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Who "Fills in" for Siblings and How? A Multilevel Analysis of Personal Network Composition and Its Relationship to Sibling Size[1]

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In the midst of widespread fertility decline, I examine the relationship between sibling number and support network composition using multilevel regression on data from 25 countries. A fundamental structural effect of having fewer siblings is that individuals have a smaller pool of available close-kin alters with whom to construct support networks. Consequently, networks of people with fewer siblings should be composed of different sorts of relations. Results confirm that such compositional adjustment occurs in systematic ways. Compared to those with three or more siblings, adults with none to two siblings (as separate categories) are more likely to expect support from parents, extended kin, and close friends but not more likely to do so from spouses/partners and children. Single children are also more likely to include neighbors and have smaller-sized and/or impersonal networks. These findings contradict the primacy of familial ties in social support networks. Moreover, adjustment of support networks towards nonsibling ties occurs in culturally expected ways. Those with fewer siblings are generally only more likely to turn to ties for the types of support typically associated with those relations—parents for instrumental and financial support and friends for emotional support. Single children, however, also violate institutionalized expectations of social support by turning to ties for a wider range of social support. The results suggest that continuing declines in fertility could bring about both reinforcement and rearticulation of the sociocultural framing of close personal relationships. Moreover, consistent with recent research, the results show that personal networks are influenced more by individual-level than country-level factors.

KEY WORDS: family; fertility; networks; sibling ties; structural position.

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INTRODUCTION

Fertility rates are declining nearly everywhere.[3] One implication of lower fertility is that people have fewer siblings, on average. Having fewer siblings reduces the size of one's available pool of close-kin ties. Moreover, to the extent that social interaction is meaningfully shaped by the number of involved parties (Simmel, 1955), the number of siblings one has (hereafter, sibsize) forms a durable context within which familial relationships develop over the lifecourse. If sibsize affects both the pool of available close-kin ties as well the texture and quality of one's affiliations, then declining fertility can have significant implications for the structure and content of close personal relationships.

Yet the relational implications of lower fertility, as it manifests in smaller-sized sibships, remain understudied. Previous research examining the association between sibsize and sociation has largely been focused on single children (e.g., Claudy, 1984; Falbo, 1981; Rosenfeld, 1966). But even this research has been described as scant and dated (cf. Trent and Spitze, 2011). Although research on single children has successfully drawn our attention to the relationship between sibsize and sociation, its current analytic framework is inadequate for two reasons. First, given that current fertility rates are converging on smaller family sizes but not on single-child families, a focus on the social behavior of single children is limited. Second, by collapsing all other sibsizes into a single comparative category, it potentially conceals differences between higher-order sibsizes. Although some recent research unpacks this dichotomized sibling category, it is mostly restricted to an in-depth examination of the role of sibsize in particular relationships, such as those between parents and children (Spitze and Logan, 1991) or among siblings (Campbell et al., 1999; Eriksen and Gerstel, 2002).

I expand on this research with three aims. One, consistent with the current world average total fertility rates, I examine if overall *support network composition* of individuals with zero, one, and two siblings (treated as distinct categories) differs from those with three or more siblings. Personal support networks consist of a focal actor (ego) and a set of alters with whom the ego reports having ties. Composition refers to the distribution of role relations in networks. Rather than emphasize the sociative uniqueness of single children, by extending the investigation to higher-order sibsizes, this approach captures the breadth of declining fertility more fully. Two, there is considerable debate in the literature on whether personal network composition is similar within

[3] The total fertility rate (TFR) is the average number of children a woman would bear over the course of her lifetime if current age-specific fertility rates remained constant throughout her child-bearing years. In 1970, 147 countries had TFR exceeding 3, nearly halving to 74 countries by 2007. During the same time, the number of countries with below-replacement TFR (2.1) rose from 2 to 56. In the 1960s, all of the 46 Muslim-majority nations of the world had TFR equal to or greater than 5. In 2008, only 11 of those countries had such high TFRs (UNCF, 2010). Although some countries in Europe are currently experiencing fertility rise, the increases are mostly from previously negative growth rates, bringing them closer to the world average.

large-scale groups such as countries or if its determinants are individual-level social structural factors such as age and gender. Multilevel models help partition the variance of the dependent variable into components occurring at different levels. One way to adjudicate between individual- and country-level factors is by means of such models on cross-national data. With few exceptions (Hollinger and Haller, 1990; Murphy, 2008), multisite studies of personal networks typically compare only two regions. A comparative analysis of two sites is limited in this regard as multilevel models are of little value when the number of groups is very small (Gelman and Hill, 2007:275). Drawing on a unique cross-national data set from the International Social Survey Programme, I conduct an investigation spanning 25 nations using multilevel logistic regression in order to assess the relative contributions of individual and country-level determinants of personal network composition.

Three, I show that culturally accepted understandings of relationships and structural tendencies implicit in having fewer siblings jointly produce patterns in network composition. More generally, adding to the growing body of literature on networks and meaning (e.g., Bearman and Parigi, 2004; Fuhse, 2009; Gondal and McLean, 2010; Ueno, 2009; White, 1992), this interaction demonstrates that the outcomes associated with network structural positions are shaped by the content of relationships in which they are located (e.g., Podolny and Baron, 1997).

SIBSIZE AND PERSONAL NETWORKS: STRUCTURAL EFFECT OF AVAILABILITY

A critical area of investigation in personal networks pertains to the factors influencing their composition—the distribution of role-relations within networks. Highly influenced by classical literature (such as Simmel, 1955; Tönnies, 1957), one strand of research hypothesizes a causal relationship between economic modernization and network composition demonstrating that urbanization and/or economic development leads to a decline in the relevance of kin ties, an increase in the importance of workplace and friendship ties, and a decline in the total number of ties (Fischer, 1982; Lee et al., 2005; Litwak and Szelenyi, 1969; Ruan et al., 1997).

Juxtaposed against modernization theory explanations, others (Fischer, 2008; Fischer and Shavit, 1995; Höllinger and Haller, 1990; Murphy, 2008) contend that the kin-centeredness of personal networks can be explained on the basis of cultural factors such as religiosity and orientation to individualism, not economic modernization. Murphy, for example, finds that individuals in countries with a higher concentration of religious attendance have networks that are more kin-centered. Literature also draws attention to the dependence of network composition on traditional social structural factors such as gender, socioeconomic status, and age, the effects of which are argued to be similar around the world (Bastani, 2007; Grossetti, 2007; Hennig, 2007). This research

demonstrates that across diverse contexts, women tend to be more involved with kin than men (Bastani, 2007; Lee et al., 2005; Ruan et al., 1997) and that socioeconomic status and kin involvement are negatively correlated (Degenne and Lebeaux, 2005; Fisher, 1982; Lee et al., 2005).

