

Effects of Survey Design Modifications in pairfam Wave 12 due to the COVID-19 Pandemic

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May 2021

Funded as long-term project by the German Research Foundation (DFG)

Cite as:

Bozoyan, Christiane, Michel Herzig, Richard Preetz, and Claudia Schmiedeberg (2021): Effects of Survey Design Modifications in pairfam Wave 12 due to the COVID-19 Pandemic. pairfam Technical Paper No. 16. <https://doi.org/10.5282/ubm/epub.91998>

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1 Introduction

The COVID-19 pandemic disrupted the fieldwork of wave 12 of the German Family Panel pairfam in early 2020. Due to an increasing number of infections and policy measures to reduce social contact in Germany, face-to-face (CAPI) interviews were halted on March 20th, 2020. Respondents who had not yet participated in wave 12 received this information via letter. The pairfam team then made the decision to switch interview modes for both the anchor and child survey once it was clear the pandemic would disrupt standard interviewing for an extended period of time. As of April 24th, 2020, fieldwork for the anchor survey was continued in CATI mode until the end of the fielding period in July 2020. Interviews were conducted by the interviewers originally assigned to the respective CAPI interviews. After the interview in CATI mode, respondents were sent a self-administered paper-and-pencil (PAPI) questionnaire per mail containing the self-administered (intimate/sensitive) modules that had previously been part of the CASI section in the standard CAPI mode. The question program was slightly adapted to the new interview modes (see pairfam codebooks).

The survey institute announced the start of the CATI fieldwork in a letter to all respondents who had not yet been interviewed in CAPI mode. Respondents whose telephone number was previously unknown (roughly 1/3 of the sample) were asked to contact the pairfam hotline and communicate their current telephone number. As infections rates declined in June 2020, interviewers were once again permitted to contact assigned respondents at their homes to make an appointment for the CATI interview from June 17th, 2020. (For an overview of survey adaptations, see Gummer et al., 2020; for field results, see Brüderl et al. 2021a.)

This unexpected mode change during the fieldwork of wave 12 bears the risk of mode effects on the data. Bias may arise due to selection effects, i.e. due to selective participation in one of the modes and selective unit non-response. Differences in the question and answer process, e.g. the visual vs. auditive presentation of questions, interviewer effects, and/or layout differences may also lead to bias. The present report attempts to raise users' awareness of this issue and suggest how different mode effects can be considered in analyses – a consideration of which should precede and accompany every substantive analysis of wave 12 data. It is important to note, however, that potential mode effects cannot be separated from substantive effects of the pandemic, as the mode change coincided with the onset of the latter. Hence, any effects found should be interpreted with care.

2 Analyses

The analytical strategy presented here consists of four steps: The first considers differences between respondents of the two modes in wave 12 (CAPI vs. CATI/PAPI). The second step investigates predictors for attrition and mode change to uncover clues about selective participation. Next, unit non-response for the PAPI questionnaire is analyzed, as a significant portion of participants of the CATI interview did not send in a completed PAPI questionnaire. Finally, example analyses of two variables of substance, namely *subjective social status* and *attachment to living locality* are presented as a guide for possible outcomes due to mode change. Here, fixed effects models are used to analyze the influence of interview mode and survey wave, alongside other substantive confounding factors (see Brüderl et al. 2021b).

2.1 Characteristics of CAPI and CATI respondents

This first step is used to demonstrate demographic differences between respondents who participated in one of the two modes in wave 12 (see Table 1). In this way, users can be sensitized for possible selection into different interview modes, which can arise simply by the field process (earlier or later interview date) or by unobserved heterogeneity. Users should interpret results carefully, as effects of the COVID-19 pandemic cannot be separated from mode differences.

Table 1 shows that a large percentage of respondents from the wave 11 refreshment sample were interviewed via CATI mode: Due to lagged field processes in wave 11, these respondents were consequently contacted later in wave 12 than respondents from the pairfam base sample (see Brüderl et al. 2021a). Compared to the CAPI mode, substantially more CATI respondents belong to cohort 4, born between 2001 and 2003. On the other hand, respondents from cohort 1 (1971-1973), which was not included in the refreshment sample, are unrepresented in the CATI sub-sample. Accordingly, CATI respondents were on average younger than CAPI respondents, which helps explain further differences between the sub-samples. For instance, the portion of respondents working full-time is 9 percentage points lower among CATI vs. CAPI respondents (33% vs. 42%, respectively). Similarly, nearly 45% of the CAPI respondents have at least one child, as compared to less than 34% of the CATI respondents. The same pattern is observed for relationship status: The probability of being single is 5 percentage points higher among CATI respondents as compared to CAPI respondents. It is also 7 percentage points more likely to be married and live together with a partner for respondents of the CAPI interview. The fact that many participants of the youngest cohort selected into the CATI mode are still currently enrolled in school (23% in CAPI vs. 36% in CATI mode) also accounts for the higher number of missing values for individual income (30% in CAPI vs. 42% in CATI mode). It is important that these differences between sub-samples are not misinterpreted as effects of the pandemic.

