Attrition in the Swiss Household Panel: Is Change Associated with Drop-out?

Marieke Voorpostel[1] and Oliver Lipps[2]

This study examines the importance of change in characteristics and circumstances of households and household members for contact and cooperation patterns. The literature suggests that there might be an underrepresentation of change in panel studies, because respondents facing more changes would be more likely to drop out. We approach this problem by analysing whether previous changes are predictive of later attrition or temporary drop-out, using eleven waves of the Swiss Household Panel (1999–2009). Our analyses support previous findings to some extent. Changes in household composition, employment status and social involvement as well as moving are associated mainly with attrition and less with temporary drop-out. These changes affect obtaining cooperation rather than obtaining contact, and tend to increase attrition.

Key words: Panel studies; nonresponse; response patterns; respondent characteristics.

1. Introduction

Studies of panel attrition have thoroughly examined the relation between characteristics of respondents, like education, marital status, parental status or home ownership, and attrition behaviour. Furthermore, a number of psychological, attitudinal, and behavioral characteristics, such as satisfaction, political interest, and social involvement, are found to be related to survey participation (Stoop 2005). Yet, although one of the main purposes of longitudinal data is to assess change, there is only limited knowledge of the relation between changes in respondents' characteristics and panel attrition.

The scarce research available suggests that changes might be related to an increased likelihood of dropping out of the panel (Fitzgerald et al. 1998; Neukirch 2002, p. 53). The consequence is that the occurrence of change tends to be underestimated and that, without any correction, longitudinal data overstates population stability (Rendtel 2002; Watson and Wooden 2004).

When it comes to comparing survey data to administrative records, only a small number of changes have been investigated so far, for instance income, employment status,

education, marital status and moving (e.g., Neukirch 2002; Rendtel et al. 2004). Yet, changes in household composition, satisfaction, political interest, and social participation are also likely to be related to temporary or permanent drop-out in panel surveys. As a first exploration of the relevance of these factors, we assess the relation between changes reported in panel studies and subsequent temporary or permanent nonresponse. Furthermore, it might not only just be change that is important, also the direction of change may help to explain dropping out.

We aim to gain more insight into the relation between reported changes on the one hand and permanent drop-out (attrition) and temporary drop-out in panel surveys on the other. Three research questions guide this study:

(1)   Are respondents in the Swiss Household Panel (SHP) who report changes more likely to drop out either temporarily or permanently;
(2)   If so, which types of changes are affected (household composition, housing, employment status, social involvement and/or satisfaction), and;
(3)   Does the direction of change matter?

We aim to contribute to knowledge on panel attrition in three ways. First, we specifically zoom in on change and the direction of change over time, rather than adopting the more common static approach of taking characteristics from a single wave. Second, we take a two-step approach in analysing obtaining contact and cooperation separately, which better reflects the actual process of participation taking place in household panel surveys. Third, we look at different response patterns, allowing the inclusion of respondents who respond irregularly, rather than solely focusing on respondents who dropped out permanently.

2.   Background

2.1.   *Change and Participation in Panel Surveys*

Not all change respondents experience is observed in panel surveys, because changes might happen at the same time as – and in fact be related to – nonresponse. Yet, respondents do report changes in surveys – and also for these reported changes, a relation to attrition can be expected.

Attrition is likely to be related to reported changes in characteristics of sample members in several ways. First, changes lead to more difficulty in locating the respondent, which is found for moving, instability in earnings and marital status (Neukirch 2002; Fitzgerald et al. 1998; Uhrig 2008).

Second, changes may also affect the willingness of respondents to participate in the panel. On the one hand, changes in, for example, marital status and income may decrease the willingness to participate, because panel surveys ask probing questions about behaviours that are perceived to belong to the private sphere (Lillard and Panis 1998; Rendtel 2002). On the other hand if people face more changes in their lives, the topics in the questionnaire may have more salience to them (Groves et al. 2004; Groves et al. 2000), resulting in a higher rate of cooperation. Finally, varying responses might simply reflect measurement error: respondents with less interest in the survey and because of that less

willingness to participate might make less effort to meticulously answer the survey questions and hence produce more variation in their responses.

Third, respondents with a higher degree of instability may also consider participating in a survey more costly. As a matter of fact, respondents who report a change in a survey are usually asked several questions about this change, lengthening the questionnaire and increasing the expense of time necessary to complete the survey. In addition, facing major changes in their lives, these people may give lower priority to participation in a survey and estimate that the survey will take more time and cognitive effort as it asks about domains in which they face more changes.

Finally, it may not only be the case that change as such is important, but also that the direction of change matters. Disruption in general, such as separation or a drop in income, may be related to response behaviour (Fitzgerald et al. 1998), whereas this may be less the case for a new partnership or an increase in income. We will now turn to the characteristics that are included in this study, and discuss their relation to response behaviour as well as how changes in these characteristics might affect response.