Fertility measured at the level of countries or other large-scale groups, like religion or socioeconomic status, is a macro-level construct comparable to urbanization or orientation to individuality. Viewed in this way, the effects of fertility decline on network composition can be evaluated by comparing networks across groups with differing fertility levels. Although this technique is appropriate for macro-level comparisons, it overlooks the micro level at which fertility decline manifests—within families, broadly defined. At this micro level, one way to operationalize fertility decline is in terms of a reduction in the number of siblings individuals have, on average.

A fundamental structural effect of having fewer siblings is that such individuals have a smaller pool of available close-kin alters with whom to construct social support networks. Consequently, as compared to those with many siblings, social support networks of people with fewer siblings should be composed of different sorts of relations. More specifically, support networks of individuals with fewer siblings are more likely to be composed of nonsibling ties. This could occur as a matter of sheer availability—the more siblings one has, the more likely frequency of contact, geographical proximity, and emotional closeness with at least one of them (Connidis and Davies, 1992; Miner and Uhlenberg, 1997). Relatedly, lower availability of siblings may also lead individuals to develop stronger ties with other relations, such as parents and close friends, through the lifecourse. If sibsize shapes the construction of support networks, we should find such "compositional adjustment" to occur in systematic rather than disorganized ways.

One possibility is that other close *familial* ties such as parents, children, and spouses rather than extra-familial ties play a more prominent role in the personal networks of single children and individuals with fewer siblings. This argument emphasizes the primacy of familial ties such that individuals "compensate" for the reduced availability of one type of familial tie by substituting it with another type of kin relationship. Consistent with this line of argument, research on single children shows that singletons have stronger ties with their parents and are more likely to include them in their networks (Kidwell, 1978; Polit and Falbo, 1987; Riggio, 1999). This suggests the following hypothesis.

> *H1: As compared with people with more siblings, people with few or no siblings are more likely to compose personal networks that include close-kin ties including spouse, parents, and children.*

An alternative adaptive outcome of having fewer siblings is the diversion of networks toward nonkin ties such as friends and colleagues. The spirit of this "downward" adaptation is captured in the hierarchical compensatory model of social support (Cantor, 1979; Carr and Khodyakov, 2007).

According to this model, individuals have a rank-ordered preference for receiving assistance from others, such that adults first seek support from close family members and only when kin are absent or unavailable do they compensate for their absence by turning to other ties. Substantiating this model, Roberts et al. (2009) find that family size is positively related to the number of kin ties in the personal networks of individuals. It also suggests that nonkin ties such as close friends are similar to friends with respect to the exchange of social support (Voorpostel and van der Lippe, 2007). This ''downward'' adaptation forms the basis of the second hypothesis.

H2: As compared with people with more siblings, people with few siblings are more likely to compose networks with extended-kin and nonkin ties.

Finally, individuals may respond to the lower availability of siblings by constructing smaller-sized personal networks rather than substituting other ties for siblings. Likewise, the depersonalization of personal networks—substituting professional services for personal ties—is another possibility. In support of these arguments, research on single children indicates that they are more self-sufficient and possess a lower need for affiliation than those with siblings (Brody, 1998; Claudy, 1984; Falbo, 1981; Rosenfeld, 1966; Trent and Spitze, 2011). In contrast, other research suggests that these tendencies are either not significant (Falbo, 1978; Kitzman et al., 2002) or attributable to socioeconomic status (Blake et al., 1991). Extending this research to higher-order sibsizes, I test the following hypothesis.

H3: As compared with people with more siblings, people with few or no siblings are more likely to report having no one to turn to or draw on professionals for social support.

SIBSIZE AND PERSONAL NETWORKS: RELATIONAL CONTENT

Hypotheses 1 and 2 pertain only to the network structural aspect of who is included in networks. This line of questioning is consistent with traditional research in social networks, which has been primarily concerned with the structure of relationships. As such, the hypotheses disregard the cultural content of ties, a topic that has received more interest in research on social networks in recent years (see, e.g., Bearman and Parigi, 2004; Gondal and McLean, 2010; McLean, 2007; Pachucki and Breiger, 2010; White, 1992). For example, the hypotheses suggest that individuals with fewer siblings construct networks that are more inclusive of parents. However, they fail to specify more precisely if and how parental roles or the content of parent-child ties vary on the basis of sibsize. The classic way to study relational content is through rich interviews by eliciting descriptions of particular relationships and/or observing interaction. Yet, relational content can also be studied on

the basis of data gathered in large-scale data sets. One way to do so is by operationalizing tie content in terms of the expectations of or actual flows of support through ties. This approach draws on White's (1992, 1995) conceptualization of tie content in terms of "stories" people tell of their relationships, which gives concrete form to otherwise abstractly defined relations. For example, we may find that people report talking with their friends about problems they face in their romantic relationships. This description—discussing relationship-related issues—helps clarify the substance of the friendship tie. Alternatively, we may find that young people expect their parents to help them out financially. Here, stories take the form of social support—emotional in the case of friends and financial in the case of parents. According to White, the set of reflexive accounts that are "accepted" stories of a tie in specific contexts form the *warranties* or the substance of that tie. These stories are accepted in that they reflect the shared understandings of the expectations and entailments of that tie. Thus, whereas a story is a description of a relationship, warranties are the stories that are frequently deployed to describe the content of a relationship. Conceptually, tie warranty is similar to relational framing (Goffman, 1974) such that dyadic-level instantiations of a tie are shaped by the broader cultural understandings of those ties (McLean, 1998; Yeung, 2005). Martin (2009) likewise describes such shared awareness of relational content as culturally institutionalized forms of relationships.

The prevalence of such cultural institutionalization should be empirically evident as regularities connecting role relations to tie content. Indeed, studies across diverse contexts reveal that the parent role relation is most often composed of financial support, advice, and exigent support (Degenne and Lebeaux, 2005; Lee et al., 2005; Plickert et al., 2007; Wellman and Wortley, 1990); friendship of emotional support (Lai, 2001; Litwak and Szelenyi, 1969; Wellman, 1979; Wellman and Wortley, 1990); neighbors are important as providers of short-term services and emergency care (Litwak and Szelenyi, 1969; Plickert et al., 2007); and siblings for both emotional and instrumental support such as household work, companionship, and support during marital problems (Lai, 2001; Wellman and Wortley, 1990; Wetherell et al., 1994).

