

The impact of siblings on the geographic distance between adult children and their ageing parents.

Does parental need matter?

Thijs van den Broek¹ & Pearl A. Dykstra²

¹ London School of Economics and Political Science, Department of Social Policy, Houghton Street, London WC2A 2AE, United Kingdom, e-mail: m.p.van-den-broek@lse.ac.uk

² Erasmus University Rotterdam, Department of Public Administration and Sociology, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands, e-mail: dykstra@fsw.eur.nl

AUTHOR VERSION

Original version published as: Van den Broek, T., & Dykstra, P. A. (2017). The impact of siblings on the geographic distance between adult children and their ageing parents.

Population, Space and Place, Early view publication. doi: 10.1002/psp.2048

URL: <https://doi.org/10.1002/psp.2048>

ABSTRACT

Research consistently shows that children with siblings live at a greater distance from their parents than do only children. We extend this literature by assessing whether this difference varies as a function of parental need. Multinomial logistic regression analyses of German Ageing Survey data enriched with indicators at the district (NUTS3) level ($n = 2,028$) show that, in general, children with a sibling are less likely than only children to share a household with a parent. We do not find that children with a sibling are more likely than only children to live at great distance, i.e. more than two hours away, from their parents. The differences between only children and children with siblings in parent-child proximity are most pronounced when parents are coping with severe health limitations. It is well-established that only children are more likely than children with siblings to provide support and care to ageing parents. Our findings suggest that, in addition, only children might be more compelled than their counterparts with siblings to adjust their living arrangements in order to facilitate caregiving when parent care needs manifest themselves.

Keywords: intergenerational coresidence; proximity; intergenerational relationships; structural solidarity; siblings; Germany

INTRODUCTION

Population ageing has made the organization of long-term care a pressing policy issue in European countries (Ranci and Pavolini, 2015). Across Europe, potential informal caregivers – particularly family members - are increasingly encouraged to take on care tasks for persons in need. Next to spouses and partners, adult children are the most important providers of support to older persons with care needs (Dykstra, 2015; Wolff and Kasper 2006).

Whether or not an adult child takes on care tasks is strongly linked to the geographic distance between the parent and the child. A large geographical distance to the parent is generally considered a legitimate excuse to refrain from taking on a large caregiving role (Finch and Mason, 1993). Empirical evidence that children are more likely to provide support to their parents when they share a household with them or live nearby is abundant (Haberkern and Szydlik, 2010; Knijn and Liefbroer, 2006; Leopold *et al.*, 2014; Van den Broek and Dykstra, 2016).

Studies on the geographic proximity between adult children and older parents tend to find that the presence of siblings is associated with living at a greater distance from parents (Hank, 2007; Malmberg and Pettersson, 2007; Rainer and Siedler, 2009; Shelton and Grundy, 2000; Van den Broek *et al.*, 2014). Several scholars have linked this pattern to children's presumed tendency to take parents' future need for care into account when choosing where to live, long before these needs manifest themselves (Konrad *et al.*, 2002; Maruyama and Johar, 2013; Rainer and Siedler, 2009). Such considerations, they argue, may keep adult children from living at great distance from their parents. For children with a sibling, a potential alternative future care provider is present, which presumably makes them feel less pressed to let parents' future care needs guide their decisions where to live.

It should be considered, however, that research suggests that people are living longer without severe disability (Christensen *et al.*, 2009; World Health Organization, 2015). For many adult children, parents' future care needs may therefore not yet be prominently on their minds.

Plausibly, the decision about how far away from parents to live will depend on whether future caregiving is merely a theoretical possibility (because parents are healthy) or a rather probable scenario (because parents have health problems). In the present study, we analyze cross-sectional data from the German Ageing Survey (DEAS) to assess whether the differences between only children and their counterparts with siblings in parent-child proximity are contingent on current parental need.

THE CASE OF GERMANY

The focus of the current study is on Germany. Rainer and Siedler (2012) have argued that, with regard to parent-child proximity, "the presence of a sibling plays a more important role in countries where eldercare is the responsibility of the family rather than the state" (p. 334). In such countries, families in which an older member is in need of care are relatively often selected into living arrangements that facilitate family caregiving (Van den Broek and Dykstra, 2016), and only children may be more prone to this form of in-selection than children with siblings (cf. Freedman *et al.*, 1991). The strong emphasis on the role of the family in the provision of care for older persons in Germany therefore makes the country an interesting case for the current study.

Until the end of the twentieth century, only residual public support was available for older Germans with care needs, which effectively forged heavily reliance on the family. With the introduction of the Long-Term Care Insurance Act (LTCI) in 1995, Germans in need of care became entitled to a range of benefits (Pavolini and Ranci, 2008). However, the scheme was designed to strengthen, rather than to weaken, family care provision (Theobald and Samsen,

2013). The number of LTCI beneficiaries remained relatively low, because benefits were only made available for persons with considerable functional limitations. Rather than providing in-kind long-term care services only, persons eligible for LTCI benefits were furthermore given the choice between such services and cash transfers, the latter of which could be used to purchase professional services or to recompense informal caregivers. Thus, cash benefits can be seen as recognition of the value of informal caregiving (Pavolini and Ranci, 2008). In Germany, a large majority of beneficiaries opted for cash transfers (Theobald and Samsen, 2013), which appeared to have fostered family caregiving (Rodrigues *et al.*, 2012). The limited availability of state supported long-term care services and the support for caregivers through cash transfers have led Leitner (2003) to classify the German model of care for older people as *explicitly familialistic*.

