



Internal migration toward siblings in later life

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Abstract

Research on the role of siblings in older adult migration lags behind a growing number of studies on adult children as a mobility attraction. We attend to this gap by examining (i) to what extent the absence of partners and/or adult children influences older adults' (age 70-84) migration toward faraway siblings (at least 50 km away) and (ii) how these migrations are patterned by the location of other family members (children, other siblings, and nephews/nieces). We use multinomial logistic regression models and analyze dyads of older adults and all distant siblings from the Swedish population register data between 2012 and 2016 (N = 1,743,234). We control for several characteristics of the study population that may impact the decision to move closer, including sociodemographic characteristics and measures of location-specific capital. Widowed, divorced, and never married older adults were more likely to move closer to distant siblings than the partnered. Not having children was associated with a higher likelihood of moving toward a sibling. Living near adult children or other siblings deterred relocation toward siblings, while family clustered at a distance reinforced the location's attractiveness for migration. As declines in fertility broadly reflect people's decisions to have fewer children or forego having families, siblings might emerge as a vital source of support. Our research indicates that siblings can be a destination for migration and, therefore, should be considered as important members of social networks of older adults, especially those who do not have partners and/or adult children available.

Keywords: geographic mobility, intergenerational relationships, population register data, family ties, Sweden

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Introduction

Many European countries implement policies seeking to increase the role of the family in care, especially when it concerns care for an increasing number of older adults (Pavolini & Ranci, 2008). Literature on family support and contact often focuses on spouses and children as caregivers for older adults, and, less frequently, on siblings [see a review by Connidis and Barnett (2018)]. Although the sibling bond may not be as duty-bound as that between parents and children, siblings do appear to provide help and care when needed (Connidis, 1989; Eriksen & Gerstel, 2002). Researchers acknowledge the importance of siblings as a source of comfort and support (Bedford, 1995; Eriksen & Gerstel, 2002), companionship (Connidis & Davies, 1990), and well-being (Jensen et al., 2020; O'Bryant, 1988).

Interactions with sisters and brothers take on new meaning in late life (Gold, 1987). As people live longer, have fewer children, remain single, or choose not to have families, their social networks may decrease. Siblings might emerge as a vital source of support in old age and older adults might want to live closer to their siblings, especially after losing a partner (Gold, 1987). However, research on the role of siblings in residential relocations lags behind a growing number of studies on the role of adult children as the motive for migration. Some noteworthy exceptions to this trend have recently focused on the role of siblings in the migration choices of young adults (Mulder et al., 2020a; Mulder et al., 2020b). Additionally, existing studies about family proximity-enhancing moves, also known as *geographic convergence* (Silverstein, 1995) often ignore older adults who do not have children.

We attend to this gap by examining (i) to what extent the availability of traditional family companions and caregivers (i.e., partners and adult children) influences older adults' (aged 70 to 84 years) migration toward siblings who live at least 50 km away and (ii) how these relocations are patterned by the location of other family members—namely adult children,

other siblings, and nephews/nieces. To answer these questions, we draw on Swedish register data between 2012 and 2016 to examine dyads of older adults and their distant siblings. We control for characteristics of older adults as well as their distant siblings, including sociodemographic characteristics, location-specific capital, and urbanization.

Sweden has several advantages for this study. First, the country has a growing proportion of older adults with one of the longest life expectancies in Europe (OECD, 2019). Second, Sweden was historically, and remains, a high-migration country (Champion et al., 2017). In spite of its citizens' dependence on formal care provision policies—one of the strongest in Europe (Haber Kern & Szydlik, 2010)—rather than on kin support (Svallfors, 2004), people continue moving closer to the family (Gillespie & Mulder, 2020). Finally, Sweden has high quality population data on links between family members, including siblings, and these links can be traced for older adults.

Theoretical Background

The sibling relationship is often considered the family relationship with the longest duration (White, 2001). Siblings tend to be permanent members of people's social networks and can therefore play an important role in people's lives (Voorpostel et al., 2012). The importance of siblings varies over the life course, with research suggesting a decrease in contact, exchange of help, and proximity during young adulthood followed by stabilization of proximity and contact in middle life, and a slight rise in exchange of help later in life (White, 2001). One of the reasons for fluctuations in sibling relationships is that spouses and children tend to be the emotional center of people's lives in adulthood and middle life while later life brings transitions (e.g. empty nest, losing a partner, or parental death) that contribute to a reemergence or intensification of sibling relationships (Gold, 1987; Kalmijn & Leopold, 2019; White, 2001).

Because geographic proximity between family members is the key determinant of exchange of support (Knijn & Liefbroer, 2006), living farther away makes provision of practical help and frequent contacts between siblings more difficult (Eriksen & Gerstel, 2002; White & Riedmann, 1992). Research suggests that living geographically nearby siblings becomes more important in later life. More than half of the informants in a study by Gold (1987) indicated that individuals' physical distance from their siblings saddened them in later life. When the respondents were asked what, if anything, they would change about their sibling relationships, many answered that they would choose to live closer to their sisters or brothers.