Cultural institutionalization of relational content implies that individuals should expect specific types of support from particular ties. For example, individuals should think it appropriate to expect exigent support from neighbors and emotional support from friends. An important question stemming from this is if and the extent to which cultural expectations of ties moderate the effects of sibsize to jointly produce patterns in network composition. That is, if individuals with fewer siblings are more prone to composing networks with parents, as the first hypothesis posits, being mindful of appropriate parental tie content, should they be more likely to turn to parents for particular types of support and not others? If, for instance, it is culturally appropriate to turn to parents for financial support but less so for emotional support, then those with fewer siblings should turn to their parents for financial support but not for emotional support. Likewise, the higher propensity to turn to friends

(Hypothesis 2) among those with fewer siblings should manifest for those relational contents typically associated with friendship.

In statistical terms, for the hypotheses above, this can be tested by means of an interaction between tie content and sibsize. If the interaction produces a replication of the sibsize effect across support types—if those with fewer siblings are more likely to turn to parents for all types of support rather than only those characteristic of parental ties, for example—then tie content has little bearing on the relationship between sibsize and network composition and the compensatory structural effect of sibling availability dominates. By attributing additional dimensions to existing relational understandings, this outcome implies that having fewer siblings makes for more expansive relational understandings rearticulating institutionalized relational content. If the interaction replicates the original relationship between sibsize and network composition for some types of support and not others—if those with fewer siblings are more likely to turn to parents in general, but this greater reliance holds only for the types of support typically associated with parents—then the interaction specifies the tie contents for which the structural hypothesis holds. A reproduction and reinforcement of existing relational understandings is implicit in this outcome.

DATA AND MULTILEVEL MODELING METHODOLOGY

The data for this study come from the ISSP "Social Relations and Social Support" (Social Networks II) component collected in 25 countries over the period 2000–2002 for which data on all variables were completely available. The sample is largely composed of European, North American, and Oceanian high- and middle-income countries. In addition, the data set contains samples from Japan, the Philippines, Israel, Brazil, and Chile. The samples were drawn using either simple random representative or stratified multistage techniques. Table I lists some of the descriptive properties of the data organized by region. The data comprise 32,712 respondents. Barring a couple of exceptions, the average age of the respondents is over 40, with the overall mean age at 46. Consequently, the results speak more to older rather than younger individuals. The sample has an approximately even distribution with respect to sex. The majority of the sample is either married or lives as if married. The percentage with university degrees varies by country, but the overall mean is about 17%. The survey asked respondents to identify the number of living, adult (older than 18-years)[4] half, full, or step brothers and/or sisters they had. Responses show that 14.5% of the respondents are singletons, 26.5% have one sibling, 21% have two siblings, and the remaining 38% are part of larger sized sibships.

[4] As the average age is mostly in the 40s and 50s, the margin of error of having siblings younger than 18 is likely to be low.

Table I. Descriptive Statistics of the Sample

Country	Sample Size	Sibsize (%)			Mean Age	Male (%)	Married or Living as if Married (%)	University Completed (%)
		0	1	2				
Australia	1,352	8.6	25.6	23.9	55.2	46.4	70.6	24.3
Austria	1,011	20.3	26.8	21.3	52.1	40.2	56.5	7.0
Brazil	2,000	8.1	11.9	13.0	38.6	49.3	45.0	–
Canada	1,115	8.7	17.4	20.7	48.7	47.8	73.3	23.5
Chile	1,504	9.0	13.4	16.6	43.8	59.1	53.9	8.9
Cyprus	1,006	13.7	31.6	30.3	40.9	50.0	68.4	21.4
Czech Republic	1,200	18.7	43.2	21.8	44.4	40.1	58.2	10.5
Denmark	1,293	11.4	33.0	26.0	48.6	44.4	56.5	10.4
Finland	1,439	12.6	28.6	21.2	43.8	43.5	66.1	15.9
France	1,398	13.0	30.3	22.7	46.2	45.6	59.0	39
Germany	1,369	15.5	36.0	21.3	46.4	49.7	57.9	10.7
Hungary	1,524	20.9	39.0	20.5	51.2	43.2	51.9	4.1
Israel	1,207	13.3	23.0	15.7	42.0	40.7	62.3	23.1
Italy	999	22.5	33.6	24.5	45.8	47.9	88.0	24.0
Japan	1,321	11.1	29.6	22.4	48.2	46.7	68.1	14.6
Latvia	1,000	29.5	39.5	16.7	43.9	42.2	53.3	17.1
New Zealand	1,146	7.9	20.9	24.3	50.2	42.6	63.4	31.5
N. Ireland	1,407	14.3	19.5	18.8	49.0	38.8	52.1	14.10
Norway	1,560	11.1	28.7	26.7	44.7	47.6	55.8	23.3
Philippines	1,200	6.8	7.7	10.5	41.7	50.0	76.8	14.8
Poland	1,221	14.4	27.8	24.5	47.9	42.5	61.2	9.8
Russia	2,000	24.1	36.4	18.3	44.6	45.5	57.2	14.6
Slovenia	1,077	17.6	34.4	20.2	44.9	44.4	65.2	13.1
Spain	1,214	14.1	24.9	22.2	45.9	48.2	59.8	6.6
USA	1,149	11.2	21.9	22.5	45.5	48.3	43.6	26.0
Total/Average	**32,712**	**14.3**	**27.4**	**21**	**46.2**	**45.8**	**61**	**17**

In addition to demographic information, the ISSP uses the exchange-generator methodology to collect information on the personal networks of individuals. Three questions are used eliciting both first and second choices, totaling six questions.

1. First suppose, you had the flu and had to stay in bed for a few days and needed help around the house, with shopping and so on. Who would you turn to (first/second) for help?
2. Now suppose you needed to borrow a large sum of money. Who would you turn to (first/second) for help?
3. Now suppose you felt just a bit down or depressed, and you wanted to talk about it. Who would you turn to (first/second) for help?

The options included: husband/wife/partner; mother; father; daughter; daughter-in-law; son; son-in-law; sister; brother; other blood relative; other in-law relative; god parent; close friend; neighbor; someone you work with; employer; government agency or someone at social services; bank or credit union; private money lender; member of clergy; psychologist; family doctor; self-help group; someone you pay; someone else; and no one. Not all these options were available for every question but, in general, each question had about 18 options.