2.2. Household Composition

Regarding household composition we look at the presence of a partner and of children in the household. The literature generally shows that married people tend to have a lower risk of attrition (Behr et al. 2005; Fitzgerald et al. 1998; Lillard and Panis 1998; Neukirch 2002; Rendtel 2002; van den Berg and Lindeboom 1998; Watson and Wooden 2004, 2009). A change of partner may be seen as belonging to the private sphere, diminishing the likelihood of cooperation. Also, a changing household composition implies people entering or leaving the household, which might be associated with changed influences on the likelihood of obtaining contact and cooperation (Rendtel 2002). A few studies report on changes in marital status in relation to response probability, generally showing that instability in partner status is positively associated to nonresponse, with a most outspoken negative effect of divorce (Fitzgerald et al. 1998; Lillard and Panis 1998; Neukirch 2002; Rendtel 2002).

The literature generally states that having children present in the household is negatively associated with attrition probabilities (Uhrig 2008; Watson and Wooden 2009). No previous studies have looked at the relation between children arriving in or leaving the household and nonresponse in panel surveys. Children arriving may be associated with giving less priority to participating in surveys due to time constraints and a lower level of interest, leading to either temporary nonresponse or dropping out altogether, but also to better contactability. Children leaving the household could potentially have the opposite effect.

2.3. Housing

We focus here on moving house and tenure of the dwelling. There is ample evidence in the literature of the relation between moving house and attrition from panel surveys. Not being able to locate a household that has moved and less time availability on the part of the household are well established reasons for this relationship (Uhrig 2008; Watson and Wooden 2009). Response rates are found to strongly depend on whether

households moved (Behr et al. 2005; Fitzgerald et al. 1998; Neukirch 2002; Rendtel 2002; Watson 2003).

In addition to the increased likelihood of noncontact, another reason is that moving generally coincides with other sorts of changes, such as changes in the family sphere (e.g., marriage or birth) or labour market transitions (Lepkowski and Couper 2002), which may in turn be related to increased likelihood of dropping out, either temporarily or permanently.

Home ownership can be seen as an indicator of community attachment (Lepkowski and Couper 2002) and is negatively associated with survey attrition (McCulloch and Buck 2003; Uhrig 2008; Watson and Wooden 2009). If home owners are more attached to the community and less likely to move, a change from renting to owning might decrease this risk.

2.4.   Employment

It is well established that the unemployed are more likely to drop out of panel surveys than the employed (Uhrig 2008; Watson and Wooden 2009). There is also evidence suggesting a change in this domain is related to attrition. Either becoming unemployed (or becoming an employee) increased attrition rates in the Finnish ECHP (Neukirch 2002), and sample members with less stable employment patterns were more likely to drop out in the National Child Development Study (Hawkes and Plewis 2006). Regarding the direction of change, Rendtel (2002) reports that social events revealing a decline in social prestige such as a job loss may be related to attrition. The group that is not active on the labour market is of a very diverse composition (still in school, housewives, retired, etc.), but changes in and out of these states tend to be major changes in a person's life and as such may lead to an increased likelihood of dropping out either temporarily or permanently. We will investigate the relation between nonresponse and the transitions in and out of paid employment.

2.5.   Social Involvement

In the domain of social involvement we explore the relevance of being active in clubs and political interest. Being active in clubs and being politically interested reflects social involvement, which tends to be positively associated to participating in surveys. Research shows that those engaged in organizational activities or voluntary work are significantly less likely to drop out of panel studies. There is also ample empirical evidence showing that political interest is positively related to responding to surveys (see for instance Lipps 2007; Uhrig 2008).

Changed scores on social participation might reflect less stable attitudes and behaviour in this domain, which leads us to expect a higher likelihood of dropping out. But one could also expect the direction of change to be of importance here: if respondents who are more socially engaged have a higher likelihood of remaining in the panel than those with less social involvement, then an increase in social involvement over time might contribute to a higher likelihood of continuing participation in the panel. However, a strong engagement in social activities might also lead to a higher level of temporary or definitive drop-outs due to increased opportunity costs.

2.6. Satisfaction Variables

The relation between satisfaction scores and panel drop-out has not been widely researched, mostly because most panels do not contain many satisfaction measures. Yet, satisfaction scores may be related to nonresponse, as lower satisfaction with certain domains in life might make respondents less willing to continue participation in a panel study. Second, changes in satisfaction scores might be a proxy for upcoming changes in these domains.

The SHP asks about satisfaction in several domains, and previous research revealed that scoring lower on satisfaction in financial situation and living arrangement is related to higher likelihood of drop-out (Lipps 2007). These measures of satisfaction will be included in this study.

2.7. Other Influences on Attrition

We include several additional known influences on attrition. First, women's response rates tend to exceed those of men (Behr et al. 2005; Hawkes and Plewis 2006; Lipps 2007; Uhrig 2008; Watson and Wooden 2009). Second, studies generally show that survey response rates tend to be relatively low among young people (Lipps 2007; van den Berg and Lindeboom 1998; Watson and Wooden 2009) and in the older age group (Lillard and Panis 1998; Uhrig 2008). Third, foreigners are more likely to drop out of the SHP than are the Swiss (Lipps 2007). Education, finally, is usually found to be positively associated with survey response (Behr et al. 2005; Fitzgerald et al. 1998; Hawkes and Plewis 2006; Lillard and Panis 1998; McCulloch and Buck 2003; Uhrig 2008; Watson and Wooden 2004, 2009). To take these known factors related to nonresponse into account, we include gender, age, nationality, and educational level as control variables.