The dominant theoretical approach to explaining migration behavior in later life is the three-stage model of Litwak and Longino (1987). In the first stage of the model, a couple's amenity-seeking move is usually undertaken in good health closely after retirement. In the second stage, older adults become widowed and acquire chronic disabilities that motivate them to move closer to adult children and other family members. In the third stage, when older adults' health deteriorates, they are likely to move to institutionalized residential care. Theoretically, a sibling's location might become an attraction for the second move, especially when core family members—traditionally represented by partners and children—are not available for assistance and company. The substitution hypothesis (Shanas, 1979) and the hierarchical compensatory model (Cantor, 1979) suggest that older adults rank their sources of support according to a common order of preference and availability. The first choice for assistance is the partner, the second choice is an adult child. If these sources are unavailable, older persons turn to other relatives (including siblings) and non-kin (Cantor, 1979; Cantor, 1991). The relationship between geographic proximity and support implies that in the absence of core family members, older adults might prefer to live closer to distant siblings. Notably, when family members move close to each other, the person in need of support is more likely to move (Smits, 2010).

However, it is worth remembering that some older adults might have moved closer or had a distant sibling move closer before our observation period.

As partners are often key sources of support (de Jong Gierveld et al., 2009), the loss of a partner can lead to loneliness and social isolation (Victor et al., 2002). Thus, access to wider networks of familial support can be particularly important (Thomas & Dommermuth, 2020). According to Cicirelli (1996), adult siblings, especially older adults, rely heavily on each other in times of crisis. When a spouse passes away, many older adults turn to their siblings for support (Gold, 1987; Merz & De Jong Gierveld, 2016).

Research further suggests that older persons without children depend more on siblings, nieces, and nephews for support than do older parents (Choi, 1994; Fihel et al., 2021). According to Kjær and Siren (2021), the role of childlessness in estimating older adults' need for assistance should be understood in its intersection with partner status. They found that for those without a partner, childlessness led to a larger support disadvantage. Partnered parents and partnered childless individuals enjoyed the highest level of available tangible support, followed by single-living parents; the lowest levels of support were experienced by single individuals without children. This disadvantage was more pronounced among men than women (Kjær & Siren, 2021). Previous research suggests that older adults who have neither a partner nor children might rely more on siblings (Campbell et al., 1999; Connidis, 1989; White & Riedmann, 1992) than those who have a partner, at least one child, or both.

Of course, not just the existence but the *location* of nonresident family members should also matter in older adults' migration decisions. According to Mulder's (2018) family ties perspective on internal migration and immobility, having family members living nearby should increase individuals' likelihood of staying in an area. Nearby children or siblings (denoted here as the index person's¹ "family ties") might affect the likelihood of moving closer to distant siblings since geographically close family members can already provide needed care and/or

companionship. For instance, the closer children live to parents, the more support they provide (Kalmijn & Dykstra, 2006). And older adults with children living close by tend to change residence less often than those whose closest children live far away (van der Pers et al., 2015). If an older parent has children but none live nearby, they are more likely to move closer to a distant child, into institutionalized care, or elsewhere rather than stay (Artamonova et al., 2020). These moves elsewhere might include moves closer to siblings. The presence of other family members nearby the distant sibling (denoted from here as distant sibling's family ties) might, in turn, strengthen the attractive effect of a distant sibling's place of residence for relocation. Moving toward several family members rather than one sibling might be more beneficial for older adults, as they could then rely on multiple informal caregivers and companions.

Hypotheses

We derive eight hypotheses on the understudied potential relationship between moving closer to siblings in later life and the presence and location of other family members (Table 1).

Table 1. Research Hypotheses

N	Hypotheses
<i>The presence of index person's partners and children</i>	
1a	Index persons without partners (unmarried, separated, and widowed) will be more likely to move closer to distant siblings than those who have partners
1b	Index persons without children will be more likely to move closer to distant siblings than those who have children
1c	Index persons who have neither a partner nor a child will be more likely to move closer to distant siblings than those who have at least a partner or a child
<i>Index person's family ties</i>	
2a	Index persons who have at least one child nearby will be less likely to move closer to distant siblings than those who do not have children in close proximity
2b	Index persons who have at least one other sibling nearby will be less likely to move closer to distant siblings than those who do not have other siblings in close proximity
<i>Distant sibling's family ties</i>	
3a	Having at least one Index person's child in close proximity to the distant sibling will increase the propensity of Index person's move toward this sibling
3b	Having at least one additional sibling in close proximity of the distant sibling will increase the propensity of the Index person's move toward this sibling
3c	Having at least one niece or nephew in close proximity of the distant sibling will increase the propensity of index person's move toward this sibling

Data and method

Data selection

The data for the analyses are drawn from several Swedish population and administrative registers, which contain information on all Swedes born from 1932 onward who have been registered as residents in Sweden at any time since 1968. Each resident of Sweden was identified by a unique identification number that enabled us to link individuals to their family members and across different registers. Annually updated socioeconomic information was

derived from the Longitudinal Integration Database for Health Insurance and Labor Market Studies.

