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Research Article

Parental status homogeneity in social networks: The role of homophilous tie selection in Germany

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Contents

1	Introduction	20
2	Theoretical background and previous research	21
3	Data, sample, and measurement	24
3.1	Data and sample	24
3.2	Analytic strategy	26
3.3	Measurements	28
4	Findings	28
5	Conclusion and discussion	35
6	Acknowledgments	37
	References	38
	Appendix	42

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Abstract

OBJECTIVE
We study network selection regarding parenthood status based on large-scale panel data on social networks in Germany.

BACKGROUND
Previous studies find that members of social networks tend to influence each other regarding the likelihood and timing of births. However, less evidence exists as to whether and how individuals actively select their network ties according to parental status. Hence, we explicitly study both the discontinuation of existing ties and formation of new ties.

METHOD
Our analyses are based on data from waves 2 and 4 of the German Family Panel (Pairfam, up to N = 36,352 ego–alter relationships). We use a record linkage procedure to match network persons longitudinally and estimate multilevel random and fixed-effect multinomial regression models.

RESULTS
We find weak evidence that young children increase the likelihood that existing social network relationships are discontinued and strong evidence that young children decrease the likelihood that new network relationships are initiated. Further, we find homophily effects regarding parental status in that both childless respondents and parents who recently had a child are less likely to dissolve ties to alters with the same parental status, respectively. Among women, homophily in parenthood status also increases the likelihood of establishing a new social network relationship.

CONTRIBUTION
By considering tie selection on the relationship level in ego-centered networks, our findings shed more light on the phenomenon of social alignment in networks regarding fertility behavior.

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1. Introduction

During the last half-century, demographers have documented global trends of fertility decline, albeit on different levels and with different times of onset, both in terms of a decrease in number of children (i.e., quantum) and postponement of parenthood to higher ages (tempo) (Morgan 2003). Whereas the decreasing quantum of children can largely be traced back to economic development (see Myrskylä, Kohler, and Billari 2009, also for an apparent recent reversal of this trend), differences across regions and countries could not be explained based solely on economic variables (Coale and Watkins 1986). Consequently, social interactions were suggested as a catalyst of demographic change, determining the onset and pace of societal shifts in fertility (Montgomery and Casterline 1996). Whereas during the second demographic transition social interaction has arguably fostered fertility decline, more recent studies show that social interaction operates rather as a fertility incentive; for instance, a simulation study by Pink (2017: 86) estimates that without social influence processes, 22% fewer children would have been born in 2010. Previous studies mainly focus on social interaction processes through which fertility (or childlessness) spreads across social networks (for an overview of theory and research, see Balbo and Barban, 2020; Bernardi and Klärner 2014), for example, via social learning and social support. The present study takes into account that social networks are not static and may evolve over time as a result of active tie choices. It is well known that network members are not recruited randomly but that, as suggested by the concept of homophily, similar others are generally preferred over dissimilar others as network members. Personal networks are more homogeneous than would be expected by chance with regard to a plethora of characteristics including social demographics, attitudes, and behavior (McPherson, Smith-Lovin, and Cook 2001).

It is likely, then, that social environments tend to become more homogeneous over time with respect to child-related attitudes, generative intentions and behavior, and ultimately parental status as a consequence of two complementary, intertwined processes: on the one hand, diffusion processes in which fertility preferences spread across networks, and on the other hand, homophily, implying that network members choose their ties with respect to similarity of individual characteristics, such as parental status. Despite a growing body of research indicating social diffusion in networks with respect to fertility (for a research overview, see the next section), the process of tie selection regarding parental status still remains not fully known. More specifically, we know little about in-selection and out-selection in social networks based on parental status likely because of the general scarcity of datasets containing longitudinal network information (Alwin, Felmlee, and Kreager 2018). Using large-scale panel data from Germany (Pairfam) on ego-centered personal networks, we aim to examine network selection processes regarding parenthood status.

2. Theoretical background and previous research

The present study aims to examine the emergence of parental status homogeneity in social networks as a homophily process resulting from both in- and out-selection of ties – that is, the formation and discontinuation of network ties, respectively. In the following section, we will briefly outline this theme by providing both theoretical considerations and current state of research. Along these lines, we will generate several hypotheses guiding our analyses.

Homophily, or the tendency to nonrandomly select network members based on their similarity with ego on certain characteristics (McPherson, Smith-Lovin, and Cook 2001), is a key mechanism of network evolution over time. The two-step process underlying homophily can be characterized as follows. In the first step, social foci of activities (Feld 1982) where potential network ties are recruited prestructure – and thus limit – opportunities of contact. Obviously, individual access to social foci (e.g., the workplace) depends on the individual socioeconomic characteristics (e.g., employment versus unemployment, educational enrollment). In his theory of social structure, Blau thus makes the important point that social position and individual living conditions determine opportunities for social contacts (Blau and Schwartz 1984). Marsden (1990) characterizes this approach as the supply-side theory of social structure.

In the second step, some of the contacts gained through foci may, by deliberate preference-based choice, become steady social interaction partners in ego's social network; this view can be characterized as a demand-side approach to social networks (Marsden 2018). In both steps, it is more likely that similar others enter and remain in the network because most foci (e.g., schools) are homogeneous with respect to different characteristics (e.g., age and educational background) and because it is usually more rewarding and thus preferable to interact with similar others (Byrne 1971). Early research such as some classic community studies (e.g., Wellman 1926) shows empirically that children with similar social backgrounds tend to affiliate to each other more frequently than those with different backgrounds.

Applied to our research question of parental status homophily, it can be theorized that having children may facilitate communication with other parents about child-related topics and may even enforce contacts through shared foci, such as playgrounds or kindergarten, whereas the likelihood of contacts with nonparents, such as in a discotheque, may actually decrease after the transition to parenthood (Hammer, Gutwirth, and Phillips 1982). It is highly plausible that network ties are maintained or discontinued according to their degree of 'child compatibility,' which involves spatial (social foci) and temporal (daily time schedules) aspects, yet we are not aware of any research explicitly addressing this issue.

