample upon their return.

Table 1 here

The attrition rate was 11.9% in the first wave of the PSID and only 48.8% of the original 18,192 individuals were present (self or proxy) for all twenty-one waves. The attrition rate dropped to 3.3% in the second wave and it was always less than or equal to 2.6% after that. There is somewhat of a trend in the unconditional attrition rate (the percent of attritors with respect to the number in sample in wave 1) but this is because the sample shrinks over time so the number of potential attritors also falls. There is no indication of a trend in the conditional attrition rate (the percent of attritors with respect to the number in sample in the same wave).

5.9% of individuals left SIPP84 in the first wave and there was a general decline in both the unconditional and conditional annual exit rate. 71.4% of the 43,781 initial respondents were present (self or proxy) for all eight waves. The comparable rates for SIPP90 are 7.6% and 73.4%. Thus while the exit rate for the first wave of SIPP90 was higher than that for SIPP84, it was lower for each subsequent wave of SIPP90 versus SIPP84.

A comparison of the attrition rates for the male heads and the female heads/wives shows that the male heads leave at a higher rate than the female heads/wives. This is particularly true for the PSID. Given this indication that the attrition behavior of these two groups is different, separate attrition equations will be estimated in the next section.

Though the first wave attrition rate was higher for the PSID, the subsequent exit rates were generally greater for the SIPP. By the fourth wave the cumulative attrition rate was actually lower for the PSID than for either SIPP84 or SIPP90. To help explain the differences in the attrition rates it is

Table 1
Number and Percentage of Attritors

WAVE	FULL SAMPLE NUMBER		PERCENT			MALE HEADS NUMBER		PERCENT		FEMALE WIVES/HEADS NUMBER		PERCENT	
	SAMPLE	EXIT	MARG	CUM*	COND	SAMPLE	EXIT	MARG	CUM*	SAMPLE	EXIT	MARG	CUM*
						PSID							
1	18192	2166	11.9	11.9	11.9	2344	343	14.6	14.6	2694	354	13.1	13.1
2	16026	600	3.3	15.2	3.7	2001	67	2.9	17.5	2340	67	2.5	15.6
3	15426	401	2.2	17.4	2.6	1934	64	2.7	20.2	2273	60	2.2	17.9
4	15025	423	2.3	19.7	2.8	1870	61	2.6	22.8	2213	38	1.4	19.3
5	14602	440	2.4	22.2	3.0	1809	62	2.6	25.5	2175	51	1.9	21.2
6	14162	401	2.2	24.4	2.8	1747	71	3.0	28.5	2124	55	2.0	23.2
7	13761	378	2.1	26.4	2.7	1676	54	2.3	30.8	2069	49	1.8	25.0
8	13383	470	2.6	29.0	3.5	1622	60	2.6	33.4	2020	60	2.2	27.2
9	12913	392	2.2	31.2	3.0	1562	48	2.0	35.4	1960	46	1.7	29.0
10	12521	316	1.7	32.9	2.5	1514	50	2.1	37.5	1914	63	2.3	31.3
11	12205	373	2.1	35.0	3.1	1464	44	1.9	39.4	1851	39	1.4	32.7
12	11832	391	2.1	37.1	3.3	1420	34	1.5	40.9	1812	48	1.8	34.5
13	11441	319	1.8	38.9	2.8	1386	45	1.9	42.8	1764	39	1.4	36.0
14	11122	267	1.5	40.3	2.4	1341	38	1.6	44.4	1725	39	1.4	37.4
15	10855	314	1.7	42.1	2.9	1303	43	1.8	46.2	1686	36	1.3	38.8
16	10541	330	1.8	43.9	3.1	1260	50	2.1	48.4	1650	51	1.9	40.6
17	10211	353	1.9	45.8	3.5	1210	55	2.3	50.7	1599	50	1.9	42.5
18	9858	369	2.0	47.8	3.7	1155	43	1.8	52.6	1549	52	1.9	44.4
19	9489	325	1.8	49.6	3.4	1112	43	1.8	54.4	1497	48	1.8	46.2
20	9164	289	1.6	51.2	3.2	1069	45	1.9	56.3	1449	45	1.7	47.9
21	8875			48.8		1024			43.7	1404			52.1
						SIPP84							
1	43781	2572	5.9	5.9	5.9	11115	646	5.8	5.8	14025	738	5.3	5.3
2	41209	2512	5.7	11.6	6.1	10469	628	5.7	11.5	13287	726	5.2	10.4
3	38697	2100	4.8	16.4	5.4	9841	545	4.9	16.4	12561	658	4.7	15.1
4	36597	1761	4.0	20.4	4.8	9296	465	4.2	20.5	11903	519	3.7	18.8
5	34836	1514	3.5	23.9	4.3	8831	374	3.4	23.9	11384	438	3.1	22.0
6	33322	1240	2.8	26.7	3.7	8457	312	2.8	26.7	10946	356	2.5	24.5
7	32082	828	1.9	28.6	2.6	8145	214	1.9	28.6	10590	235	1.7	26.2
8	31254			71.4		7931			71.4	10355			73.8
						SIPP90							
1	47870	3632	7.6	7.6	7.6	12236	866	7.1	7.1	15375	1009	6.6	6.6
2	44238	2294	4.8	12.4	5.2	11370	512	4.2	11.3	14366	600	3.9	10.5
3	41944	1933	4.0	16.4	4.6	10858	486	4.0	15.2	13766	568	3.7	14.2
4	40011	1747	3.6	20.1	4.4	10372	482	3.9	19.2	13198	513	3.3	17.5
5	38264	1423	3.0	23.0	3.7	9890	349	2.9	22.0	12685	367	2.4	19.9
6	36841	980	2.0	25.1	2.7	9541	250	2.0	24.1	12318	279	1.8	21.7
7	35861	710	1.5	26.6	2.0	9291	195	1.6	25.7	12039	220	1.4	23.1
8	35151			73.4		9096			74.3	11819			76.9