From these data, we extract unique dyads of index persons and their distant siblings. People were identified as siblings if they had the same mother (Raab et al., 2014). The first requirement for entering the population at risk is that the index person's age is 70 or over at the beginning of observation. We chose this distinction because by this age, a majority of older adults' parents will be deceased (Kridahl & Silverstein, 2020), which helps separate the migration attraction of siblings from that of older parents in need of care. An older person enters the population at risk of moving closer to a sibling if the sibling lived at least 50 kilometres (km) away in the baseline year. Older adults who did not have siblings and those whose siblings lived outside Sweden or all within 50 km of the index person's neighborhood were excluded from the study. We observed 1,743,234 dyad-years for the population of index persons under risk of moving toward a distant sibling or elsewhere.

We tracked the geographic relocations of index persons between 2012 and 2016, across four pooled time periods: 2012 (t_0) – 2013 (t_1), 2013 (t_0) – 2014 (t_1), 2014 (t_0) – 2015 (t_1), and 2015 (t_0) – 2016 (t_1). At t_0 we measured baseline characteristics of the study population. We analyzed relocations between pairs of years t_0 and t_1 .

Measures

The outcome variable included three categories: (i) no migration of the index person (the reference category), (ii) migration resulted in a distance that was less than 10 km between the index person and a distant sibling, (iii) migration elsewhere. As Gillespie and Mulder (2020) found, moving toward family can be considered a reasonably valid proxy for family-motivated migration. We considered relocation to within 10 km as a convergent move because this distance can be travelled in less than 30 minutes, thereby enabling relatively frequent contact

and exchange of support (Thomas & Dommermuth, 2020). Only moves that exceeded 40 km were classified as migration. However, we employed several sensitivity checks using alternative distance thresholds.

Because residents of Sweden are registered within Small Areas for Market Statistics (SAMS), it was possible to identify relocation distances as well as the distances between households of non-resident family members. There are approximately 9,200 SAMS divisions throughout the country, which are based on the subdivision of areas in large municipalities and on election districts in small municipalities. Distance was measured by the Euclidean distance between the geographic centroids of the index person's and a sibling's SAMS-areas.

Independent variables were measured at t_0 . The central explanatory variables for our analysis of moving closer to distant siblings in later life are measures of presence of the index persons' partners and children and measures of family ties of the index persons and distant siblings, namely, their location relative to the members of the dyads.

The partnership state of the index person included four categories: married/partnered (0 – the reference category), unmarried/unpartnered (1), divorced/separated (2), widowed (3). We distinguished between those index persons who have children (the reference category) and those who do not. A separate measure distinguished between index persons with a partner and at least one child (0 - the reference category), neither a partner nor a child (1), those with at least one child but no partner (2), and those who have only a partner (3).

To account for the location of the index person's children, we included two dummy variables: having a child within 10 km of own neighborhood or not (the reference category) and having a child living within 10 km of the distant sibling's neighborhood or not (the reference category). The index person's and a distant sibling's ties to other siblings were operationalized as having at least one sibling within 10 km (1) or not (0 - the reference category). A measure for distant

siblings' availability of children (nieces or nephews of the index persons) included three categories: having at least one child within 10 km of the neighborhood, having a child living more than 10 km far, and not having children (the reference category).

We incorporated several additional variables that may relate to a decision to move closer to a distant sibling. We controlled for baseline sociodemographic characteristics of the index persons and their faraway siblings (gender composition of a dyad, age of the index person and relative age of a sibling, whether siblings are full biological or half, number of siblings, partnership state of the distant sibling, education and disposable income of both siblings in a dyad), their location-specific capital (living in a county of birth, the baseline duration of residence of the index person), the level of urbanization of their baseline places of residence, and a baseline distance between siblings in t_0 .

We incorporated several additional variables that may relate to a decision to move closer to a distant sibling. We identified whether a distant sibling in a dyad is full (the reference category) or half-sibling because full biological siblings tend to have more contact than half-siblings (Gilligan et al., 2020). Also, the distribution of time and energy among more siblings may make solidarity toward any given sibling less likely (Dykstra & Knipscheer, 1995; Eriksen & Gerstel, 2002). Alternatively, if family orientation is shared among siblings, those from large families might be more inclined to converge with a distant sibling. We therefore included the index person's *number of siblings*: 1 (the reference category), 2, 3, and more than 3 to account for possible variations.

Based on findings from previous research showing that the gender composition of sibling dyads is linked to siblings' emotional closeness (Gold, 1987; Stocker et al., 2020), we distinguish between the following index-distant sibling dyads: sister-sister (the reference category), sister-brother, brother-sister, and brother-brother. Because increasing age is often associated with a lower likelihood of migration, with a slight increase in the propensity to move in later life

(Gillespie, 2017), we included *the index person's age* in years. To the extent that siblings' age difference is associated with the closeness of their relationships (Ross & Milgram, 1982) and the potential to provide help (Eriksen & Gerstel, 2002), we included a measure of whether the index person is younger (the reference category), close in age (i.e., the age difference is no more than three years), or older than their distant sibling in the dyad.

As partnered siblings have lower levels of contact and support exchange than siblings without partners (Gilligan et al., 2020), a distant sibling's partnership state might contribute to a decision to converge geographically. We distinguished between those distant siblings who were single versus had a partner in the household (the reference category).