THEORETICAL BACKGROUND AND HYPOTHESES

Presence of siblings and parent-child proximity

Konrad and colleagues (2002) were the first to link differences between only children and children with siblings in parent-child proximity to children's considerations about their parents' future care needs. Their premise was that children are altruistic towards their parents. Long before parents need care, adult children may recognize that their mothers and fathers may very well become dependent on them for support and care in the future (cf. Rainer and Siedler, 2009). Given that the provision of support and care requires close proximity (cf. Bengtson and Roberts, 1991), concerns about their parents' future care needs may compel only children to live near. However, when parents have two children rather than one, a public good problem emerges (Konrad *et al.*, 2002; Maruyama and Johar, 2013). Both children may want to see their parents' need for a child nearby to be fulfilled. However, when one child lives close to the parent, there is less of an urgency for the other child to do the same. The

possibility for freeriding that exists for children with a sibling, but not for only children presumably makes the latter less likely than the former to let parents' future care needs guide their decisions where to live. This leads us to formulate a general sibling hypothesis:

Adult children with a sibling are less likely than only children to share a household with (H1A) and more likely to live at great distance from (H1B) their parents.

Contingency on birth order

The geography of the family thesis (Konrad *et al.*, 2002) holds that not only the presence of a sibling, but also the birth order of siblings is relevant for the geographic distance between parents and a given adult child. Despite their altruism towards parents, adult children with siblings act farsighted and strategically when choosing where to live, with the aim of minimizing their own share in future caregiving tasks to older parents. First-borns may have an advantage over second-borns in this regard, because they are typically the first to be in the position to leave the parental home. They can capitalize on this by moving to place so far away from the parental home that they will be legitimately excused from providing care when their parents start requiring assistance (cf. Finch and Mason, 1993; Leopold *et al.*, 2014). Similar to the situation of only children, second-borns will then be under relatively strong pressure to keep living near to their parental home. This reasoning is reflected in our birth order hypothesis:

First-born children are less likely than second-born children to share a household with (H2A) and more likely to live at great distance from (H2B) their parents.

Contingency on parental need for care

As laid out above, Konrad and colleagues (2002) and Rainer and Siedler (2009) have linked parent-child proximity to adult children's considerations of parents' future need for care. Only children in particular would be inclined to remain close to the parental home. Leopold and

colleagues (2012), who like Konrad and colleagues (2002) and Rainer and Siedler (2009) studied the case of Germany, did not find an association, however, between the number of siblings and the distance of a young adult's initial move out of the parental home. Though children might not give future parental care needs great consideration when they make decisions about leaving the parental home, they might be responsive to parental needs later in life. Earlier work on the links between the presence of a sibling and parent-child proximity recognized this possibility, but its relevance was dismissed with the argument that "most often the cost of such a move is prohibitive" (Konrad *et al.*, 2002, p. 981; cf. Rainer and Siedler, 2009). However, longitudinal studies have shown that the onset of care needs triggers change in parent-child proximity (Silverstein, 1995; Smits *et al.*, 2010). We argue that differences in the distance to parents between children with siblings and only children are most pronounced when parents are dependent on care rather than when parental dependency is merely a theoretical future possibility. We thus expect a needs-contingent sibling effect:

The extent to which only children are more likely than children with a sibling to share a household with a parent (H3A) and less likely to live at great distance from their parents (H3B) is stronger when parents are coping with severe care needs.

DATA

We use data from the scientific release of the German Ageing Survey (DEAS) (Engstler and Schmiade, 2013; Lejeune and Engstler, 2014; Motel-Klingebiel *et al.*, 2010), provided by the Research Data Centre (FDZ-DEAS) of the German Centre of Gerontology (DZA). We use the most recent baseline sample (wave 3). The third wave data were collected between April and September 2008.

In the scientific release of DEAS, information on respondents' regions of residence is limited to the *Bundesland* (state) in which they live. However, at our request FDZ-DEAS provided a

set of additional district level indicators from the INKAR (Indicators, Maps and Graphics for Spatial and Urban Development) dataset of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). Districts (German: *Kreise*) are so-called Nomenclature of Statistical Territorial Units (NUTS) level 3 units. The current number of districts is 402 (EUROSTAT, 2015). The NUTS classification system was developed by the European Union for the purpose of producing regional statistics for the European Community. Level 3 units are the smallest regional entities in the NUTS-system (EUROSTAT, 2015). Micro-data and district data were matched using non-retraceable district ID's, as a result of which district names remained unknown.

The baseline sample of the third wave of DEAS consisted of 6,205 respondents nested in 211 districts. We selected respondents with one or two children ($n = 3,860$) (cf. Konrad *et al.*, 2002; Rainer and Siedler, 2009; 2012). We further restricted our analyses to parents of whom the youngest child was at least 30 years old ($n = 2,192$) (cf. Holmlund *et al.*, 2013; Konrad *et al.*, 2002; Smits, 2010). At this age, children can be expected to have had the opportunity to leave the parental home. Almost nine out of ten German children have left the parental home by the age of thirty (Iacovou, 2011). We excluded 134 respondents with missing values on any of the child or parent characteristics of our interest. Parent-child dyads are our unit of analysis. For parents with two children, we randomly selected one child to be included in the analyses. Our final sample consisted of 2,028 parent-child dyads. Parents were living in 197 different districts.

MEASURES

Dependent variable

Our dependent variable is parent-child proximity. We distinguished four categories. In the closest proximity category, parent and child lived in the same house or the same household.

We furthermore distinguished parents and children who lived in independent households but in the same town in the second category and those who lived in different towns that could be reached within 2 hours in the third category. The final category consisted of pairs of parents and children who were living in different towns that were more than 2 hours apart.

Child characteristics

The main independent variable in this study is a dichotomous measure indicating whether a child had a sibling or not. To be able to test our birth order hypothesis, we furthermore coded a categorical variable, distinguishing only children, children with an older sibling, and children with a younger sibling.