Dependent Variables

The responses to these questions were consistently dichotomized to reflect the three hypotheses outlined above. More specifically with respect to H1, for each of the six questions above, if a respondent answered mother or father, the response was coded 1; otherwise it was coded 0. This resulted in a set of six dichotomous responses (parent or not parent) for each respondent. A similar coding scheme was adopted for the remaining hypotheses: spouse and children as other parts of H1; extended kin, close friend, neighbor, and colleague for each part of H2; and no one and/or professional agent (such as social services) for H3.

Method

The effect of sibsize and relational content on network composition is tested using multilevel (hierarchical) binary logistic regression with penalized quasi-likelihood estimation. Multilevel models are typically applied to data that occur at multiple levels, such as students in classrooms within schools. The basic principle of multilevel modeling is that variation in the dependent variable can be traced to sources at multiple levels. In two-level data, say, individuals in countries, variance of an individual-level dependent variable (e.g., income levels) will have both individual-level explanations (e.g., education) and country-level explanations (e.g., manufacturing vs. service economy). The task of multilevel modeling involves estimating coefficients of variables at different levels with proper accounting for the error structure at multiple levels (for details, see Hox, 2002; Snijders and Bosker, 1999). My motivation with cross-national data is to seek the best possible estimates of coefficients at different levels with appropriate accounting for uncertainty in inherently multilevel data, not to conduct cross-national comparisons.

Sinjders et al. (1995) demonstrate the utility of multilevel modeling for personal network data using two-level models—networks nested within individuals. As they argue, the various relations identified by each individual are likely to be interdependent and therefore should not be treated as independent observations in a standard regression. This means if our interest is in network composition, we cannot treat the one choice (say, parent) as independent from the second (say, friend) for the same individual. A multilevel approach where personal networks are considered to be nested within individuals accounts for this interdependence. Hox (2002:ch. 9) makes a similar argument regarding multiple measures (say, p in number) of the same construct. These interdependent p measures (which could be a personal network) can be modeled by creating a distinct lower level and defining a categorical independent variable whose categories are the p questions. In line with the work of Hox and Snijders et al., the design of the ISSP data set calls for a three-level nested structure—network responses nested within individuals and individuals

nested within countries. The dependent variables outlined above are at the lowest, network level. The independent variables are the categorical variable indicating tie content, individual-level, and country-level variables. I operationalize tie content in terms of the six exchange-generator network questions. This tie-content level corresponds to tie warranties outlined above. Specifically, the tie-content dummies answer the following question: What contents are most associated with particular role relations? To the extent that choice of alter is systematically determined by content (e.g., parents are often chosen for financial support but not emotional support), it reflects cultural expectations of relations. The individual level captures effects of individual-level factors affecting network composition, including sibsize. The country level is informative of the extent to which personal network composition varies across countries.

Analytical Strategy

One of the key uses of multilevel models is to determine how the variance of the dependent variable is distributed across levels. This will aid in deciphering how much of the variation in personal network composition comes from the two levels. A large proportion of individual-level variance supports research in favor of individual-level determination of personal networks; and high country-level proportional variance would indicate that there is wide variation in personal network composition across countries, suggesting that cross-national comparisons are an appropriate technique of analysis. To glean these proportions, I first estimate the variance components at the individual and country levels using a random intercept model. Next, I add sibsize to the equation with the aim of explaining that variance and testing its effect on network composition (for a similar analysis of longitudinal data, see Rink et al., 2009). Subsequently, I include control variables at the individual and country levels. Finally, I interact tie content with sibsize to test the extent to which the former moderates the effect of the latter on network composition. The random-intercept model I utilize is depicted in Equation (1), where γ is the average intercept, α coefficients are for network-level, β coefficients are for individual-level, and δ coefficients are for country-level variables. U and V represent the variance of the intercept at the individual and the country levels, respectively. The models are fit using the GLMMPQL algorithm in the R (GUI) environment (Schall, 1991).

$$\log it(P_{ijk}) = \gamma_0 + \sum_{l=1}^{r} \alpha_l x_{ijk} + \sum_{m=1}^{s} \beta_m y_{jk} + \sum_{n=1}^{t} \delta_n z_k + U_{0j} + V_{0k} \qquad (1)$$

Independent Variables

Following Hox (2002), the lowest-level independent variable is a categorical variable taking the values of the six tie-content questions—first and second

choice in illness, first and second choice to borrow money, and first and second choice when feeling low. I treat this variable as representative of the content of ties. For consistency, first choice in illness is the omitted category in all models. Sibsize is the key individual-level independent variable. Given the paucity of research linking sibsize to patterns of sociation, there is no straightforward justification for distinguishing between small and large sibsizes. In previous research, either single children have been treated as a distinctive category or sibsize has been treated as a linear variable (e.g., Miner and Uhlenberg, 1997). The former suppresses potential differences among higher-order sibling categories and the latter implies that the added effect of each sibling is identical.

I follow two approaches to differentiate between small and big sibsizes. First, I follow an empirically grounded approach. Toward this end, I conducted a step-wise regression analysis sequentially adding higher sibsizes to the model and treating correspondingly smaller sibsizes as the omitted category. Thus, the first model included zero siblings and omitted one or more siblings (equivalent to the singleton-sibling dichotomous model). The next model was expanded to include zero and one siblings as distinct dummies with two or more siblings as omitted. This process was continued until further additions to the model generally ceased to produce significant results, which resulted in three or more siblings as the omitted category. Second, average TFR around the world is approximately 2.6 (UNWPP, 2008). Consistent with average world TFR, the final model equations include zero, one, and two siblings as separate categories with three or more siblings as the omitted category. The data do not distinguish between full, half, and step siblings. It seems reasonable to assume that individuals feel closer and more comfortable with full siblings than with half or step ones if they have spent more of the formative childhood years with full siblings. At the same time, increasing rates of divorce, nontraditional family structures, and remarriage imply that sibships are more likely than ever to include step and half siblings. Consequently, the relational implications of such forms of sibships can scarcely be overlooked. Nevertheless, the effects may be distinct from full siblings. However, the current data do not allow for those effects to be explicitly differentiated.