Table 1: Descriptive statistics of wave 12 participants by survey mode

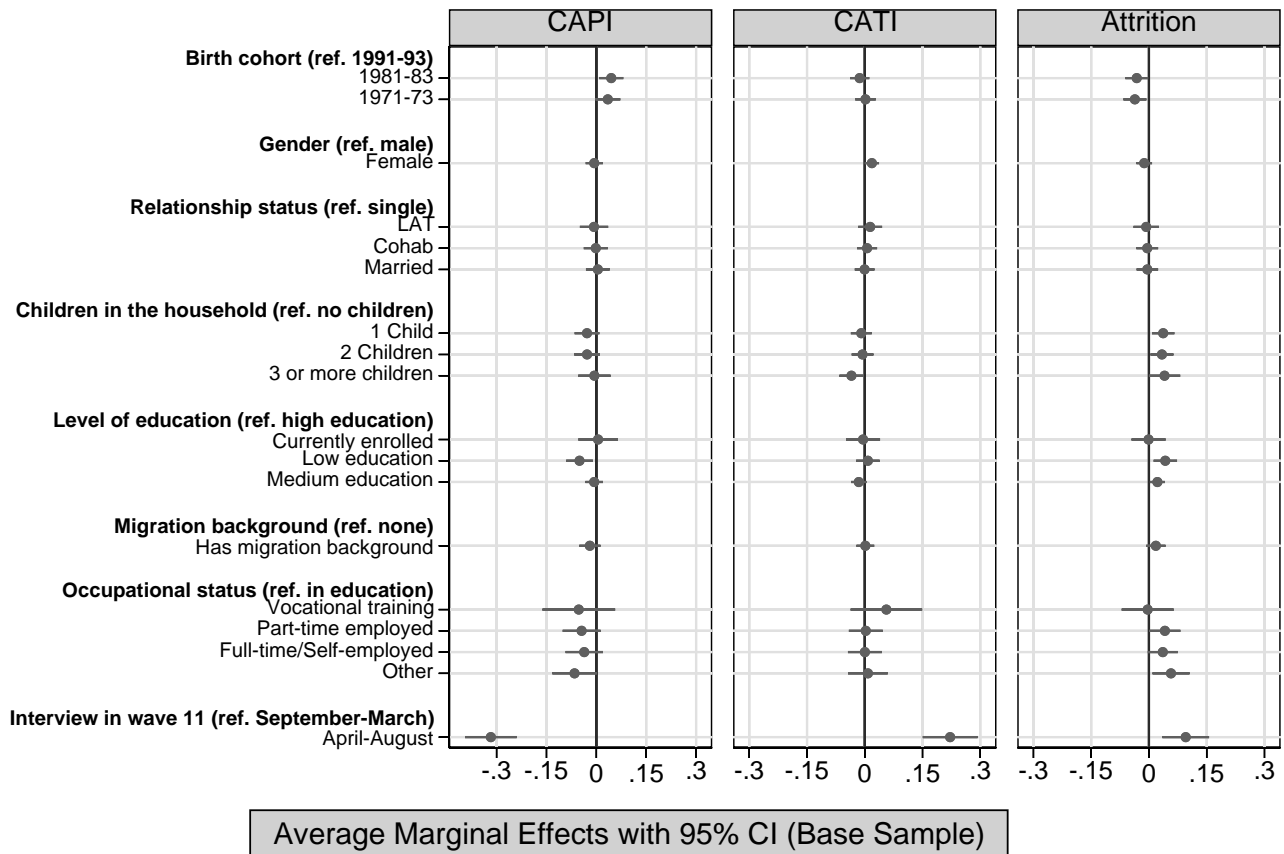
Variable	W12 CAPI (Oct 2019-March 2020)	W12 CATI (April 2020-July 2020)
<i>Gender</i>		
Women	53.07	55.77
Men	46.91	44.23
Other	0.02	0.00
<i>Cohort</i>		
1971-1973	23.13	8.39
1981-1983	29.70	27.89
1991-1993	26.44	26.53
2001-2003	20.73	37.20
<i>Education</i>		
Years of education	11.86 (5.48) [N= 5,775]	10.45 (6.37) [N= 1,821]
Currently enrolled	22.54	36.22
Low educational level	10.60	7.63
Medium educational level	39.89	32.08
High educational level	26.98	24.07
<i>Children</i>		
Number of children	0.89 (1.89)	0.65 (1.03)
Share of having at least one child	44.89	33.71
<i>Relationship status</i>		
Single	32.29	37.80
Living apart together (married or not)	14.08	18.68
Cohabitation (not married)	17.33	15.25
Cohabitation (married)	35.85	27.89
% missing	0.45	0.38
<i>Migration background</i>		
No migration background	78.74	75.49
1st generation migrant	8.01	9.37
2nd generation migrant	11.17	12.96
% missing	2.09	2.18
<i>Income</i>		
Personal net income in EUR	1,993 (2,101) [N=4,040]	1,769 (1,192) [N= 1,069]
Household net income in EUR	3692 (2,703) [N=5,080]	3662 (2,214) [N= 1,489]
% missing: Personal net income	30.27	41.78
% missing: Household net income	12.32	18.90
<i>Labor force status</i>		
Employed full-time	42.10	32.95
Not employed full-time	57.82	66.83
% missing	0.09	0.22
N	5,794	1,836