We controlled for a range of child-level characteristics to minimize bias in the estimates of the sibling effect. We included dummy variables in our models to distinguish daughters (coded as 1) from sons (coded as 0) and married children from their non-married counterparts. In addition, we created a dummy variable indicating whether or not the child had any offspring of his or her own. Research suggests that individuals with a larger number of siblings are less likely to remain childless (Parr, 2006). This is relevant, because adult children with offspring of their own are known to be relatively likely to move closer to their parents, plausibly because of childcare assistance that grandparents can provide (Pettersson and Malmberg, 2009; Smits, 2010). Finally, we included a categorical variable capturing children's socio-economic status, based on occupational status and occupational prestige according to Mayer and Wagner's (1996) 5-level occupational prestige scheme. We distinguished (1) children who were not employed, (2) children employed in low prestige jobs (lower and lower middle level in Mayer and Wagner's scheme), (3) children employed in medium prestige jobs (middle level), and (4) children employed in high prestige jobs (upper middle and upper level).

Parent characteristics

Our third hypothesis postulates particularly strong sibling effects on parent-child distance when parents have severe health limitations. Respondents were asked whether they had been limited in doing normal activities during the past six months due to health problems, with the answering categories being (1) *yes, limited a lot*, (2) *yes, limited a little* and (3) *no, not limited at all*. Respondents who indicated that health problems limited them a lot in doing normal activities were coded as having severe health limitations. Those who indicated that they felt only a little bit or not at all limited in performing normal activities were coded as not having severe health limitations.

We also controlled for a range of parent characteristics to minimize bias in our estimates of the sibling effect. We included dichotomous variables in the model to distinguish whether respondents were mothers (coded as 1) or fathers (coded as 0) and whether they were married or not. We also included the parent's age, which we grand mean centered for model interpretation purposes. In addition, we included a dummy variable indicating whether or not the parent was a homeowner.

District characteristics

We controlled for a set of regional characteristics that are known to be relevant for parent-child proximity (Van den Broek *et al.*, 2014; Van der Pers and Mulder, 2013). We used the population density of the parent's district of residence to measure the regional level of urbanization. Given the positively skewed distribution of population density across districts in the sample, i.e. many districts with relatively low population density levels and a few very densely populated districts, we performed a logarithmic transformation. We used the average gross monthly wage in a district (in € 1,000) as a measure of regional economic performance (cf. Porter, 2003; Van den Broek *et al.*, 2014). District level information on population density and average wages were derived from the INKAR dataset, and referred to the districts'

characteristics in the year 2008. Finally, we included a dummy variable to distinguish whether the parent's district of residence was located in the former German Democratic Republic (GDR) in the East (coded as 1) or the former Federal Republic of Germany (FRG) in the West (coded as 0). Berlin was coded as a former GDR district (cf. Goldstein and Kreyenfeld, 2011).

METHOD

As Silverstein (1995) pointed out, “one can argue that intergenerational co-residence is qualitatively distinct from all types of independent living arrangements, even those in which the parties live near one another” (p. 32). Shared and independent households differ, for instance, with regard to the level of privacy and the opportunities for cost-sharing and exchange of functional intergenerational support (Dykstra *et al.*, 2013). Given these qualitative differences, antecedents of coresidence may differ radically from those of a situation in which a child and a parent live close to each other, but in separate households (Compton and Pollak, 2015). Therefore, we treated parent-child proximity as a categorical variable and estimated multinomial logistic regression models. In our data, parent-child dyads were nested in districts. We accounted for the non-independence due to this nesting by estimating our models with cluster robust standard errors (White, 1980).

RESULTS

<Table 1 here>

Table 1 provides an overview descriptive statistics. In our sample, about one out of every nine adult children shared a household with the parent. One third lived nearby, but in a separate household. Another third of the children lived at a greater distance, but still within a two-hour vicinity of the parent. One in five children lived more than two hours away from the parent.

As illustrated in Figure 1, the distribution across the parent-child distance categories was

different for children with and without a sibling. Compared to their counterparts with a sibling, only children in our sample more often shared a household with the parent and less often lived independently in a different town within a two-hour vicinity of the parent. A chi-squared test indicated that parent-child proximity differed significantly between only children and children with siblings ($\chi^2(3) = 12.9, p < .01$).

<Figure 1 here>

To test whether the association between the presence of a sibling and parent-child distance persisted after taking relevant characteristics of child, parent and regional context into account, we estimated a series of multinomial logit models. Results of these analyses are presented in Table 2. Given that coefficient estimates of a multinomial model are difficult to interpret, we chose to present average marginal effects (Wang, 2004; Williams, 2012). For categorical independent variables, the presented marginal effects can be interpreted as the average discrete change in the predicted probability of being in a specific parent-child proximity category associated with being in the non-reference category as opposed to the reference category. For continuous independent variables, it reflects the average instantaneous rate of change in the predicted probability.

<Table 2 here>

In Model 1, adult children with a sibling were 4.1 percentage points ($p < .05$) less likely to share a household with a parent than adult children with siblings. This is consistent with hypothesis H1A. Contrary to our expectations formulated in hypothesis H1B, we did not find that adult children were more likely than only children to live at great distance from their parents. An additional finding that stands out is that adult children were markedly more likely to share a household with a parent (marginal effect: 8.7%, $p < .001$) and substantially less likely to live at great distance from parents (marginal effect: -5.0%, $p < .001$) when the latter

had severe health limitations. This suggests that when parents are confronted with limitations, parents and children adjust their living arrangements in order to facilitate caregiving.

The model further indicated that daughters and married children were less likely to share a household with a parent than were sons and unmarried children. Daughters were also more likely than sons to live at great distance from their parents. Compared to their childless counterparts, children who had children of their own live more often lived in an independent household in the same town and less often at great distance from their parents. Furthermore, adult children were more likely to share a household with the parent when parents were older and when parents owned the homes in which they lived.