3. Methods

3.1. Data

We use data from the Swiss Household Panel (SHP) from 1999–2009, a yearly CATI panel survey, representative of the Swiss population living in private households. The SHP consists of two random samples that were sampled and surveyed in the same way. The first sample started in 1999 with 5,074 completed households, the refreshment sample in 2004 with 2,578 completed households. Once new household members enter a sample household they become eligible for interview. If sample members move, respondents from an existing household are followed. New household members in the newly formed household have become eligible for interview since the 2007 wave. The household identification number is tied to the telephone number, meaning that when a household splits up, the household with the new telephone number receives a new household identification number, irrespective of which household member moved (reference person or not).

In each year, the household composition is first asked about, together with the relationships between all household members and the basic sociodemography of the household reference person in the grid questionnaire. After completion of the household

grid, all persons from the age of 14 years on are asked to answer an individual questionnaire. The household reference person must be an adult and should preferably be the same individual across years (Lipps 2009). Among adults in multiadult households who gave their individual interview in the previous wave but refused to do so in the current wave, 16% changed from reference person to no reference person, 78% kept their status, and 5% became reference person.

To be able to measure potential changes, all sampling units must have participated at least twice to be included in our analyses. Characteristics of the second of these reported waves as well as change scores between the first and the second of these waves are used in the models. We consider household noncontact as household level nonresponse, and individual noncooperation conditional on household contact as individual level nonresponse. "Individual" household characteristics are represented by those of the household reference person. For example, educational level of the reference person is included in the analyses on household contactability. The analysis sample contains all households whose (then) reference person completed the individual questionnaire at least twice. If the household drops out, the reports must have been given before the drop−out to be considered in the analyses. Similarly, to analyse individual cooperation, all persons that participated at least twice before the drop−out or delivered two waves without dropping out are considered.

Usually respondents were no longer included in the sample if they left the country, were institutionalized, deceased, or temporarily absent (nonsample case, such as doing the military service). We excluded the wave of noneligibility of the respective households and individuals from the analysis. Similarly, we excluded a few specific cases in which households were not entered in the CATI system in a particular wave and were consequently not part of the gross sample in that wave. Note, however, that in many cases the eligibility status is not known. For example, in one−person households, where no one could be reached and the person could not be tracked, the eligibility status is not known. In deeming these cases as noncontact (household level) it is therefore very likely that the actual attrition is overestimated (Voorpostel 2010). Usually, households were not reapproached once they refused for two consecutive waves. A number of households were, however, recontacted from 2007 and onward. In sum, the total sample on which this analysis is based comprises 6,931 households and 11,450 individuals.

3.2.   *Dependent Variables*

Rather than solely focusing on attrition, the permanent drop−out of respondents, we also look at temporary nonresponse. There is reason to assume that there are different mechanisms at work for the two groups: the fact that respondents (households or household members) come back after nonresponse in a certain wave indicates that they are generally interested and motivated, but temporary reasons (time constraints, sickness, absence, etc.) might prevent them from participating during some waves. This might be different for the group that dropped out. When examining differences between these two groups on the individual level, Voorpostel (2010) found that the group that did not respond temporarily had sociodemographic characteristics that were somewhere between those of the group that always responded and those of the group that dropped

out permanently. Finally, it is insightful to distinguish between these two groups because they differ in how one can deal with the consequences of nonresponse: missing information about the respondents who come back at a later wave can be imputed by asking them, after their return to the panel, about for example life events that might have happened during the nonreported period(s).

We distinguish between three patterns of household and individual level response: households can either be successfully contacted in every wave ("always in"), irregularly, but at least in the last two waves ("ever out"), or not contacted in at least the last two waves ("dropped out"). For the household members we also create three groups reflecting different response patterns: loyal respondents (every time the household was contacted, the individual cooperates: "always in"), respondents with an irregular response pattern ("ever out"), that is, not every time the household was contacted did the individual participate, but he/she did participate in the last two waves at which the household was contacted; and finally respondents that drop out (even though the household was contacted). Individuals in non−contacted households are thus regarded as "always in" if they participate as long as the household is contacted. Only if an individual does not cooperate conditional on household contact, he or she is considered "ever out" or "dropped out". All sample members with less than two validly reported waves before dropping out ("ever out" and "dropped out"), or new panel members with just one wave of data were thus ignored in the analyses. In addition, households or individuals who reported during the last wave but one but did not do so during the last wave were excluded from the analysis so as not to confuse "dropped out" with "ever out" sample members. Using this definition, 5,640 of the sample analysis households were "always in," 412 were "ever out," and 351 dropped out. Among the individuals in our sample, 7,508 were "always in," 1,430 were "ever out," and 774 dropped out. For the descriptive statistics of the dependent, independent, and control variables we refer to Table 1.