Resource availability can contribute to spatial independence from the family, as those with higher educational attainment and income are more likely to move (Chiswick, 2000) and more likely to do so irrespective of the location of family members (Silverstein, 1995) than others. On the other hand, resources might facilitate geographic convergence and further exchange of support since siblings with a higher educational level (Voorpostel et al., 2007) and greater family incomes (Eriksen & Gerstel, 2002) are more likely to provide support for siblings with fewer resources. Therefore, for both the index persons and distant siblings in each dyad, we distinguished between receiving *disposable income* below the median (reference category) or above it. Disposable income (in 100,000s of Swedish crowns) was calculated by Statistics Sweden; the few registered negative incomes were recoded to 0. *Educational attainment* had four categories: primary education (reference category), secondary, post-secondary, and no information.

Since people who are settled are more likely to remain in their area (Fischer & Malmberg, 2001), we controlled for the index person's *duration of residence* at the current address, which was calculated using the date of their last registered move within the country and a dummy variable for whether or not the index person was living in their *county of birth in t_0* . We also

controlled for whether the distant sibling was living in their county of birth, since moving closer to a sibling could reflect return migration to an area.

Older adults might be apt to relocate toward urban areas, where access to public services and formal care facilities is usually better than those found in rural areas (Stockdale & Catney, 2014). For this reason, we identified whether the index person and a distant sibling lived in a metropolitan area (the reference category), smaller town/suburb, or sparsely populated area using Eurostat's definition of the level of urbanization. Finally, since the volume of migration declines as distance increases (Lee, 1966), we included a *distance* (as the logarithm of the number of kilometres) between siblings in t_0 , expecting that a move closer to a sibling might be less attractive when this sibling lives too far and the costs of migration outweigh the benefits of proximity.

Summary statistics are presented in Table 2.

Analytical strategy

We structured the data into long form, such that multiple occasions of observations were nested within the index person-sibling dyads and within index persons (Figure 1), causing the standard assumption of independence of observations to be violated. In order to record the model estimates appropriately, we used two-way clustered standard errors (Cameron et al., 2011) for the dyad- and index person-levels. Observations were treated as censored after the index persons moved closer to a sibling.

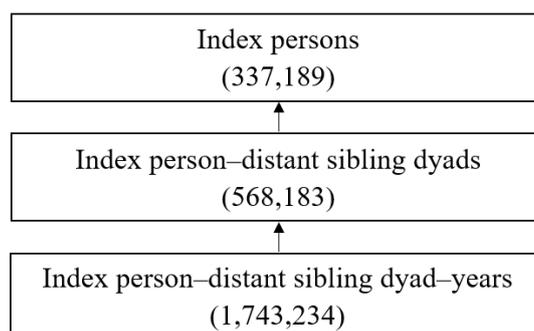


Figure 1. Data structure

We present the results of two models. In Model 1, we show the results of tests of *Hypotheses 1a, 1b* (related to the presence of the index persons’ partners and children on moving toward siblings), *2a, 2b* (related to family ties of the index persons), and *3a-3c* (related to the family ties of distant siblings). In Model 2, we present the interplay between the presence of a partner and at least one child to test *Hypothesis 1c*. Besides our main models, we discuss the results of auxiliary analyses below. We also explored the stability of our models for index persons whose parents were no longer alive and examined how different initial distances between siblings, distance after a convergent move, and moving distance thresholds influenced our findings.

Results

Descriptive findings

As shown in Table 2, in less than one percent of observations (in dyad-years) the index persons moved at least 40 km between 2012 and 2016. Among them, 14.2 percent moved toward a distant sibling and 85.8 percent elsewhere. The mean distance between siblings following the convergent moves was equal to 3.02 km (SD = 3.04). After migration toward a sibling, 36.2 percent ended up also living closer to their children, while among those who moved elsewhere, 41.4 percent were closer to children. Overall, there were slightly more moves among men (0.9 percent) than women (0.8). Among movers, more women (15.4 percent) than men (13.0 percent) ended up within a 10-kilometre radius of the neighborhood of a distant sibling.

Table 2. Summary statistics for main explanatory variables, percentage in the sample or means (SD)