* - last entry in this row is the percent remaining in sample for each data set.

useful to look at the reasons for exiting the two surveys given in Table 2.

Table 2 here

In the SIPP, every household member is interviewed and is asked the same set of questions, while in the PSID, only one family member is interviewed and the main set of questions is asked only about the head. A much smaller set of questions is asked about the other household members and the answers are given by the same individual who answers the questions about the head. Thus, it is possible for some household members to be interviewed in the SIPP but for others to refuse to answer the survey questions or to be absent for the interview but in the PSID, since only one individual is interviewed, there are only household refusals or absences. The percent of individuals who leave because of personal refusal or absence is 11.4 in SIPP84 and 17.0 in SIPP90 for the full samples. This is one explanation for the higher attrition rates in the SIPP.

Another striking difference between the surveys is the percent of exits attributable to death. The much higher rate in the PSID is due to two factors. First, because of the differences in interview frequency, the death rates are annual in the PSID versus every four months in the SIPP. Second, the PSID has been going on for twenty years, so the probability of death increases as the sample ages over time. Note that the conditional exit rates for the final waves of SIPP84 and SIPP90 are actually lower than those for the PSID. This may be due to the higher death rates in the later years of the PSID. It may also be an indication that there is stronger positive duration dependence in the SIPP.

Finally, one might ascribe the lower exit rate in the PSID to the fact that there is more time between interviews in the PSID than in the SIPP to locate individuals who move. For example, an experiment conducted with the National Crime Survey showed a 3% increase in average response rates when the time

Table 2
Reasons for Leaving Survey

Reason	SIPP84 Percent	SIPP84 Percent w/o Death	SIPP90 Percent	SIPP90 Percent w/o Death	PSID Percent	PSID Percent w/o Death
			Full Sample			
Death	5.0		4.5		18.8	
Household						
Refusal	46.3	48.7	35.7	37.4	42.5	52.3
Absent	10.1	10.6	9.1	9.6	5.4	6.6
Person						
Refusal	6.0	6.3	6.9	7.2		
Absent	5.4	5.7	10.1	10.6		
Move	18.9	19.9	24.7	25.9	26.8	32.9
Institution	3.8	4.0	4.0	4.2	1.4	1.7
Other	4.6	4.8	4.8	5.0	5.3	6.5
			Male Heads			
Death	8.6		8.3		43.0	
Household						
Refusal	45.5	49.9	36.9	40.2	38.2	66.9
Absent	11.2	12.3	10.7	11.6	3.9	6.9
Person						
Refusal	6.6	7.3	7.0	7.6		
Absent	5.1	5.6	8.9	9.7		
Move	16.1	17.6	20.5	22.4	10.8	19.0
Institution	3.4	3.8	4.5	4.9	1.8	3.2
Other	3.4	3.7	3.4	3.7	2.3	4.0
			Female Heads/Wives			
Death	6.4		6.1		30.2	
Household						
Refusal	51.1	54.6	42.5	45.3	50.4	72.1
Absent	11.2	12.0	10.0	10.7	3.7	5.3
Person						
Refusal	5.8	6.2	6.4	6.9		
Absent	3.8	4.1	7.4	7.9		
Move	13.8	14.8	18.6	19.9	10.0	14.3
Institution	3.4	3.6	4.6	4.8	3.4	4.9
Other	4.4	4.6	4.4	4.6	2.3	3.3

between interviews was doubled from two to four months (Sebold 1988). But there is also more time between interviews for PSID sample members to move. The results for male heads and female heads/wives indicate that the percent of exits due to moves is comparable across surveys once the percent due to death is excluded (one reason the percent of exits due to moving is much higher in the full sample for the PSID is because children under eighteen are not followed if they move into a household without an original sample member). Another possible advantage of having a longer period between interviews is that this gives more time to obtain an interview if the first attempt is unsuccessful. This can occur if household members are absent or the respondent postpones the interview to a later date. The results in Table 2 support this theory since the percent of exits due to household absence is higher for the SIPP than for the PSID.

4. Estimation of the attrition equation

The analysis will be conducted for male heads of households and for females who were either married or a head of household at the initial interview. Individuals are included if they were interviewed (self or proxy) in the first wave, if they did not die during the survey, and if there were no missing values for the variables used in this analysis. Only the SRC sub-sample of the PSID is used so that the initial sample of respondents in representative of the U.S. population.