3.3. Independent Variables

As mentioned above, we construct the variables measuring the characteristics of the respondents by taking the respective values of the last wave reported before dropping out (for the first time in case of the "ever out" group, permanently for the "dropped out" group). To measure change, we calculated the respective variable's differences between the last two waves reported before dropping out (either for the first time or permanently). For "ever out" cases, this means that these transitions might have gaps, such that if e.g., Wave 3 was not reported, Waves 2 and 4 are used to calculate changes. We did a sensitivity analysis by dropping cases with gaps, but obtained very similar results.

In the case of an "always in," to measure the characteristics of the respondents we randomly selected a wave, excluding the first wave.

Specifically, we use the following independent variables:

- Sample: original from 1999 vs. refreshment from 2004
- Gender: male vs. not
- Age in years coded as age dummy classes: 14−25, 26−34, 35−59 (base), 60+
- Education dummy in four classes: below high school (base), not (yet) graduated, high school, above high school

Table 1.   Descriptive statistics

	Mean
Household level (N = 6,403)	
Always in	.881
Ever out	.064
Dropped out	.055
Partner in household	.630
Change of partner	.045
Partner arrived in household	024
Partner left household	.021
Children in household	.297
Change of children	.036
Children arriving in household	.013
Children leaving household	.023
Household moved	.094
Home owner	.450
Household moved and became home owner	.015
Household moved and became renter	.010
Original sample	.698
Individual level (N = 9,712)	
Always in	.773
Ever out	.147
Dropped out	.080
Male	.444
Age 14–25	.256
Age 26–34	.137
Age 35–59	.458
Age 60+	.150
Education below high school level	.185
Currently in primary/secondary education	.074
Education high school level	.487
Education above high school level	.254
Reference person	.573
Change of reference person	.099
Becomes reference person	.053
Becomes non-reference person	.046
Employed	.565
Change of employed	.036
Transition from not in labour force to employed	.018
Transition from employed to not in labour force	.018
Swiss nationality	.902
Active in club	.523
Change of active in club	.140
Start participating in clubs	.065
Stop participating in clubs	.075
Political interest (range 0. . .10)	5.496
Change of political interest	.917
Increase political interest	.489
Decrease political interest	.428
Satisfaction with finances (range 0. . .10)	7.185
Change of satisfaction with finances	.951

Table 1.   Continued

	Mean
Increase satisfaction with finances	.447
Decrease satisfaction with finances	.504
Satisfaction with living arrangements (range 0. . .10)	8.462
Change of satisfaction with living arrangements	.731
Increase satisfaction with living arrangements	.339
Decrease satisfaction with living arrangements	.393

- First nationality: Swiss vs. first nationality foreign
- Partner present in the household vs. not
- Children under the age of 18 years present in the household vs. not
- Owner of the house/flat vs. tenant
- Employment status: employed vs. all others (unemployed and inactive)

The following variables are in addition used on the individual level:

- Was reference person vs. not
- Participation in a club vs. not
- (linear) Political interest using an 11-point (0 = absolutely not. . .10 = absolutely) item
- (linear) Satisfaction with finances using an 11-point item (see above)
- (linear) Satisfaction with living arrangements (living together or alone in the household) using an 11-point item (see above)
- Being member of a household that was ever out (not contacted)
- Being member of a household that dropped out (not contacted)

The change variables are:

- The household moved since the previous wave (or during the previous twelve months in the case of a gap) vs. not, without a change in house ownership
- The household moved since the previous wave (or during the previous twelve months in the case of a gap) vs. not, with a change in house ownership
- Change in political interest: difference score between the two waves (only individual level)
- Change in satisfaction with finances: difference score between the two waves (only individual level)
- Change in satisfaction with living together or alone in the household: difference score between the two waves (only individual level)
- Change in participation in a club or not (dummy variable, only individual level)
- Change in employment status or not (dummy variable)
- Change in presence of children under the age of 18 years in the household or not (dummy variable)
- Change in having a partner present in the household or not (dummy variable)
- Change of reference person status or not (dummy variable)

3.4. Analytical Strategy: Starting with Status, Adding Instability, then Adding Direction of Change

The aim of the analyses is to check whether, over and above the characteristics of the respondents, instability in these characteristics explains residual variance of attrition ("ever out" or "dropped out") relative to always taking part. In addition, we have analysed the effects of the direction of change. That is, each change measure was substituted by two (positive or zero) measures indicating an increase (e.g., of presence of children in the household) or a decrease. To summarize, we built the final model in three steps:

1. We started with the inclusion of the characteristics of the households and the household members;
2. We added the (absolute) change of these characteristics;
3. We looked at the direction of change. Technically this last step duplicates the number of change variables. For this last step, we only compared dropped-out households/individuals with the always participating households and individuals.