We did not find that characteristics of the parent's living region were associated with the probability that a given child shared a household with the parent or lived at great distance from the parent. Regional characteristics appeared to be relevant, however for the likelihood of living in the same town or of living with a two-hour travelling distance. If parents lived in a region with a higher level of urbanization, living independently yet in the same town as one's parents was more likely, whereas living in a different town within a two-hour travelling distance was less likely. If parents lived in a district in the former GDR, as opposed to the former FRG, children were less likely to live in a different town within a two-hour travelling distance. For children of parents living in a region with a better economic performance, living in a different town within a two-hour travelling distance was, in turn, more likely.

To assess whether parent-child proximity differed between firstborn and secondborn children, as has been suggested by Konrad and colleagues (2002), we estimated a model in which the effects for the presence of a younger sibling and for the presence of an older sibling were allowed to differ. This model is presented in Appendix A. A comparison of Akaike Information Criterion (AIC) (Akaike, 1974) scores indicated that this model did not fit better with our data than the more parsimonious Model 1. Having a younger sibling as opposed to

having an older sibling was not significantly associated with the probability of any specific parent-child proximity category. Our analyses thus do not provide support for the birth order hypothesis (H2A; H2B).

In Model 2 we assessed whether the differences between only children and children with siblings in parent-child proximity were contingent on parental need for care. Results are again presented in Table 2. A comparison of AIC scores indicated that Model 2 fitted the data slightly better than Model 1. The effects of all control variables remained virtually unchanged between Model 1 and Model 2. Consistent with our expectations, the differences between only children and children with siblings in parent-child proximity were most pronounced when parents were coping with severe health limitations. Only children were much more likely to share a household with parents (marginal effect: 11.6%, $p < .05$), and markedly less likely to live in a different town within a two-hour travelling distance (marginal effect: -12.6%, $p < .01$) when parents were coping with severe health limitations. As postulated in H3A, the magnitude of the effects of parental need for care was smaller for children with siblings. Yet, children with siblings were more likely to share a household with parents (marginal effect: 6.8%, $p < .05$) and less likely to live at great distance (marginal effect: -8.1%, $p < .01$) when parents were coping with severe health limitations. We did not find support for our expectation that differences between only children and children with siblings in the probability of living at great distance from parents were larger when parents were coping with severe care needs (H3B).

DISCUSSION

In this study we explored the differences in parent-child proximity between only children and their counterparts with siblings. We focused on Germany, because of the country's strong emphasis on the role of the family in the provision of care for older persons. Our multinomial

logistic regression analyses indicated that, in general, children with a sibling were less likely than only children to share a household with a parent. We did not find support for our expectation that children with siblings were more likely than only children to live at great distance, i.e. more than two hours away, from their parents.

Consistent with our expectations, we found that differences between only children and children with siblings were most pronounced when parents were coping with severe health limitations. Particularly only children were substantially more likely to share a household with parents when the latter were coping with severe health limitations. These findings suggest that only children respond more strongly to parental need than do children with siblings.

Michielin, Mulder and Zorlu's (2008) analysis of Dutch administrative data has indicated that the impact of parental needs on children's residential choice was generally rather small in the Netherlands. Our findings suggest, however, that, particularly for only children, the impact of parental needs on parent-child proximity is substantial in Germany.

Konrad and colleagues (2002) have argued that not only the presence of siblings, but also birth order is relevant for the geographic distance between parents and a given adult child. First-borns – who are typically in a position to leave the parental home before their younger siblings – presumably have a strategic incentive to relocate to a place at great distance from the parent. By doing so, they bring younger siblings in a situation where a choice to move far away implies that the parents are geographically isolated from their offspring. Given that this situation clashes with their altruism towards their parents, second- (and later-) borns would end up living closer to their parents than first-borns. Later studies (e.g., Rainer and Siedler, 2009; 2012) have failed to replicate this pattern, however, and our results are also inconsistent with the thesis of Konrad and colleagues.

It should be noted that Konrad and colleagues (2002; but see also Rainer and Siedler, 2009; 2012) used ordered logistic regression to estimate parent-child proximity. Compton and

Pollak (2015) have argued that such an approach, which disregards the qualitative differences between coresidence and independent living arrangements, yields biased estimates. We re-estimated our models with an ordered logistic regression specification (not presented here; results are available on request), but Brant tests (Brant, 1990) indicated that the parallel regression assumption underlying ordered logistic regression was violated. Thus we confirmed Compton and Pollak's point that using ordered logistic regression models to estimate parent-child proximity is problematic.

In the current study, we focused only on families with one or two children. This is common in studies about the association between family composition and parent-child distance (cf. Konrad *et al.*, 2002; Rainer and Siedler, 2009; 2012). As a consequence, we cannot make statements about parent-child proximity in families with more than two children. Holmlund, Rainer and Siedler (2013) have recently shown that in Sweden, there is no effect of having more than one sibling on parent-child distance. Future studies could assess whether having more than one sibling impacts parent-child proximity under specific circumstances, for instance when the parent has severe health limitations.

The distance between a parent and child is determined by the residential trajectories of both parties. In earlier work, it has been suggested that residential trajectories of the younger generation are more relevant for parent-child proximity than residential trajectories of the older generation (Konrad *et al.*, 2002; Rainer and Siedler, 2009). Drawing on Dutch data, Smits and colleagues (2010) have shown, however, that parents typically moved in with children when transitions to coresidence were driven by parental need for support. As a robustness check, we re-estimated our models on a subsample in which parents were excluded if they had relocated after any child left the parental home ($n = 1,350$). In this subsample, differences in parent-child proximity were fully attributable to the residential trajectories of children and not to those of parents. The model is presented in Appendix B. The additional

models confirm our key finding that only children are more likely than children with a sibling to share a household with parents, particularly when the latter have severe health limitations. This pattern should thus, at least partly, be attributed to differences between the residential trajectories of only children and those of children with siblings, rather than to the residential trajectories of parents.