Control Variables

The hypotheses are tested net of a number of variables that have previously been argued to have a bearing on the composition of personal networks. At the individual level, these include gender, age (coded in decades in the data set: 15–24, 35–44, 45–54, 55–64, 65–101), educational attainment (still in school/university, incomplete or completed primary, incomplete or completed secondary, incomplete or completed university), work status (full time/self-employed, part time or less than part time, unemployed/not in labor force,

student, and retired), living father, living mother, number of adult children, subjective socioeconomic class, frequency of religious attendance, geographical distance from mother, and marital status (married/living as if married, divorced or separated, widowed, or no current partner/spouse). At the country level, I test the effect of three variables. In line with modernization theory arguments, I control for per-capita GDP (UNSD, 2010) and total fertility rates (UNCF, 2010). Third, in accordance with Murphy's (2008) argument that religiosity is positively associated with kin concentration in networks, I created a religious attendance "context" variable. Context variables are typically created in multilevel studies by calculating averages of lower-level variables to generate higher-level variables. In this data set, religious attendance is coded in two ways: (1) in terms of attendance at religious services and (2) participation in a religious organization. Only the latter variable, categorized as attendance over the past 12 months—more than twice (1), once or twice (2), belong but do not participate (3), and do not belong to such a group (4)—was available for all the countries in the sample. The religiosity variable is the mean of these values for each country.[5]

RESULTS

Baseline Models

Baseline models show how the variance in the dependent variables is distributed across the individual and country levels. The results for the variances of the baseline models are shown in Fig. 1. Following Hox (2002), rather than fitting baseline models with just the intercept, I fit one that includes the intercept and dummy variables for the lowest network level. Unlike models where the dependent variable is normally distributed, the lowest-level variance in logistic regression models is not estimated; rather, it is assumed to equal the standard logistic distribution, $\frac{\pi^2}{3} = 3.29$ (Snijders and Bosker, 1999:224). Applying this value, the fraction of total variability in the dependent variables due to the two other levels is shown in Fig. 1. A comparison of the individual- and country-level values indicates that individual-level variability contributes substantially more to dependent variable variances than the country level across all hypotheses, except spousal/partner responses. The latter case suggests that, having accounted for those who are married or live as if they are, there is very little variation in reporting spouse/partner at the individual level. In other cases, the individual-level variances are 12 to 28 times the size of country-level variances. These results suggest that individual-level factors play a considerably greater role in determining personal network composition (at least of the role relations included here) than country-level factors.

[5] A similar fertility contextual variable created from the average sibsize in countries yielded results comparable to the TFR measure.

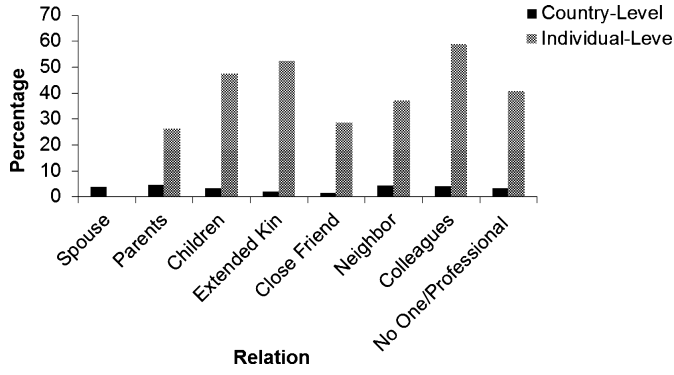

Fig. 1. Multilevel logistic regression baseline models showing the distribution of variance across levels.

Structural Effects of Sibsize

Figures 2 and 3 show the results of modeling whether or not respondents with zero to two siblings are more likely than those with more siblings to choose spouses, parents, children, extended kin (other blood relative, other in-law relative, and god parent), close friends, neighbors, colleagues, and no one/professional services.[6] The bars represent odds ratios adjusted for all the individual- and country-level control variables listed previously. Given the large sample-size, only differences significant at the 0.001 and 0.0001 levels are depicted. The figures reveal that those with fewer siblings are *not* more likely to compose personal networks of spouses, children, or colleagues. Those with zero, one, or two siblings are systematically more likely to turn to parents. Those with zero or one sibling are also more prone to extended kin and close friends. Finally, singletons are additionally more likely to turn to neighbors and report having smaller-sized or depersonalized networks. These figures partially support the availability structural hypotheses that individuals with fewer siblings are more likely to compose networks with close-kin and nonkin ties and they are more prone to having smaller-sized or depersonalized networks.

In the following sections, I elaborate only on the role relations whose association with sibsize is statistically significant in Figs. 2 and 3. As extended kin is composed of a mixed-bag of relations, it is harder to make sense of the content of this ambiguously defined tie. Consequently, I do not present more in-depth results for that category. It is nevertheless significant that those with zero and one siblings are also more prone to composing networks with extended-kin relations.

[6] The results are depicted graphically for ease of presentation and interpretation. Tabular results are available from the author upon request.

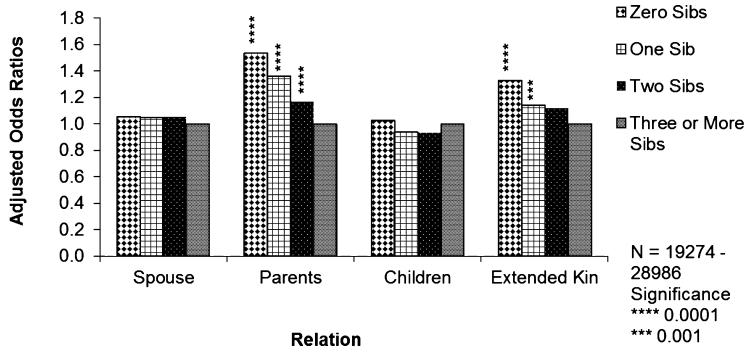

Fig. 2. Multilevel logistic regression models showing the effects sibsize on whether or not respondents choose close-kin and extended-kin ties net of individual- and country-level control variables. Three or more siblings is the omitted category.

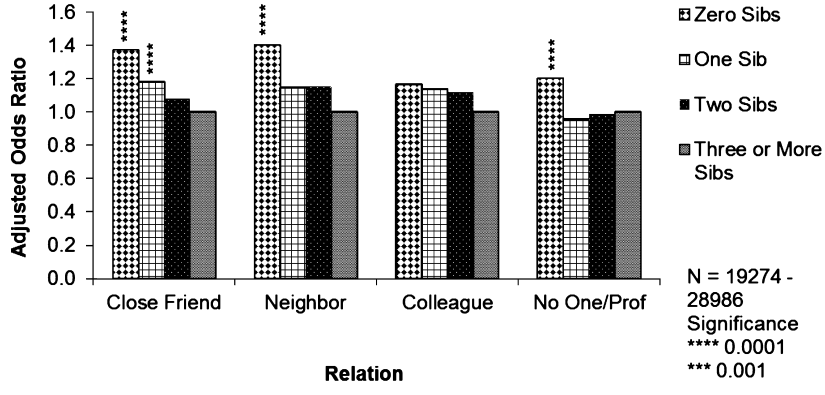

Fig. 3. Multilevel logistic regression models showing the effects of tie-content and sibsize on whether or not respondents choose nonkin ties or choose no one/professional services net of individual- and country-level control variables. Three or more siblings is the omitted category.

