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Moving to the Green? The Importance of Private, Semi-Private and Neighborhood Green Spaces in Residential Relocations across the Life Course.

In addition to the large body of literature highlighting the benefits of contact with nature (several reviews conducted, e.g. Gascon et al., 2015; Hartig et al., 2014; White et al., 2013), a growing body of research specifically analyses the advantages of green residential environments in cities (e.g. Bonaccorsi et al., 2020; Groenewegen et al., 2012; Roemmich et al., 2006; Takano et al., 2002; van den Berg et al., 2010). While some previous studies investigated the relevance of green spaces in cities for the overall well-being and its subdomains for families (e.g. Dadvand et al., 2015; Hystad et al., 2014; Izenstark & Ebata, 2017; McCormick, 2017; McEachan et al., 2016; Wells, 2000) or the elderly (Xu et al., 2022 for a review), comprehensive research across life course phases is seldom (with the exeption of the review by Douglas et al., 2017). Moreover, there have been relatively few attempts to explore the importance of green spaces in residential relocations: Some studies analysed the well-being outcomes of relocating to greener areas (Alcock et al., 2014; Wells, 2000; White et al., 2013), but these studies have not prospectively analysed whether green spaces played a part in the decision-making process for relocation. Thus, the question which relevance urbanites attribute to the different categories of nature in the living environment remains open.

Theoretically, we build on the three-stage migration model, which distinguishes between the stages of considering, planning and realizing a move (Kalter, 1997; Kley, 2011). Hypotheses about the importance of neighborhood, private and semi-private green spaces for overall well-being and therefore for relocations are deduced from the theory of Social Production Functions (Lindenberg, 1996; Ormel et al., 1999). Furthermore, we analyse the relevance of green spaces in different life-course phases of both families and the elderly. To broaden the scope of our analysis, we complement subjective data on neighborhood green spaces with objective spatial data to analyse whether these two data sources provide comparable results regarding the relocation decision-making process.

The data come from a primary survey in two large German cities, Cologne and Hamburg, involving a random sample which yielded 1,856 respondents after data clearance. The study was set up as a two-wave panel with a first wave from September 2020 to February 2021 to assess relocation decision-making, and a second wave roughly 12 months later, from December 2021 to April 2022, to assess relocation behaviour. The sample was drawn using the random digit dialling procedure (Häder et al., 2019) with additional random selection on the household level using the last birthday method, and administered by Computer Assisted Telephone Interviews (CATI). To ensure enough cases of relocation behaviour in the second wave, respondents who considered moving were oversampled. The analysis involves two key methods: First, generalized ordered logit regression (Williams, 2016) are used to study the stages of the relocation decision-making process, which involve considering and planning relocation. This method is well-suited for examining sequential ordinal dependent variables. Second, a probit model

with sample selection (Heckman, 1979) is employed to analyse actual relocations while accounting for non-responses in the second study wave, predicting movers from non-movers.

We test whether neighborhood green spaces, private gardens and semi-private joint green yards matter for relocation decisions, at which stage of the decision-making process they hold importance, and whether their relevance would be recognized without considering the decision-making process. Our findings in Table 1 indicate that all three types of green spaces are relevant at the very beginning of relocation decision-making processes, when individuals form their moving intentions. Private gardens

Table 1. Relevance of private, semi-private and public green spaces for considering and planning relocation

