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Interrelationships Among Fertility, Internal Migration, and Proximity to Nonresident Family: A Multilevel Multiprocess Analysis

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ABSTRACT Past research has found that relations to nonresident family can influence individual fertility and migration behaviors separately. However, fertility and migration outcomes may also be interrelated, suggesting potential links across all three demographic processes. With this in mind, we track a cohort of women in Norway from age 18 to 31, recording the emergence of birth and migration events as well as their proximity to nonresident family networks (siblings and parents). Using a multilevel multiprocess statistical framework, with observations nested within women and equations for births, migrations, and proximity to nonresident family estimated simultaneously, our results support the notion that linked lives matter. Even in early adulthood, proximity to nonresident family has a positive effect on transitions to motherhood, whereas the presence of children (itself an outcome of past fertility) is associated with lower propensities to migrate. Mothers also have higher propensities to be living near family than women without children. The presence of local nonresident family reduces propensities for second and third migrations. However, after accounting for unobserved heterogeneity and selection, we observe a small positive effect of proximity to family on first migrations undertaken after age 18. Significant cross-process residual correlations exist across all three outcomes, suggesting that separately estimated model estimates may be vulnerable to bias emerging from unobserved sources of heterogeneity and selection. Our analysis therefore suggests that decisions about fertility, migration, and proximity to family are jointly determined and endogenous, and they should be analyzed simultaneously when possible.

KEYWORDS Fertility • Internal migration • Family proximity • Multilevel multiprocess analysis • Endogeneity

Introduction

Macro-demographic thinking, from the second demographic transition (Lesthaeghe 2010) to the risk society (Beck 1992), has emphasized a decades-long progression toward greater self-articulation and individualization as well as a weakening of traditional institutions, including that of the family. Alongside the effects of the gender

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revolution and the associated shifts in attitudes toward roles and obligations in the spheres of work and family, these sociocultural shifts have traditionally been understood to have led to an overall decline in the importance of family relationships, especially in early adulthood (Goldscheider and Goldscheider 1992). Yet, other research challenges this notion, building on the important contribution of Elder's (1994) linked lives perspective and the idea that the sociodemographic behaviors and outcomes of intergenerational family members are inherently interdependent, wherein they actively synchronize and coordinate their lives in anticipation or response to the timing of linked life events. With proximity to nonresident family thought to be particularly important in facilitating better quality contact, care, and support exchange (Bordone 2009; Hank 2007; Holmlund et al. 2013; Lawton et al. 1994; Rainer and Siedler 2012), it is perhaps unsurprising that researchers of fertility and migration have been the most active in recognizing the potential relevance of wider family networks. Studies have emerged that consider how proximity to nonresident family can influence transitions to first or higher-order births (Kolk 2014; Rindfuss et al. 2007). Others have examined how the presence and location of nonresident family networks can influence the propensity to move or stay as well as the direction of migration (Ermisch and Mulder 2018; Mulder and Malmberg 2011, 2014; Thomas and Dommermuth 2020). Meanwhile, a somewhat separate literature has considered the ways in which the timing of fertility and internal migration events can also be closely linked (Kulu et al. 2019).

Separate studies of the role of nonresident family on fertility and migration outcomes are promising starting points in recognizing how all three factors are likely to be closely interconnected, endogenous, and influenced by a range of shared observed and unobserved individual and family characteristics. Indeed, whereas proximity to nonresident familial support may be expected to have positive effects on fertility transitions, birth events often coincide with migration events. Thus, the presence and location of family are likely to play an important role in influencing parents' choices over whether, when, and where to migrate. Beyond this, decision-making processes are likely to be open to the effects of unobserved shared or correlated influences, such as individual variations in risk aversion and low/high senses of familism or individualism. Examining processes of fertility, migration, and proximity to family separately may thus lead to incorrect inferences due to the failure to account for endogeneity and unobserved sources of heterogeneity and selection across the three outcomes. With this in mind, this study aims to build on a growing yet fragmented demographic literature examining the role of nonresident family networks on fertility and migration. In so doing, it integrates all three processes simultaneously through the combination of uniquely detailed full population register data for Norway and multilevel multiprocess models. Following a cohort of women from age 18 in 2005 to 31 in 2018, this approach enables us to measure the presence and location of family networks (resident and nonresident siblings and parents), the emergence of birth and migration events, and the potential for processes of unobserved endogeneity and selection within and across the three outcomes.