Due to the cross-sectional nature of our analyses, we could not explore the residential trajectories of parents and children that have resulted in the geographic proximity at the time of data collection. Further understanding of the choices that parents and children make with regard to where to live could be gained from longitudinal analyses. Given the rarity of residential relocations driven by older persons' need for care (Smits *et al.*, 2010), the use of register data rather than survey data is preferred. Recently, longitudinal studies on parental and offspring residential histories have been published for the Netherlands (Smits *et al.*, 2010) and Sweden (Kolk, 2016). For Germany, similar data as used in these studies are not available for researchers. This is unfortunate, because it would be interesting to test whether the responsiveness to parental needs, in the sense of living nearby, is stronger in Germany than in the Netherlands and Sweden where public provisions lessen the necessity to rely on family members for care in later life (Rainer and Siedler, 2012).

Despite the limitations outlined above, the current study contributes to the knowledge on the differences in the intergenerational relationships of only children and those of their counterparts with siblings. It is well-established that only children are more likely than children with siblings to provide support and care to ageing parents (Knijn and Liefbroer, 2006; Rainer and Siedler, 2012; Van den Broek and Dykstra, 2016). Our findings suggest that, in addition, only children's responsiveness to parental need might make them more compelled than their counterparts with siblings to adjust their living arrangements in order to facilitate caregiving.

ACKNOWLEDGEMENTS

The authors would like to thank Clemens Tesch-Römer, Heribert Engstler and Constanze Lejeune at the German Centre of Gerontology in Berlin for their helpful support when the first author visited their institute to work on this study. The helpful suggestions from two anonymous reviewers are also gratefully acknowledged.

Financial support for this paper comes from the European Research Council “Families in Context” project (grant agreement No. 324211); The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement no. 320116 for the research project FamiliesAndSocieties; The research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Programme (FP7/2007-2013)/ ERC grant agreement no. 324055 (“FAMHEALTH”); The first author’s research stay at the German Centre of Gerontology was supported by Erasmus Trustfonds and COST Action IS1311: Intergenerational Family Solidarity across Europe (INTERFASOL), funded by the EU Framework Programme for Research and Innovation Horizon2020.

REFERENCES

- Akaike H. 1974. A new look at the statistical model identification. *IEEE Transactions on Automatic Control* **19** : 716–723. doi: 10.1109/TAC.1974.1100705.
- Bengtson VL, Roberts REL. 1991. Intergenerational solidarity in aging families: An example of formal theory construction. *Journal of Marriage and Family* **53** : 856–870. doi: 10.2307/352993.
- Brant R. 1990. Assessing proportionality in the proportional odds model for ordinal logistic regression. *Biometrics* **46** : 1171–1178. doi: 10.2307/2532457.

- Christensen K, Doblhammer G, Rau R, Vaupel JW. 2009. Ageing populations: The challenges ahead. *The Lancet* **374** : 1196–1208. doi: 10.1016/S0140-6736(09)61460-4.
- Compton J, Pollak RA. 2015. Proximity and coresidence of adult children and their parents in the United States: Description and correlates. *Annals of Economics and Statistics* **117-118** : 91–114. doi: 10.15609/annaeconstat2009.117-118.91.
- Dykstra PA. 2015. Aging and social support. In *The Blackwell encyclopedia of sociology*, Ritzer G (ed.); Blackwell: Oxford; 88–93.
- Dykstra PA, Van den Broek T, Muresan C, Haragus M, Abramowska-Kmon A, Kotowska, IE. 2013. *State-of-the-art report: Intergenerational linkages in families. FamiliesAndSocieties Working Paper Series, No. 1*. Stockholm University: Stockholm
- Engstler H, Schmiade N. 2013. The German Ageing Survey (DEAS) - A longitudinal and time-series study of people in the second half of life. *Schmollers Jahrbuch* **133** : 97–108. doi: 10.3790/schm.133.1.97.
- EUROSTAT. 2015. *Regions in the European Union. Nomenclature of territorial units for statistics. NUTS 2013/EU-28*. Publications Office of the European Union: Luxembourg
- Finch J, Mason J. 1993. *Negotiating family responsibilities*. Routledge: London
- Freedman VA, Wolf DA, Soldo BJ, Stephen EH. 1991. Intergenerational transfers: A question of perspective. *The Gerontologist* **31** : 640–647. doi: 10.1093/geront/31.5.640.
- Goldstein JR, Kreyenfeld M. 2011. Has East Germany overtaken West Germany? Recent trends in order-specific fertility. *Population and Development Review* **37** : 453–472. doi: 10.1111/j.1728-4457.2011.00430.x.

- Haberkern K, Szydlik M. 2010. State care provision, societal opinion and children's care of older parents in 11 European countries. *Ageing and Society* **30** : 299–323. doi: 10.1017/S0144686X09990316.
- Hank K. 2007. Proximity and contacts between older adults and their children: A European comparison. *Journal of Marriage and Family* **69** : 157–173. doi: 10.1111/j.1741-3737.2006.00351.x.
- Holmlund H, Rainer H, Siedler T. 2013. Meet the parents? Family size and the geographic proximity between adult children and older mothers in Sweden. *Demography* **50** : 903–931. doi: 10.1007/s13524-012-0181-1.
- Iacovou M. 2011. *Population division expert paper no. 2011/10. Leaving home: Independence, togetherness and income in Europe*. United Nations: New York
- Knijn TC, Liefbroer AC. 2006. More than kind: Instrumental support in families. In *Family solidarity in the Netherlands*, Dykstra PA, Kalmijn M, Knijn TC, Komter AE, Mulder CH (eds.); Dutch University Press: Amsterdam; 89–106.
- Kolk M. 2016. A life-course analysis of geographical distance to siblings, parents, and grandparents in Sweden. *Population, Space and Place* **Published online before print**. doi: 10.1002/psp.2020.
- Konrad KA, Künemund H, Lommerud KE, Robledo JR. 2002. Geography of the family. *American Economic Review* **92** : 981–998. doi: 10.1257/00028280260344551.
- Leitner S. 2003. Varieties of familialism: The caring function of the family in comparative perspective. *European Societies* **5** : 353–375. doi: 10.1080/1461669032000127642.
- Lejeune C, Engstler H. 2014. *German Ageing Survey (DEAS): Codebook of the SUF DEAS2008, version 2.0*. DZA German Centre of Gerontology: Berlin

