Relationship-Based Selective Participation of Secondary Respondents in a German Multi-Actor Panel Study

Objective: This study investigates the extent to which participation of secondary respondents (SRs), here mothers, in a multi-actor study is cross-sectionally and longitudinally biased regarding relationship characteristics with the primary respondent (PR) of the same study.

Background: Family research emphasizes the importance of analyzing family relations over time and from the perspectives of several family members. Following the leverage-salience theory, selective (re-)participation of PRs and SRs might bias a sample toward certain relationship characteristics, in particular over time.

Method: For 8,579 PRs of the German Family Panel Study (www.pairfam.de/en/), it is analyzed whether or not their mothers as SRs participated in Wave 2 and 4. A latent class analysis identifies relationship types based on the PR’s evaluation of “intergenerational solidarity and conflict”. Their influence on the respondents’ probability of (re-)participation is examined using simultaneously estimated linear probability models.

Results: Each of the four identified relationship types exhibited a particular but constant pattern of SR survey participation. This resulted in an overrepresentation of structurally and functionally closer relationships at each observation. This bias is mostly based on the PR’s selectively given consent to interview her/his SR and to a smaller extent on the selective (re-)participation of the SR or PR themselves.

Conclusion: SR data are selective, but the degree of selectivity remains rather stable over time. We discuss these findings with respect to both data users and future data collectors.

INTRODUCTION

A multitude of family research deals with questions regarding the mutual relations between two individuals’ attitudes, well-being, relationship quality, or health (e.g., Kalmijn & Liefbroer, 2011). To address these issues properly, dyadic longitudinal data are needed (Lyons & Sayer, 2005). Multi-actor panel surveys can provide such data. In this type of survey, a primary
respondent (PR) repetitively serves as the central target of the study and is asked for access to her/his main dyadic partners—known as secondary respondents (SRs)—such as children, partners, and parents. This procedure for approaching the SR is particularly important if the PR and the SR do not share a household and thus for target populations with individuals in early-stage partnerships or adult children not living with their parents, for instance.

Up to now, only a few studies have implemented multi-actor surveys over several points in time. This might be due to the extensive organizational effort required, but also because little is known about the success of this data collection mode so far (see exceptions Kalmijn & Liefbroer, 2011; Schröder, Castiglioni, Brüderl, & Krieger, 2013; Slauson-Blevins & Johnson, 2016; Brüderl et al., 2018). In the current paper, we therefore examine one crucial aspect potentially threatening the quality of longitudinal dyadic data: selective participation of SRs over time. Therefore, we investigate participation of (young) adults between the ages of 16–39, the PRs, as well as their mothers, the SRs, and analyze the potential longitudinal selection bias with regard to their mutual relationship quality.

Selective participation is a major problem in survey research because it puts the generalizability of findings at risk (Peytchev, 2013). Compared to the cross-sectional selectivity of PRs common in social surveys, SR as well as PR data from multi-actor panel studies might suffer from further selection problems because of the multiple steps to approach the respondents: First, the PR needs to pass on the SR’s contact information and thus functions as a “gatekeeper” (e.g., Schröder et al., 2013). Second, the SR needs to decide whether or not to participate her/himself. In addition to these cross-sectional processes, longitudinal data might also be affected by panel attrition in each wave not only for the PR but also for the SR. This might attenuate or intensify already existing cross-sectional biases (Schöni, Stafford, Mcgonagle, & Andreski, 2013).

In the field of family research, in particular, the selectivity might be associated with family relationship characteristics (Kalmijn & Liefbroer, 2011; Young & Johnson, 2013). In accordance with the leverage-salience theory proposed by Groves, Singer, and Cornning (2000), we argue that respondents might differ in their likelihood to participate or to give consent, based on their relationship quality with other family members. Predominantly positive and important notions regarding the considered relationship are presumably associated with higher and predominantly negative notions with lower propensities of participation. If this is the case, unit nonresponse is not at random and therefore findings based on these data are systematically biased (Schnell, Hill, & Esser, 2013). If the same selection occurs repeatedly at several points in time, this selection bias would lead to samples with an increasing share of respondents with close family relations over time. Accordingly, it is important for data users to know whether or not longitudinal SR data are biased toward individuals from well-functioning families to be able to evaluate the quality of the findings of the study. For data providers, it is additionally of interest to identify the steps of the interview process in which selectivity occurs.

To analyze SR selectivity over the interview process and over time, we use data from the German Family Panel (pairfam), which is a longitudinal multi-actor cohort study funded by the German Research Foundation (DFG) as a long-term project (Brüderl et al., 2015). Even though partners, children, biological, and adoptive fathers as well as adoptive mothers can participate as SRs, we focus on the relationships to biological mothers because they are the most important people in intergenerational relationships with on average high levels of exchange and contact (Knijn & Liefbroer, 2006; Das, de Valk, & Merz, 2017). Within the Western European comparison, intergenerational solidarity structures of families in Germany are generally known to take on an intermediate position between the Southern “strong” and the Northern “weak” family bonds (Brandt, Haberkern, & Szydlik, 2009) with the German welfare state regime often classified as being rather conservative and familialistic (Leitner, 2003, for instance).

Due to our focus on intergenerational relationships, we follow a long-standing body of research showing these relationships are of a multidimensional nature (Bengtson & Roberts, 1991) and that they can consist of seemingly opposing features (Lüscher & Pillmer, 1998). Therefore, as it is currently state-of-the-art, we first apply latent class analysis (LCA) to reduce the complexity of intergenerational relationships by identifying groups of individuals with similar relationship types. In a next step, we use the
identified relationship types to predict selective participation for several participation steps. We analyze whether PRs with particular relationship types to their SR have higher or lower chances of giving consent to interview their mothers as well as whether the SRs participated in the study or not. We do so for two waves of panel data in order to examine whether or not the selection of dyadic partners with particular relationship types is intensified or attenuated when data are collected at several time points.