The results provide new insights on the interrelations among fertility, internal migration, and proximity to nonresident family. Proximity to nonresident family appears to have a positive effect on young women's transition to motherhood but appears less relevant for second- and third-order births. Prior birth events influence subsequent migration risks, with propensities to migrate reduced when a child is present and reduced further when two children are present. Mothers also have higher propensities to be living near family than households without children. We find a negative association between the presence of local nonresident family on second- and third-order migrations. However, for the first migration undertaken after age 18, we observe a small positive effect of living near family. Significant cross-process residual correlations exist across all three outcomes, suggesting that researchers interested in the links among fertility, migration, and proximity to nonresident family should analyze these outcomes simultaneously.

Background

Prior Work on Fertility and Internal Migration

A considerable body of work has examined the demographic processes of fertility and internal migration as major determinants of population size, composition, and distribution. Although most researchers have tended to study fertility or internal migration as distinct processes, some work has investigated the relationships that bind them. Researchers studying these interrelationships have often drawn on a life course perspective, informing us of the importance of recognizing how events and transitions in one demographic career often have significant implications for those in other, parallel life careers (Elder 1994). Residential mobility and migration tend to increase around the time of a birth event, with parental desires for greater housing space and/or a more pleasant environment in which to raise child(ren) said to reflect the primary motives for such moves (Kulu and Milewski 2007; Kulu and Vikat 2007; Michielin and Mulder 2008; Vidal et al. 2017). Focused studies on the Norwegian context have also shown a positive relationship between fertility intentions and relocation intentions (Dommermuth and Klüsener 2019). Yet, aside from the effect of the birth event itself, transitions into parenthood tend to be associated with migration-deterring effects (Clark and Withers 2007; Dommermuth and Klüsener 2019). Indeed, immobility is especially common among households with school-age children, with parental desires to avoid disruptions to children's schooling and/or access to friends thought to be key (Bailey et al. 2004). The reverse relationship—the effect of migration on fertility—has also received attention, although mainly in the context of international migration, wherein the fertility outcomes of immigrants are compared with those of native nonmigrants at the destination or with nonmigrants at the origin (Kulu et al. 2019; Wolf and Mulder 2019). The few studies that examined the effects of internal migration on fertility have tended to draw on the same hypotheses as those employed in the international context. Here, a range of potential influences from *socialization* in the origin region, *adaptation* at the destination region, the *selection* of individuals into migration, and possible short-term *disruption* effects linked to the act of relocating itself have been considered. In testing the full range of hypotheses, Kulu's (2005) analysis of postwar female cohorts in Estonia found most support for the adaptation theory: internal migrants gradually adapted to fertility levels prevalent in destination areas, whereas migrant selection and disruption effects were found to be trivial to nonexistent as factors affecting individual fertility levels. The failure to observe a disruption effect would certainly make sense given the apparent link between the timing of birth and migration events observed in other studies (Kulu and Milewski 2007; Kulu and Vikat 2007; Michielin and Mulder 2008; Vidal et al. 2017).

Studies have proven useful in demonstrating how prior events and transitions within the household can come to affect future migration and fertility dynamics. Unfortunately, very few of these studies have recognized the potentially crucial role played by wider networks of nonresident family, which is especially surprising given the centrality of the linked lives perspective within Elder's original depiction of the life course framework (Elder 1994). With individuals and households naturally situated within wider networks of social relationships, the linked lives perspective emphasizes how ties to significant others outside the household can influence individual behaviors via, among other things, their role as important sources of social interaction and support exchange (Coulter et al. 2016). Fortunately, a small but growing body of research has started to consider how local opportunity structures—relevant to decisions about whether, when, and where to migrate or have children—might be affected by the presence and location of nonresident family networks.