Variable definitions are given in Table 3. Generally, the demographic and location variables are comparable across samples. Other variables included are measures of home-ownership, mobility, and characteristics of the interviewer and the interview process.

Table 3 here

Table 3
Definitions of Sample Variables

Variable	Definition
HHINC	Total household income in thousands of dollars divided by the Consumer Price Index.
NKIDLT6	Number of child less than six years old living at home.
NKID6T17	Number of child between six and seventeen years old living at home.
AGE	Age in years.
HS	1 if high school degree only, 0 otherwise.
COL	1 if college degree, 0 otherwise.
NORTHC	1 if living in the North-Central region, 0 otherwise.
SOUTH	1 if living in the South, 0 otherwise.
WEST	1 if living in the West, 0 otherwise.
MSA	1 if living in Metropolitan Statistical Area (MSA) or Primary MSA, 0 otherwise.
URBAN1*	1 if living in an urban area, 0 otherwise, for years 1968-1982.
URBAN2	1 if living in an urban area, 0 otherwise, for years 1983-1986.
MAR	1 if married and spouse present, 0 otherwise.
BLACK	1 if race listed as black, 0 otherwise.
OTHNW	1 if race listed as other nonwhite, 0 if race listed as black or white.
NFAM	Number of family members.
EXFAM	1 if family members include others than husband, wife, or children, 0 otherwise.
SCHOOL	1 if in school, 0 otherwise.
OWN	1 if home is owned by household member, 0 otherwise.
MOVE	1 if moved between waves, 0 otherwise.
PMOVE	1 if might move in next couple of years, 0 otherwise.
PROXY	1 if interview given to proxy, 0 otherwise.
ILENGTH	Length of interview in minutes.
ILENG712	Length of 1968 interview in minutes for years prior to 1972 and length of 1972 interview in minutes for after (and including) 1972.
CLENGTH	Length of time interviewer spent editing forms, in minutes.
INTCH	1 if there was a change in the interviewer where the new interviewer is another field interviewer and not a field rep.
NCALLS	Number of contacts made by the interviewer.
PHONE	1 if interview was conducted by phone, 0 otherwise.
PHONE7	1 in Wave 8 of SIPP90 if interview was conducted in person for the first six waves and by phone in the seventh, 0 otherwise.
PHONE73	Same as PHONE for individuals in PSID for whom interviews were conducted in person for 1968-72 and by phone in 1973, 0 otherwise.
NIMP	The number of imputations made to asset variables is SIPP.
NIMPMI	The number of minor imputations made to selected variables.
NIMPMA	The number of major imputations made to selected variables.

* - There are two urban variables because the source of the information for whether a respondent lived in an urban area changed in 1983.

Means for the first wave values of the demographic and location variables for male heads are given for attritors and non-attritors in Table 4. While there was some indication in the previous section that the attrition behavior of female heads and wives is different, the results for the means by attrition status for female heads and wives are similar so they are not presented. Individuals who exit are more likely to live in urban areas, live in the South, be nonwhite, be not married, and not own homes than those who remain. Note that individuals who leave are more likely to be younger in the SIPP and older in the PSID. One explanation for this difference is that, even though those who died are not included, there are other reasons for leaving that are age related such as becoming too ill to participate and entering a health care facility. Also note that attritors have significantly lower household incomes than non-attritors in the two PSID samples but income is not a significant factor in any of the SIPP samples.

Table 4 here

While the comparison of means reveals many significant differences between attritors and non-attritors, it is useful to obtain partial correlations and their significance levels since the demographic and location variables are likely to be correlated. An equation is estimated using probit where the dependent variable indicates whether the individual ever leaves (atr=1) or remains in sample (atr=0). Wave 1 values for the regressors are used. The results are given in Table 5. The coefficients are transformed to measure changes in the probability of attrition by multiplying by the probability density function evaluated at the sample means. These results are similar to the simple comparison of means though the race variables are no longer significant in the PSID and marital status does not significantly affect

Table 4
Wave 1 Variable Means for Attritors and Non-attritors
(standard deviations for means in parentheses)