Note: Total sample size is denoted in the last row of the table. Net sample sizes used for calculation are denoted in square brackets behind the parameters. For categorical variables, percentages are presented; otherwise, mean values with SD are noted in parentheses.

2.2 Predictors with respect to attrition and mode

The next step considers factors that predict selection into one of the two interview modes, as well as drop-out. Multinomial logistic regression models are estimated for all respondents who participated in the (pre-pandemic) wave 11. The dependent variable measures participation in wave 12. The sample is divided into two groups: respondents from the pairfam base and DemoDiff samples who entered the panel in 2008/2009, and respondents from the refreshment sample who entered the panel in wave 11. Differences between samples, especially regarding attrition, may exist because for refreshment sample respondents, wave 12 was the first follow-up survey after recruitment in wave 11. Accordingly, the refreshment sample may be affected by effects of elevated attrition in early panel waves. Figure 1 shows the results from multinomial logistic regression models for the pairfam base and DemoDiff samples (N=4,265) with estimated average marginal effects (AME).

Figure 1: Multinomial logistic regression model for pathways of respondents from the pairfam/DemoDiff base sample, wave 11 to wave 12



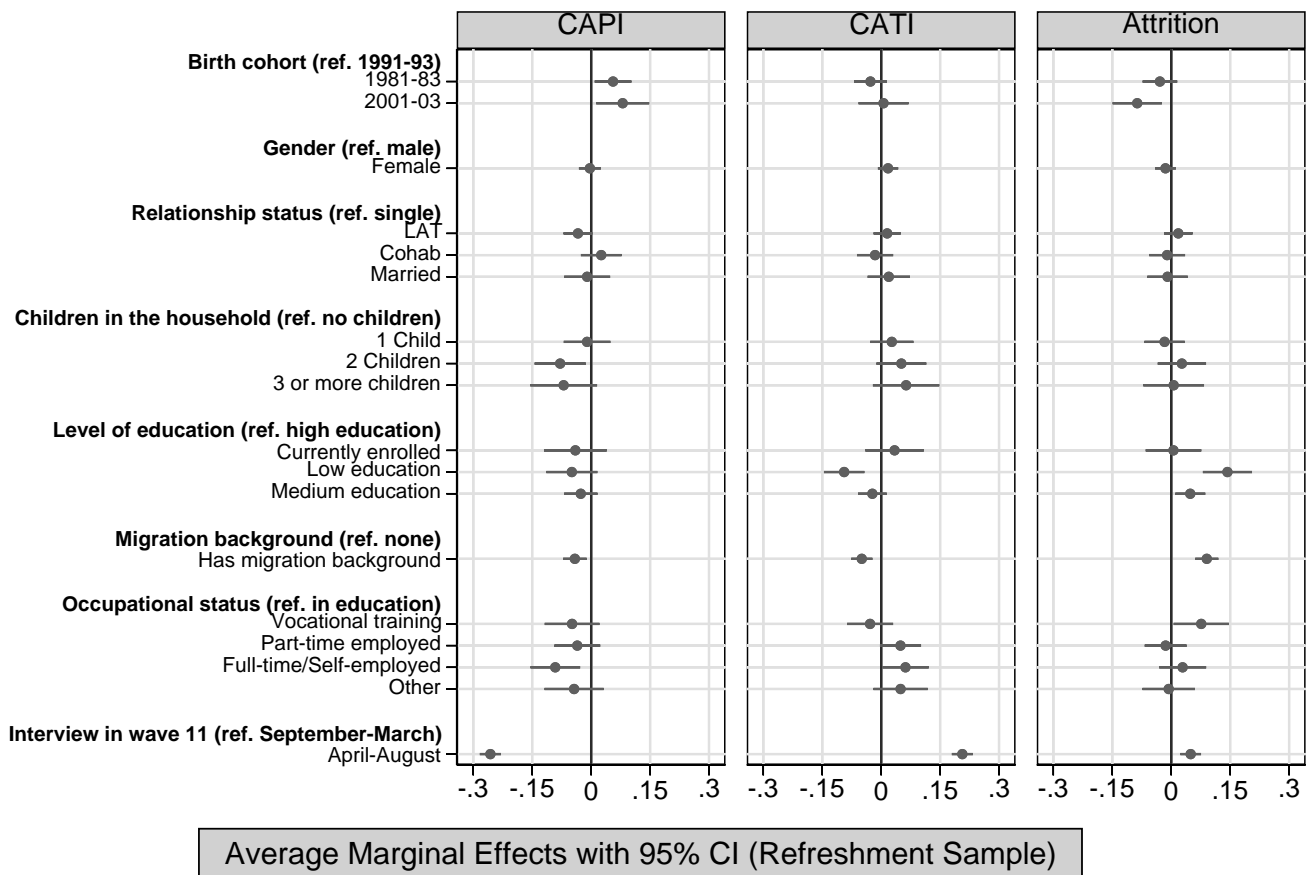
Some significant selection effects were found to apply to the CATI interview mode: Respondents with three or more children in the household show lower chances of being interviewed via CATI. Women are more likely than men to participate via CATI, but this finding is only significant at the 10% level. For the pairfam/DemoDiff base sample, no systematic selection into CATI mode is apparent. This is in contrast to the descriptive statistics in Table 1: The descriptive analysis neither differentiated between pairfam base and refreshment samples, nor considered wave 11. Systematic selection could have occurred only if respondents with specific characteristics were interviewed systematically later (or earlier) in the fielding period. As interviewers typically aim to keep intervals between waves at about one year, chances of participating late (in particular: after face-to-face