When examining network evolution over time, different types of relationships should be considered theoretically. Basically, ascribed ties such as (extended) family members are not always chosen and can thus be expected to be strong and often more stable than acquired ties (e.g., friends and work colleagues) (McPherson, Smith-Lovin, and Cook 2001). Similarly, tie strength should be positively associated with stability of ties over time, even after becoming a parent (e.g., Marsden 2018).

From a gendered view, it is often assumed that because of clearly gendered roles and access to different social positions (Fischer and Oliker 1983), life course transitions may have different implications for men's and women's network dynamics, although the few existing empirical studies have not been able to substantiate any clear gendered patterns (e.g., Marsden 2018). Most notably, according to women's kin-keeping role (Moore 1990), it can be expected that their networks are more strongly affected by family transitions than men's networks. Specifically, because in Germany mothers are more involved in childcare than fathers and are more likely to exit the labor force after the transition to parenthood than men (Grunow 2019), we expect women's networks to be affected more strongly overall than men's. However, it is plausible that whereas parenthood may produce marked turnover within women's networks, their overall number of ties (net change) may remain rather unaffected. This might partly explain why previous studies, which mostly examine aggregated network measures instead of single network relationships, fail to find gender differences (cf. Marsden 2018).

Although from a theoretical view it is obvious that social networks are not static entities but instead tend to evolve and transform over the life course, relatively few studies have pursued a longitudinal empirical approach. A large part of previous research is cross-sectional probably because longitudinal social network information has only recently started to be gathered in some large-scale studies (Alwin, Felmlee, and Kreager 2018). With regard to parental status homogeneity of social networks, selective choice of network members based on parental status homogeneity has mostly been considered as a nuisance and controlled for in models aimed at explaining social network influences (e.g., Balbo and Barban 2014). As a consequence, there is hardly any research examining explicitly network tie selection effects based on parental status, both in terms of new tie formation ('in-selection') and discontinuation of ties ('out-selection'). The few existing studies address mostly aggregate shifts in network structure (e.g., network size or number of specific tie types) at the network level but do not consider each relationship added to or removed from the network. In the following, we will provide a brief summary of relevant existing studies.

A meta-analysis by Wrzus et al. (2013) summarizing both cross-sectional and longitudinal research suggests mostly negative global effects of parenthood on personal networks and social relations to family and friends. For instance, in a pioneering cross-sectional study, Hammer, Gutwirth, and Phillips (1982) suggest that young parents focus their contacts either on a restricted set of network members they called “child-linked” or on own kin. At the same time, the total network size decreased, especially among nonworking mothers. These results point to a reduction of the diversity of contacts after becoming a parent. Similar findings have been reported for marriage, a transition often coinciding temporally with first birth (Sarkisian and Gerstel 2016).

At least regarding selection on the aggregate network level, more recently a couple of longitudinal studies have been published. Using a panel regression approach, Kalmijn (2012) reports complex changes within networks after transition to parenthood in the form of rebalancing processes, leading to a shifting focus away from friends and toward more local ties, such as neighbors; he suggests an explanation for this pattern, namely that young parents may form new ties with other parents and may increasingly resort to their proximity (i.e., neighborhood) to recruit new ties. A follow-up analysis of the same Swiss panel dataset reveals that having a particularly younger age at first birth tends to exacerbate the disruption of contact with friends and decreases contacts with neighbors (Rözer, Poortman, and Mollenhorst 2017). Similarly, a panel study using German data finds a reduction of meeting with friends across the transition to parenthood (Böhnke and Link 2017). Another longitudinal study based on fixed-effects panel regressions by Marsden (2018) suggests, in contrast, that the only social contacts negatively affected by small children in the household were those with neighbors. Another longitudinal study examines the discontinuation of social network ties (Mollenhorst, Volker, and Flap 2014) but finds no clear effect of transition to parenthood at all.

Although the aforementioned and further studies offer some insights into global structural network changes, they do not test whether networks actually tend to sort into becoming more or less child-centered – that is, with a large versus small share of parents. Previous studies provide, at best, insights into aggregate changes in network composition toward (or away from) child-centered environments with a presumed large (or small) share of other parents. For instance, Lois (2016) considers transitions across different network types over time based on network structure and predominant tie types such as kin or friends. However, the hypothesis that respondents were more likely to self-select into more family-centered networks over time if they became parents was not supported by the data, hence the findings remain somewhat inconclusive. We are not aware of any previous study that directly examines the role of parental status homogeneity for choice of network ties on the relationship level.

Building on previous studies, we first hypothesize that young children have a negative effect on the size of social networks due to the time constrains and lifestyle changes associated with them. More specifically, this implies that parents of small children are more likely to give up existing network relationships than persons without or with older children (H1, Out-Selection Main-Effect Hypothesis). Moreover, parents are generally less likely to establish new network relationships than persons without or with older children (H2, In-Selection Main-Effect Hypothesis). Second, we hypothesize homophily effects of parenting status, which may be caused by both changing opportunity structures of meeting and active tie choices. More specifically, this implies that parents (a) are more likely to dissolve ties with childless alters than with parents (H3, Out-Selection Homophily Hypothesis) and (b) are more likely to choose new ties who are also parents (H4, In-Selection Homophily Hypothesis). We will explore gender differences in these patterns with the general expectation that both the main effects of children and the homophily effects should be more pronounced among women than men.

3. Data, sample, and measurement

3.1 Data and sample

The data for this study came from the German Family Panel study, Pairfam (Brüderl et al. 2021); conceptual study information can be found in Huinink et al. (2011). Pairfam is a national interdisciplinary panel study on partnership and family arrangements in Germany. The survey started in 2008 with an initial sample of 12,402 randomly selected respondents (the so-called anchor persons) from the three birth cohorts 1991–1993, 1981–1983, and 1971–1973. Currently, 12 waves of the panel have been completed.