**Selective Participation of SRs in Longitudinal Studies**

To answer our central research question, namely if relationship types, defined as typical clusters of intergenerational solidarity and conflict, affect participation patterns of PRs and SRs cross-sectionally and longitudinally, we derive five hypotheses. These deal with selectivity by relationship types and are structured in accordance with the conditional participation steps of the pairfam study: Cross-sectionally, the PR needs to give consent first (Hypothesis H1) so that the SR can participate in the next step (Hypothesis H2). Longitudinally, the PR has to reparticipate (Hypothesis H3) and then again give consent (Hypothesis H4) so that finally the SR can participate again (Hypothesis H5).

**Consent Giving and Participation of the SR at First Observation**

The PR’s consent giving to interview the SR might be associated with the quality of their mutual relationship. According to the leverage-salience theory (Groves et al., 2000), survey participation in general depends on two aspects: leverage and salience. Salience refers to how visible a certain survey characteristic is made upon request. Leverage is defined as the importance one assigns to this attribute and whether it is perceived as positive or negative. Survey participation should be more likely if the salient survey characteristics are perceived as positive and more important than features perceived as negative. We assume this theory helps to understand PRs’ consent giving decisions as well. In the current case, the topic *family relationships* is made particularly salient through the direct request to interview the SR during the PR interview which itself strongly focuses on family issues. Hence, we expect that PRs with a mainly negatively perceived relationship with the SR are more likely to deny contact to the SR. Similarly, Kalmijn and Liefbroer (2011) argue that due to feelings of shame over their poor relationship, parents as PRs might not want their teenage children to report on this low-quality relationship as SRs. In the most extreme cases, the authors assume that parents might not even have their children’s contact information and are therefore unable to provide consent. Empirically, the authors find support for their assumption: more face-to-face contact, higher relationship quality and more support from the child as well as more financial support given to the child increased the probability of consenting to the SR interview. Higher frequencies of conflict were linked to lower rates of consent.

Besides the quality of relationships, the opportunity structure is crucial for the PR’s role as gatekeeper. Müller (2017) investigated the associations between the living arrangements of romantic couples and the chance that the PR will give consent to interview her/his partner as well as the SR’s eventual likelihood of participating. The author shows that among former living-apart-together couples, moving in together increased the PR’s probability of giving consent but not the SR’s chances of participating. For structurally closer relationships, characterized by cohabitation, PRs might be more likely to give consent because the SR questionnaire can be left right at the PR’s home without the PR’s having to reveal the address of the SR to the interviewer. Summing up, we expect that consent giving depends on relationship characteristics between the PR and SR. Due to the high complexity of these intergenerational relationships which are based on several dimensions of solidarity, we mostly focus on the disparity of relationships and argue that different relationship types show different levels of selectivity.

**Hypothesis H1:** The PR’s probability to give consent to contact the SR for an interview differs by relationship type.

The SR’s cross-sectional participation presumably depends on the relationship as well. Pursuing the leverage-salience theory, the survey topic might be more important if the person—in this case the SR—has strong associations with her/his family relations. Accordingly, this might differ with relationship quality to her/his child,
the PR. Moreover, for SRs with close exchange with the PR, the study might be more salient because they are more likely to already have spoken about it.

Previous research on cross-sectional unit non-response by SRs partially supports this assumption. With children as SRs, it is relationship quality which significantly predicts child’s participation whereas contact frequency and social support between PRs and SRs had no effects (Kalmijn & Liefbroer, 2011). For parents as SRs, only overall participation was analyzed without accounting for each participation step separately (Schröder et al., 2013). The authors demonstrated that for the parent’s (SR) participation many conflicts in the parent–child relationship reduced the chances while reporting admiration for the PR’s behavior, a close emotional bond as well as frequently shared leisure time and contact between the SR and PR increased the chances of the parent’s participation (Schröder et al., 2013). Summing up, we expect to find that relationship quality affects the SR’s decision to participate in the survey.

Hypothesis H2: The SR’s likelihood to participate differs by relationship type.

Reparticipation of PRs over Time

The PR’s decision to reparticipate in the survey might be affected by the relationship quality with her/his mother. Remembering that the previous interview addressed many family questions, whereas family issues are not a pleasant topic to talk about when relationships are perceived as mainly negative might lead to lower probabilities of reparticipation. In panel studies in general, respondents who drop out more often tend to be lower educated, male, mobile, childless, and are likely to not share a household with other adults (Haunberger, 2011; Lepkowski & Couper, 2002; Vercruyssen, Roose, Carton, & Putte, 2014). Despite numerous of such studies examining selective panel attrition for PRs, the effect of explicit relationship characteristics between the PR and various family members on the PR’s reparticipation in family related panel studies found only little attention. Müller and Castiglioni (2015) showed that separation from one’s partner affected the PR’s reparticipation in the next wave, but subjective relationship stability did not influence the chances of the PR’s reparticipation. Summing up, we argue that the quality of the PR’s family relationships influences the decision to reparticipate in a family survey. Thus, we expect to find selective participation among PRs over time based on different relationship types with their mothers.

Hypothesis H3: Reparticipation of PRs differs by the type of relationship with their mothers.

Consent Giving and Participation of the SR at Later Observations

Little is known if the PR’s consent giving and SR’s reparticipation change over time. We argue that—in addition to the leverage-salience considerations mentioned above—at a later point in the survey, both the PR and the SR know more about the procedure of the survey and PRs might also remember whether the SR participated in the previous wave (and liked it) or not (Lepkowski & Couper, 2002; Müller, 2017). This might add to the effects of relationship quality on consent giving and the SR’s reparticipation. When the relationship is characterized by extensive communication and exchange of thoughts, we assume that the likelihood of giving consent and reparticipation of the SR increases due to an even higher salience and a positive association with the topic family for both, the SR and the PR. However, when the relationship is of a less positive nature the role of the PR as the gatekeeper might also become stronger. PRs might know about the negative attitudes of the SR through the previous interview more explicitly and thus more thoroughly evaluate if the SR should report on the poor relationship again. We expect that a stronger gatekeeping function of the PR at the second observation leads to a stronger selection in the decision to give consent. To our knowledge, participation patterns of SRs have only been analyzed longitudinally once. Müller (2017) showed that partners as SRs participated more often in the next wave if they began cohabiting with the PR and less often if they stopped living together. The author furthermore showed that this effect was mostly based on an increase/decrease, respectively, in the PR’s likelihood of giving consent. Summing up, we posit that consent will be given even more selectively based on relationship type in later waves. However, the SR’s participation will still be selective by relationship types but is not expected to be different from the first observation.
Hypothesis H4: The PR’s probability to give consent to contact the SR for an interview differs by relationship type more strongly at the later wave.