Local Opportunity Structures: The Role of Nonresident Family

In terms of fertility, analyses of local opportunity structures have tended to focus attention on the availability of formal childcare provisions (public or private day care facilities). Here, there is some suggestion that an increase in the provision of formal childcare can reduce the postponement of births and might lead to a slight increase in completed cohort fertility (Kravdal 1996; Rindfuss et al. 2010; Rindfuss et al. 2007). Other studies, meanwhile, have found no impact of variations in the costs or availability of formal childcare on fertility (for an overview, see Gauthier 2007). Yet, proximity to family—particularly parents—has been noted as an important factor in facilitating access to cost-free and reliable childcare as well as in improving opportunities for more intensive grandparent–grandchild interaction (Compton and Pollak 2014; Silverstein and Giarrusso 2010). Although its role tends to be supplemental, the contribution of family in childcare remains important, even in countries such as Norway, where access to public childcare is extensive (Herlofson and Hagestad 2012). Thus, despite the primary focus being on the role of formal provisions, some studies have attempted to at least control for the role of informal networks of familial care and support. These studies have operationalized the role of familial care and support via direct measures of caregiving, financial transfers or gifts, measures of the availability of grandparents, and/or the geographical distance between (potential) grandchildren and grandparents. Based on the Netherlands Kinship Panel Study, a detailed survey of kinship relations, Thomese and Liefbroer (2013) found that the provision of grandparental childcare increased the likelihood of additional childbirths. Meanwhile, a recent survey-based analysis of parental retirement and intergenerational time transfers in Germany has revealed how parents' retirement positively influences the fertility of adult children, most clearly in encouraging more rapid transitions to second births (Eibich and Siedler 2020). From a slightly different perspective, research from Italy has highlighted how parental support in children's housing costs and home purchases is associated with closer proximity to parents (Tomassini et al. 2004), with such support potentially also contributing to a change in housing environment that is better suited to family formation.

Although survey data provide useful information on family time use, transfers, and care exchange, population register data have offered different benefits in terms of being able to study full populations, linking all resident family members across time while tracking their locations, proximity, and the emergence of key life events. In the Norwegian context, Rindfuss et al. (2007) drew on full population register data to examine the role of public childcare provision for transitions into motherhood. Although not their primary focus of interest, the study included a time-varying variable measuring whether the mother (i.e., the potential grandmother) lived in the same municipality, lived in a different municipality, emigrated, or was deceased. The authors found no support for the effects of proximity to grandparents, although this could be related to the bluntness of the measurement used to capture proximity to family.[1]

Another large-scale register-based study, this time by Kolk (2014), examined the intergenerational transmission of fertility across three generations in Sweden. Here, the author included a time-varying measure of the geographical distance between family members by comparing the distance between the population-weighted centroids of each family member's municipality of residence. Geographical proximity was suggested to have almost no effect on the intergenerational transmission of fertility (Kolk 2014), although estimates from event-history models on the transition to first birth for women did reveal lower relative risks when living further away from the mother compared with living within a 20km radius of the mother.

How the presence of local nonresident family might differently affect transitions to first-, second-, or third-order births remains an open question, with little prior work existing from which to form solid expectations. In general, one might assume that access to local familial support systems and the greater potential for regular and intensive intergenerational interaction and support exchange increase evenly the speed of fertility transitions regardless of parity. However, it is also possible that the accumulation of childcare experience among existing parents works to reduce the relative importance of proximity to family for transitions to second- and higher-order births. Moreover, the persistence of the two-child norm in Norway may also encourage parents to transition to a second child regardless of their proximity to nonresident family. As such, we expect proximity to family will increase fertility risks, but we remain open to the possibility that the strength of this relationship may vary between first and subsequent parities.