In waves 2 and 4, Pairfam includes the assessment of the ego-centered networks of the anchor persons. Therefore, we use data from waves 2 and 4. The boundaries of the networks were determined via four name-generator queries that identified the names of persons with whom the anchor is in direct contact. The four questions were formulated as follows: (1) "With whom do you share personal thoughts and feelings or discuss things that you would not discuss with just anyone?" (2) "Which persons do you meet regularly for activities, for example sports, or when you go out (cinema, dancing), or when you just want to talk to someone?" (3) "Who helps you whenever you need information or concrete advice in practical matters?" and (4) "With whom do you occasionally have quarrels or conflicts?" This name generator is intended to assess a multiplex set of social ties (Marsden 1990; McCallister and Fischer 1978).

We consider the following parts of the ego-centered network of an anchor person: friends, acquaintances and other unrelated persons (e.g., work colleagues), siblings, and other relatives (siblings of the anchor's partner, cousins, other relatives). Ego's partner was not considered a part of the social network.

By repeatedly surveying networks among the same respondents (in wave 2 and 4), Pairfam opens the rare opportunity to examine changes in personal networks over time. However, no unique identifier exists for single network persons. Thus, we used a record linkage procedure (Stata command reclink; Blasnik 2010; Wasi and Flaaen 2015) to match network persons across waves 2 and 4. The main criterion for identifying a network person was their first name. Due to different spellings of first names, however, the match of a network person's name between waves may be imperfect. To assess imperfect string matches, the reclink procedure employs a bigram string comparator (Elmagarmid, Ipeirotis, and Verykios 2007), which compares two strings using all combinations of any two consecutive characters within each string. Additionally, we use age (normalized to wave 2) and gender as criteria for identifying a network person. Just like the first name, these features were provided by the anchor person (ego) as proxy information.

The record linkage procedure comprised the following steps:

1. The first names of the network persons (alters) were typed in by the interviewers as part of the computer-assisted personal interview. Accordingly, different spellings of the first names had to be standardized for typical cases (e.g., Amelie to Amely, Benedikt to Benedict, Carmen to Karmen, Nadia to Nadja, Sophie to Sofie) initially.
2. Using first name, gender, and age, an automated record linkage procedure was employed. To consider recall errors in the age information, five-year age groups were used instead of the exact age. First name matches were weighted higher (factor: 10) than in the case of gender (6) and age (2). As a result, reclink produced a matching score that takes on the value 1 for perfect matches (i.e., for an alter in ego's network where first name, five-year age group, and gender are identical between waves 2 and 4) and lower scores for imperfect matches.
3. Imperfect matches were then reviewed manually in descending order of the matching score. For example, further (less typical) differences in the spelling of the first names (e.g., Rosemarie versus Rose-Marie, Finola versus Finolá) or typing errors were considered here. In addition, abbreviations of middle names and nicknames (e.g., Caro for Carolin, Ilo for Ilona, Michi for Michael, Betty for Bettina) were also considered.
4. As an additional plausibility check, we coded records as 'mismatch' if ego stated in wave 4 that he or she had only known the network person for less than a year.

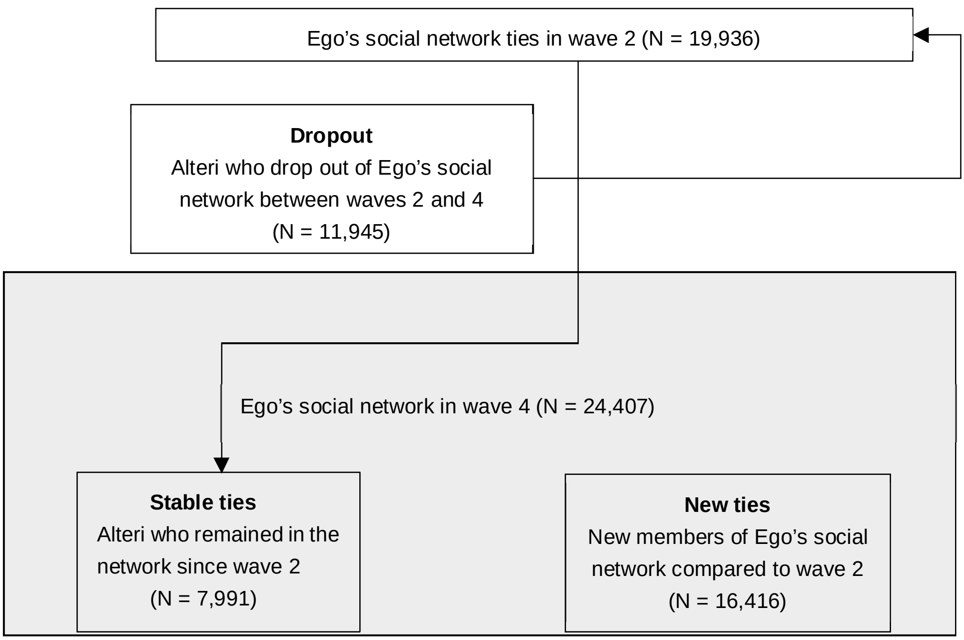
As a result, N = 7,991 network persons were coded as matches between waves 2 and 4. Of these, N = 6,061 (75.8%) were perfect matches, and N = 1,930 (24.2%) were coded as matches manually because of a high similarity of the record.

3.2 Analytic strategy

We combine our network selection analyses in a multinomial logistic regression model. The dependent variable has three outcomes (a graphical illustration and the corresponding case numbers can be found in Figure 1):

1. The dependent variable takes on the value 0 (discontinued tie, reference category) if a network person who was part of ego's network in wave 2 is no longer named in wave 4. This applies to N = 11,945 alters.
2. The value 1 (maintained tie) is coded if the network relationship remains stable – that is, the network person is named by ego, according to the matching procedure described in Section 3.1, in wave 2 as well as in wave 4 (N = 7,991).
3. If the dependent variable takes on the value 2 (new tie), ego names a network person in wave 4 who was not named in wave 2 (N = 16,416).