interviews were halted in March 2020) in wave 12, and therefore of being interviewed in CATI mode, are far higher for respondents who participated late in the fieldwork for wave 11.

Results for attrition show that older respondents are less likely to drop out of the panel in wave 12. For the parameters regarding number of children, education, and occupational status, results may be interpreted as hints to pandemic-related attrition effects. Respondents with children in the household are significantly more likely to drop out of the panel compared to those without children. Respondents with low or medium educational levels show a higher attrition probability than those with high level of education. Employed participants have higher attrition rates compared to respondents in education. These effects may be due to pandemic-related time strain as, for instance, respondents with children may not have had time to participate in the survey due to school and child care facility closures. Respondents with lower or medium educational levels may work in occupations with particular work-related burden, e.g. in hospitals, or without the possibility to work from home. In contrast, students had more time to participate in the survey due to school closures. However, these are only some of the possible explanations related explicitly to the pandemic circumstances. It is not possible to differentiate whether the panel drop-out occurred before or after the outbreak of the pandemic.

Figure 2 presents the results for respondents from the refreshment sample who experienced their first panel follow-up questionnaire in wave 12 (N=4.882).

Figure 2: Multinomial logistic regression model for pathways of refreshment sample respondents; wave 11 to wave 12



Results show lower chances of being interviewed in the CATI mode for respondents with low educational attainment and/or a migration background. Further socio-economic characteristics did not prove significant. The largest factor in CATI participation is related to field processes:

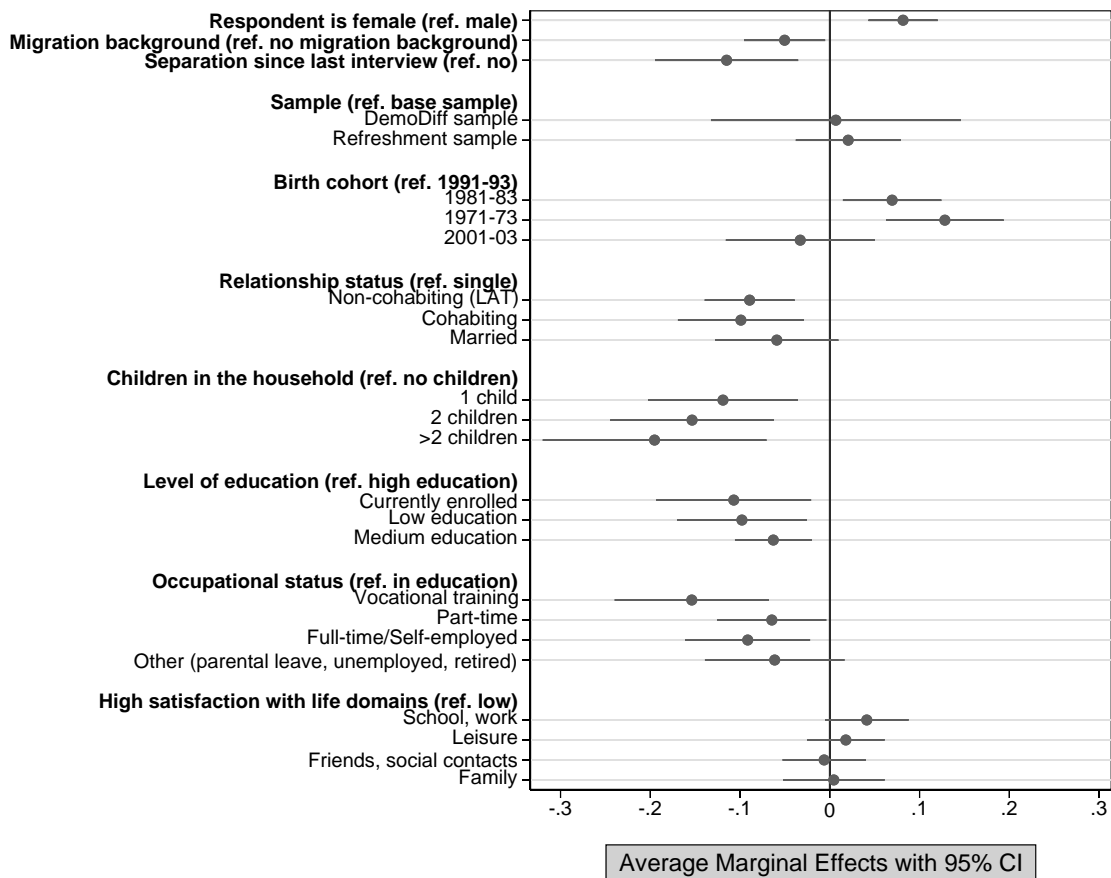
Respondents who were interviewed late in wave 11 had higher chances of being interviewed late, and therefore via CATI, in wave 12.

Contrary to the results from the pairfam base sample, the effects of attrition in the refreshment sample may be related to a well-known panel attrition effect: Respondents with lower levels of education and/or migration backgrounds have a higher chance of dropping out of the panel during the first follow-up wave. Results for pairfam confirm the attrition literature in this regard, as respondents with low educational attainment and a migration background have higher drop-out probabilities. Respondents with medium education and those in vocational training are also more likely to drop out of the panel.

2.3 Factors associated with participation in the mail questionnaire (PAPI)

The following is an investigation of whether participation in the self-administered (PAPI) section of the survey was selective. The mail-in questionnaire (PAPI) contained questions normally posed in the CASI section of the face-to-face interview. It was sent to respondents by mail after completing the CATI interview. In total, 81% of the CATI respondents sent in the completed PAPI to the survey institute. Figure 3 exhibits factors associated with the probability of completing the PAPI questionnaire; results are presented as AMEs of logit models with a binary dependent variable that assumed the value 1 if the respondent completed and sent in the PAPI questionnaire. Accordingly, the analytic sample includes only respondents of the CATI mode.

Figure 3: Average marginal effects (AMEs) of logit model for returning a completed PAPI



The analysis is based on several hypotheses regarding participation: First, respondents are expected to be less likely to complete the PAPI questionnaire if they needed to answer more questions in order to do so. The number of questions to be answered increased, for example, for respondents with a partner, as a large part of the questionnaire covered intimate relationships. Second, for respondents who might be less able to read and answer the German-language questionnaire (i.e., respondents with low educational levels and/or a migration background), the burden of the PAPI questionnaire and therefore the risk of not completing and sending it in is expected to be higher. Third, respondents with high time strain, in particular during the pandemic, for example respondents with children, are expected to be less likely to complete the questionnaire. On the other hand, those with particularly low time strain during the pandemic, such as students, are expected to be more likely to completed and send in the PAPI questionnaire. Finally, respondents might be reluctant to complete the PAPI if they feel that they must report negative or socially undesirable news from their life, for example mental health issues or a separation from a partner. These parameters were included in the model presented in Figure 3. All variables included were drawn from the wave 12 CATI data.

Results from the logit models clearly indicate that participation in the PAPI questionnaire was selective. Women and older respondents were more likely to participate, whereas refreshment sample respondents, for whom wave 12 was the first follow-up wave, were not less likely to complete the PAPI (conditional on CATI participation). Relative strain also appears to influence participation: Respondents with a partner, irrespective of cohabitation and marriage, exhibited a lower participation probability. Similarly, respondents with lower levels of education were less likely to participate, as well as those with a migration background. In particular, the hypothesis regarding time strain could be confirmed: Respondents with children had lower participation propensities, which is not likely a consequence of increased questionnaire length as the PAPI questionnaire did not include many questions about children and parenting. As expected, students exhibited higher participation probabilities, assumedly due to an increase in availability due to school closures during the fielding period.