- Leopold T, Geissler F, Pink S. 2012. How far do children move? Spatial distances after leaving the parental home. *Social Science Research* **41** : 991–1002. doi: 10.1016/j.ssresearch.2012.03.004.
- Leopold T, Raab M, Engelhardt H. 2014. The transition to parent care: Costs, commitments, and caregiver selection among children. *Journal of Marriage and Family* **76** : 300–318. doi: 10.1111/jomf.12099.
- Malmberg G, Pettersson A. 2007. Distance to elderly parents: Analyses of Swedish register data. *Demographic Research* **17** : 679–704. doi: 10.4054/DemRes.2007.17.23.
- Maruyama S, Johar M. 2013. *Australian School of Business Research Paper No. 2013 ECON 06: Do siblings free-ride in "being there" for parents?* University of New South Wales: Sydney doi: 10.2139/ssrn.2250914.
- Mayer KU, Wagner M. 1996. Lebenslagen und sozial Ungleichheit im hohen Alter [Living conditions and social inequality in old age]. In *Die Berliner Altersstudie. Das höhere Alter in interdisziplinärer Perspektive [The Berlin Aging Study. Old age in interdisciplinary perspective]*, Mayer KU, Baltes PB (eds.); Akademie Verlag: Berlin; 251–275.
- Michielin F, Mulder CH, Zorlu A. 2008. Distance to parents and geographical mobility. *Population, Space and Place* **14** : 327–345. doi: 10.1002/psp.509.
- Motel-Klingebiel A, Wurm S, Engstler H, Huxhold O, Jürgens O, Mahne K, Schöllgen I, Wiest M, Tesch-Römer C. 2010. *German Ageing Survey (DEAS): The second half of life. Research instruments of the third wave*. DZA German Centre of Gerontology: Berlin

- Parr N. 2006. Do children from small families do better? *Journal of Population Research* **23** : 1–25. doi: 10.1007/BF03031865.
- Pavolini E, Ranci C. 2008. Restructuring the welfare state: reforms in long-term care in Western European countries. *Journal of European Social Policy* **18** : 246–259. doi: 10.1177/0958928708091058.
- Pettersson A, Malmberg G. 2009. Adult children and elderly parents as mobility attractions in Sweden. *Population, Space and Place* **15** : 343–357. doi: 10.1002/psp.558.
- Porter ME. 2003. The economic performance of regions. *Regional Studies* **37** : 549–578. doi: 10.1080/0034340032000108688.
- Rainer H, Siedler T. 2009. O brother, where art thou? The effects of having a sibling on geographic mobility and labour market outcomes. *Economica*, **76** : 528–556. doi: 10.1111/j.1468-0335.2008.00696.x.
- Rainer H, Siedler T. 2012. Family location and caregiving patterns from an international perspective. *Population and Development Review* **38** : 337–351. doi: 10.1111/j.1728-4457.2012.00495.x.
- Ranci C, Pavolini E. 2015. Not all that glitters is gold: Long-term care reforms in the last two decades in Europe. *Journal of European Social Policy* **25** : 270–285. doi: 10.1177/0958928715588704.
- Shelton N, Grundy E. 2000. Proximity of adult children to their parents in Great Britain. *International Journal of Population Geography* **6** : 181–195. doi: 10.1002/1099-1220(200005/06)6:3<181::AID-IJPG181>3.0.CO;2-U
- Silverstein M. 1995. Stability and change in temporal distance between the elderly and their children. *Demography* **32** : 29–45. doi: 10.2307/2061895.

- Smits A. 2010. Moving close to parents and adult children in the Netherlands: The influence of support needs. *Demographic Research* **22** : 985–1014. doi: 10.4054/DemRes.2010.22.31.
- Smits A, Van Gaalen RI, Mulder CH. 2010. Parent-child coresidence: Who moves in with whom and for whose needs? *Journal of Marriage and Family* **72** : 1022–1033. doi: 10.1111/j.1741-3737.2010.00746.x.
- Theobald H, Samsen S. 2013. Radical institutional change and incremental transformation: Long-term care insurance in Germany. *In Reforms in long-term care policies in Europe. Investigating institutional change and social impacts*, Ranci C, Pavolini E (eds.); Springer: New York; 117–138.
- Van den Broek T, Dykstra PA. 2016. Residential care and care to community-dwelling parents: In-selection, out-selection and diffusion of responsibility. *Ageing and Society* **Published online before print**. doi: 10.1017/S0144686X16000519.
- Van den Broek T, Dykstra PA, Schenk N. 2014. Regional economic performance and distance between parents and their employed children. A multilevel analysis. *Population, Space and Place* **20** : 222–234. doi: 10.1002/psp.1757.
- Van der Pers M, Mulder CH. 2013. The regional dimension of intergenerational proximity in the Netherlands. *Population, Space and Place* **19** : 505–521. doi: 10.1002/psp.1729.
- Wang CL. 2004. Marginal effects. *In SAGE encyclopedia of social science research methods*, Lewis-Beck MS, Bryman A, Liao TF (eds.); Sage: Thousand Oaks; 609–610.
- White H. 1980. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, **48** : 817–838. doi: 10.2307/1912934.

- Williams R. 2012. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata Journal*, **12** : 308–331.
- Wolff JL, Kasper JD. 2006. Caregivers of frail elders: Updating a national profile. *The Gerontologist*, **46** : 344–356. doi: 10.1093/geront/46.3.344.
- World Health Organization. 2015. *Germany: WHO statistical profile*. World Health Organization: Geneva

Table 1. Descriptive statistics.