	Total ^a	Index did not move a long distance ^b	Index moved within 10 km of a sibling ^b	Index moved elsewhere ^b
Index's having children				
No children	10.88	99.13	0.22	0.65
At least one child	89.12	99.12	0.11	0.76
Index's partnership state				
Married/partnered	58.45	99.26	0.09	0.65
Unmarried/unpartnered	7.64	99.23	0.18	0.59
Divorced/separated	18.14	98.69	0.19	1.12
Widow/widowed	15.77	99.07	0.14	0.79
Index's having children and a partner				
At least one child and a partner	55.43	99.30	0.09	0.62
No children and no partner	7.45	99.10	0.25	0.65
At least one child and no partner	33.69	98.84	0.16	1.00
No children and a partner	3.43	99.20	0.13	0.67
Index's child nearby				
At least one child within 10km	51.12	99.61	0.06	0.33
No children within 10km	48.88	98.62	0.19	1.19
Index's ties to other siblings				
At least one sibling within 10km	15.86	99.53	0.06	0.41
No siblings within 10km	84.14	99.05	0.14	0.82
Index's child nearby a distant sibling				
At least one child within 10km	4.18	97.94	0.98	1.08
No children within 10km	95.82	99.18	0.09	0.74
Sibling's ties to other siblings				
At least one sibling within 10km	17.74	98.94	0.31	0.75
No siblings within 10km	82.26	99.16	0.09	0.75
Sibling's ties to children				
No children	12.10	99.16	0.13	0.71
No children within 10km	37.50	99.15	0.10	0.75
At least one child within 10km	50.40	99.10	0.14	0.76
Sibling lives with a partner				
No	39.65	99.11	0.14	0.75
Yes	60.35	99.14	0.12	0.75
Gender composition of a dyad (Index-sibling)				
Sister-sister	27.54	99.18	0.13	0.69
Sister-brother	25.44	99.16	0.12	0.72
Brother-sister	25.01	99.08	0.12	0.81
Brother-brother	22.01	99.07	0.13	0.81
Index's age, years	74.1 (0.01)	74.1 (0.01)	73.7 (0.07)	73.6 (0.03)

	Total ^a	Index did not move a long distance ^b	Index moved within 10 km of a sibling ^b	Index moved elsewhere ^b
Sibling's age relative to the Index's				
Index younger	13.33	99.14	0.11	0.75
Around the same age (+/-3 years)	35.34	99.12	0.13	0.75
Index older	51.33	99.12	0.13	0.75
Type of sibling				
Full	96.65	99.12	0.13	0.75
Half (different fathers)	3.35	99.12	0.08	0.80
Index's education				
Primary	31.87	99.28	0.11	0.61
Secondary	39.52	99.10	0.13	0.77
Post-secondary	28.29	99.00	0.13	0.87
No information	0.32	98.29	0.32	1.39
Index's income				
Below median	51.54	99.16	0.12	0.72
Above median	48.46	99.08	0.13	0.79
Index's duration of residence	21.4 (0.01)	22.6 (0.01)	15.8 (0.32)	14.1 (0.12)
Index's living in a county of birth				
Does not live in a birth county	62.84	99.01	0.13	0.86
Lives in a birth county	37.16	99.32	0.11	0.57
Urbanicity of Index's place of residence				
Metropolitan area	23.08	99.27	0.13	0.61
Smaller town or suburb	38.95	99.24	0.11	0.65
Sparsely populated area	37.97	98.92	0.14	0.94
Sibling's education				
Primary	28.24	99.15	0.14	0.71
Secondary	41.42	99.12	0.13	0.75
Post-secondary	30.07	99.11	0.11	0.78
No information	0.27	98.90	0.13	0.97
Sibling's income				
Below median	50.09	99.15	0.13	0.73
Above median	49.91	99.10	0.12	0.78
Sibling's living in a county of birth				
Does not live in a birth county	60.26	99.21	0.07	0.72
Lives in a birth county	39.74	98.99	0.21	0.80
Urbanicity of Sibling's place of residence				
Metropolitan area	22.76	99.10	0.13	0.77
Smaller town or suburb	38.41	99.12	0.12	0.76
Sparsely populated area	38.83	99.14	0.12	0.74
Baseline distance, km	262.47 (0.17)	262.25 (0.17)	213.10 (4.27)	299.65 (2.12)

	Total ^a	Index did not move a long distance ^b	Index moved within 10 km of a sibling ^b	Index moved elsewhere ^b
Index's number of siblings				
1	21.89	99.19	0.12	0.69
2	27.44	99.14	0.12	0.74
3	20.47	99.11	0.13	0.76
4+	30.20	99.07	0.13	0.80
N	1,743,234	1,727,972	2,164	13,098

Note: ^acolumn percentages, ^brow percentages

Multinomial regression analysis of migration toward siblings

In the multinomial logistic regression models presented in Tables 3 and 4, we compared the “effects”² of independent variables on the likelihoods of moving toward siblings or elsewhere relative to not moving. The first set of hypotheses related to testing potential associations between the likelihood of moving closer to a geographically distant sibling and the presence of the core family members. The results supported *Hypotheses 1a*. Compared with married or partnered individuals, those who were never married ($B = 0.251, p < .05$), divorced or separated ($B = 0.417, p < .001$), and widowed ($B = 0.336, p < .001$) were more likely to move closer to siblings (Table 2). Divorced/separated and widowed older adults were also more likely to move elsewhere rather than to remain. In an additional model, we distinguished between those who remained in one partnership state between t_0 and t_1 : remaining married (0 - reference category), remaining divorced (1), remaining widowed (2); and those who changed the status between t_0 and t_1 : newly married (3), newly divorced (4), and newly widowed (5). The results of this auxiliary model indicated that the associations between all these states and transitions increased likelihood of moving closer to a distant sibling except for entering a partnership/marriage. In line with Hypothesis 1b, index persons without children were more likely to move closer to distant siblings than those who had at least one child ($B = 0.757, p < .001$).