Variable	SIPP84 NAT	SIPP84 AT	SIPP90 NAT	SIPP90 AT	PSID NAT	PSID AT
			Men			
AGE	46.194	44.002**	47.016	44.702**	35.721	42.339**
	(0.238)	(0.394)	(0.228)	(0.416)	(0.531)	(0.711)
HS	0.517	0.530	0.534	0.559	0.540	0.402**
	(0.007)	(0.012)	(0.007)	(0.013)	(0.028)	(0.022)
COL	0.224	0.219	0.277	0.206**	0.203	0.108**
	(0.006)	(0.010)	(0.006)	(0.010)	(0.023)	(0.014)
NKIDLT6	0.273	0.240	0.272	0.242	0.933	0.816
	(0.009)	(0.014)	(0.009)	(0.015)	(0.051)	(0.025)
NKID6T17	0.568	0.466**	0.519	0.435**	1.517	1.128**
	(0.014)	(0.022)	(0.013)	(0.021)	(0.085)	(0.071)
NFAM	2.992	2.764**	2.901	2.717**	4.448	3.630**
	(0.022)	(0.037)	(0.021)	(0.039)	(0.101)	(0.092)
EXFAM	0.101	0.132**	0.107	0.191**	0.089	0.112
	(0.004)	(0.008)	(0.004)	(0.010)	(0.016)	(0.014)
MAR	0.831	0.744**	0.810	0.696**	0.975	0.884**
	(0.006)	(0.011)	(0.006)	(0.012)	(0.009)	(0.015)
WIDOW	0.024	0.020	0.029	0.027	0.000	0.023**
	(0.002)	(0.003)	(0.002)	(0.004)	(0.000)	(0.007)
DIVSEP	0.064	0.113**	0.072	0.128**	0.006	0.025*
	(0.004)	(0.008)	(0.004)	(0.009)	(0.004)	(0.007)
BLACK	0.075	0.105**	0.064	0.120**	0.063	0.114*
	(0.004)	(0.007)	(0.004)	(0.008)	(0.014)	(0.014)
OTHNW	0.022	0.035**	0.028	0.039*	0.013	0.054**
	(0.002)	(0.004)	(0.002)	(0.005)	(0.006)	(0.010)
SCHOOL	0.056	0.062	0.015	0.031**	0.029	0.023
	(0.003)	(0.006)	(0.002)	(0.005)	(0.009)	(0.007)
HHINC	9.245	8.863	12.953	11.658*	10.328	8.837**
	(0.263)	(0.308)	(0.205)	(0.472)	(0.275)	(0.333)
MSA/URBAN	0.709	0.788**	0.788	0.832**	0.644	0.705
	(0.007)	(0.010)	(0.006)	(0.010)	(0.027)	(0.021)
NORTHC	0.275	0.185**	0.272	0.175**	0.314	0.254
	(0.007)	(0.009)	(0.006)	(0.010)	(0.027)	(0.020)
SOUTH	0.305	0.364**	0.299	0.387**	0.292	0.320
	(0.007)	(0.012)	(0.007)	(0.013)	(0.026)	(0.021)
WEST	0.152	0.201**	0.194	0.237**	0.165	0.163
	(0.005)	(0.010)	(0.006)	(0.011)	(0.021)	(0.017)
OWN	0.726	0.601**	0.773	0.609**	0.711	0.556**
	(0.007)	(0.012)	(0.006)	(0.013)	(0.026)	(0.023)
number	4561	1677	4748	1495	315	484
percent	0.731	0.269	0.761	0.239	0.394	0.606

*,** - The difference between the means for attritors and nonattritiors

attrition in the SIPP samples.

Table 5 here

Next, the attrition equation (1) is estimated using probit. This amounts to maximizing the log-likelihood function

$$\text{LogL} = \sum \log(\phi[(1-2a_{it})\cdot(Z_{it}\alpha_1+D_{it}\alpha_2+Z_{i1}\alpha_3)]) \qquad (2)$$

where ϕ is the standard normal cumulative distribution function. The results are given in Table 6 (again, the coefficients are transformed to measure changes in the probability of attrition by multiplying by the probability density function evaluated at the sample means). This will provide information about the effect of the interviewer and the interview process on attrition. Note that the wave 1 values of the time-varying variables, Z_{i1}, are included in equation (2) (but not listed in Table 6). This allows for a test of duration dependence and also means that the coefficients for the time-varying variables measure how changes in these variables affect attrition, holding the wave 1 values constant. This goes beyond the previous regression since it explains more than which variables are correlated with attrition. For example, the results in Table 5 indicate that household income in 1967 is negatively correlated with attrition in the PSID but the coefficients for household income are insignificant in Table 6. Thus, while individuals who remained were likely to have higher household incomes in 1967 than those who left, changes in household income do not seem to impact attrition.

Table 6 here

The coefficient estimates and their corresponding t-statistics are very similar for SIPP84 and SIPP90 for both men and women. The differences between the PSID and SIPP samples apply less to the parameter estimates than to the

Table 5
Estimates for the Ever Exited Equation
(absolute value of t-statistic in parentheses)