Institutionalized Relational Content

Figure 4 depicts the typical content associated with particular role relations in comparison to first choice in illness. These are akin to stories frequently deployed to describe a role relation or tie warranties. The bars depict odds ratios adjusted for all control variables as well as sibsize. The bars for parents show that, as compared to first choice in illness, parents are more likely to be named for second choice in illness and both choices in financial support but less likely to be named as sources of emotional support. Friends, in contrast, are considerably more likely to be named for both choices in emotional support but not for first choice in financial support. Neighbors are significantly more likely to be viewed as providers of alternative support during

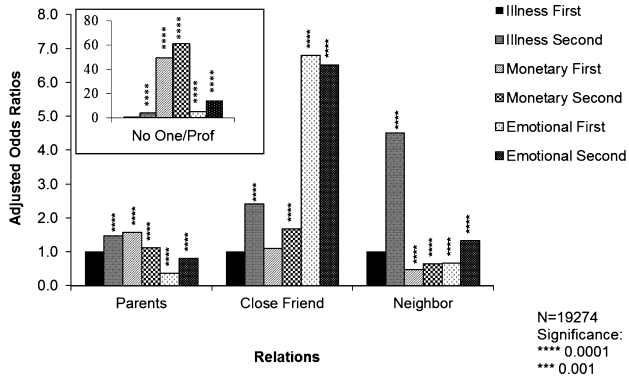

Fig. 4. Multilevel logistic regression models showing the tie content of particular relations. First choice in illness is the omitted category.

an illness and for emotional support but *not* for financial support. Lastly, reporting no one or professional services is higher for all types of support compared to first choice in illness.

Figures 2 and 3 demonstrate the structural tendency that those with fewer siblings are more likely to turn to certain role relations. Figure 4, suggestive of institutionalized cultural content of those role relations in terms of understandings of flows of social support, is largely consistent with previous studies. Next, I test the extent to which such institutionalized relational content moderates the effect of sibsize on network composition.

Parents

Figure 5 compares zero, one, and two siblings to three or more with respect to their tendency to name their parents for all six tie contents. The

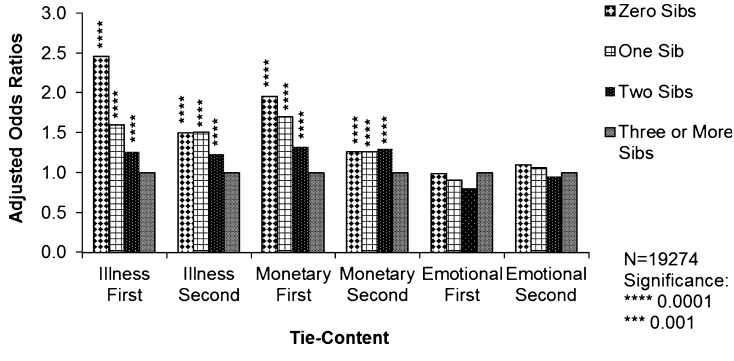

Fig. 5. Multilevel logistic regression models showing the effects of sibsize and tie contents on whether or not respondents choose parents net of individual- and country-level control variables. Three or more siblings is the omitted category.

bars depict odds ratios adjusted for all individual- and country-level control variables. Nested models (not shown) demonstrate that the proportion of explained variance increases considerably when individual-level control variables are included but does not increase by much with the addition of country-level variables. Moreover, the proportion of the variance attributable to the country level declines when individual-level variables are added, indicating that some of the country-level variance in Fig. 2 is attributable to different types of individuals residing in those countries or population composition effects. Lastly, none of the country-level variables are significantly related to the inclusion of parents in personal networks. These findings support the earlier variance decomposition results that individual-level variables outweigh country-level effects in structuring personal network composition.

According to Fig. 2, those with fewer siblings are more likely to turn to parents for support and, according to Fig. 4, parents are viewed as providers of financial and exigent support, but not emotional support. Figure 5 shows that the greater tendency of those with fewer siblings to draw on their parents is present *only* for exigent and financial support but not for emotional support. As compared to those with three or more siblings, those with fewer siblings are consistently and significantly more likely to say they would turn to their parents for both choices in exigent and financial support but are no different from them for either choice in emotional support. It is thus evident that the effect of sibsize is not the same across tie content. Rather, those with fewer siblings are only more likely than those with more siblings to turn to their parents for the types of support typically associated with the parental tie. Culturally institutionalized understandings of the parental relationship meaningfully shape the diversion of networks toward parents implied by the structural tendency of having fewer siblings.

Close Friend

Figure 3 shows that as compared to those with three or more siblings, singletons and those with one sibling are significantly more likely to turn to their close friends in need. Figure 4 demonstrates that, consistent with previous research, friends are most likely to be viewed as providers of emotional support. Moreover, expanding on previous research, the figure shows that close friends are also crucial as alternative sources of support. In the case of close friends, too, the addition of individual-level variables considerably improves the model fit, while country-level variables produce insignificant coefficients and fail to contribute much toward explained variation (models not shown). Figure 6 shows the results of modeling whether the structural tendency of substituting siblings with friends for those with fewer siblings holds across all types of tie content. The figure demonstrates that as compared to those who have more, individuals with zero to two siblings are significantly more likely to turn to close friends for first choice in emotional support. Thus, like in the

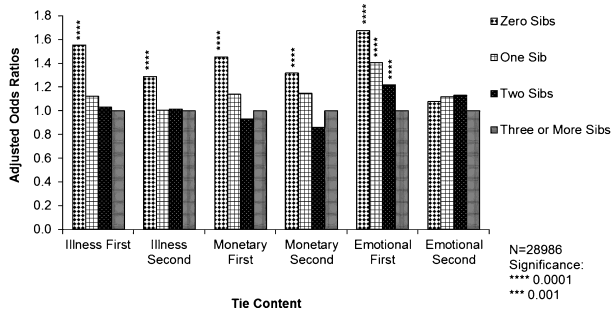

Fig. 6. Multilevel logistic regression models showing the effects of sibsize and tie contents on whether or not respondents choose close friend net of individual- and country-level control variables. Three or more siblings is the omitted category.

case with parents, even though the availability effect of sibsize suggests that individuals with fewer siblings are more likely to divert networks toward close friends, this tendency is most pronounced for the type of support typically associated with friendship. Singletons, on the other hand, are more likely to turn to close friends for all sorts of support, including first choice in financial support, indicative of a more expansive view of friendship ties.