Table 3. Multinomial logistic regression of migration toward a geographically distant sibling or elsewhere (ref: No migration)

	Index moved within 10 km of a sibling		Index moved elsewhere	
	B	SE	B	SE
Index's having children (ref: at least one child)				
No children	0.757***	0.094	-0.533***	0.055
Index's partnership state (ref: married/partnered)				
Unmarried/unpartnered	0.251*	0.113	-0.096	0.070
Divorced/separated	0.417***	0.071	0.281***	0.036
Widowed	0.336***	0.085	0.224***	0.044
Index's child nearby (ref: no children within 10 km)				
At least one child within 10km	-0.749***	0.071	-1.264***	0.036
Index's ties to other siblings (ref: no siblings within 10 km)				
At least one sibling within 10km	-0.488***	0.123	-0.485***	0.051
Index's child nearby a distant sibling (ref: no children within 10 km)				
At least one child within 10km	2.121***	0.074	-0.009	0.047
Sibling's ties to other siblings (ref: no siblings within 10 km)				
At least one sibling within 10km	0.913***	0.069	-0.172***	0.036
Sibling's ties to children (ref: no children)				
No children within 10km	-0.060	0.076	0.054†	0.032
At least one child within 10km	0.117	0.072	0.070*	0.032
Sibling lives with a partner (ref: no)				
Yes	-0.117*	0.046	-0.012	0.020
Gender composition of a dyad (ref: sister-sister)				
Sister-brother	-0.102†	0.061	0.016	0.027
Brother-sister	-0.270***	0.075	0.098**	0.038
Brother-brother	-0.211**	0.078	0.058	0.039
Index's age, years				
	-0.023*	0.010	-0.030***	0.005
Sibling's age relative to the index's (ref: index younger)				
Around the same age (+/-3 years)	0.199**	0.076	0.035	0.031
Index elder	0.177*	0.079	0.040	0.032
Type of sibling (ref: half)				
Full	0.614***	0.174	0.017	0.067
Index's education (ref: primary)				
Secondary	0.112	0.074	0.115**	0.038
Post-secondary	0.180*	0.083	0.165***	0.042
No information	0.826*	0.348	0.671***	0.187
Index's income (ref: below median)				
Above median	0.183**	0.062	0.042	0.033
Index's duration of residence, years				
	-0.020***	0.002	-0.032***	0.001
Index's living in a county of birth (ref: does not live in a birth county)				
Lives in a birth county	-0.149*	0.065	-0.197***	0.033

	Index moved within 10 km of a sibling		Index moved elsewhere	
	B	SE	B	SE
Urbanization of index's place of residence (ref: metropolitan area)				
Smaller town or suburb	-0.145†	0.079	0.057	0.040
Sparsely populated area	-0.108	0.077	0.320***	0.039
Sibling's education (ref: primary)				
Secondary	0.009	0.056	-0.011	0.024
Post-secondary	-0.012	0.068	-0.009	0.030
No information	-0.135	0.411	0.231	0.153
Sibling's income (ref: below median)				
Above median	-0.029	0.049	0.019	0.021
Sibling's living in a county of birth (ref: does not live in a birth county)				
Lives in a birth county	0.694***	0.059	0.120***	0.024
Urbanization of sibling's place of residence (ref: metropolitan area)				
Smaller town or suburb	0.242***	0.073	0.021	0.027
Sparsely populated area	0.385***	0.076	0.034	0.028
Baseline distance, km	-0.252***	0.040	0.178***	0.016
Index's number of siblings (ref: 1)				
2	-0.288***	0.071	0.134***	0.031
3	-0.296***	0.082	0.213***	0.039
4+	-0.360***	0.083	0.323***	0.042
Constant	-4.806***	0.784	-3.146***	0.394
Log Likelihood			-86760.952	
Pseudo R2			0.0744	
Total N			1743234	

Note: †p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.001

We further hypothesized that index persons who have neither a partner nor a child would be more likely to move closer to distant siblings than those who have at least a partner or a child (*Hypothesis 1c*). The results presented in Table 3 support this hypothesis. Relative to index persons who have a partner and at least one child, those ones who have neither a partner nor a child were more likely to move closer to distant siblings ($B = 1.183$, $p < .001$). Similar but smaller effects were found for those who have only a partner and no children ($B = 0.481$, $p < .01$), and at least one child but no partner ($B = 0.446$, $p < .001$). Interestingly, compared with the index persons who have both a partner and at least one child, those who do not have children and either have a partner ($B = -0.456$, $p < .001$) or not ($B = -0.455$, $p < .001$) were less likely to

move elsewhere, while those who have children ($B = 0.322, p < .001$) were more likely to do so, potentially indicating moves toward adult children. In an additional model, we tested whether there are the gender variations in the association between the presence of core family members and the likelihood of moving closer to a distant sibling. Women with neither a partner nor a child were more likely to move closer to distant siblings than their male counterparts, although the interaction term was only marginally significant.