Finally, the last hypothesis supposed negative events and feelings that may arise when answering the respective sensitive questions would deter respondents from completing the questionnaire. For instance, respondents may be reminded of negative feelings during their separation or be reluctant to report specifics such as having had an abortion or suffering from depression or substance abuse. This hypothesis is only partially confirmed: Respondents who separated from their partner since the previous interview (according to their own report in the wave 12 CATI) were less likely to complete the PAPI, whereas satisfaction with work, family, leisure, and social contacts did not affect participation probabilities to a significant extent. It should be noted, however, that the effect of separation might also be due to additional questions, i.e. the increased questionnaire length.

2.4 Examples: Influences on substantive results

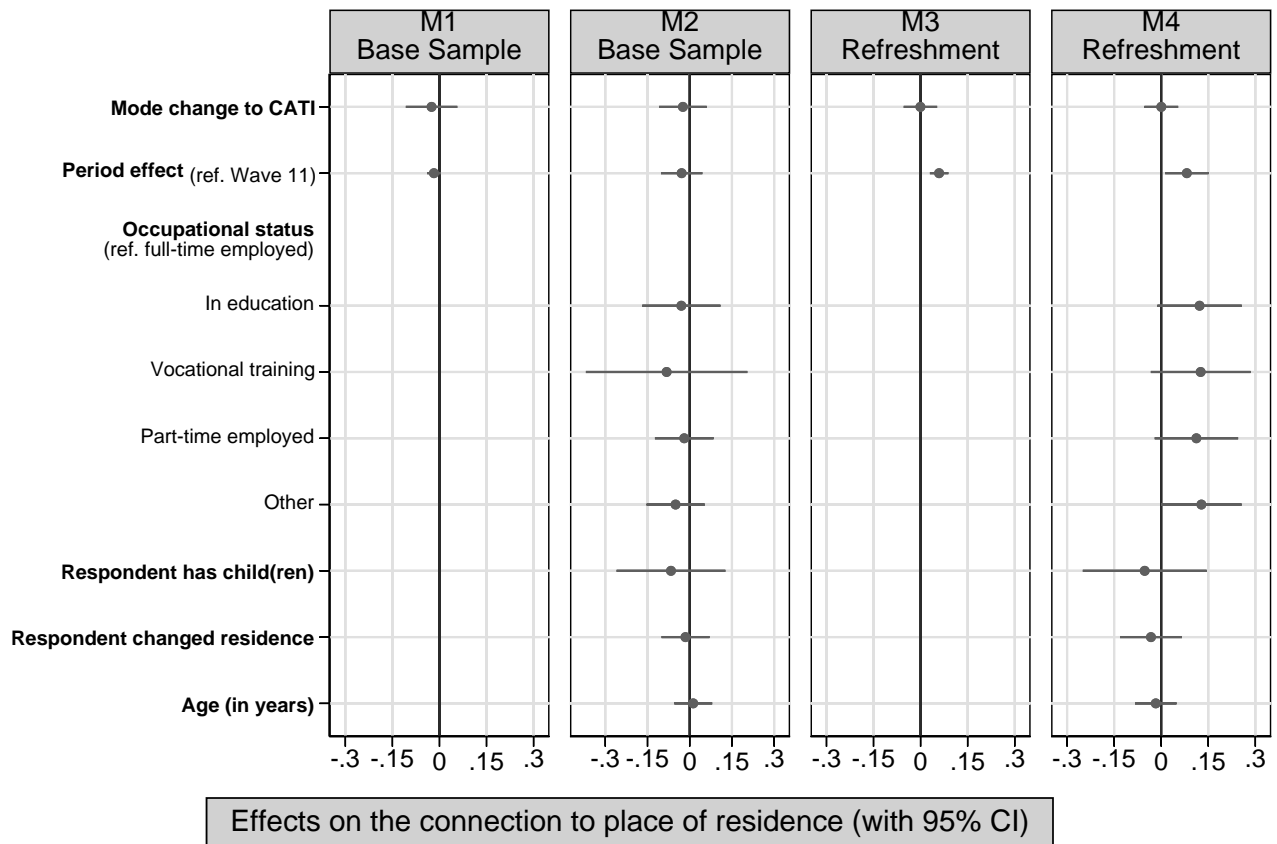
In a final step, mode effects are illustrated by investigating change in two outcome variables (i.e., *attachment to place of residence* (CATI) and *subjective social status* (PAPI)) between wave 11 and wave 12 of the panel. Both outcome variables were selected as they were assumed to be as unaffected as possible by substantial effects of the COVID-19 pandemic. The anchor data sets from wave 11 and 12 are used for the following analyses, with the application of listwise deletion for missing values on the variables of interest.