Neighbor

Figure 3 shows that only single children are significantly more likely than those with three or more siblings to compose personal networks with neighbors. According to Fig. 4, the neighborly relation is more likely to be viewed as a source of exigent support and an alternative source of emotional support. Consistent with institutionalized content, Fig. 7 shows that the net of control

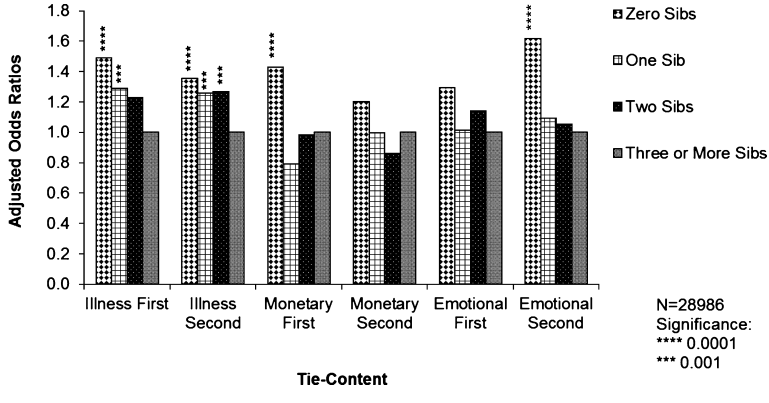

Fig. 7. Multilevel logistic regression models showing the effects of sibsize and tie contents on whether or not respondents choose neighbors net of individual- and country-level control variables. Three or more siblings is the omitted category.

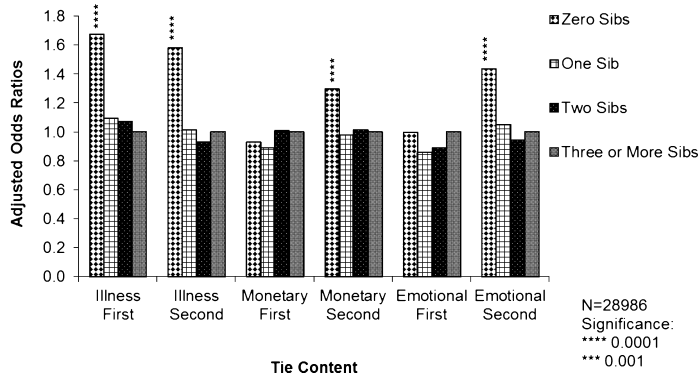

Fig. 8. Multilevel logistic regression models showing the effects of sibsize and tie contents on whether or not respondents choose no one/professional services net of individual- and country-level control variables. Three or more siblings is the omitted category.

variables, those with zero to two siblings are significantly more likely than those with three or more to view neighbors an alternative source of exigent support. In addition, those with zero to one sibling are also more likely to seek out neighbors as a first choice of exigent support. Finally, single children also have more expansive views of neighborly ties, as evident from their greater tendency to turn to them for financial help. Country-level factors are insignificant and contribute little toward the explained variance.

Isolation and Depersonalization

The results of modeling the final hypothesis—greater likelihood of isolation—are shown in Fig. 8. Figure 3 demonstrates that only single-child adults are more likely to report inadequate access to social support in the form of having no one to turn to or seeking out nonpersonal ties. Similar to other choices, the effect of country-level variables is not significant. The figure shows that except for first choices in financial and emotional support, single children are significantly more likely to report isolation or depersonalization of personal networks for all other types of support. Neither those with one sibling nor those with two siblings display any tendencies toward such isolation, suggesting that the presence of even one sibling is enough to mitigate inadequacies in access to personal social support.

DISCUSSION

Despite current decline in fertility rates, with the exception of single children, surprisingly little has been said about its relational implications.

Comparing small and large sibling sizes, I investigate how the composition of personal networks varies on the basis of sibsize and relational content. The results are indicative of several noteworthy findings.

First, the results demonstrate that individual-level social structural determinants considerably outweigh country-level factors in shaping personal network composition. Given the consistently and considerably higher individual-level variances from Fig. 1, the results here support recent research (e.g., Bastani, 2007; Grossetti, 2007) favoring the micro-level determination of personal networks. Furthermore, decreases in the country-level unexplained variance components as a result of including individual-level factors indicate that some of that country-level variability is, in fact, attributable to differences in the type of individuals residing in those countries and not a country-level contextual effect. The consistent nonsignificance of the coefficients of country-level variables supports this finding. Preliminary analyses of the data (not shown) using hierarchical clustering grouped countries into geographically-, economically-, culturally-, and fertility-wise heterogeneous clusters. It is not surprising thus that country-level variables yielded insignificant coefficients. This finding that personal network composition is relatively stable across countries is an important one in light of debates surrounding cross-national variations in personal networks.

Second, the results show associations of tie content with role relations that are largely consistent with previous findings. The parental relation is viewed as composed of exigent and financial support but less of emotional support. Close friends are more likely to be viewed as providers of emotional support. Friends also fill in as alternative sources of exigent and financial support. Neighbors likewise occupy the role of alternative sources of support, especially for exigent support. Following White (1992, 1995) and Martin (2009), these associations between expectations of social support and relations are telling of the institutionalized cultural content of close personal ties.

The results demonstrate that an important structural outcome of having fewer siblings is the diversion of networks toward other role relations in systematic ways. An important implication of this finding is that the *availability* of kin ties meaningfully structures the construction of support networks. We could also infer that other pools of available alters that are likewise constrained by size, such as the workplace, neighborhood, and school, may shape personal networks in a similar way. Individuals working in small-sized organizations, for instance, may regularly draw on support from ties other than their colleagues. In contrast, co-workers may play a more prominent role in the social support networks of their counterparts in larger-sized organizations. To the extent networks are also shaped by other factors such as gender, skewed gender distributions in an organization may lead those in the minority to construct networks outside of the workplace. Similar outcomes may obtain in other contexts such as in schools and neighborhoods generally and/or more specifically with respect to factors structuring networks such as race and socioeconomic status. This is not to suggest that smaller-sized groups are not

suitable for the creation of close, supportive ties, but that *sheer availability* also plays an important role in the construction of supportive ties.