Figure 1: Overview of the analysis sample



These case numbers give the impression that the stability of the networks measured here is relatively low. For example, just under a third of ego's network relationships in wave 4 seem to have remained stable within two years (7,991/24,407 = 0.327; see

Figure 1). However, this impression is deceptive because, to save survey time, descriptors (e.g., first name, age, gender) were collected for up to eight network persons only, who – if more than eight persons were named by the anchor – were selected randomly. This applies to 8.9% or 12.8% of the anchor persons in wave 2 and wave 4, respectively. This means that network stability is underestimated, especially in large networks. Due to the random selection of network persons, however, we do not expect any systematic influence on our results. Additionally, we control for network size in all models.

The data structure is hierarchical: Ego–alter relationships were nested within anchor persons (egos). To account for this, we apply a multinomial logistic regression model with random effects (Hedeker 2003; xtmlogit with 're' option in Stata 17). In this multilevel model, ego's network relationships are on level one, and ego is on level two. Accordingly, covariates on both levels can be considered (i.e., characteristics of ego, characteristics of the network person, and properties of the relationship between ego and the network person, such as relationship duration).

The random-effects specification is necessary for our purposes because we have formulated hypotheses about the main effect of ego's children on network composition that can be tested only with this model. However, a potential disadvantage of the random-effect model is that the effects of level one variables (e.g., children of the network person) can be biased by level two variance (i.e., unobserved ego characteristics). To get rid of (unobserved) heterogeneity, we additionally estimate a multinomial logistic regression model with fixed effects as a robustness check (Pforr 2014; xtmlogit with 'fe' option in Stata 17). This model considers variance only within ego's network – that is, differences between network persons (or relationships).

In all analyses, we assumed that an anchor person who participated in wave 2 remained in the panel at least until wave 4. To take potential selection effects due to panel attrition (of egos) into account, we specified a Heckman-type selection model (probit model, pseudo $r^2 = .05$), which predicts the participation of an anchor person in wave 4 (Heckman 1979). As covariates, we use on the one hand sociodemographic variables, such as gender and birth cohort, and on the other hand, for identification purposes, field variables (not used in the substantive models), such as the anchor's willingness to participate in the study, and the number of contact attempts by the interviewer. The Mill's Lambda (inverse Mill Ratio) of this Heckman selection model was included as a covariate in all analyses.[3]

[3] All steps of data preparation and data analysis are documented in the attached syntax file.

3.3 Measurements

On the right-hand sight of our equations, we use the following predictors: basic demographic information includes ego's age (in years, linear and squared term), absolute age difference between ego and the respective network person (alter), ego's gender, a dummy variable measuring gender homogeneity between ego and alter, ego's marital status (1 = married, 0 = not married), and a dummy variable indicating homogeneity in marital status between ego and alter (1 = yes, 0 = no).[4]

Regarding the type of relationship between ego and the respective network person, we considered relationship type with three categories: (1) alter is a friend, acquaintance of ego, or another unrelated person; (2) alter is a sibling of ego; or (3) alter is otherwise related to ego (e.g., siblings of the anchor's partner, cousins, other relative). Additionally, we control for ego's assessment of his or her emotional closeness to the respective alter (ranging between 1 = not close and 5 = very close).

Ego's parenthood status was measured by four categories: (1) ego (and the respective partner) is childless, (2) ego and his or her cohabiting partner are living with children aged 0 to 2 years old, (3) coresident children aged 3 to 7 years, or (4) 8 years and older. Stepchildren and foster children were included. For network persons, the descriptor measuring parenthood status reads: "How many children under 3 years does [network person] have?" Based on this question, we created a dummy variable 'alter has at least one child 0 to 2 years.'

Furthermore, we aggregated the size of ego's social network as a basic structural indicator.

For all cases in the dataset that refer to either stable network ties or network persons that drop out between waves 2 and 4, anchor characteristics are measured at the time of wave 2. In the case of new network relationships in wave 4, the anchor characteristics at the time of wave 4 are used.

Occasionally missing values and values missing by survey design were imputed. Missing values by design arise because ego did not provide any information about the presence of children for underage network persons. For descriptive statistics, see Table A-1.

4. Findings

Tables 1 and 2 show the multinomial logistic regression models. Because we consider gender to be a potential moderator of selection effects (see Section 2), we compute

[4] For the importance of marital status for the composition of social networks, see Hurlbert and Acock (1990).

separate models for female and male anchor persons. This roughly splits the analysis samples shown in Figure 1 into two halves.

We compute the models in a specification with random effects (Tables 1 and 2, upper part) as well with fixed effects (Table 2, lower part). In the random-effects models, the statistical dependence of the network relationships assigned to ego is modeled by a random intercept. Effects can be estimated for level two covariates that differ only between egos as well as for level one characteristics that differ within ego's network (i.e., between network relationships). The fixed-effects model is restricted to the variance within ego's network and corresponding covariates. However, the estimates in the fixed-effects model are conceptually more robust because the variance between egos is fully controlled (e.g., Gangl 2010).

The dependent variable has three outcomes: stable tie, discontinued tie, and new tie. We define discontinued ties as the reference category and examine two contrasts: The first contrast, stable tie versus discontinued tie, tests which covariates affect the likelihood that a network tie existing in wave 2 will remain stable (i.e., will not be dissolved) until wave 4. The question is whether a network tie is maintained over time. The second contrast, new tie versus discontinued tie, compares network relationships that were new to ego's network in wave 4 to those that were discontinued between waves 2 and 4. This is a comparison between different network relationships (i.e., a between-tie analysis).