Variable	Men			Women		
	SIPP84	SIPP90	PSID	SIPP84	SIPP90	PSID
AGE	-0.0012	-0.0009	0.0077	-0.0010	-0.0005	0.0114
	(2.59)	(1.90)	(4.59)	(2.21)	(1.09)	(6.77)
HS	-0.0021	-0.0281	-0.0795	-0.0025	-0.0309	-0.0336
	(0.14)	(1.90)	(1.76)	(0.18)	(2.09)	(0.79)
COL	-0.0126	-0.0872	-0.0611	-0.0410	-0.0447	-0.0974
	(0.71)	(4.85)	(0.97)	(2.08)	(2.31)	(1.26)
NKIDLT6	-0.0256	-0.0239	-0.0315	-0.0361	-0.0186	0.0726
	(2.01)	(1.86)	(0.72)	(2.78)	(1.46)	(1.72)
NKID6T17	-0.0229	-0.0211	0.0209	-0.0170	-0.0203	0.0681
	(2.17)	(1.95)	(0.49)	(1.67)	(1.92)	(1.62)
NFAM	0.0043	0.0103	-0.0298	0.0107	0.0176	-0.0977
	(0.53)	(1.20)	(0.88)	(1.33)	(2.12)	(2.88)
EXFAM	0.0097	0.0600	-0.1516	-0.0123	-0.0090	-0.0446
	(0.49)	(3.27)	(2.00)	(0.59)	(0.45)	(0.65)
MAR	-0.0348	-0.0388	-0.2532	-0.0170	-0.0384	0.1129
	(1.41)	(1.61)	(2.23)	(0.63)	(1.57)	(1.06)
WIDOW	-0.0408	-0.0172		-0.0059	-0.0286	-0.1582
	(0.93)	(0.43)		(0.19)	(1.01)	(1.24)
DIVSEP	0.0541	0.0444	-0.1387	0.0303	0.0019	0.0311
	(2.06)	(1.83)	(0.87)	(1.10)	(0.08)	(0.27)
BLACK	0.0419	0.0821	0.0244	0.0562	0.0591	0.0034
	(2.09)	(4.10)	(0.34)	(2.86)	(3.31)	(0.51)
OTHNW	0.0594	0.0413	0.2299	0.0880	0.0427	0.0014
	(1.72)	(1.32)	(2.17)	(2.19)	(1.33)	(1.39)
SCHOOL	-0.0025	0.0079	-0.0235	-0.0003	-0.0020	
	(1.02)	(2.12)	(1.98)	(0.14)	(0.50)	
HHINC	0.0001	0.0003	-0.0037	0.0001	0.0007	-0.3514
	(0.19)	(0.81)	(4.66)	(0.17)	(1.78)	(4.62)
MSA/URBAN	0.0729	0.0335	0.1610	0.0471	0.0132	0.0764
	(5.42)	(2.29)	(3.91)	(3.52)	(0.84)	(1.91)
NORTHC	-0.0609	-0.0442	-0.0099	-0.0439	-0.0505	-0.0953
	(3.81)	(2.68)	(0.19)	(2.68)	(3.23)	(1.83)
SOUTH	0.0359	0.0716	0.0007	0.0478	0.0537	-0.0526
	(2.44)	(4.75)	(0.01)	(3.18)	(3.63)	(0.92)
WEST	0.0321	0.0496	-0.0465	0.0348	0.0203	-0.0778
	(1.84)	(2.99)	(0.78)	(2.04)	(1.20)	(1.37)
OWN	-0.0677	-0.0997	-0.1163	-0.0427	-0.1036	-0.0964
	(5.00)	(7.47)	(2.55)	(3.19)	(7.90)	(2.21)

Table 6
Estimates for Attrition Equation
(absolute value of t-statistics in parentheses)

	Men			Women		
Variable	**SIPP84**	**SIPP90**	**PSID**	**SIPP84**	**SIPP90**	**PSID**
AGE	-0.0003	-0.0002	0.0012	-0.0003	-0.0001	0.0015
	(3.59)	(3.25)	(7.31)	(3.26)	(1.61)	(1.82)
HS	0.0129	0.0065	0.0007	-0.0064	-0.0006	-0.0091
	(1.58)	(0.69)	(0.07)	(0.81)	(0.07)	(0.80)
COL	0.0141	-0.0104	-0.0021	-0.0296	-0.0307	-0.0111
	(1.07)	(0.64)	(0.13)	(2.16)	(2.22)	(0.62)
NKIDLT6	-0.0140	-0.0039	-0.0021	-0.0085	-0.0048	-0.0044
	(3.15)	(1.90)	(0.62)	(1.92)	(1.27)	(1.07)
NKID6T17	-0.0009	-0.0050	0.0030	-0.0017	0.0002	-0.0015
	(0.24)	(2.95)	(0.95)	(0.50)	(0.07)	(0.47)
NFAM	0.0029	-0.0012	-0.0027	-0.0003	0.0035	-0.0003
	(1.30)	(0.53)	(0.89)	(0.13)	(1.70)	(0.11)
EXFAM	0.0131	0.0064	-0.0022	0.0049	-0.0027	-0.0018
	(2.51)	(1.31)	(0.32)	(0.95)	(0.53)	(0.30)
MAR	-0.0158	-0.0006	-0.0559	-0.0541	-0.0091	-0.0409
	(1.09)	(0.06)	(2.84)	(1.84)	(0.55)	(2.42)
WIDOW	-0.0117		-0.0923	-0.0595	0.0111	-0.0525
	(0.53)		(2.91)	(1.85)	(0.62)	(3.03)
DIVSEP	-0.0031	-0.0013	-0.0462	-0.0463	-0.0015	-0.0408
	(0.19)	(0.11)	(2.31)	(1.53)	(0.62)	(2.55)
BLACK	0.0064	0.0128	0.0007	0.0100	0.0077	0.0071
	(1.84)	(4.15)	(0.12)	(3.10)	(0.08)	(1.33)
OTHNW	0.0094	0.0076	0.0200	0.0121	0.0046	0.0209
	(1.61)	(1.55)	(2.34)	(1.84)	(2.77)	(2.52)
SCHOOL	-0.0020	-0.0094	-0.0045	0.0018	-0.0045	
	(0.36)	(1.11)	(1.01)	(0.35)	(0.53)	
HHINC	0.0000	-0.0004	0.0002	0.0001	-0.0003	-0.0001
	(0.15)	(2.27)	(0.29)	(0.42)	(1.97)	(0.28)
$HHINC^2$	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001
	(0.07)	(2.78)	(1.52)	(0.39)	(1.65)	(1.26)
MSA/URBAN1	0.0143	0.0073	0.0059	0.0125	0.0071	-0.0027
	(1.49)	(0.72)	(1.55)	(1.39)	(0.56)	(0.78)
URBAN2			0.0119			0.0116
			(1.32)			(1.37)