To test our expectations we use logistic regression models. On the individual level, we control for clustering of individuals in households in the models by using 2-level models (first-level household, second-level individuals). Importantly, the base group of the models are the "always in" respondents, on both the household and the individual level. Therefore the coefficients of the independent variables compare response behaviour of the "ever out" and the "dropped out" households/individuals with the "always in" households/individuals.

4. Results

4.1. Characteristics and Changes: Household Level

Table 2 presents the results of the analysis on obtaining contact with households. First, we look at the results of the characteristics without adding the change variables. Model 1A shows the results of the "ever out" group compared with the always responding households and Model 2A presents the "dropped out" households compared with the always responding ones. The likelihood of being in the "ever out" group as compared to the always responding group (Model 1A) was higher for households from the original sample (they had, after all, more occasions not to be contacted), households with reference persons who were younger (26–35 years), without children, who rented their dwelling rather than owned it, and who were employed. Model 2A shows that more characteristics were significantly associated with permanently dropping out of the panel than with temporary nonresponse: while on the one hand the presence of children in the household was not significantly related to dropping out, on the other hand being male, a foreigner, or having a lower education or no partner in the household increased the likelihood of dropping out permanently as compared to the always responding households. These results are generally in line with previous research.

Adding the coefficients of change in Models 1B (irregular response pattern versus always responding) and 2B (dropped out versus always responding) hardly changed the results. No change variable reached the 5% significance level. Consequently, in adding the

Table 2.   Results of logistic regression of household contact on stability of responses (Models 1: N = 6,052, Models 2: N = 5,991). The reference group is "always in"

	Model 1A: Ever out	Model 2A: Dropped out	Model 1B: Ever out	Model 2B: Dropped out
Original sample member	.596***	1.347***	.582***	1.337***
Male	.181	.268*	.170	.274*
Age 14−25[a]	.006	.407*	−.050	.385*
Age 26−34[a]	.617***	.751***	.590***	.724***
Age 60+[a]	−.851***	−.427	−.847***	−.413
Educational level: high school[b]	.152	−.151	.153	−.167
Educational level: above high school[b]	−.186	−.442*	−.188	−.461*
Swiss nationality	−.246	−.584***	−.248	−.573***
Partner in household	−.183	−.818***	−.183	−.828***
Children in household	−.355**	−.116	−.347**	−.111
Home owner	−.684***	−1.286***	−.686***	−1.235***
Employed[c]	.325*	.268	.313*	.270
Moved, no ownership change[d]			.120	.263
Moved, ownership change[d]			.365	−.825
Change employed			−.126	.162
Change children in household			.117	.253
Change partner in household			.233	.228
Constant	−2.701***	−2.741***	−2.697***	−2.780***
Loglikelihood	−1,414	−1,153	−1,412	−1,148
Pseudo-R^2	.060	.138	.062	.141

Source SHP 1999−2009.

[a] Reference is 35 to 59 years old, [b] reference is below high school, [c] reference is unemployed or not in the labour force, [d] reference is no move. *$p < .05$, **$p < .01$, ***$p < .001$.

coefficients of change in Models 1B and 2B, we found that both models improved only marginally and the pseudo-R^2 increased only slightly. A likelihood-ratio test revealed that on the household level, change was neither related to dropping out of the panel, nor to temporary drop-out.

4.2.   Characteristics and Changes: Individual Level

On the individual level, we looked at cooperation of individual household members conditional on contact of the household. Results are presented in Table 3. Models 3A and 4A show the results without the coefficients of change. These variables were added in Models 3B (irregular respondents) and 4B (dropped-out respondents).

We found similar results for the individuals from the "ever out" group and from the "dropped out" group. When the coefficients had the same sign, the effect was generally stronger for individuals who dropped out (Model 3A) than for the "ever out" group (Model 3B), both compared with the always in individuals. In Models 3A and 4A we see that individuals who were reference persons, from the refreshment sample, female, or older were more likely to cooperate both permanently or temporarily. While a higher level of education or living in a household with a partner present had negative effects on dropping out permanently only, having Swiss nationality or being employed affected temporary non-cooperation only. The effect of housing was in the opposite direction than anticipated: conditional on contact on the household level, where home owners were more likely to be contacted, home ownership was associated with temporary drop-out for the individual household members. This suggests that while making contact with the household was more likely, home ownership did not assure cooperation of the household members. The presence of children had no effect. While interest in politics as well as more satisfaction with finances was negatively related to both dropping out and to responding irregularly, participating in clubs was only negatively related to dropping out.

In Models 3B and 4B the change coefficients were added. There was no association between moving and dropping out permanently or temporarily. Respondents who changed their level of interest in politics were less likely to drop out temporarily and more likely to drop out permanently. Respondents who reported changes in satisfaction with living arrangements and especially with political interest were less likely to display an "ever out" pattern, whereas a change in reference person or employment status, a change in satisfaction with finances and political interest and a change in presence of a partner in the household were all positively associated with dropping out permanently.

Finally, there were several associations between response patterns on the household and on the individual level that are worth mentioning. Respondents who lived in households that could not always be contacted (temporary nonresponse) were more likely to respond themselves, which is not surprising as they had fewer occasions to not cooperate. Household drop-out, however, was not associated with different individual cooperation patterns.