Hypothesis H5: The SR’s likelihood to participate differs by relationship type at the later wave as well.

In conclusion, we expect that the SR’s participation is cross-sectionally biased by the relationship type. We argue that this selectivity is rooted both in the selection step of giving consent and in the SR’s participation. We further expect that these associations appear repeatedly over observations. Lastly, the PR’s reparticipation at the second time point is also likely to depend on the relationship to the SR.

Data and Method

Data

Our analysis is based on data from the German Family Panel study (pairfam), release 6.0 (Brüderl et al., 2015), Huinink et al. (2011) provide a detailed description of the study and its purpose. The random sample of PRs consists of individuals living in Germany in three different birth cohorts: 1991–1993, 1981–1983, and 1971–1973. These PRs have been interviewed yearly since 2008/2009 using face-to-face interviews. SRs, such as romantic partners or parents, are asked to participate in the study via paper-and-pencil surveys. In each wave, PRs are encouraged to give consent to pass on the address of the SRs. To reduce the burden of participation, only partners were included as SRs in Wave 1. Starting in Wave 2, up to three (step-)parents and one child aged 8–15 were additionally included. We use data from Waves 2 and 4, that is years 2009/2010 and 2011/2012, in our analyses because a broader questionnaire on intergenerational relationships (for both PRs and SRs) is only available in nonconsecutive waves. In Wave 2, 9,069 PRs were interviewed. We focused our analyses on biological mothers as SRs and their relationships to the PR. Because the mothers of 458 PRs had died (5.06%), 24 PRs did not know if their mother was still alive (0.26%), and 8 PRs did not respond to the item on contact frequency (0.01%), we examine a total of 8,579 PRs.

Explaining Variable: Relationship Types between PR and SR

Significant research on intergenerational relationships has been conducted over the past decades (Bengtson, Giarrusso, Mabry, & Silverstein, 2002; Ferring,Michels, Boll, & Filipp, 2009). To assess the characteristics of these relationships, early research focused on several one-dimensional facets, which were most prominently conceptualized as intergenerational solidarity (Bengtson et al., 2002). In more recent years, contradictory dimensions have also been considered, such as experiencing conflict but also showing strong affection. These are combined under the construct of ambivalent relations (Bengtson et al., 2002; Ferring et al., 2009; Giarrusso, Silverstein, Gans, & Bengtson, 2005; Lendon, Silverstein, & Giarrusso, 2014; Lüscher & Pillemser, 1998; Silverstein, Gans, Lowenstein, Giarrusso, & Bengtson, 2010).

To classify the heterogeneity of relationships, LCA enjoys some popularity in the field of family research (Dykstra & Fokkema, 2011; Lin & Yi, 2011; Nauck & Arranz Becker, 2013; Rooyackers, de Valk, & Merz, 2014; Schenk & Dykstra, 2012; Silverstein et al., 2010; van Gaalen & Dykstra, 2006, for instance). This method is well suited to identifying groups (namely latent classes) of similar individuals based on a set of particular characteristics (Hagenaars & Halman, 1989). Because the classification only serves as the basis for our further analyses, we followed the procedure for identifying relationship types established by van Gaalen and Dykstra (2006) as closely as possible. They developed a typology of adult child–parent relationships using LCA. Following their strategy was feasible because they used the Netherlands Kinship Panel Study (NKPS) which exhibits major similarities with the pairfam study, particularly in the field of intergenerational relationships. Both studies focus on solidarity as a core concept for describing family relations (following Bengtson & Roberts, 1991) and also apply a multi-actor design (Dykstra et al., 2005; Huinink et al., 2011).

However, there are also some differences between the two studies. Most prominently, the pairfam study focuses on PRs aged 15–37 years at baseline, whereas the NKPS covers an age range of 18–79. Other dissimilarities exist in the operationalization of relationship dimensions and the selection of corresponding items for the LCAs. Van Gaalen and Dykstra (2006) included
two separate measures for frequency of contact in the past 12 months (namely face-to-face and via telephone, e-mail, and letters) and measures for behaviors in several types of conflict situations (namely money, practical matters, norms/values, politics, and the relationship itself). In pairfam, by contrast, only overall measures of these dimensions of intergenerational relationships were included (Huinink et al., 2011). Moreover, in van Gaalen and Dykstra’s work, emotional, practical and financial support exchanges were assessed with one item from the perspective of each respondent, but we included constructs for these dimensions consisting of two items each except for financial support: as only a very small number of PRs reported supporting their mothers financially, we included only the transfers from the SR to the PR and not vice versa.

In line with van Gaalen and Dykstra (2006), we dichotomized the applied items because this procedure reduces the complexity of the underlying matrices for the LCA. In Table 1, we present the wording, criteria for dichotomization, and some descriptive statistics for the applied items.

**Applying the LCA over Time**

In comparison to previous, largely cross-sectional analyses of family research, we apply a longitudinal perspective and hence need to hold the definitions of the relationship types constant over time. Thus, we use the data from the first measurement occasion (pairfam Wave 2) as the reference point and apply the same latent class structure to the second measurement occasion (Clogg & Goodman, 1985). This means that we identify the number of classes and class characteristics based on the first observation only. For the following measurement occasion, we constrained the LCA to apply the class characteristics of the first occasion in terms of the number of classes and their respective thresholds of transition probabilities. These thresholds define which class of relationship an individual is selected into given certain values of the different indicators. Accordingly, the assignment of a particular set of relationship indicators to a particular relationship type is stable over both observations.