With respect to sibsize, the diversion is most pronounced toward parents. Individuals who have fewer siblings "compensate" by being more reliant on their parents. In a sense, parents substitute for siblings by providing support that might otherwise have been drawn from brothers/sisters. To the extent lower fertility is associated with delayed childbirth, the greater reliance on parents, especially for financial support, is suggestive of grounds to rethink the current age structure of dependency ratios. Close friends and neighbors likewise fill in for siblings by playing a more significant role in the personal networks of those with fewer siblings. On the one hand, this reliance on nonkin ties signals greater diversity in networks. On the other, earlier research (Degenne and Lebeaux, 2005; Wellman et al., 1997) suggests that friends and neighbors who have been previously been identified as intimate tend to disappear from the personal networks of individuals over time, whereas kin ties have a much higher chance of surviving. While a longitudinal analysis is needed to test if kin persistence and nonkin fragility applies equally across sibsizes, the greater reliance on nonkin ties of those with fewer siblings suggests that they are perhaps at a greater risk of being engaged in ties that are less stable over time.

The overall texture of this compositional adjustment suggests that both familial and extra-familial ties absorb the redirection of social support attributable to the reduced availability of siblings. The results suggest that both parents and close friends are viewed as appropriate "substitutes" for siblings with respect to social support. These findings are contrary to that hierarchical compensatory model of social support that accords primacy to familial ties. That those with fewer siblings are not more likely to turn to other familial ties such as children and spouse/partner for social support is also noteworthy, as it suggests that the content of those ties is perceived as meaningfully different from those of siblings.

Single children also have a greater propensity to report having no one to turn to or seeking out the services of professionals. Network instruments such as the one used here are meant to capture the close personal ties of individuals. The tendency among single-child adults to "replace" personal ties with professionals is suggestive of a depersonalization of personal networks and their greater tendency to report "no one" is indicative of smaller-sized networks. This finding is consistent with previous research that single children are at a greater risk for isolation and possess a lower need for affiliation. From a policy perspective, it is also important to understand what type of support is most likely to elicit professional/no one responses. Whereas individuals may readily employ professional services like bank loans for financial needs, responding no one or seeking professional services for support during an illness conveys a qualitatively different and more troubling kind of social disengagement.

Yet, the tendency to adjust for the lower availability of siblings by constructing networks with other ties or smaller-sized and depersonalized

networks is shaped by the institutionalized cultural content of relationships. In building networks, individuals are not simply acting on the structural tendency implicated in the availability of siblings, they are also mindful of the expectations of support laden on various relationships. If a structural tendency associated with having fewer available siblings is to be more reliant on parents, individuals not only act on that tendency, but also on the cultural expectations of what appropriate parental relations entail. Fuhse (2009) argues that "order principles" consisting of opportunity structures and cultural categories produce regularities in relational expectations and transactions. Opportunity structures like place of residence affect networks by enabling or restricting access and contact. Cultural categories order interactions in expected ways as individuals interact with others through the medium of roles and identities. Sibling size, as a factor producing order in networks, operates in both domains. Having fewer siblings limits the opportunities of constructing support networks, redirecting networks to other ties but in culturally expected ways. In support of this joint effect, the results indicate that when those with fewer siblings substitute parents for the lower availability of siblings, they do so for the types of support typically associated with parents. Likewise the sibsize-based adjustment toward friends and neighbors is also most pronounced for the types of support characteristic of those role relations. The data demonstrate that institutionalized tie content limits and clarifies the scope of the structural availability effect of sibsize. This interaction between structural tendency and cultural expectations implies a reproduction and implicit reinforcement of existing relational content with declining fertility. More generally, in line with recent research in networks and culture, the results here suggest that network structural effects do not operate stably across ties of different types; rather, the cultural content of ties significantly shapes structural outcomes, which, in turn, reproduce institutionalized relational content.

At the same time, singletons are prone to more expansive understandings of nonkin relationships. In addition to the greater likelihood of drawing exigent support from neighbors as displayed by their one- and two-sibling counterparts, single children are also more likely to turn to their neighbors for financial support. Among the four categories of siblings utilized here—zero, one, two, and three or more—single children are alone in this regard. In contrast to other relations, single children are also significantly more likely turn to close friends for exigent and financial support. In their case, the structural opportunity constraint presented by the complete absence of siblings as potential network alters, as well as a lack of experiencing siblinghood, overshadow some of the culturally institutionalized expectations imposed on relationships. Single children contribute toward the reproduction of institutionalized parental roles, but by attributing additional dimensions of supportive content to nonkin relationships, they partake in rearticulating the substance of those relations.

There are some limitations to this research. Due to data constraints, I have not been able to account for the effects of birth-order, age, and gender

composition of sibships. The data do not differentiate between step, half, or full siblings, which could also be a confounding variable. Moreover, the data pertain mostly to high- and middle-income countries in Europe, North America, and Australia. It remains to be seen how family size has a bearing on personal network composition in other regions of the world. It is also possible that some other factors, like race and parental age, can explain the effect of sibsize. However, the unavailability of these measures in the data set makes it impossible to test the effects of such factors.

Despite these limitations, the results from this research are suggestive of some important results that merit further investigation. The findings demonstrate that, in addition to individual-level factors such as age and gender, sibsize, in a form richer than the singleton-sibling dichotomy, ought to be treated as an important factor affecting the composition and content of relationships. Although single children exhibit an amplified tendency toward sociational differences, those with one and two siblings also compose networks differently from those with more siblings. Given the absence of country-level effects, in a climate of declining fertility, these differences have the potential to significantly affect the current and future framing of those ties across diverse contexts. The results here suggest that continuing declines in fertility rates could bring a rising role of parents in the lives of children but in a narrowly conceived instrumental capacity; a similarly greater presence of friends especially for emotional support and neighbors for instrumental support; an increased reliance on professional services; and possibly smaller-sized and less stable personal networks. In the absence of longitudinal data, these inferences should be treated as suggestive rather than conclusive. Nevertheless, such an approach to the analysis of close personal networks can be crucial for intriguing cases like China and India where the unintended relational consequences of state-advocated population control measures, including the single-child policy initiative, have the potential to seriously alter the social landscape in the years to come.

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