Both models improved significantly after inclusion of the change coefficients. This implies that change estimates are likely to be biased if only always responding individuals are considered, compared with the other response groups.

Table 3. Results of multilevel logistic regression of individual household member cooperation on stability of responses (Models 3: Household level N = 5,614, individual level N = 8,808, Models 4: Household level N = 5,296, individual level N = 8,168). The reference group is "always in"

	Model 3A Ever out	Model 4A Dropped out	Model 3B Ever out	Model 4B Dropped out
Individual is reference person	−.747***	−1.407***	−.724***	−1.453***
Original sample member	.423***	.921***	.456***	.901***
Male	.307***	.774***	.303***	.781***
Age 14−25[a]	.413**	.059	.415**	−.028
Age 26−34[a]	.048	−.501**	.036	−.565**
Age 60+[a]	−.501**	−.775***	−.478**	−.769***
Educational level: still at school[b]	−.249	−.581*	−.280	−.526*
Educational level: high school[b]	−.044	−.411**	−.050	−.448**
Educational level: above high school[b]	−.133	−.820***	−.152	−.832***
Swiss nationality	−.301*	−.188	−.321*	−.134
Partner in household	.149	−.470**	.139	−.431**
Children in household	−.013	.206	−.017	.249
Home owner	.215*	.152	.226*	.138
Employed[c]	.227*	.252	.226*	.263
Active in club	−.011	−.314**	−.020	−.297**
Political interest	−.047**	−.085***	−.050**	−.082***
Satisfaction with finances	−.071***	−.057*	−.078***	−.034
Satisfaction with living arrangements	.018	.032	−.001	.019
Household ever out[e]	−1.817***	−1.832***	−1.901***	−1.767***
Household dropped out[e]	.186	−.136	.128	−.095
Moved, no ownership change[d]			.267	.110
Moved, ownership change[d]			.159	.434
Change reference person			−.054	.384*
Change employed			.006	.563*
Change satisfaction with finances			−.026	.119**
Change satisfaction with living arr.			−.084*	−.534
Change political interest			−.129***	.105**
Change children in household			.001	.240
Change active in club			−.132	.205
Change partner in household			−.449	.753*
Constant	−1.798***	−2.879***	−1.354***	−3.282***
Rho	.460	.530	.465	.536
loglikelihood	−3,619	−2,215	−3,600	−2,193

Source SHP 1999−2009.

[a] Reference is 35 to 59 years old, [b] reference is below high school, [c] reference is unemployed or not in the labour force, [d] reference is no move, [e] reference: household always in. *$p < .05$, **$p < .01$, ***$p < .001$.

4.3. Direction of Change

Finally, we turn to the results on the direction of change. Table 4 shows these results for the households (Model 5) and the individual household members (Model 6). In the models the same characteristics as in the previous models were entered, but only the coefficients for the change variables are shown in the table. Both models only consider the dropped-out group in comparison to the always responding group. In Model 5 we see that children arriving in the household increased the likelihood of consecutive drop-out from the panel study due to household noncontact, whereas no significant result was found for children leaving the household.

Model 6 shows that although individuals who changed their activities in clubs were not more likely to drop out (Model 4B), starting such an activity increased the likelihood of dropping out. This is not in line with the idea that an increase in civic participation would stimulate continued participation in the panel. While a changed satisfaction with finances

Table 4. Results of multilevel logistic regression of households and individual household members participation ("dropped out" versus "always in" respondents) on the direction of change (N = 5,991 households, 8,161 individuals)[a]

	Model 5 Households	Model 6 Individuals
Household became owner (incl. move)	− .483	.537
Household became renter (incl. move)	− 1.856	.373
Partner arrived in household	.313	.689
Partner left household	.213	.833
Children arriving in household	.913**	− 1.043
Children leaving household	− .367	.505
Not in paid labour to employed	− .110	.527
Employed to not in paid labour	.461	.560
Start participating in clubs	–	.565**
Stop participating in clubs	–	− .061
Increase in satisfaction with living arrangements	–	− .043
Decrease in satisfaction with living arrangements	–	− .068
Increase in satisfaction with finances	–	.189***
Decrease in satisfaction with finances	–	.071
Increase in political interest	–	.144**
Decrease in political interest	–	.057
Becomes reference person	–	1.379***
Becomes nonreference person	–	− .536*
Constant	− 2.934***	− 2.927***
Rho		.546
Loglikelihood	− 1,177	− 2,170

Source: SHP 1999–2009.
[a] Models 5 and 6 are controlled for reference person (Model 6 only), partner, children, owner, original sample, male, age 14–25, age 26–34, age 60+ , education, employed, household move without a change in ownership, Swiss, club (Model 6 only), political interest (Model 6 only), satisfaction with finances (Model 6 only), satisfaction living arrangements (Model 6 only), household was ever out (Model 6 only), household dropped out (Model 6 only). Reference groups are no change. – indicates the variable was not included in the model.
*$p < .05$, **$p < .01$, ***$p < .001$.

increased dropping out, it was only an increase and not a decrease in satisfaction score that was associated with dropping out. The same held for political interest, which was contrary to our expectation that more social involvement would be associated with a lower risk of dropping out. Finally, while becoming a household reference person increased individual drop-out, changing from reference person to nonreference person was positively associated with always participating in the panel. The finding that respondents who increased their interest and social involvement scores (and those who became a reference person) were more likely to drop out, points to increased opportunity costs of participation. A decrease of such costs does not, however, seem to be related with an increased participation. Overall, apart from a change in reference person status, we found that only changes in one direction were relevant to participating in the SHP.