No clear criteria are available to identify the appropriate number of classes for LCAs (Nylund, Asparouhov, & Muthén, 2007). Hence, we started by estimating an LCA with one latent class only and added additional classes in a step-wise manner. Following the Lo–Mendell–Rubin Test, the Vuong-Lo–Mendell–Rubin Test (VLMR) and the similar but more conservative Bootstrap-Likelihood-Ratio-Difference Test, we assume that a particular number of classes saturate the amount of variation in the data explained. In addition, we conducted the Likelihood-Ratio-$\chi^2$ Test. Unlike the aforementioned tests, this test does not analyze whether an additional class helps better explain the clustering of the data despite an increase in degrees of freedom, but instead indicates whether the model fits well in general. Similarly, entropy indicates the similarity of observations within one class. Alongside these statistical criteria, we assume that a further important quality characteristic of an LCA is a plausible classification content-wise.

*Analytic Approach: Tracing the Steps of Participation*

To analyze selective participation, we remodel the data collection process of the pairfam study. For each step, we estimate a linear OLS regression model with a binary dependent variable (consent giving (no/yes) and participation (no/yes), respectively), which represents a linear probability model (Wooldridge, 2013, p. 224ff.). This results in percentages (by group) of those who participated and those who did not, which add up to 100% for each selection step. For the final table, we calculate a column showing the probability of not participating as the inverse of the sum of probabilities of having participated. A major advantage of this approach is that the results are easy to interpret. However, this comes at the expense of not being able to integrate further control variables, which would corrupt the interpretation of the parameters as percentages. We elaborate on this limitation in the discussion section. Furthermore, we apply seemingly unrelated regression models of several linear probability models to estimate the probabilities for the five participation steps which are simultaneously reflected in the hypotheses. This enables us to compare the effect sizes across models using $\chi^2$-testing. Finally, we calculate conditional probabilities by multiplication of the unconditional probabilities of each selection step. Therewith, we assess the overall probability of participation for the SR taking into
| Items                        | Dimension | Values                        | Mean<sup>b</sup> | SD<sup>b</sup> |
|------------------------------|-----------|-------------------------------|-----------------|---------------|
| **Contact frequency**        |          |                               |                 |              |
| 1.84 1.28                    |           | “How often are you in contact with your mother, adding up all visits, letters, phone calls, etc.?" |                 |              |
|                              |           | 1: Daily                      | ≤2 | 0.78 | 0.41 |
|                              |           | 2: Several times per week     |    |      |     |
|                              |           | 3: Once per week              |    |      |     |
|                              |           | 4: 1–3 times per month        |    |      |     |
|                              |           | 5: Several times per year     |    |      |     |
|                              |           | 6: Less often                 |    |      |     |
|                              |           | 7: Never                      |    |      |     |
|                              |           | 10: Never had contact         |    |      |     |
| **Conflict frequency**       |          |                               |                 |              |
| 2.33 0.88                    |           | “How often are you and your mother annoyed or angry with each other?" | 1: Never | 0.52 | 0.50 |
| 2.49 0.91                    |           | “How often do you and your mother disagree and quarrel?" | 1: Never | 0.53 | 0.50 |
|                              |           | 2: Seldom                     | ≥3 |      |     |
|                              |           | 3: Sometimes                  |    |      |     |
|                              |           | 4: Often                      |    |      |     |
|                              |           | 5: Always                     |    |      |     |
| **Emotional support given**  |          |                               |                 |              |
| 2.76 1.04                    |           | “During the past 12 months, how often did you give advice regarding personal problems?" | 1: Never | 0.59 | 0.49 |
| 2.83 1.09                    |           | “During the past 12 months, how often did you talk to your mother about their worries and troubles?" | 1: Never | 0.59 | 0.49 |
|                              |           | 2: Seldom                     | ≥3 |      |     |
|                              |           | 3: Sometimes                  |    |      |     |
|                              |           | 4: Often                      |    |      |     |
|                              |           | 5: Very often                 |    |      |     |
| **Emotional support received**|          |                               |                 |              |
| 3.11 1.09                    |           | “During the past 12 months, how often did you receive from your mother advice regarding personal problems?" | 1: Never | 0.59 | 0.49 |
| 2.73 1.12                    |           | “During the past 12 months, how often did the following persons talk to you about your worries and troubles?" | 1: Never | 0.59 | 0.49 |
|                              |           | 2: Seldom                     | ≥3 |      |     |
|                              |           | 3: Sometimes                  |    |      |     |
|                              |           | 4: Often                      |    |      |     |
|                              |           | 5: Very often                 |    |      |     |
Table 1. Continued

| Items                             | Mean<sup>a</sup> | SD<sup>a</sup> | Wording                                                                                                                                                                                                 | Values                                                                 | Threshold for dichotomization | Mean<sup>b</sup> | SD<sup>b</sup> |
|-----------------------------------|------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------|----------------|---------------|
| Instrumental support given        | 2.84             | 1.26           | “During the past 12 months, how often did you give help to your mother with shopping, housework, or yard work?”                                                                                             | 1: Never                                                              | ≥3                          | 0.22           | 0.42          |
|                                  | 1.51             | 1.00           | “During the past 12 months, how often did you give help to your mother in preparing documents such as tax forms or in taking care of official business?”                                                 | …                                                                      |                             |                |               |
| Instrumental support received     | 1.95             | 1.24           | “During the past 12 months, how often did you receive help from your mother with shopping, housework, or yard work?”                                                                                        | 1: Never                                                              | ≥3                          | 0.15           | 0.36          |
|                                  | 1.57             | 1.06           | “During the past 12 months, how often did you receive help from your mother in preparing documents such as tax forms or in taking care of official business?”                                                 | …                                                                      |                             |                |               |
| Financial support received        | 2.49             | 1.45           | “During the past 12 months, how often did you receive from your mother financial help?”                                                                                                               | 1: Never                                                              | ≥3                          | 0.38           | 0.49          |
|                                  | 2.27             | 1.08           | “During the past 12 months, how often did you receive from your mother gifts of money or valuables (more than 100 Euros per gift)?”                                                                       | …                                                                      |                             |                |               |

<sup>a</sup>Displays statistics for original items. <sup>b</sup>Dichotomized scales for 8,579 PRs at Wave 2.
account whether or not the PR gave consent and reparticipated at second observation.