With regard to internal migration, several studies have demonstrated how the presence of local nonresident family works to deter migration and encourage periods of individual/household immobility (Ermisch and Mulder 2018; Mulder and Malmberg 2011, 2014; Thomas and Dommermuth 2020). From this perspective, the opportunities for more intensive forms of support and interaction linked to familial proximity are said to represent a form of nontransferable location-specific insider advantage, which become sunken costs lost in the event of a move elsewhere (Fischer and Malmberg 2001). Although most previous studies have consistently observed a lower

[1] For instance, daughters and parents living in close geographical proximity on either side of a geographical boundary would be classed as having the same potential for support exchange and interaction as those living at opposite ends of the country. Meanwhile, instances where daughters lived in the same municipality as their parents could include cases where both generations lived together in the parental home. The null finding may therefore result from a blurring of different effects associated with two groups with very different likelihoods of fertility.

propensity to migrate when family members are nearby, certain factors are worth considering in the analysis of proximity to family in early adulthood. First, the mechanisms underpinning propensities for first migrations out of the home or away from the place of origin are typically linked to such things as the pursuit of independence as well as related intentions for educational advancement and the start of labor market careers (Dommermuth and Klüsener 2019; Thomas 2019). Thus, similar mechanisms to those noted in the literature on nest-leaving (e.g., Iacovou 2010; Schwanitz et al. 2017) may be at play, with migration away from the family often considered necessary as young adults peruse their own independent residential, educational, and occupational careers. Indeed, our own calculations, based on recent register data, reveal that most Norwegian students (83.4%) enroll at universities located in a different municipality than where they lived at age 16. Beyond this, many young adults will still be living in the parental home before a first migration. For these individuals, we will observe them as either having no local nonresident family (they are still coresident) or having local nonresident family that are quite different in their composition (i.e., older siblings who have already moved out or a separated parent) compared with those who have left the parental home.[2] This complexity means the observed effects of local nonresident family on first migrations in early adulthood may be blurred by the confounding effects of variations that exist between those still living in the parental home and those who have moved out but remained local. Thus, based on prior research, we expect that the presence of local nonresident family will generally work to deter migration, but we remain open to the possibility that the observed effect on first migrations in early adulthood could be different.

Although no previous studies have explicitly examined the three-way associations among fertility, internal migration, and proximity to nonresident family, some studies have hinted at links across the three demographic processes. For instance, using detailed individual-level geocodes to examine the role of nonresident family ties on internal migration, Thomas and Dommermuth (2020) revealed how birth events greatly increased the likelihood of new parents' migrating toward (grand)parents, whereas the presence of young grandchildren was linked to a small increase in the likelihood of grandparents moving toward their grandchildren. Research in the Dutch context has also revealed an increased likelihood of (grand)parents moving toward (prospective) grandchildren (van Diepen and Mulder 2009). Thus, previous register-based studies do hint at a close relationship between the emergence of fertility and migration events, but both demographic behaviors appear to be influenced by considerations about access to nonresident family networks.

Unobserved Heterogeneity and Selection

In studying interrelationships between demographic processes, such as those we suspect exist among fertility, internal migration, and proximity to nonresident family,

[2] Another scenario is that young adults live independently without family living nearby. This could occur in cases where family have moved away or when repeated short-distance moves have taken place such that the distance to family has gradually increased. Based on the cohort studied here, this scenario reflects just 1.3% of observations before a first migration.

it is important to consider the potential for bias associated with unobserved sources of heterogeneity and selection. Although previous studies of internal migration have accounted for the role of nonresident family, at best as a time-varying covariate, they have tended to ignore the possibility that decisions about migration and proximity to family will be subject to shared but unobserved influences. In other words, migration risks may be endogenous with proximity to nonresident family. Survey analysis has shown that individual predispositions toward risk aversion work to lower propensities for migration (Clark and Lisowski 2017), and we might also expect risk-averse individuals to place a greater value on the relative safety and support offered by proximity to family. Alternatively, we might also expect that individuals who have a relatively weak sense of familialism, or a high sense of individualism, will be more likely to migrate away from the family and/or delay transitions to motherhood. If these shared or correlated unobserved influences operate as we suspect, such that women with below-average risks of migration also have above-average propensities to live near family, we will get a selection of women with low migration risks into the category of women living near family. If we did not account for this possibility, we would observe a downward bias in the estimated effect of proximity to family on migration. If women with above-average propensities to be living near family also have above-average fertility risks, we would observe a selection of women with high risks of fertility into the category of women living near family and thus an upward bias in the estimated effect of proximity to family on fertility. It is crucial, therefore, that we employ a modeling strategy that can identify the interrelationships between the three processes, net of the effects of unobserved sources of heterogeneity and selection.