2.4.1 Example 1: Attachment to place of residence (CAPI vs. CATI)

The variable regarding attachment to the place of residence (*hc29*) was chosen to examine mode differences as it is assumed to remain relatively stable over time. The translated question wording is as follows: “How strongly attached do you feel to the locality and region here where you live?”. Respondents rated their attachment to their place of residence on a scale from 1=“very strongly” to 4=“not really”. Figure 4 shows the results of fixed effects panel regression models estimated separately for those from the pairfam base sample and respondents of the refreshment sample. Base models (M1 and M3) for both groups include the mode switch from answering the question in CAPI in wave 11 to CATI in wave 12, as well as a wave dummy to measure period effects. Further models (M2 and M4) include several control variables added as potential influential factors on both the dependent variable and survey mode: whether respondents switched from full-time employment to another labor force status, whether a child was born since the wave 11 interview, respondent age, and whether respondents moved to a new place of residence since the wave 11 interview.

Results for the pairfam base sample in models 1 and 2 indicate no significant mode or period effect on the attachment to the place of residence. However, models 3 and 4 show a significant and positive period effect, but no mode effect, for the refreshment sample. Results from this example analysis indicate no mode effects for the switch from CAPI to CATI. However, researchers are advised to check for possible mode effects for CAPI/CATI variables if working with wave 12 data.

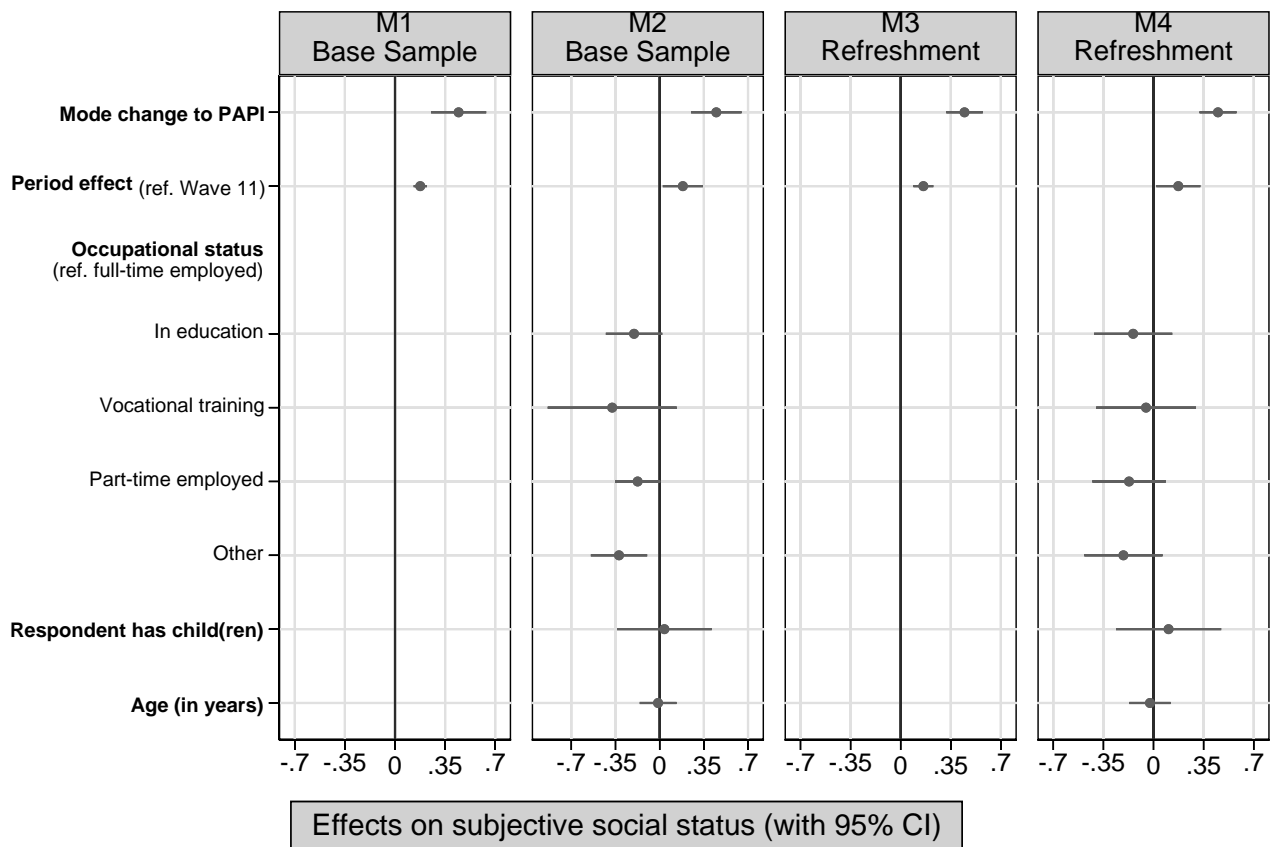
Figure 4: Effects of switching from CAPI to CATI on *attachment to place of residence*. Results from linear fixed effects regression models