**Results**

*Conducting the LCA: Identifying and Describing Relationship Types*

We first conducted an LCA with our baseline sample of 8,579 PRs to identify typical types of relationships serving as the independent variable of our further analyses. As shown in Table 2, all three tests for identifying the optimal number of classes, the Lo–Mendell–Rubin Test, VLMR and the Bootstrap-Likelihood-Ratio-Difference Test, showed that each additional class up to the fifth led to a better model fit (despite an increase in degrees of freedom). The Likelihood-Ratio-χ² Test revealed that models with two to four classes exhibited appropriate model fit, whereas models with five or more classes did not fit the data well. Moreover, while models with two to four classes showed high entropy values, all above 0.80, observations in the 5-class solution showed distinctly less entropy. Based on these indicators of the model fit, we opted for a 4-class solution.

Additionally, we looked more closely into the content-related distinctions between the models with four and five classes. We found that the 5-class solution separated participants of one particular class into those who did and those who did not support their mothers instrumentally. We later refer to the overall group as “obligatory”. As the 4-class solution more coherently matched van Gaalen and Dykstra’s (2006) findings and provided more straightforward insights into the relationship types, this solution not only found support from statistical tests but also seemed to have a meaningful interpretation. We present the 4-class solution below and refer to the heterogeneity of the “obligatory” group in the discussion.

In Figure 1, the class loadings of each included item by identified relationship type for our categorization are displayed. In order to find suitable labels for the groups, we considered not the absolute class loadings, but rather their relative standing with respect to one another and followed van Gaalen and Dykstra’s (2006) choice of terms closely. Table 3 contains descriptive information on the distribution of relevant socio-demographic characteristics between the relationship types. We report differences by cohorts, educational attainment (still being enrolled in school, having obtained a degree without access to higher third education and having a degree including access to universities (at least A-level) or higher third education), gender (male and female) and co-residence with their mother (versus living separately).

Relationship type 1 (22.5% of total PRs) was characterized by high contact, high exchanges of emotional, financial, and instrumental support, and frequent conflict. This came closest to the *ambivalent* type found by van Gaalen and Dykstra (2006). Around two-thirds of the PRs with an ambivalent relationship were part of the youngest cohort, who were often still enrolled in school and lived in a shared household with their mothers. Predominantly women belonged to this relationship type.

The second relationship type (24.1%) also exhibited a high frequency of both contact and conflict as well as significant financial support provided by the mothers. However, emotional and instrumental exchange only reached a medium level. We labeled this type *obligatory*. Like the ambivalent type, PRs with obligatory relations to their mothers tended to be young, enrolled in school and living with their mothers. PRs of the obligatory type were more often male than PRs of the ambivalent type.

The third relationship type (29.1%) was characterized by less contact but extensive emotional exchange, especially by the PR. Relatively little conflict was present and instrumental help was largely provided by the PR to the SR. This closely reflected the *affective* type by van Gaalen and Dykstra (2006). PRs of the affective type were generally a bit older than those in the obligatory and ambivalent groups. This was also mirrored in lower rates of enrollment in school (13.1%) and co-residence with the mother (25.7%). The proportion of females in this group was just as high as in the ambivalent group, a type that was also very much characterized by high emotional support exchange.

Last, the fourth relationship type (24.3%) showed overall low loadings on all dimensions. Although the probability of contact and emotional exchange was very low compared to the other types, conflict remained relatively high. Therefore, the overall relationship between the PR and SR was labeled *discordant*. The age of PRs of this relationship type was comparable to the affective type. A slightly higher share of PRs in this group had already completed school and only every fifth PR shared the same household.
| No. of classes | 2   | 3   | 4   | 5   | 6   |
|---------------|-----|-----|-----|-----|-----|
| No. of observations | 8,579 | 8,579 | 8,579 | 8,579 | 8,579 |
| Log likelihood | −22,394.94 | −21,905.21 | −21,644.80 | −21,633.16 | −21,631.92 |
| Entropy | 0.94 | 0.86 | 0.90 | 0.73 | 0.74 |
| BIC | 44,889.51 | 43,964.38 | 43,497.92 | 43,528.99 | 43,580.85 |
| AIC | 44,811.88 | 43,844.41 | 43,335.60 | 43,324.33 | 43,333.84 |
| No. of free parameters | 11 | 17 | 23 | 29 | 35 |
| Lo–Mendell–Rubin Test | 2 × Diff in log likelihood | 961.77 | 511.40 | 22.85 | 2.31 |
| p-value | 0.00 | 0.00 | 0.01 | 0.72 | 0.72 |
| Vuong-Lo–Mendell–Rubin Test | Log likelihood of H_0 | −22,394.94 | −21,905.21 | −21,644.80 | −21,633.10 |
| 2 × Diff in log likelihood | 979.47 | 520.81 | 23.27 | 2.35 |
| Mean | 7.80 | 0.29 | 7.84 | 4.75 |
| SD | 7.26 | 6.71 | 4.98 | 3.88 |
| Diff in parameters | 6 | 6 | 6 | 6 |
| p-value | 0.00 | 0.00 | 0.01 | 0.72 | 0.72 |
| Bootstrap-Likelihood-Ratio-Difference Test | Successful bootstrap draws | 500 | 500 | 498 | 490 |
| Log likelihood of H_0 | −22,394.94 | −21,905.21 | −21,644.80 | −21,633.10 |
| 2 × Diff in log likelihood | 979.47 | 520.81 | 23.27 | 2.35 |
| p-value | 0.00 | 0.00 | 0.00 | 0.53 |
| Likelihood-Ratio-χ^2 Test | Mean | 992.16 | 239.81 | 25.93 | 2.66 | 0.18 |
| df | 20 | 14 | 8 | 2 | / |
| p-value | 0.00 | 0.00 | 0.00 | 0.26 | / |
Selective Participation of Secondary Respondents

Figure 1. Latent Class Loadings by Relationship Types (on Probability Scale).