Variable	M ^a	SD	Range
Parent-child distance:			
Shared household	11.1%		
Independent household, same town	33.2%		
Independent household, < 2 hours	36.6%		
Independent household, > 2 hours	19.0%		
Child characteristics:			
Has sibling	60.8%		
Female	48.1%		
Married	61.0%		
Has children	66.5%		
Socio-economic status:			
Not employed	16.9%		
Employed, low prestige job	22.2%		
Employed, medium prestige job	25.9%		
Employed, high prestige job	35.0%		
Parent characteristics:			
Severe health limitations	11.7%		
Female	50.0%		
Age ^b	68.9	7.5	47-85
Married	73.9%		
Home-owner	60.6%		
District characteristics:			
Former GDR	36.4%		
Population density (inhabitants / km ²) ^c	675.2	875.8	39.7-4,270.5
Average gross monthly wage (in €1,000) ^b	2.7	0.4	2.0-4.0

Notes: Data are from Wave 3 (2008) of the German Ageing Survey (DEAS) ($n = 2,028$); ^a For categorical variables, percentages are presented; ^b Values before centering; ^c Values before log transformation and centering

Table 2. Results of multinomial logistic regression models of parent-child proximity; marginal effects ($n = 2,028$).

Variable	Model 1				Model 2			
	Shared household	Same town	< 2 hours	> 2 hours	Shared household	Same town	< 2 hours	> 2 hours
Child:								
Has sibling	-4.1% *	-1.3%	3.4%	2.1%				
Sibling x parental limitations:								
No sibling, no severe limitations parent					(ref.)	(ref.)	(ref.)	(ref.)
No sibling, severe limitations parent					11.6% *	2.0%	-12.6% **	-1.0%
Has sibling, no severe limitations parent					-3.6% *	-0.7%	1.4%	2.9%
Has sibling, severe limitations parent					3.2%	-3.6%	5.5%	-5.2%
Female	-6.9% ***	-1.7%	3.8%	4.9% **	-6.9% ***	-1.7%	3.7%	4.9%
Married	-5.6% ***	2.2%	4.6%	-1.2%	-5.5% ***	2.2%	4.5%	-1.2%
Has children	-0.3%	7.5% **	-0.4%	-6.8% **	-0.3%	7.5%	-0.6%	-6.7% **
Socio-economic status:								
Not employed	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)
Employed, low prestige job	-2.6%	5.3%	-1.9%	-0.9%	-2.6%	5.3%	-1.9%	-0.9%
Employed, medium prestige job	-5.7% **	6.8%	-1.5%	0.4%	-5.7% **	6.8%	-1.5%	0.4%
Employed, high prestige job	-7.5% ***	-2.4%	-1.5%	11.3% ***	-7.5% ***	-2.4%	-1.4%	11.3% ***
Parent:								
Severe health limitations	8.7% ***	-0.9%	-2.9%	-5.0% *				
Female	0.6%	-0.7%	-0.1%	0.1%	0.6%	-0.7%	-0.0%	0.1%
Age ^a	0.3% **	0.1%	-0.2%	-0.2%	0.3% **	0.1%	-0.2%	-0.2%
Married	0.5%	-2.4%	4.3%	-2.4%	0.4%	-2.4%	4.3%	-2.4%
Home-owner	5.3% ***	-4.5% *	0.5%	-1.2%	5.3% ***	-4.4% *	0.3%	-0.1%
District:								
Former GDR	1.5%	0.4%	-7.1% *	5.1%	1.5%	0.4%	-6.9% *	5.0%
Population density (log) ^a	-0.6%	7.0% ***	-7.5% ***	1.2%	-0.6%	7.0% ***	-7.6% ***	1.2%
Average gross monthly wage ^a	-1.7%	-8.6%	14.1% **	-3.8%	-1.8%	-8.8%	14.6% **	-4.0%
Log-likelihood	-2,491.6				-2,488.3			
Degrees of freedom	48				51			
Akaike Information Criterion (AIC)	5,079.1				5,078.7			

Notes: Data are from Wave 3 (2008) of the German Ageing Survey (DEAS); Models were estimated with clustered standard errors; ^a parent's age, district population density (log) and district average wage were mean centered.

* $p < .05$, ** $p < .01$, *** $p < .001$

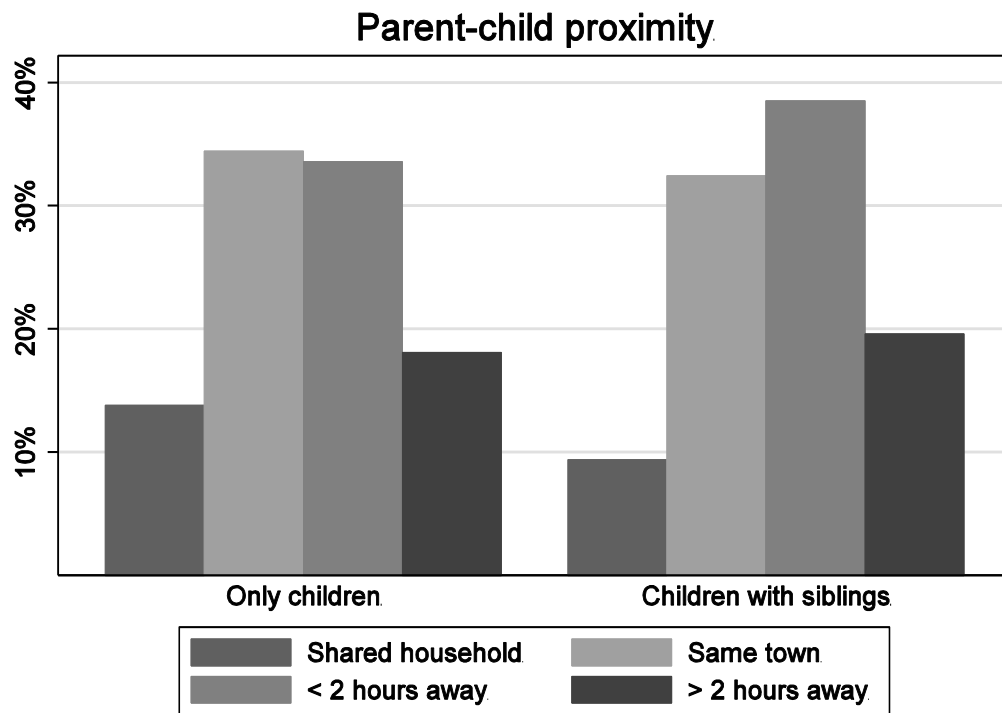


Figure 1. Parent-child proximity.