2.4.2 Example 2: Subjective social status (CASI vs. PAPI)

Figure 5 shows the results of fixed effects regression models for the effect of interview mode change on *subjective social status*, for pairfam base sample and refreshment sample respondents separately. Subjective social status was assessed by a (vertically positioned) 11-point Likert scale, asking for respondents' subjective placement of themselves at the "top" or "bottom" of society (higher values correspond to a higher perceived social status). The base models M1 and M3 only include the mode switch (CASI to PAPI) and a wave dummy. The extended models M2 and M4 account for additional time-varying factors likely to affect both survey mode and changes in perceived social status: labor force status, parenthood, and age. Respondents' household income was not included due to the large amount of missing values, in particular among younger respondents from the refreshment sample.

Figure 5: Effects of switching from CASI to PAPI on *subjective social status*. Results from linear fixed effects regression models



The base models (M1 and M3) estimate a statistically significant and substantive positive effect (around half a scale point) of switching from the CASI section of the CAPI interview to the PAPI questionnaire after completing the CATI interview. Furthermore, the wave dummy indicates an increase in perceived social status of around 0.2 scale points between wave 11 and wave 12. The mode and period effects remain virtually the same if additional time-varying variables enter the models (see M2 and M4). Within the pairfam base sample, a change from full-time employment to no employment (i.e., unemployed, homemaker, parental leave, retirement, or other) results in a statistically significant decline in perceived social status (-0.3 scale points). However, no further effects emerge within the extended models. The results indicate a strong mode effect within both

the pairfam base sample and the refreshment sample that is not created by changes in labor force status or by becoming a parent between wave 11 and wave 12. However, these results should not be interpreted as a simple mode effect, as the switch from CASI to PAPI can analytically not be separated from potential pandemic effects that may have influenced respondents' subjective assessment of social status. In addition, other time-varying confounding factors that were not considered in this (didactic) example analysis could have contributed to the result presented here.

As respondents of the pairfam study in wave 12 are comparatively young (median age: 35, maximum age: 49), the lower risk of serious complications from an infection with the COVID-19 virus could be one additional explanation for the detected increase in perceived social status. The presented results are exploratory in nature and illustrate that (substantive) mode effects can occur when analyzing outcomes from the CASI/PAPI section of the anchor questionnaire within a longitudinal research design. If these effects are not considered in an analysis, statements with regard to content-related research questions are likely to be biased. Substantive analyses are further complicated by potential pandemic effects that cannot be analytically separated from mode effects. Therefore, users are advised to use caution when analyzing questions from the wave 12 CASI/PAPI sections over time.

3 Recommendations

The goal of this technical paper is to raise user awareness of selectivity issues associated with the interview mode changes due to the COVID-19 pandemic. Before March 2020, standard CAPI interviews were completed. After March 2020, interviews were conducted exclusively via CATI combined with a PAPI questionnaire for sensitive questions.

In the first step of the analyses presented here, descriptive analyses showed that, for some variables, large differences between survey modes are observed, which are mainly explainable by the field process. In part 2, attrition in wave 12 was assessed. Higher attrition is mostly due to general panel attrition appearing in the second wave of a longitudinal study, which particularly affects respondents with low educational levels and/or a migration background. A substantial portion of parents who were part of the pairfam base sample also dropped out in wave 12, which could be due to the high (time) strain due to the pandemic. In a third step, respondents who did and did not complete the PAPI questionnaire were compared. Again, the analysis indicated selectivity issues. Users should therefore consider this when analyzing wave 12 data. Finally, two analytical examples were proposed to illustrate the outcome of estimations that do not control for interview mode and wave. In one case, there is no mode effect; in the other, the results are clearly biased.

Based on this technical paper, the pairfam team suggests the following:

Robustness checks: When analyzing...

- ... the pairfam data with a longitudinal analyses, always check whether the results remain stable if wave 12 data is excluded.
- ... CASI variables (in particular), always check whether the results remain stable if the refreshment sample is excluded.
- ... pairfam wave 12 data (cross-sectionally), always check whether the results remain stable if CATI responses are excluded.

Recommendations: Users should always...

- ... control for both wave and interview mode when analyzing wave 12 data.
- ... look closely at the sample composition, and choose appropriate control variables.
- ... carefully consider possible biases of the central variables.
- ... take item non-response into account, which could be different for PAPI and CASI responses.

Most important to note is that effects found in wave 12 should be at least be considered to be an effect of the field process, not hastily interpreted as a COVID-19 effect, as these effects mix both mode and period effects.

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