Subsequent hypotheses related to the family ties of the index person and their distant sibling(s). *Hypothesis 2a* stated that index persons who have at least one child nearby would be less likely to move closer to distant siblings than those who do not have children in close proximity. In line with it, we found a negative association between having at least one child nearby and the likelihood of moving closer to a distant sibling ($B = -0.748, p < .001$) or elsewhere ($B = -1.264, p < .001$). *Hypothesis 2b* stated that index persons who have at least one other sibling nearby would be less likely to move closer to distant siblings than those who do not have other siblings in close proximity. The results provided support for this hypothesis ($B = -0.486, p < .001$). Having at least one sibling within a 10-kilometre radius was also negatively associated with their propensity to move in other directions ($B = -0.482, p < .001$).

As expected (*Hypothesis 3a*), our models point to a strong negative effect for the index person's child living close to their distant sibling on their propensity to migrate toward this group of relatives ($B = 2.121, p < .001$). These moves might represent the return migration of older adults who moved away in adulthood. Our results also support *Hypothesis 3b*, indicating that at least one additional sibling in close proximity to the distant sibling increased the likelihood of index person's convergence move ($B = 0.913, p < .001$), while slightly decreasing the likelihood of migrating elsewhere ($B = -0.172, p < .001$). We further hypothesized that there would be a similar effect for the presence of the index person's nieces or nephews in close proximity of the distant sibling (*Hypothesis 3c*). Our results do not support this hypothesis. Additionally,

assuming that nieces or nephews might be more important for those older adults who do not have their own children, we ran an additional model with an interaction effect between not having their own children and the presence and location of nieces or nephews. This model did not support our expectations.

Table 4. Multinomial logistic regression of migration toward a sibling or elsewhere: interplay between having a spouse and children (ref: No migration)

	Index moved within 10 km of a sibling		Index moved elsewhere	
	B	SE	B	SE
Index's having children and a partner (ref: At least one child and a partner)				
No children and no partner	1.183***	0.097	-0.455***	0.061
At least one child and no partner	0.446***	0.066	0.322***	0.032
No children and a partner	0.482**	0.158	-0.456***	0.082
Constant	-4.777***	0.773	-3.206***	0.389
Log Likelihood	-86707.994			
Pseudo R2	0.0750			
Total N	1743234			

Note: †p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.001. The control variables are the same as in the models presented in Table 3.

Regarding other potential factors of moving toward a distant sibling in later life (in addition to the absence of partners and/or adult children and the location of other family members discussed in the main text), older adults were, indeed, more likely to move closer to full than half-siblings. Having more than one sibling was associated with a lower propensity of moving closer to a sibling in the dyad and a higher propensity to move elsewhere. Relative to dyads of older women and their distant sisters, index persons from other gender composition dyads were less likely to move closer to a sibling, although the difference between sister-sister and sister-brother dyads was only marginally significant. The propensity to relocate closer to a distant sibling was higher if this sibling did not have a partner. The index person's age was associated

with a lower propensity of migration in any direction. Moves toward a sibling were more likely if the sibling was a similar age or younger than the index person.

If an index person's disposable income was above the median, they had a higher likelihood of moving toward a sibling. Older adults with secondary and post-secondary education had a higher propensity of migrating compared with people with a primary education but the effect of having secondary education was not statistically significant for moves toward siblings. We did not find the effects of a distant sibling's level of education or income on the propensities of the index person's migration.

The longer people lived in their baseline year location, the less likely they were to migrate. Living in a county of birth was associated with a lower propensity to move in any direction, while having a distant sibling living in one's county of birth increased these propensities. Older adults residing in smaller towns or suburbs were less likely to move closer to distant siblings than those living in metropolitan areas, although the effect was marginally significant. Living in sparsely populated areas was associated with a higher propensity of moving elsewhere. Having a distant sibling in a less-urban area increased the likelihood of moving closer to this sibling. The greater the initial distance between siblings, the less likely the index person was to move closer to this sibling and the more likely they were to migrate elsewhere.

Sensitivity analyses

The first sensitivity check explored the stability of our models for index persons whose parents were no longer alive. The only difference in the average marginal effects of the main explanatory variables on the likelihood of moving toward a distant sibling was that the effect of being unmarried/unpartnered (compared with married/partnered) was only marginally significant, while it was statistically significant in the main model.

We also checked how different initial distances between siblings, distance after a convergent move, and moving distance thresholds changed our results. We ran the models of an initial distance of at least 40 km (with a moving distance of at least 30 km) and at least 60 km (with a moving distance of at least 50 km). Additionally, we ran models in which moving closer meant moving within a 5- and 15-kilometre radius of a distant sibling. The direction and magnitude of the average marginal effects of the main explanatory variables on the likelihood of moving toward distant siblings in these four sensitivity checks did not show substantial differences relative to the main models. The only difference was the positive effect of having a niece or nephew living near a distant sibling on the likelihood of moving closer to this sibling was statistically significant in models of moving from outside of at least 60 to within 10-kilometre radius and from outside of at least 50 to 15-kilometre radius of a sibling. We opted to retain the model with an initial distance of 50 or more km threshold as a more conservative option than at least 40 km, which also enabled us to work with slightly more events of interest than the 60 km option. We also opted to keep the 10 km threshold as a proxy for moves toward distant siblings, in line with previous research on changes in geographic proximity between family members (Artamonova et al., 2020; Thomas & Dommermuth, 2020).