5. Discussion

This study assessed whether respondents in the Swiss Household Panel (SHP) who reported changes were more likely to drop out either temporarily or permanently than those who remained stable. The study examined contact versus noncontact on the household level and cooperation versus refusal on the individual level. It further distinguished between always participating respondents, respondents who dropped out of the panel permanently and respondents who dropped out temporarily but were still in the panel.

Our study shows that, for the case of the SHP, reported changes are not related to subsequent contactability of the household, but are more likely to be followed by noncooperation of individual household members, although effects are generally weak. This is in line with previous findings on the relation between changes and survey participation (Lillard and Panis 1998; Neukirch 2002; Rendtel 2002). Moreover, reported change was more predictive of permanent drop-out from the panel than of temporary nonresponse. We were also interested in whether the direction of change was predictive of temporary or permanent drop-out in the case of the SHP. Our study shows that this is indeed the case, again more so for cooperation of individual household members than for contact with the household.

We considered changes in various domains, but found only a few to be associated with nonresponse. As for individual cooperation patterns, while a change in satisfaction with one's living arrangements and a change in political interest affect temporary drop out, a number of changes such as change of reference person, partner and employment status, a change in satisfaction with one's finances and in interest in politics increase subsequent permanent drop-out.

Regarding the direction of change on the *household level*, we found that while instability in the presence of children in the household or employment status did not have an effect on obtaining contact subsequently, children arriving in the household increased dropping out due to noncontact. This is at odds with the general finding that households with children tend to be more at home, and hence easier to contact.

On the *individual level* – where we consider cooperation rather than contact – the direction of change in several domains is decisive, indicating that not only change as such is important but also that the direction of change matters for participation in the SHP.

For participation in clubs and associations, satisfaction with finances, and political interest, scores indicating an increase have a comparatively strong positive effect on cooperation, whereas variation as such mostly has a rather weak positive effect on subsequent noncooperation. Only for a change in reference person status is there an effect for both directions of change (becoming a reference person and ceasing to be a reference person): while a changed status as such only has a weak positive effect on subsequent noncooperation, becoming a reference person has a strongly positive effect, becoming a nonreference person a weak negative effect. These findings suggest that opportunity costs might play a role: sample members who increased their obligations (by becoming a reference person or volunteering in clubs) were less likely to continue their participation. While panel participants may be socially involved to a higher than average degree, an increase might cause future noncooperation due to too great a time loss. Probably the obligation that is considered most easy to abandon (panel participation) is actually dropped.

One main finding is that while most characteristics associated with attrition are very similar for households and individuals, when change is considered there are clear differences between contact on the household level and cooperation on the individual level. Changes people experience in certain domains (and report in panel surveys) appear to be more decisive for their decision to cooperate in the future than for the contactability of the household.

Further research is needed using other panel studies and more and different change variables to deepen these still tendentious findings. This research is a first exploration of the effect of change on subsequent attrition due to noncontact or refusal, and more research is needed based on existing concepts in nonresponse research. For example, one additional theory is that in cognitively demanding surveys such as panel surveys the effect of change on subsequent participation might be dependent on the cognitive skills of the respondents. Knäuper et al. (1996) report that respondents with lower cognitive ability were particularly likely to answer "don't know" to difficult questions. As item-nonresponse may be a predictor of later unit-nonresponse (Loosveldt et al. 2002), these respondents may have a higher likelihood of dropping out after having experienced a cognitively demanding survey. After respondents have experienced a major change, while the topic becomes more interesting for those able to cope with the efforts necessary, those not able may become frustrated because reporting many changes overburdens them. Once larger sample sizes become available, future research could examine these moderating effects of for example education.

Whereas one main purpose of collecting panel data is to model change, our study shows that not all change is captured equally well. Although effects are modest, the most loyal panel respondents are also the ones that tend to display less variation in several domains. For panel data collection it is especially important to prevent attrition among those groups that can be expected to change the most, such as young adults (leaving the parental home, entering the labour market, starting a family). One way to deal with the issue of underrepresentation of change in panel surveys is to incentivise reporting change and continuation in the panel following the change. An example is to encourage moved sample members or those with major changes that are known in advance, or to welcome new household members with a special incentive. As for the latter, the BHPS had good

experiences with a "golden handshake" handed to children who become eligible at the age of 16 years (Laurie and Lynn 2009).