In the first step, let's take a brief look at the control variables based on the results shown in Table 1. For both male and female egos, the picture is relatively consistent: The likelihood of a network relationship remaining stable until wave 4 exhibits a bell-shaped relationship with both ego's age and the duration of the relationship between ego and the respective network person. The likelihood of a stable network relationship is also higher among friends/acquaintances and especially among siblings than among other related individuals. Other factors that promote stability include gender homophily (ego and alter have the same gender), age homophily (negative impact of age differences), and high emotional attachment between ego and alter. If, on the other hand, ego has a large network at the time of wave 2, the probability of tie stability decreases.[5]

The main subject of our hypotheses is the influence of children. The Out-Selection Main-Effect Hypothesis (H1) postulates that egos with young children are more likely to give up existing network relationships than anchor persons without or with older children. This hypothesis can be tested based on only the random-effects model shown in Table 1 because the number and age of egos children do not vary within ego.

[5] Regarding sex homophily, age differences, and duration of relationship, similar results are reported by van de Bunt, van Duijn, and Snijders (1999), Değirmencioğlu et al. (1998), van Duijn et al. (2003), and Snijders van de Bunt, and Steglich (2010) in studies on (complete) friendship networks.

Table 1: Multinomial logistic regression models with random effects predicting changes in the composition of ego-centered social networks over time

	Maintained vs. discontinued tie		Sex diff.	New vs. discontinued tie		Sex diff.
	Female	**Male**	**p**	**Female**	**Male**	**p**
Ego characteristics						
Age of ego/100	4.99 [4.01; 5.98]	2.44 [1.38; 3.49]		10.50 [9.31; 11.69]	15.68 [13.63; 17.75]	
Age of ego²/100	–.35 [–.45; –.24]	–.19 [–.31; –.07]		–.52 [–.62; –.42]	–1.05 [–1.21; –0.90]	
Ego is married	.03 [–.15; .21]	.14 [–.09; .37]		–.30 [–.46; –.13]	–.22 [–.45; .01]	
Ego's child status						
Ego has child 0–2 Years	.01 [–.15; .16]	–.13 [–.34; .07]	.06	–.39 [–.54; –.24]	–.55 [–.75; –.34]	.89
Ego has child 3–7 years	–.10 [–.24; .05]	–.06 [–.26; .14]	.54	–.34 [–.47; –.21]	–.47 [–.68; –.26]	.79
Ego has child 8 years or older	–.14 [–.30; .02]	–.25 [–.47; –.02]	.06	–.18 [–.33; –.03]	.25 [.03; .47]	.04
Ego is childless (ref.)	-	-		-	-	
Mill's λ (panel attrition)	–.97 [–1.41; –.52]	–.92 [–1.41; –.43]		–.43 [–.83; –.02]	–1.20 [–1.73; –.66]	
Relationship/alter characteristics						
Type of relationship						
Alter is friend or acquaintance	.19 [–.02; .40]	.29 [.04; .54]		–.01 [–.19; .17]	.16 [–.06; .38]	
Alter is sibling	.57 [.29; .85]	.08 [–.24; .40]		.16 [–.10; .42]	.04 [–.26; .34]	
Other kin (ref.)	-	-		-	-	
|Age difference| Ego–alter	–.03 [–.04; –.03]	–.04 [–.04; –.03]		.00 [–.01; .01]	–.01 [–.01; .00]	
Gender homogeneity Ego–alter	.88 [.76; 1.00]	.77 [.65; .89]		–.01 [–.09; .08]	.10 [.01; .19]	
Marriage homogeneity Ego–alter	.09 [–.08; .26]	–.11 [–.33; .12]		–.10 [–.25; .05]	–.16 [–.36; .04]	
Relationship duration/100	4.40 [3.53; 5.26]	5.33 [4.34; 6.33]		–1.84 [–2.59; –1.09]	–3.06 [–3.94; –2.18]	
Relationship duration²/100	–.20 [–.24; –.15]	–.19 [–.24; –.14]		.05 [.01; .10]	.08 [.03; .12]	
Emotional closeness	.53 [.47; .58]	.44 [.38; .50]		–.10 [–.14; –.05]	–.01 [–.05; .04]	
Alter has child 0–2 years	–.15 [–.30; –.01]	.07 [–.10; .25]	.23	–.21 [–.33; –.08]	–.04 [–.20; .12]	.13
Network characteristics						
Total size of ego's network in wave 2	–.02 [–.04; –.00]	–.01 [–.03; .01]		–.17 [–.18; –.15]	–.16 [–.18; –.14]	
Random effects						
Var (ego)	.42 [.33; .53]	.49 [.38; .63]		.54 [.43; .68]	1.33 [1.06; 1.69]	
N (ego–alter-ties)	19,439	16,913		19,439	16,913	
N (egos)	3,359	3,039		3,359	2,696	

Notes: Displayed are logit coefficients with 95% confidence intervals in brackets; the p-values in the sex differences columns refer to interaction effects between the child variables and ego's sex (models not shown).

Overall, we find only limited evidence for the assumption that children of different ages increase the likelihood that a network relationship will end. For female egos, a weak negative effect of alter's prekindergarten children on the stability of the ego–alter relationship is detectable (b = –0.15). For male egos, we find small negative effects of ego's prekindergarten children (b = –0.13) and school-age children (b = –0.25) on the probability of a continuation of the network relationship. To test sex differences for significance, we additionally computed a full model that included interaction terms between the focal child-related variables and sex of ego (not shown).[6] According to this model, the effects of ego's prekindergarten children and of school-age children are slightly stronger for male egos than for female egos (p = .06 for the interaction effect, respectively).

In the next step, we consider the second contrast – that is, newly established network relationships. Again, let's first look at the control variables (Table 1). The probability that a new network relationship is entered, compared to ties that are discontinued, develops into a bell-shaped trend over ego's age. If ego's network is already large in wave 2, the likelihood of making new contacts until wave 4 decreases. Moreover, the emotional closeness to network persons mentioned for the first time in wave 4 is relatively low. This is true even when these ties are compared with network relationships that drop out (the reference category). This effect is plausible insofar as new contacts are probably often weak ties with whom an emotional relationship must first be established.