Note: The class loadings of emotional support for the obligatory relationship type and instrumental support for the discordant relationship type had a class loading of zero.

Table 3. Descriptive Statistics on the Distribution of Socio-demographics by Relationship Type (in Proportions of Total)

|                      | Ambivalent | Obligatory | Affective | Discordant | Full sample |
|----------------------|------------|------------|-----------|------------|-------------|
| Pairfam cohort       |            |            |           |            |             |
| 1991–93              | 0.67       | 0.64       | 0.21      | 0.18       | 0.41        |
| 1981–83              | 0.22       | 0.22       | 0.38      | 0.33       | 0.29        |
| 1971–73              | 0.10       | 0.14       | 0.41      | 0.49       | 0.30        |
| Education            |            |            |           |            |             |
| Currently enrolled   | 0.45       | 0.43       | 0.13      | 0.10       | 0.27        |
| Lower level          | 0.37       | 0.41       | 0.50      | 0.59       | 0.47        |
| Upper level          | 0.18       | 0.17       | 0.37      | 0.31       | 0.26        |
| Gender               |            |            |           |            |             |
| Female               | 0.62       | 0.41       | 0.61      | 0.41       | 0.51        |
| Living in the same household | 0.74 | 0.69 | 0.26 | 0.20 | 0.46 |
| Number of individuals| 1,932      | 2,065      | 2,495     | 2,087      | 8,579       |

with her/his mother. Only 40.8% of PRs of the discordant type were female.

Overall Participation of SRs in the Interviewing Process

First, we present information on the participation process independently of relationship types. Starting with cross-sectional dropout at observation one, the final model presented in Figure 2 showed that 54.6% of all PRs gave consent to interview their SR. 62.6% of the contacted SRs eventually participated in the survey. Longitudinally, 72.4% of all PRs reparticipated at observation two. Out of those, 43.5% gave consent to interview their SR. A $\chi^2$-test showed that the proportion of PRs giving consent was significantly smaller at observation two compared to observation one ($\Delta \chi^2 = 3,470.29; p = .00$). Out of those for whom consent for an interview at observation two was provided, 69.0% of SRs were interviewed. This probability was significantly higher compared to the participation of SRs at observation one ($\Delta \chi^2 = 3,655.75$;
To assess the overall probability of participation for the SR irrespective of whether or not the PR gave consent and/or re-participated at observation two, the probabilities within these nested models can be multiplied for each selection step. Based on this, the conditional probability of a SR participating at observation one was $0.55 \times 0.63 = 0.35 = 34.7\%$ and hence clearly larger than $0.72 \times 0.44 \times 0.69 = 0.22 = 21.9\%$ at observation two.

**Selective Participation of SRs over Time by Relationship Type**

Next, we added the information on relationship type to each selection step. Starting again with cross-sectional dropout at observation one, we found, in line with hypothesis H1, that giving consent to interview the SR was selective based on relationship type. PRs with ambivalent and obligatory relationship types gave consent with probabilities of 71.4% and 64.3%, respectively, whereas PRs with affective and discordant relations exhibited significantly smaller consent rates of 50.1% and 35.1% (see Table 4, column (1)). All of these differences were statistically significant (ambivalent vs. obligatory: $\Delta \chi^2 = 106.68; p = .00$; affective vs. obligatory: $\Delta \chi^2 = 388.32; p = .00$; obligatory vs. discordant: $\Delta \chi^2 = 1,739.71; p = .00$).

The differences between groups in the SR’s subsequent participation were much smaller but still significant and followed the same pattern: SRs whose PRs identified their relationship as ambivalent or obligatory (66.3% and 66.5%, respectively; no significant difference) participated significantly more often than SRs with affective relations (58.0%; compared to obligatory: $\Delta \chi^2 = 140.20; p = .00$) and discordant relations (55.7%; compared to obligatory: $\Delta \chi^2 = 225.64; p = .00$) (see Table 4, column (2)). This was also in line with hypothesis H2. Hence, SRs with discordant relations were cross-sectionally the most selective group due to the high selectivity in the PRs’ consent. SRs with ambivalent relations were the least selective group.

At the second observation, 72.4% of PRs reparticipated. However, we found differences in the probability of reparticipation based on relationship types: PRs with an ambivalent relationship type dropped out with a probability of 26.0%, and thus significantly less often than discordant types, with 30.1% ($\Delta \chi^2 = 8.56$; $p = .005$). Displayed $\beta$-coefficients of the linear regression with a dependent binary variable can be interpreted as percentages participating. Probabilities in the column “Drop-out” are calculated post-hoc as the inverse of the (sum of) estimated participation probabilities.
Selective Participation of Secondary Respondents

Figure 2. Tree Diagram of Interview Flow with Probabilities of Participation (with Standard Errors and Case Numbers).

- PR participated
- PR gave consent to interview SR
  - yes
    - (N=8,579) .72 (.01)
  - no
    - yes
      - (N=6,210) .44 (.01)
    - no
      - yes
        - (N=2,700) .63 (.01)
      - no
        - yes
          - (N=4,682) .55 (.01)

SR participated
  - yes
    - (N=2,932)
  - no
    - yes
      - (N=1,863)

The results show that the extent of selectivity remained rather stable over both occasions ($r_{T1} = 0.36$, $r_{T2} = 0.35$; $SD_{T1} = 0.16$, $SD_{T2} = 0.16$). The selectivity patterns by relationship type, namely higher consent rates for ambivalent and obligatory relations and lower consent rates for affective and discordant relations, also remained similar, albeit at a lower level of consent (see Table 4, column (4)). Therefore, hypothesis H4 cannot be supported although differences between the relationship types remain significant.