Table 6 - continued

Variable	Men			Women		
	SIPP84	SIPP90	PSID	SIPP84	SIPP90	PSID
NORTHC	0.0372	-0.0264	0.0082	-0.0175	-0.0383	-0.0077
	(1.88)	(1.19)	(0.69)	(0.86)	(1.96)	(0.67)
SOUTH	0.0521	-0.0090	-0.0045	0.0036	-0.0184	-0.0078
	(3.53)	(0.50)	(1.01)	(0.22)	(0.91)	(1.82)
WEST	0.0166	-0.0152	-0.0093	-0.0085	-0.0227	-0.0079
	(1.04)	(0.66)	(1.89)	(0.41)	(0.98)	(1.74)
OWN	-0.0152	-0.0176	-0.0045	-0.0080	-0.0088	-0.0078
	(3.14)	(3.90)	(1.01)	(1.68)	(1.80)	(1.82)
MOVE/PMOVE	0.0126	0.0157	-0.0093	0.0136	0.0062	-0.0079
	(2.83)	(3.57)	(1.89)	(3.05)	(1.35)	(1.74)
SAMEST68			-0.0098			
			(2.87)			
ILENGTH	-0.0002	-0.0003	-0.0004	0.0000	-0.0006	-0.0003
	(1.61)	(2.02)	(2.83)	(0.05)	(4.69)	(2.45)
ILENG6872			0.0005			0.0005
			(3.02)			(3.15)
PROXY	0.0096	0.0022		0.0167	0.0010	
	(1.90)	(0.43)		(2.86)	(0.16)	
LENGPR	-0.0002	-0.0001		-0.0001	0.0004	
	(1.14)	(0.37)		(0.40)	(1.55)	
CLENGTH	0.0002	0.0005		0.0004	0.0008	
	(0.78)	(3.20)		(2.41)	(4.86)	
INTCH	0.0092	0.0030		0.0137	0.0092	
	(3.70)	(1.10)		(5.99)	(3.60)	
PHONE	0.0239	0.0123		0.0215	0.0144	
	(6.44)	(4.34)		(5.95)	(5.18)	
PHONE7/PHONE73		0.0017	0.0233		-0.0054	0.0099
		(0.25)	(1.99)		(0.76)	(0.71)
NIMP/NIMPMI*	0.0132	0.0112	0.0043	0.0162	0.0094	0.0034
	(6.57)	(6.65)	(3.39)	(8.29)	(5.24)	(2.67)
NIMPMA*			0.0046			0.0028
			(3.98)			(2.38)
NCALL			0.0050			0.0043
			(5.69)			(5.27)

Table 6 - continued

Variable	Men SIPP84	Men SIPP90	Men PSID	Women SIPP84	Women SIPP90	Women PSID
T1			0.0248			-0.0034
			(1.52)			(0.16)
T2	-0.1131	-0.0875	-0.0332	-0.1214	-0.0880	-0.0607
	(15.8)	(14.4)	(1.97)	(17.1)	(13.0)	(2.77)
T3	-0.1181	-0.1064	-0.0418	-0.1254	-0.1052	-0.0677
	(16.8)	(16.6)	(2.44)	(17.8)	(15.0)	(3.05)
T4	-0.1229	-0.1097	-0.0581	-0.1293	-0.1053	-0.0889
	(17.0)	(17.3)	(3.26)	(17.7)	(15.0)	(3.86)
T5	-0.1286	-0.1083	-0.0582	-0.1308	-0.1118	-0.0771
	(17.6)	(16.9)	(3.27)	(18.0)	(15.8)	(3.28)
T6	-0.1368	-0.1174	-0.0453	-0.1360	-0.1212	-0.0790
	(18.7)	(18.1)	(2.62)	(18.5)	(16.8)	(3.38)
T7	-0.1414	-0.1271	-0.0819	-0.1431	-0.1312	-0.1047
	(19.0)	(19.3)	(4.17)	(19.2)	(17.5)	(4.28)
T8	-0.1570	-0.1398	-0.0626	-0.1566	-0.1386	-0.0850
	(20.4)	(17.8)	(3.44)	(20.3)	(17.0)	(3.60)
T9			-0.0634			-0.0990
			(3.43)			(4.14)
T10			-0.0582			-0.0777
			(3.28)			(3.31)
T11			-0.0628			-0.0878
			(3.40)			(3.71)
T12			-0.0815			-0.1109
			(4.09)			(4.40)
T13			-0.0702			-0.0894
			(3.81)			(3.76)
T14			-0.0903			-0.1020
			(4.14)			(4.29)
T15			-0.0744			-0.1100
			(3.89)			(4.44)
T16			-0.0824			-0.1169
			(4.19)			(4.77)
T17			-0.0687			-0.1078
			(3.48)			(4.24)
T18			-0.0999			-0.1196
			(4.77)			(4.74)
T19			-0.0804			-0.1183
			(3.96)			(4.72)
T20			-0.0837			-0.1225
			(4.10)			(4.80)
sample size	37,350	37,791	8,129	36,695	35,448	9,436
% atr=1	0.955	0.960	0.940	0.959	0.962	0.945
% atr=0	0.045	0.040	0.060	0.041	0.038	0.055

* - In the attrition regression for the PSID samples, the imputation variables are standardized to have a mean of zero and standard deviation of one. This is done because the number of variables for which imputations were possible changed from year to year.

significance levels and these are largely due to the smaller sample size for the PSID. The results for the PSID are comparable to those in Becketti et al. (1988) who estimate a hazard function for attrition using the first fourteen waves of the PSID.