Let's turn to the main effects of children. In the In-Selection Main-Effect Hypothesis (H2) we have assumed that anchor persons with young children are less likely to establish new network relationships than anchor persons without or with older children. This hypothesis is clearly confirmed for prekindergarten children and kindergarten children for both genders. Almost all effects are negative and comparatively strong. However, in the case of school children, a gender difference emerges: While in the case of female egos, school children lower the probability that a new network relationship will be established (b = –0.18), in the case of males, school children even have a positive effect (b = 0.25).

There is also the question of how a similarity or dissimilarity in child status between ego and alter plays out. To test this, the random-effects models presented in Table 1 are extended by interaction effects between the children of ego and alter. A fixed-effects model is also estimated as a robustness check. For both models, excerpts of the full results (comprising solely the interaction effects) are presented in Table 2.

The Out-Selection Homophily Hypothesis (H3) postulates that the stability of network relationships increases when there is a match in the presence and age of children at ego and the corresponding network person. We can first test this for the case when both ego and alter have prekindergarten children aged 0 to 2 years. The results support the hypothesis for both sexes. The interaction effect 'ego has child 0 to 2 years × alter has child 0 to 2 years' is positive and of small to moderate size in all corresponding models with random-effects or fixed-effects specification (b = 0.20 (RE) and b = 0.49 (FE) for

[6] The significance level of these interaction effects is entered in a separate column ("sex diff.") in Tables 1 and 2.

female egos, b = 0.52 (RE) and b = 0.31 (FE) for male egos, see Table 2). In addition, for female anchors, the interaction 'ego has child 3 to 7 years × alter has child 0 to 2 years' has a negative sign (b = –0.26 in the RE model and b = –0.40 in the FE model). Consequently, the combination of a prekindergarten child with a kindergarten child has a negative effect on tie stability – at least for women. This is further evidence that homophily in parenthood status has a stabilizing impact on network relationships.

Table 2: Multinomial logistic regression models with random effects and fixed effects predicting changes in the composition of ego-centered social networks over time (section of the full output)

	Maintained vs. discontinued tie		Sex diff.	New vs. discontinued tie		Sex diff.
	Female	Male	p	Female	Male	p
Random-effects model						
Interaction effects:						
Ego has child 0–2 ×	.20	.52	.17	.32	.01	.26
Alter has child 0–2	[–.11; .52]	[.09; .94]		[.03; .60]	[–.39; .41]	
Ego has child 3–7 ×	–.26	–.09	.85	.17	.22	.75
Alter has child 0–2	[–.55; .03]	[–.51; .32]		[–.09; .43]	[–.15; .59]	
Ego has child 8+ ×	.15	–.08	.58	.23	–.26	.10
Alter has child 0–2	[–.17; .48]	[–.55; .39]		[–.06; .51]	[–.65; .16]	
N (ego–alter ties)	19,439	16,913		19,439	16,913	
N (egos)	3,359	3,039		3,359	3,039	
Fixed-effects model						
Interaction effects:						
Ego has child 0–2 ×	.49	.31	.80	.20	–.25	.04
Alter has child 0–2	[.15; .83]	[–.16; .79]		[–.09; .49]	[–.66; .17]	
Ego has child 3–7 ×	–.40	.12	.07	–.13	–.15	.97
Alter has child 0–2	[–.73; –.08]	[–.37; .60]		[–.41; .15]	[–.55; .25]	
Ego has child 8+ ×	.33	–.33	.03	.41	–.05	.09
Alter has child 0–2	[–.05; .71]	[–.90; .22]		[.09; .72]	[–.48; .39]	
N (ego–alter ties)	17,533	14,832		17,533	14,832	
N (egos)	2,696	2,297		2,696	2,297	

Notes: Displayed are logit coefficients with 95% confidence intervals in brackets. The case number in the fixed-effects model is smaller because some egos have no variation in the outcome variable (i.e., no change in the status of the network members between wave 2 and wave 4). The p-values in the sex differences columns refer to interaction effects between the child variables and ego's sex (models not shown). The chi²-values of the Hausman tests are 10.9 (contrast: maintained vs. discontinued, male egos), 32.1 (maintained vs. discontinued, female), 162.4 (new vs. discontinued, male), and 86.7 (new vs. discontinued, female) with 4 degrees of freedom, respectively (main effect of alter's child 0 to 2 and interaction effects).

Furthermore, the question arises whether new network relationships are established primarily between network persons who both have children or who have children in the same age range (In-Selection Homophily Hypothesis, H4). Some empirical evidence for this assumption is found for female anchors. Here, the probability of establishing a new tie increases slightly if both ego and alter have prekindergarten-age children (b = 0.32 in the RE model and b = 0.20 in the FE model, see Table 2). Similar effects cannot be observed for men. Another gender difference is that the likelihood of forming a new network relationship also increases when female egos have schoolchildren and alters have prekindergarten children (the interaction effect ‘ego has child 8+ × alter has child 0 to 2’ is positive for female egos (b = 0.41) and practically zero for male egos). This pattern of effects is also evident for the discontinuation of already-existing network relationships (especially in the fixed-effects model, see Table 2: b = 0.33 for female egos and b = –0.33 for male egos). An ad hoc explanation for these findings is that experienced mothers with school-age children are happy to offer advice to ‘fresh’ mothers and, compared to mothers of younger children, have more time resources to carry out this ‘counseling’ activity.