Appendix A. Results of multinomial logistic regression models of parent-child proximity; marginal effects ($n = 2,028$).

Variable	Shared household	Same town	< 2 hours	> 2 hours
Child:				
Presence of siblings:				
Has younger sibling	(ref.)	(ref.)	(ref.)	(ref.)
Has older sibling	-0.3%	-1.1%	2.7%	-1.4%
Does not have sibling	4.0%*	0.8%	-2.1%	-2.8%
Female	-6.9%***	-1.8%	3.8%	4.9%**
Married	-5.6%***	2.1%	4.6%	-1.2%
Has children	-0.3%	7.5%**	-0.3%	-6.8%**
Socio-economic status:				
Not employed	(ref.)	(ref.)	(ref.)	(ref.)
Employed, low prestige job	-2.6%	5.4%	-1.9%	-0.9%
Employed, medium prestige job	-5.7%**	6.8%	-1.5%	0.4%
Employed, high prestige job	-7.5%***	-2.4%	-1.5%	11.3%***
Parent:				
Severe health limitations	8.7%***	-0.9%	-2.8%	-5.0%*
Female	0.6%	-0.7%	-0.1%	0.1%
Age ^a	0.3%**	0.1%	-0.2%	-0.2%
Married	0.5%	-2.4%	4.3%	-2.4%
Home-owner	5.3%***	-4.5%*	0.4%	-1.2%
District:				
Former GDR	1.5%	0.4%	-7.1%*	5.1%
Population density (log) ^a	-0.6%	7.0%***	-7.5%***	1.2%
Average gross monthly wage ^a	-1.8%	-8.7%	14.2%**	-3.8%
Log-likelihood	-2,491.0			
Degrees of freedom	51			
Akaike Information Criterion (AIC)	5,084.1			

Notes: Data are from Wave 3 (2008) of the German Ageing Survey (DEAS); Models were estimated with clustered standard errors; ^a parent's age, district population density (log) and district average wage were mean centered.

* $p < .05$, ** $p < .01$, *** $p < .001$

Appendix B. Results of multinomial logistic regression models of parent-child proximity; non-relocated parents only; marginal effects ($n = 1,350$).

Variable	Model 1				Model 2			
	Shared household	Same town	< 2 hours	> 2 hours	Shared household	Same town	< 2 hours	> 2 hours
Child:								
Has sibling	-7.3% **	2.4%	5.3% *	-0.3%				
Sibling x parental limitations:								
No sibling, no severe limitations parent					(ref.)	(ref.)	(ref.)	(ref.)
No sibling, severe limitations parent					22.3% **	2.1%	-16.9% **	-7.5%
Has sibling, no severe limitations parent					-5.9% *	2.9%	2.8%	0.3%
Has sibling, severe limitations parent					2.7%	0.1%	10.5%	-13.4% ***
Female	-9.8% ***	-1.1%	8.0% **	2.8%	-9.7% ***	-0.9%	7.7% **	2.9%
Married	-7.4% ***	2.3%	6.0%	-0.8%	-7.3% ***	2.3%	5.8%	-0.8%
Has children	0.1%	7.5% *	-2.3%	-5.4% *	0.1%	7.6% *	-2.3%	-5.3% *
Socio-economic status:								
Not employed	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)	(ref.)
Employed, low prestige job	-2.5%	6.7%	-3.0%	-1.3%	-2.2%	6.8%	-3.5%	-1.1%
Employed, medium prestige job	-6.4% *	10.8% *	-2.5%	-1.8%	-6.4% *	10.8% *	-2.7%	-1.7%
Employed, high prestige job	-8.4% **	1.5%	-2.9%	9.8% **	-8.3% **	1.6%	-3.2%	9.9% **
Parent:								
Severe health limitations	14.0% ***	-1.1%	-1.7%	-11.2% ***				
Female	-0.3%	-1.5%	2.0%	-0.2%	-0.3%	-1.5%	2.0%	0.2%
Age ^a	0.3%	0.0%	-0.2%	-0.0%	0.3%	0.1%	-0.2%	-0.0%
Married	-1.7%	-3.0%	7.2% *	-2.4%	-1.8%	-3.1%	7.3% *	-2.4%
Home-owner	1.9%	-6.0%	-0.3%	4.4% *	1.9%	-6.0%	-0.4%	4.4% *
District:								
Former GDR	4.3%	-5.5%	-7.2%	8.3% *	4.3%	-5.5%	-7.1%	8.2% *
Population density (log) ^a	-1.4%	8.6% ***	-8.2% ***	1.2%	-1.3%	8.6% ***	-8.2% ***	1.0%
Average gross monthly wage ^a	0.7%	-16.2% *	15.6% **	-0.1%	0.5%	-16.3% *	16.1% **	-0.3%
Log-likelihood	-1,661.1				-1,656.6			
Degrees of freedom	48				51			
Akaike Information Criterion (AIC)	3,418.2				3,415.3			

Notes: Data are from Wave 3 (2008) of the German Ageing Survey (DEAS); Models were estimated with clustered standard errors; ^a parent's age, district population density (log) and district average wage were mean centered; * $p < .05$, ** $p < .01$, *** $p < .001$