Formal tests for the differences in the attrition behavior across samples can be carried out using the t-test to compare individual parameters and the likelihood ratio (LR) test to compare all parameters simultaneously. The comparison of individual parameters across surveys and across gender results in very few significant differences. On the other hand, the test that the coefficients are equivalent in the attrition equation for males and females is rejected at the 1% significance level for SIPP84 and SIPP90 but not for the PSID. The equality of all the coefficients for SIPP84 and SIPP90 is also rejected for both men and women. Thus, the results for the attrition equation (1) are provided for all six samples.

In contrast to the comparison of means by attrition status, the results in Table 6 indicate that changes in the demographic and location variables do not generally have a significant impact on attrition. Age has a negative effect on attrition in the SIPP and a positive effect in the PSID. Getting a college degree has a negative effect on attrition for women but not for men. The effect of an additional child is generally negative but not significant. The effect of a change in marital status is negative but is only significant for the PSID. Nonwhites are more likely to leave the survey than whites. A change in the level of household income does not seem to influence attrition. A squared term is included to capture nonlinear effects but it is generally not significant. Finally, a change in region or urban residence does not appear to have much of an impact on attrition.

Home-ownership is a significant (negative) indicator of attrition in all the samples but SIPP84 for women. Movers are more likely to attrit in both the SIPP samples for men and in SIPP84 for women.

While attention has been paid to the effect of the interviewer and interview process on response accuracy in the survey methodology literature (Groves and Kahn 1979, Groves 1989, Kasprzyk, Duncan, Kalton, and Singh 1989), there is little discussion of the effect on attrition. Couper and Groves (1992) find evidence that interviewer experience is a significant positive indicator of initial response rates but they do not consider the effect on attrition rates. Lavrakas, Settersten, and Maier (1991) find that whether or not respondent names are elicited in the first wave had little effect on attrition rates in the second wave in two telephone surveys.

Respondents who completed the 1985 panel of the SIPP were asked to give the main reason why they continued to participate in the survey (Meier 1988). The most often cited reason was that they liked the interviewer. Thus, variables are included that attempt to measure the relationship between the interviewer or the interview process and attrition; including the length of the interview, the number of contacts between the respondent and the interviewer, whether there was a change in the interviewer, the number of adjustments (imputations) that were made to certain variables, the length of time the interviewer spent editing the response forms, and whether the interview was conducted by phone or in person. These variables are expected to be positively correlated with attrition.

A number of these variables have significant impacts on attrition. For all six samples, the number of imputations has a positive effect on attrition. The number of contacts for the PSID samples and the length of time the SIPP interviewers spent editing forms has a strong positive effect on attrition. These are signs of respondents who may spend less time preparing for the

interviews and who are less interested in the surveys.

Surprisingly, interview length has a negative effect on attrition. This may arise because interviewers spend more time with respondents who enjoy the survey or the interviewer's company more and hence are less likely to attrit. In the PSID, there was an explicit attempt to reduce the length of the interview in 1973 (Hill (1992), though for some unknown reason the reduction in length began in 1972). This allows for a test of whether an exogenous change in interview length affects attrition. A variable is included that equals the 1968 interview length for waves prior to 1972 and the 1972 interview length for all waves after, and including, 1972. The 1968, rather than 1971, interview length was used because not all individuals were present in 1971. The estimated coefficients are positive and significant at the 1% level for both samples of men and women. This indicates that the reduction in interview length in 1972 had a negative affect on attrition.

Since some interviews are given to a proxy, the binary variable PROXY is included to determine if this affected the probability of attrition for SIPP84 and SIPP90. PROXY is also interacted with interview length since the length should not matter if the individual is not present. PROXY is significant only for the sample of women in SIPP84. Thus whether the interview was given to the individual or to a proxy does not seem to have much of an impact on attrition.

One very important positive indicator of attrition in the SIPP is a change in interviewer. But since the interview change might arise because there was a problem with the interview, the causality of the relationship between interview change and attrition is not clear. To minimize the probability that the change in interviewer was due to a problem interview, INTCH only includes cases where there was a change to another field interviewer and not to a supervisor since the latter is often called in when a problem arises. The estimated coefficients

for this variable are positive and significant for all but the sample of men from SIPP90. This result supports the hypothesis that the interviewer builds up a positive rapport with the respondent. A new interviewer will not have established this rapport and hence the possibility of attrition is greater. Interestingly the effect of a change in interviewer is larger and more significant for women than for men. It might be that the interviewers, who are mostly female, are better able to establish a rapport with women than with men.