Also shown in Figure 2, SRs were 6.4 percentage points more likely to participate at observation two than at observation one. This increase seemed to mostly be attributed to higher participation rates among SRs with discordant ($\Delta b = 0.14$; $\Delta \chi^2 = 377.47$; $p = .00$), affective ($\Delta b = 0.10$; $\Delta \chi^2 = 183.04$; $p = .00$) and obligatory relationships ($\Delta b = 0.05$; $\Delta \chi^2 = 57.95$; $p = .00$) and only little by SRs with ambivalent relationships ($\Delta b = 0.02$; $\Delta \chi^2 = 7.69$; $p = .01$) (see Table 4, column (2 & 5)). These results are in line with hypothesis H5. However, the extent of selectivity in participation of SRs at observation two was slightly smaller compared to observation one: both, the ranges ($r_{T1} = 0.11$, $r_{T2} = 0.04$) and standard deviations ($SD_{T1} = 0.06$, $SD_{T2} = 0.02$), decreased over time.

We previously focused on each selection step separately and now turn to the composition of the subsamples. Therefore, we explore
selectivity over time with regard to the baseline sample at $T = 1$. In Table 5 on the left-hand side (a), the values depict the SRs’ conditional probabilities of participation based on relationship type at baseline and respective selection step. For instance, out of all PRs, 22.5% exhibited an ambivalent relationship with their mothers at baseline. Mothers with an ambivalent relationship to their PR participated at observation one with a probability of 10.7% of the full sample. These SRs participated with a probability of 6% at observation two.

Based on these conditional probabilities, we calculated the distribution of relationship types of the baseline sample for each selection step separately and show them on the right-hand side (b) in Table 5. Note that these values relate to relationship types of the first observation only and do not represent the distribution of observed relationship types in the subsamples because they do not account for changes between relationship types over time. This approach allows us to visualize how individuals drop out differently by relationship types over time. SRs initially showing an ambivalent relationship were over-represented at observation one, with 31.2% compared to 22.5% at baseline. These SRs were still over-represented in observation two, although less strongly. Mothers with a discordant relationship at baseline (PR at T1: 24.3%) showed the same pattern but in the opposing direction. They were more strongly underrepresented at observation one (13.9%) than at observation two (18.0%). Summing up, we did not find any differences in the distribution of PRs regarding their relationship types over the waves, but the extent of relationship-biased individual selectivity tended to become smaller over time for the SRs.

**DISCUSSION**

In the current study, we analyzed whether relationship types, understood as classifications of typical patterns of intergenerational solidarity and conflict, affect the PR’s probability of giving consent to interview the SR and the SR’s probability of eventually participating at two different points in time. We assumed that PRs and SRs with different relationship types assign different leverages to family as the survey topic and are therefore unequally willing to participate in the survey (Groves et al., 2000). We found that this relationship-based selectivity is a major issue in SRs’ participation patterns and showed that this can mostly be attributed to the PR’s function as a gatekeeper. PRs with ambivalent and obligatory relationships gave consent to interview their mothers more often than PRs with affective and especially with discordant relations. The same pattern was found for the SRs’

| Relationship Type | Participated in T = 1 (PR) | Participated in T = 1 (SR) | Participated in T = 2 (PR) | Participated in T = 2 (SR) |
|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Ambivalent        | 0.22                      | 0.11                      | 0.17                      | 0.06                      |
| Obligatory        | 0.24                      | 0.10                      | 0.18                      | 0.06                      |
| Affective         | 0.29                      | 0.08                      | 0.21                      | 0.06                      |
| Discordant        | 0.24                      | 0.05                      | 0.17                      | 0.04                      |
| Drop-out          | —                         | 0.66                      | 0.27                      | 0.78                      |

Note: Values in italics retrieved from LCA. Other values based on own calculations: Values on the left-hand side (a) represent the conditional probability to participate in a selection step for individuals (PR or SR) (based on estimations shown in Table 4). They are clustered by relationship type at baseline. These probabilities are calculated via multiplying the share of the relationship type with each sum of the product of relationship-based probabilities to (re-)participate (including those who changed to another relationship type) and consent probability. Values on the right-hand side (b) show the proportion of relationship types (based on first observation) within the respective selection step. They refer to participants only and hence sum up to 1 in the row.
Selective Participation of Secondary Respondents

Participation but the extent of selectivity was less pronounced.

If relationship types are observed at a later point of the study cross-sectionally only, the selectivity problem could be widely underestimated. The most selective relationship types for SRs, namely affective and discordant, are also the most time-stable ones with the least changes toward other relationship types. At the same time, SRs with other relationship types frequently change towards exhibiting these affective and discordant relations at observation two and therefore substitute for those SRs who drop out. Changes between the relationship types obscure the actual extent of selectivity on the aggregate level. Following individuals over time reveals that at each wave SRs’ selective participation follows the same pattern. However, over time the extent of selectivity becomes smaller and so do the differences between the relationship types.

How do these results fit to the arguments provided by the leverage-salience theory (Groves et al., 2000)? It seems reasonable that PRs and SRs with discordant relationships are the most selective group throughout all the selection steps. Discordant relationships are characterized by not only the least contact but also by least emotional as well as instrumental and financial support. In accordance with the leverage-salience theory, this might be linked to little importance individuals assign to family as a survey topic. Therefore, PRs might be unmotivated to pass on consent for interviewing this respective family member. Moreover, for both PRs and SRs with discordant relationships the interview situation might be perceived as more stressful because they have to report on their poor relationship. SRs with an ambivalent relationship were the most over-represented. Despite many conflicts, the positive attitudes of the relationship such as frequent emotional exchange seem to outweigh this negative aspect. Moreover, ambivalent relationships appear to be the most intense type and are therefore maybe also perceived as most important and therefore salient. Despite seemingly lower importance and frequencies of mutual support, SRs with obligatory relationships participate significantly more often than SRs with affective or discordant relationships. Obligatory relationships are characterized by high frequency of contact and high prevalence of co-residence. Therefore, their high frequencies of consent giving in particular seem plausible because both the relationship to the SR is highly salient and passing on the questionnaire is easier for this type. This can explain overall higher SR participation rates within obligatory types. Contrastingly, for PRs with affective relationships lower rates of consent giving might result from their low levels of co-residence. Accordingly, they have higher costs of passing on the questionnaire because they need to reveal the SR’s address. The structural component of intergenerational relationships appears to be crucial for cross-sectional survey participation (see also Müller, 2017). Nonetheless, comparing obligatory and ambivalent relationships which show similar rates of co-residence, differences in selective survey participation point to the importance of affective and functional relationship characteristics.