A main limitation is that the study was limited to changes that are reported, and could not take into consideration the changes respondents experienced but did not report. When drop-out happens at the same time or just after a major change, it remains, of course, unreported. The selective inclusion of only reported change warrants modesty in the interpretation of our results. Yet, our study indicates that the change that is reported is related to response behaviour; the results of the study tell us that individuals who report more change over time are slightly more likely to drop out permanently, whether this is related to an actual change at the moment of nonresponse or not.

6. References

Behr, A., Bellgardt, E., and Rendtel, U. (2005). Extent and Determinants of Panel Attrition in the European Community Household Panel. European Sociological Review, 21, 489–512.

Fitzgerald, J., Gottschalk, P., and Moffitt, R. (1998). An Analysis of Sample Attrition in Panel Data: The Michigan Panel Study of Income Dynamics. Journal of Human Resources, 33, 251–299.

Groves, R.M., Presser, S., and Dipko, S. (2004). The Role of Topic Interest in Survey Participation Decisions. Public Opinion Quarterly, 68, 2–31.

Groves, R.M., Singer, E., and Corning, A. (2000). Leverage-Saliency Theory of Survey Participation: Description and Illustration. Public Opinion Quarterly, 64, 299–308.

Hawkes, D. and Plewis, I. (2006). Modelling Non-Response in the National Child Development Study. Journal of the Royal Statistical Society, Series A, 169, 479–491.

Knäuper, B., Belli, R., Hill, D., and Herzog, A. (1996). Question Difficulty and Respondent's Cognitive Ability: The Impact on Data Quality, HRS/AHEAD Working paper Series 96-038, Ann Arbor: University of Michigan.

Laurie, H. and Lynn, P. (2009). The Use of Respondent Incentives on Longitudinal Surveys. In Methodology of Longitudinal Surveys, P. Lynn (ed.). Colchester: John Wiley and Sons.

Lepkowski, J.M. and Couper, M.P. (2002). Nonresponse in the Second Wave of Longitudinal Household Surveys. In Survey Nonresponse, R.M. Groves, D.A. Dillman, J.L. Eltinge, and R.J.A. Little (eds). New York: Wiley.

Lillard, L.A. and Panis, C.W.A. (1998). Panel Attrition from the Panel Study of Income Dynamics: Household Income, Marital Status, and Mortality. Journal of Human Resources, 13, 437–457.

Lipps, O. (2007). Attrition in the Swiss Household Panel. Methoden – Daten – Analysen, 1, 45–68.

Lipps, O. (2009). Attrition of Households and Individuals in Panel Surveys. SOEP-Papers, 164. Berlin: Deutsches Institut für Wirtschaftsforschung.

Loosveldt, G., Pickery, J., and Billiet, J. (2002). Item Nonresponse as a Predictor of Unit Nonresponse in a Panel Survey. Journal of Official Statistics, 18, 545–557.

McCulloch, A. and Buck, N. (2003). Impact of Panel Attrition on Analysis. In Report on Attrition Analysis and Item Non-Response. Chintex Working Paper 16, N. Buck, A. McCulloch, and J. Burton (eds). Colchester: ISER.

Neukirch, T. (2002). Nonignorable Attrition and Selectivity Biases in the Finnish Subsample of the ECHP: An Empirical Study Using Additional Register Information. Chintex Working Paper 5. Frankfurt-am-Main: J.W. Goethe Universität.

Rendtel, U. (2002). Attrition in Household Panels: A Survey. Chintex Working Paper 4. Frankfurt-am-Main: J.W. Goethe Universität.

Rendtel, U., Behr, A., Bellgardt, E., Neukirch, T., Pyy-Martikainen, M., Sisto, J., Lehtonen, R., Harms T., Basic, E., and Marek, I. (2004). Report on Panel Effects. Chintex Working Paper 22, The Change from Input Harmonisation to Ex-post Harmonisation in National Samples of the European Community Household Panel – Implications on Data Quality.

Stoop, I.A.L. (2005). The Hunt for the Last Respondent: Nonresponse in Sample Surveys. The Hague: SCP.

Uhrig, S.C.N. (2008). The Nature and Causes of Attrition in the British Household Panel Survey. ISER Working Paper 2008-05. Colchester: ISER.

van den Berg, G.J. and Lindeboom, M. (1998). Attrition in Panel Survey Data and the Estimation of Multi-State Labor Market Models. Journal of Human Resources, 33, 458–478.

Voorpostel, M. (2010). Attrition Patterns in the Swiss Household Panel: An Analysis of Demographic Characteristics and Social Involvement. Swiss Journal of Sociology, 36, 359–377.

Watson, D. (2003). Sample Attrition Between Waves 1 and 5 in the European Community Household Panel. European Sociological Review, 19, 361–378.

Watson, N. and Wooden, M. (2004). The HILDA Survey Four Years on. The Australian Economic Review, 37, 343–349.

Watson, N. and Wooden, M. (2009). Identifying Factors Affecting Longitudinal Survey Response. In Methodology of Longitudinal Surveys, P. Lynn (ed.). London: Wiley.