Discussion

In this paper, we addressed migration toward siblings in later life. More specifically, we examined whether the presence of traditional companions and caregivers—partners and adult children—mattered for sibling-focused migration in Sweden. We further expected that the location of children, other siblings, and nephews/nieces would pattern migration toward distant siblings. A striking finding is the rarity of moves toward distant siblings. In our data, only 0.13 percent of older adults aged 70 to 84 years who had at least one sibling living more than 50 km away moved within a 10-kilometre radius of a sibling between 2012-2016.

Our findings indicated that widowhood, divorce, or never-married older adults were more likely to move closer to distant siblings than the married or partnered. Older adults without children were more likely to make proximity-enhancing moves toward siblings, relative to those who had at least one child. The effect of having neither a partner nor a child on moving closer to a sibling was particularly large. The substitution hypothesis (Shanas, 1979) and the hierarchical compensatory model (Cantor, 1979; Cantor, 1991)—according to which older adults turn to other relatives when partners and children are not available—are fully supported by our data.

The location of other family members beyond the dyad patterned the locational choices of older adults. We found that living near a child or another sibling has a strong deterring effect on moving toward distant siblings, while the clustering of siblings at a distance reinforces the location's attractiveness for migration. Expectedly, the migration attraction effect of having an index person's child near the distant sibling was large. The presence of nephews or nieces nearby the distant siblings is associated with an increased likelihood of migration toward them but the effect was not statistically significant. The proximity of nephews/nieces to the distant sibling does not seem to significantly increase the attraction effect of this sibling for migration, even for index persons without children.

Our study contributes to the literature on internal migration and the geography of kinship in later life in several ways. We have taken a first step toward understanding whether older adults move closer to their siblings, and under which circumstances they tend to do so. Consistent with Litwak and Longino's (1987) classic model, siblings can be a destination for the second later life migration. Furthermore, our findings provide novel insight into how older adults without children and partners adapt to the spatial unavailability of traditional informal caregivers and companions. The study also highlights the interplay between the availability of these core family members and the gender of the older adult. Finally, the results emphasize the

importance of other non-resident family members beyond the sibling dyad of interest in migration, both as a deterrent to moving away and as an attraction to migrate toward. A major strength of this study is that we use register data that enabled us to trace such rare events as long-distance moves toward siblings in later life taking into account all sibling dyads where the index person's age is 70-84 and the distant sibling (of any age) lives at least 50 km far at baseline.

Our study has several limitations. First, we trace migration toward siblings and control for the index person's county of birth as well as having a child near the distant sibling. However, in these cases, the index person's main attraction for migration is still unclear since they migrated to their place of birth where their siblings and children also reside. Based on the hierarchical compensatory model, we can speculate that in selecting a place for relocation in later life, having a child in close proximity is more important than having a sibling nearby. Future research describing motivations for migration could shed light on whether a desire to be close to siblings in later life may function as an independent motive. We also have no information on social interactions between family members. It is therefore unclear what role siblings play for each other: caregivers, care recipients, companions, or another role. Further studies on sibling relationships among older adults would help pinpoint whether siblings—especially younger ones—can provide reliable care for the growing number of older adults without children and partners.

Second, we could only observe index persons until age 84. This age approximately corresponds with older adults' transition to the "fourth age," marked by deteriorating health (Lloyd et al., 2014). However, we also had no information about older adults' health. There is some evidence that siblings step in as important caregivers when siblings fall ill (Horwitz, 1994; Voorpostel et al., 2012). It might be that siblings move toward each other to facilitate this informal caregiving. In the absence of other health measures, we employed closeness to death as a proxy

for severe health problems of the index person and a distant sibling (van der Pers et al., 2015). However, cases of closeness to death were extremely rare for the population at risk for migration so we did not include this measure in the final models. Future research should trace individuals' migrations toward siblings or formal care facilities at the fourth age, especially those without children or partners available to provide care.

It is important to keep in mind that in Sweden, citizens are considered quite independent of family caregivers. Formal support may well provide a substitute for care that would otherwise come from informal sources. This means that in an international perspective, our estimates of the influence of unavailability of other family members on moving closer to siblings are likely low. We therefore expect researchers to find larger rates of moving closer to siblings (especially when no core family are available) in other international contexts—namely those with higher rates of family-based care.

Our results indicate that older adults without partners and children might be in the highest demand of support, necessitating relocation (including closer to siblings and other nonresident family) in search of it. Policymakers should pay special attention to this particularly-vulnerable group. Since recent cohorts of older adults have experienced reductions in their social networks (Wrzus et al., 2013), siblings might become more prominent in their lives than in the past (Jensen et al., 2020). If it happens, siblings of older adults should not be overlooked in both research and policy.

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Footnotes

¹ We denote the main person in a dyad as the index person and a sibling who lives far at the initial observation as the distant sibling for convenience.

² The term ‘effect’ is used to denote a statistical association without necessarily implying a causal relationship.

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