Finally, we illustrate our results graphically. To fit the graphs to our hypotheses, we decompose the dependent variable in the multinomial logit model (0 = discontinued tie (ref.), 1 = stable tie, and 2 = new tie) into two dichotomous dependent variables: one for the probability transition ‘discontinued tie versus stable tie’ (out-selection) and one for the contrast ‘new tie versus discontinued tie’ (in-selection).[7]

Figure 2 shows predicted probabilities that alter will drop out of ego’s social network until wave 4 for selected combinations of ego’s and alter’s parental status and separated for male and female anchors. Displayed are marginal probabilities with 95% confidence intervals.[8] Consistent with the Out-Selection Homophily Hypothesis (H3), it becomes clear that the stability of a network relationship depends on the age combination of ego’s and alter’s children. For female egos, the lowest probability of a tie discontinuation occurs when both ego and alter both either have or do not have prekindergarten children.[9]

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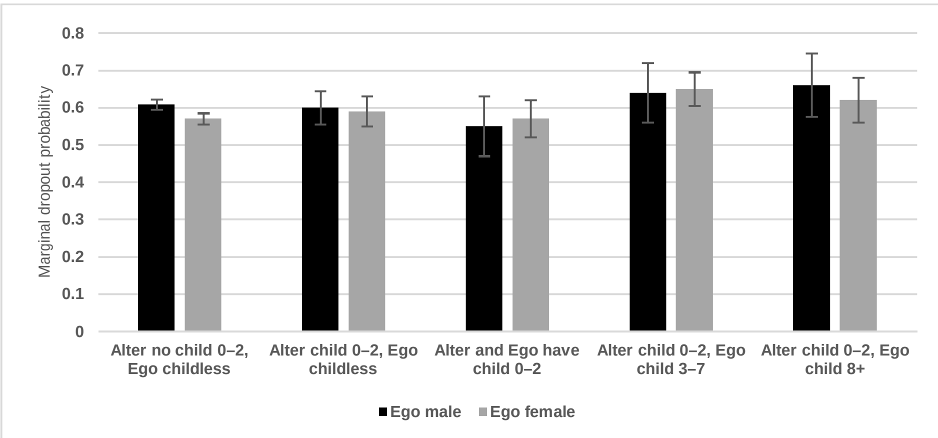
[7] According to Begg and Gray (1984), this decomposition leads to unbiased and consistent estimators. Further, we use random-effect (RE) and not fixed-effect (FE) models to estimate marginal probabilities. This is for substantive reasons since the main effects of Ego’s children are not estimable in the FE model. To assess differences between the RE and FE models, we conducted Hausman tests. These refer only to those variables that are focal for us and comparable between the RE and FE models (these are the main effect of Ego’s children and the interaction effects between ego’s and alter’s children). As a result, there are rather small differences for the contrast ‘maintained versus discontinued’ and moderate differences for the contrast ‘new versus discontinued’ (see notes below Table 2).

[8] In Figures 2 and 3, we display a selection of 5 combinations (out of 16 possible) between the parental status of ego and alter. Note that although probabilities can be meaningfully compared, absolute probabilities cannot be interpreted because there was a random selection if more than 8 network persons were generated. Also, remember that it was only assessed if the network person (alter) has prekindergarten children. Thus, for example, no clear group can be defined in which both ego and alter are definitely childless. For example, it is possible that network individuals from the first group in Figure 1 (‘ego is childless, alter has no child 0 to 2 years’) have children older than 2 years.

[9] However, it should be remembered here that the probabilities presented are a combined result of the main effects of having children and of the homophily in the parental status between ego and alter. As has been discussed, the likelihood of contact loss is slightly increased when young children are present (see the negative main effect of alter’s prekindergarten children for female egos in Table 1). This means that the probability of tie discontinuation in the group where both ego and alter have prekindergarten children would be even higher

With male egos, the homophily effect is even stronger. Here, the lowest probability of a tie discontinuation is shown when both ego and alter have prekindergarten children. Comparatively 'incompatible' (i.e., dissolution-prone) is the combination of a prekindergarten child (of alter) with a kindergarten child (of ego) – especially among female egos.

Figure 2: Marginal probabilities of network relationships dropping out of ego-centered social networks over time (reference: relationship is stable)



Note: Based on a random-effects logit model (dependent variable: 1 = discontinued tie, 0 = stable tie, not shown).

Figure 3 shows the probability of entering new network relationships in wave 4 for the selected constellations of parenthood status. The reference category is a discontinued tie. Here the interpretation is quite clear. The initiation of new relationships is most likely when both ego and alter do not have prekindergarten children (first bar from the left). In contrast, as the other groups show, it decreases when children are present – the younger the children are, the more strongly so. Accordingly, the likelihood of a new network relationship is lowest when both ego and alter have a prekindergarten child. However, for female anchors, the positive effect of homophily (see Table 2) again counteracts the negative main effect of prekindergarten children. In other words, if no homophily effect existed, the probability of a newly emerging network relationship would be even smaller if both ego and alter had prekindergarten children.

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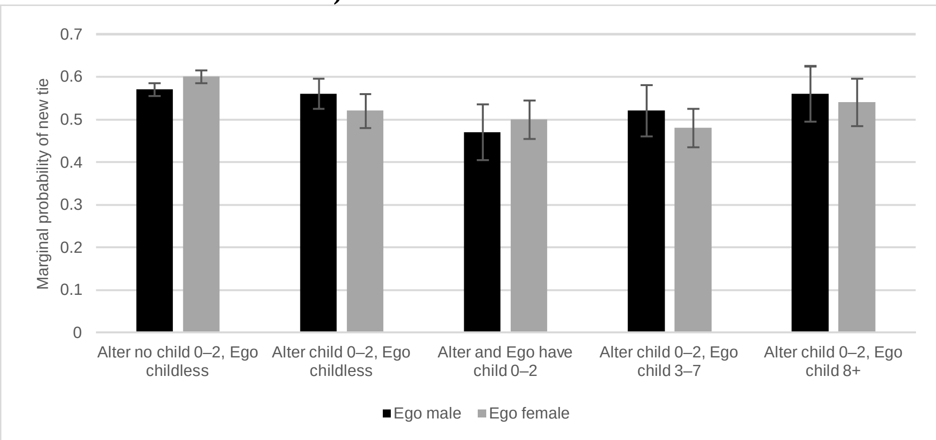
if the main effects of children were not counteracted by the positive homophily effect, which has been shown in the regression models.