Contrary to our expectations, the extent of selectivity in consent giving was not higher at the second compared to the first observation (Hypothesis H4). We found that selectivity remained equally stratified by the relationship types over time despite overall lower levels of giving consent at the second observation. The mechanism underlying selective consent giving seems to re-manifest at every request resulting in a rather stable selectivity pattern over time.

In the following, we discuss potential drawbacks of the identification of the relationship types: Clustering several dimensions with LCA is a state-of-the-art way of dealing with the high complexity of social relationships (van Gaalen & Dykstra, 2006). Nevertheless, some underlying assumptions of this method might have affected the results. Several criteria are used to decide on the number of classes in an LCA, and the selection of relevant items remains partly arbitrary. To tackle these concerns, we followed the procedure by van Gaalen and Dykstra (2006). Our 4-class solution exhibited a good model fit, and the classes we identified were highly comparable to the groups defined by van Gaalen and Dykstra (2006). We also applied a 5-class solution and found that this would result in the same ambivalent, affective and discordant classes. However, the obligatory relationship type would be differentiated further into two subgroups with high and low instrumental exchange. The type we ultimately decided in favor of was mainly characterized by frequent contact and little emotional support, but more heterogeneous in instrumental support exchange. The already quite high consent and
response rates of this relationship type might be even higher for the subgroup with high instrumental exchanges.

We found surprisingly high levels of changes between relationship types over time. Although a previous study identified a high stability of relationship types over time (Schenk & Dykstra, 2012), we found that the structure of every second intergenerational relationship alters towards showing another relationship type in the following wave. These different findings might be partially explained with the differences in the age composition of the study samples: While Schenk and Dykstra (2012) examined adults aged 18 and older, the individuals here under survey were on average younger and might hence experience more changes in their lives. Further research on this issue might want to disentangle life course effects in more detail.

The current study suffers from some further methodological limitations: We applied easy to interpret linear probability models and estimated all selection steps simultaneously to test for differences between relationship types. However, this approach did not allow us to easily control for other variables, such as socio-demographics, because it would corrupt the possibility of having each selection step sum up to 100% and sully the interpretation. This leads to two disadvantages: First, disentangling the causal pathway of relationship indicators and socio-demographics is always difficult in LCAs because living conditions and developmental stages affect parent–child relationships, but—vice versa—the type of relationship also affects living conditions. Secondly, separating the influence of relationship type and structural covariates might reveal that selection is driven more strongly by structural forces than proposed in this manuscript. For instance, co-residence has been shown to be related to the participation of partners as SR (Müller, 2017). In order to tackle this drawback and to get an impression in how far structural dimensions of the mother–child-relationship matter for selectivity in participation, we applied the main analysis to cohabitors and non-cohabitors separately (results shown upon request). We assume that cohabitation is one of the strongest factors that might influence consent giving and SR participation, in particular (Müller, 2017). The main patterns for each selection step which we observed for the full sample did also show for both subsamples, although the level of (re)participation was lower for those not cohabiting. In sum, the stratification of participation by relationship type did not vanish for those who cohabited suggesting that relationship types explain selection over structural influences. Still, some portion of selectivity might be related to other socio-demographic characteristics. Future research might further want to partialize out the effects of relationship types and socio-demographics.

The German pairfam-study focuses on family formation processes and hence over-represents younger cohorts. Germany is a country with a conservative welfare state and high levels of familialism. Intergenerational exchanges are close to the European average (Brandt et al., 2009; Leitner, 2003). Also, response and overall attrition rates in Germany are on a European average (Bergmann, Kneip, De Luca, & Scherpenzeel, 2017; Fokkema, Kveder, Hiekel, Emery, & Liefbroer, 2016, for instance). Although contextual settings might affect the importance of family as a survey topic and thus mean levels in response rates, contextual effects are very time stable and should hence not affect the patterns of SRs’ re-participation. Future research might also want to focus on a reverse generational sequence with mothers as PRs and children as SRs, longitudinal participation patterns of other SRs, and equivalent analyses in other country contexts.

This study’s findings are particularly interesting for data users and data collectors. Data users interested in analyzing SR data, for instance for dyadic analyses, need to know that SRs participation strongly depends on PRs willingness to give consent to interview the SR. This consent is biased by relationship quality. Accordingly, SR data users need to deal with selective unit non-response. For an overview of approaches to deal with unobserved missingness see Young and Johnson (2013). The current study shows that relationship indicators conducted in the PR’s survey are a source of information which can help to tackle selective unit non-response in SR data. Information on the PR-SR relationship drawn from the PR surveys should hence be introduced as clustered relationship type, as distinct control variables or included in a weighting procedure to address cross-sectional drop-outs in particular. The paper shows that this selectivity is almost equally strong in each participation wave and that PRs’ re-participation
is less biased by relationship quality to his/her mother. Thus, longitudinal selectivity requires less attention. Most important for future data collectors is the finding that the PR plays a crucial role as gatekeeper when it comes to interviewing the SR, and that this role is related to their relationship to the SR. Motivation to give consent to interview the SR should receive particular attention in future data collection. Measures such as specifically incentivizing PRs to pass on their SRs’ addresses, changing the way these addresses are requested and deciding who is PR and who is SR might be important for the success of a multi-actor study.

Summing up, cross-sectional as well as longitudinal SR data are selective by relationship quality. The current study shed light on the underlying mechanism: Although the (re-)participation of the SRs themselves does little depend on relationship quality, getting access to the SRs strongly does. A reduction of selectivity through PRs’ gatekeeping seems to be crucial for obtaining less biased dyadic family survey data. Family researchers working with multi-actor panel data should be aware of the non-response bias and use the PRs’ assessment of relationship quality to account for it.

**Note**

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