Variables relating to telephone interviews are included to test whether the mode of interview affects attrition. It is hypothesized that the rapport between the interviewer and the respondent is stronger when interviews are conducted in person rather than by telephone. For the SIPP samples, the variable PHONE indicates whether an interview was conducted by phone for individuals who chose this mode of interview starting with the second wave. Rather than provide evidence that phone interviews are more likely to lead to attrition, the significantly positive estimates indicate that the type of person who chooses to be interviewed by phone is more likely to attrit. This may be a signal of individuals who are less interested in the survey and hence are more likely to leave before it ends.

One case where the change to phone interview was close to being random was the seventh wave of the 1990 panel (the interviewers had some discretion over whether or not the interview was conducted by phone and not all respondents had phones). Over half the sample that received personal interviews for the first six waves were contacted by phone in the seventh wave. The variable PHONE7 is a dummy variable that has a value of one in the final wave for individuals whose first six interviews were conducted in person and for whom the seventh was a phone interview. The estimated coefficients are not significant for either sample and the sign is actually negative for women. This limited evidence

indicates that the mode of interview does not affect attrition (for individuals whose first six interviews were in person) for this survey.

Almost all interviews were conducted in person for the first five waves of the PSID but starting with the sixth wave the vast majority of interviews were conducted by telephone. The dummy variable PHONE73 indicates whether an interview was conducted by phone for individuals who had personal interviews for the first five waves but who had a phone interview in the sixth wave. The estimated coefficient for this variable is positive for both samples and is significant for the sample of men. This provides some evidence that phone interviews result in higher attrition rates.

Wave dummies are included to account for possible duration dependence and they are highly significant in all six samples (using the LR test). There is strong evidence of positive duration dependence in the SIPP as indicated by the monotonically decreasing coefficient estimates. The decrease in the probability of attrition between the first and last waves is estimated to be 4.4% and 3.5% for the samples of men and women in SIPP84 and 5.2% and 4.9% for the samples of men and women in SIPP90. The larger decrease for SIPP90 is consistent with the differential attrition rates in Table 1. The PSID exhibits less evidence of positive duration dependence. The relatively large coefficient estimate for the first year is consistent with the high exit rate in the first wave of the survey, but there is not a consistent pattern of declining coefficients for the later waves. This result is in agreement with Becketti et al. (1988) who find no evidence of duration dependence using a Weibull hazard specification.

As a test for linear duration dependence, a linear trend variable, TREND, is included instead of the wave dummies. TREND is negative and significant for all three samples. The restrictions that are imposed on the coefficients for the wave dummies to obtain TREND are not rejected at the 1% level for either

sample for SIPP84 or the sample of women for SIPP90 but they are significantly rejected for the sample of men for SIPP90 and for both samples for the PSID. This result provides support for the hypothesis of positive duration dependence in SIPP84 and SIPP90.

The positive duration dependence in the SIPP may be due to the shorter length of the panel and to the known ending date (individuals may be more likely to continue if they know the end is near). It may also be due to the greater use of personal interviews in the SIPP though the evidence on differential attrition rates for personal versus phone interviews is not strong.

5. Conclusion

In this paper, attrition models were estimated using samples of adult men and women from the PSID and the 1984 and 1990 panels of the SIPP. While changes in demographic and location variables do not appear to have much of an impact on attrition, a number of variables that relate to the interviewer and the interview process are significant. These include the length of the interview, the length of time spent by the interviewer editing forms, whether there was a change in the interviewer, the number of imputations made to variables in the surveys, and the number of contacts made by the interviewer. The evidence suggests that keeping the same interviewer across waves and reducing the interview length should help to lower attrition rates.

Generally, the attrition results are similar for SIPP84 and SIPP90. The discrepancies between the coefficient estimates for the PSID and SIPP samples tend to be smaller than the differences in the significance levels which are due to the larger sample sizes of SIPP84 and SIPP90. While women tend to exit the surveys at lower rates than men, the results from the attrition equations are quite comparable across the sexes.

One important difference between the SIPP and PSID is the strong evidence of positive duration dependence in the SIPP and the weaker evidence of duration dependence in the PSID. This may be due to the shorter length of the SIPP and to the fact that the ending date of survey is known by the respondent.

Also, while the PSID suffers from a high exit rate in the first wave, the subsequent attrition rates are generally less than those for the SIPP. This may be due to the longer time period that is available to make contact with respondents when the first attempt at an interview is unsuccessful. The lower attrition rate in the PSID may also result from the fact that, in the SIPP, individual members of interviewed households can refuse to answer the survey or be absent while this is not possible in the PSID since only one person answers questions for all family members.

The results from this analysis show that attrition is a complex process that is influenced by many aspects of the interview procedure. Incorporating these aspects into the weighting scheme that accounts for non-random attrition should lead to more accurate estimates of population parameters.

These results from the analysis of the PSID and SIPP provide some evidence about the effects of survey duration and frequency on attrition. Surveys of shorter duration are likely to exhibit a higher degree of positive duration dependence which will decrease attrition rates. Also more frequent interviews are likely to lead to higher exit rates since there is less time to obtain interviews when the first attempt is unsuccessful.

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