Figure 3: Marginal probabilities of new network relationships emerging in ego-centered social networks over time (reference: relationship is discontinued)



Note: Based on a random-effects logit model (dependent variable: 1 = new tie, 0 = discontinued tie, not shown).

5. Conclusion and discussion

Based on unique longitudinal network and fertility data from the German Family Panel (Pairfam), with the present study we aim to advance existing evidence on the emergence and persistence of fertility differentials across different social contexts. As previous studies show, an important channel of social diffusion of fertility is that interaction networks provide opportunities to learn about the implications of both childlessness and parenthood (Montgomery and Casterline 1996, Balbo and Barban 2020). Although previous research has shed some light on diffusion processes (e.g., via social learning) within networks, we think that it has not fully acknowledged the agency of actors within the life course (Mayer 2009). Not only do actors influence each other socially, but, as our results illustrate, they also engage actively in a process of continuously recreating and readjusting their social environments to meet the challenges and demands of different life course stages. It thus appears that actors not only are guided by existing learning models and social capital but also deliberately choose their ties with respect to demands and goals pursued throughout the life course.

In our analysis, we were first able to follow up on previous studies (Wrzus et al. 2013) by showing that young children have a negative effect on the size of personal social networks. On the one hand, this manifests itself, to a lesser extent, in the fact that existing network relationships are more likely to be discontinued in the presence of young children (out-selection). On the other hand, to a significantly greater extent, we were able to show that young children reduce the probability that new network relationships are established (in-selection). These findings corrobate previous research findings in that we were able to test the selection effects for the first time not only indirectly (i.e., in the aggregated social networks) but also at the level of individual network relationships. Theoretically, it is again confirmed that the time restrictions and lifestyle changes that go along with the existence of young children make it more difficult to maintain or create social relationships with peers, respectively.

Further, we find support for processes of network homophily regarding parenthood. First, network ties to alters who match ego in terms of parental status – either both having or not having young kids – were the least likely to be dissolved over time; conversely, this implies that if ego and alter do not coincide in their intentions – or even in their time schedules – regarding transition to the family stage in their life courses, there is an increased risk that such 'poor' matches are dissolved (out-selection). This finding might explain why earlier studies have produced mixed findings regarding effects of parenthood on aggregate-level contacts (e.g., Mollenhorst, Volker, and Flap 2014; also see background section); it may be necessary to look more closely at characteristics of dissolved versus continued individual ties. Our findings suggest that the match concerning the focal transition (here, parenthood) may play an important role in tie selection that has largely been overlooked so far.

As a second, complementary aspect of network selection, we examined the formation of new ties (in-selection). Our analyses showed that for female egos with prekindergarten children (or with school children), the likelihood of establishing new network ties with parents of prekindergarten children increases. This partly attenuated the overall negative impact of young children on tie formation, suggesting the relevance of new social foci opened when entering certain life course stages. Although we cannot examine shifts of social foci directly, we assume that after becoming a parent, many of these foci become mostly child-centered, thereby facilitating contact between previously unrelated parents of children interacting with each other (Hammer, Gutwirth, and Phillips 1982).

The fact that the homophily mechanism via in-selection is detectable only for female egos shows that that fertility transitions seem to influence women's personal networks more strongly than men's, as expected. This could be reinforced by the German context, where mothers are more involved in childcare than men (see Section 2). For example, it can be expected that toddler groups, playgrounds, or parent cafés in kindergartens are more frequently attended by mothers than by fathers, thus providing mothers with more opportunities to establish new contacts.

Our study also has limitations. First, we had only two assessments of network relations with a lag of two years, hence we can study only a relatively short period in the life course. Second, alters' parental status was measured in a coarse way (i.e., whether they had infants at the time of the interview). Third, the data did not allow for a more fine-grained assessment of the types of relationships with alters (e.g., work colleagues). And finally, for respondents with large networks (more than eight ties), descriptors were assessed only for a random sample of eight ties, so we are unable to provide an accurate description of network turnover. However, to the best of our knowledge, large-scale datasets with narrowly spaced, repeated network measurements comprising all the required pieces of information do not exist yet.

In sum, the present study suggests that personal networks tend to become more homogeneous over time with respect to parental status. It appears that this increasing homogeneity is, at least in part, a result of homophilous tie selection regarding parenthood status. Future studies might go a step further by considering other transitions (e.g., marriage or divorce) and by looking into potential moderators, for instance, strength and quality of ties. A more in-depth analysis could also address the question to what extent the discussed homophily effects are due to altered opportunity structures (changing foci) or active tie selection through altered interaction incentives. Finally, it would be desirable to disentangle and compare relative effects of network diffusion and tie selection in shaping demographically homogeneous networks.

6. Acknowledgments

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Appendix

Table A-1: Descriptive statistics

	Female egos		Male egos	
	Mean	**SD**	**Mean**	**SD**
Ego characteristics				
Age of ego	26.67	8.59	25.53	
Ego is married	0.29		0.20	
Ego has child 0–2 years	0.11		0.08	
Ego has child 3–7 years	0.19		0.12	
Ego has child 8 years or older	0.19		0.11	
Relationship/alter characteristics				
Alter is friend or acquaintance	0.88		0.89	
Alter is sibling	0.08		0.07	
|Age difference| ego–alter	4.77	7.31	4.61	7.41
Gender homogeneity ego–alter	0.77		0.75	
Marriage homogeneity ego–alter	0.18		0.12	
Relationship duration ego–alter	9.28	8.26	9.93	8.52
Alter has child 0–2 years	0.11		0.09	
Emotional closeness ego–alter	3.86	0.95	3.65	0.93
Network characteristics				
Total size of ego's network	4.72	3.18	4.54	3.40
N (ego–alter relationships)	19,439		16,913	