	Family phase[1]		Elderly[1]		Else[1]	
	Not considering versus considering relocation	Considering versus planning relocation	Not considering versus considering relocation	Considering versus planning relocation	Not considering versus considering relocation	Considering versus planning relocation
	Model 1		Model 2		Model 3	
	(b)		(b)		(b)	
Female	-0.13	=	0.15	=	-0.04	=
Migration background	0.02	=	-0.45+	=	0.21	=
Hamburg	0.13	=	0.03	=	0.24	=
Recent relocation experience[2]	0.48	=	0.36	=	0.17	=
Age	-0.01	=	-0.01	=	0.00	-0.03***
Partner outside household	0.51	=	-0.29	=	0.22	=
Equivalised income[3], in thousands	0.36*	=	0.07	=	-0.02	=
Teleworking	1.03*	=	0.43	=	0.13	=
Homeownership	-0.88***	=	-0.43+	=	-0.46*	=
Living space density[4], in 10m²	-0.03	=	0.01	=	0.02	=
Noise annoyance at home[5]	0.35**	=	0.16	=	0.51***	0.23*
Private garden and/or terrace	-0.49+	=	0.20	=	0.13	=
Joint green yard	-0.53+	=	-0.69*	=	-0.62***	=
Satisfaction with neighborhood green space availability	-0.23*	=	-0.21*	=	-0.08	=
Negative influence COVID-19[6]	0.11	=	0.49***	=	0.08	=
Nature relatedness[7]	0.46***	=	0.41**	=	0.37***	=
Life-course events:						
Marriage/Childbirth	-0.08	0.93*	1.87	=	1.11**	=
Caregiving/Spouse loss/Divorce	0.62+	=	0.19	=	-0.01	=
Leave parent. home/Complete school/Start studies/Job change	0.70*	=	0.09	=	0.92***	1.25***
No. of persons	435		468		953	
Pseudo R^2 (degrees of freedom)	0.142 (21)		0.086 (20)		0.116 (23)	

Notes: Generalized ordinal logit regression, design weighted, robust standard errors applied;
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001;
= estimated coefficient is equal across the stages of considering and planning relocation (the proportional odds assumption is met, p<0.05);
Missing income information was controlled for (not shown in the table).
[1] Family phase: households with children aged < 18 years or expecting childbirth within 6 months; Elderly: aged 65+ years, without children in the household or with children aged 18+ years; Else: aged < 65 years, without children in the household or with children aged 18+ years.
[2] Respondent relocated two or more times in the last 10 years.
[3] According to the OECD standard (OECD, n.d.): monthly household income divided by weighted household size (square root of household members), with partial income imputation for respondents.
[4] Square meters per person.
[5] Index (0/6) measuring the noise disturbance level from multiple sources at the respondent's dwelling, including road traffic, aircraft, railway, commercial (including constructions), neighbours', and recreational noise.
[6] Index (0/6) assessing the extent of burdens experienced by respondents due to the coronavirus pandemic, including financial and occupational losses, reduced engagement in hobbies, feelings of spatial confinement within their dwellings, and reduced time for outdoor activities and sports.
[7] Adapted nature relatedness scale (1/7) based on Nisbet et al. (2009), encompassing affective, conative, and cognitive dimensions, as well as childhood nature experiences.

decrease the likelihood of considering and planning relocation in the family phase. Having joint green yards reduces the probability of considering and planning relocation across all subgroups. Satisfaction with the availability of neighborhood green space reduces the probability of considering and planning relocation among the families and the elderly. Moreover, our study adds to previous findings on the importance of subjective assessments of neighborhood green spaces, which have a more pronounced impact on well-being outcomes than objective geocoded data (not reported in Table 1).

In terms of relocation behavior in the second study wave, as shown in Table 2, none of the three types of green spaces directly influence the actual realization of relocations. Therefore, green spaces might be strongly underestimated in studies of residential relocations that do not account for the longitudinal process of relocation decision-making.

Table 2. Relevance of private, semi-private and public green spaces for realizing relocation (does not become apparent)

	Model 4 (b)
Considered relocation	-
Planned relocation	-
Female	-0.22+
Migration background	-0.33+
Hamburg	0.11
Recent relocation experience[1]	0.17
Age	0.00
Partner outside household	0.32+
Equivalised income, in thousands	0.05
Teleworking	0.22
Homeownership	-0.31*
Living space density[1]	-0.02
Noise annoyance at home[1]	0.06
Private garden and/or terrace	0.01
Joint green yard	-0.25
Satisfaction with neighborhood green space availability	-0.03
Negative influence COVID-19[1]	0.05
Nature relatedness[1]	-0.02
Marriage/Childbirth	0.26
Caregiving/Spouse loss/Divorce	-0.05
Leave parent. home/Complete school/Start studies/Job change	0.29*
No. of persons	
Wald chi^2 (degrees of freedom)	54.88 (21)
LR test of independent equations: chi^2 (significance)	4.92 (0.03)

Notes: Probit model with sample selection (selection equation omitted) with N of 953 in the 2nd wave, design weighted, robust standard errors applied; + p<0.1, * p<0.05, ** p<0.01, *** p<0.001. Missing income information and survey method were controlled for (not shown in the table).
[1] See Table 1.

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