The Norwegian Context

With a population of 5.3 million (in 2020) and a mainland size of 323.80 km^2 (about the same size as the state of New Mexico), Norway has one of the lowest population densities in Europe. Approximately 15% of the population change address within a given year (Tønnessen et al. 2016), and mobility is particularly high among people in their early 20s, often related to education (Dommermuth and Klüsener 2019). Most tertiary education programs are offered only at universities located in or near the largest cities, and many young people must move toward larger urban areas to obtain higher education (Løken et al. 2013), which may also affect later migration decisions. In line with this, mobility rates are particularly high for people with tertiary education (Machin et al. 2012).

With regard to fertility, Norway had one of the highest total fertility rates in Europe in 2009 (1.98). Since then, a continuous decline has been observed. In 2019, Norway's total fertility rate matched the European Union average (1.53) (Eurostat 2020). Decomposed by parity, this decline is mainly related to a decrease in first births and partly third births, whereas second-birth rates remained rather stable (Hellstrand et al. 2021). Thus, despite recent development, the two-child norm remains strong in Norway: most one-child mothers have a second child, and having two children remains the most common family form (Syse et al. 2020). Such norms may suggest that transitions to second births might be less affected by proximity to local familial support systems.

From the perspective of social support and family policies, Norway is similar to the other Nordic countries in being categorized as a social-democratic welfare state, providing comparatively generous universal social support to its citizens, with the aim of minimizing social inequality (Esping-Andersen 1990). Keeping such a system sustainable requires a high labor market participation for both men and women, a factor that has implications for the way Norway designs its family policies. Only through employment can one acquire the right for paid parental leave, and eligible parents usually take approximately one year of paid leave. Thereafter, most children attend kindergarten, with more than 80% of all children aged 1–2 years enrolled in 2019 (Statistics Norway 2020a), when parents return to employment. Such strong formal provisions may be thought to limit dependency on practical care and support from family members and thus the relative importance of proximity to nonresident family on fertility and possibly migration outcomes. However, recent research has shown that family ties affect the propensity and direction of internal migration in Norway, especially when birth events occur (Thomas and Dommermuth 2020). More generally, intergenerational contact and interaction remain relatively high in Scandinavian welfare states, such as Denmark and Sweden (Hank 2007), and research in Norway suggests that a large share of grandparents care for their grandchildren on a regular or occasional basis, which is described as "step-in babysitters" in the literature (Herlofson and Hagestad 2012).

Hypotheses

Based on the preceding discussion, we form five testable hypotheses.

> *Hypothesis 1* (H1): The presence of nonresident family living nearby (i.e., siblings and parents) increases female fertility risks.
>
> *Hypothesis 2* (H2): The presence of nonresident family living nearby reduces migration propensities.
>
> *Hypothesis 3* (H3): Compared with childless women, women with children have lower risks of migration (H3a) and higher propensities of living near family (H3b).
>
> *Hypothesis 4* (H4): A cross-process correlation exists between fertility and migration, such that the emergence of migration events is positively linked to the emergence of birth events.
>
> *Hypothesis 5* (H5): Cross-process correlations exist between the family ties and the fertility and migration outcomes, such that women with below-average risks of migration tend to have above-average propensities to live near family, whereas women with above-average propensities to be living near family have above-average fertility risks.

Data

The following analysis draws on several administrative registers from Norway. Each resident and/or Norwegian citizen is assigned a unique ID number, which makes it possible to link information from different individual-level registers. The Central Population Register includes demographic information, such as birth and death events, sex, civil status, country of birth, place of residence, and ID numbers of parents. Based on the latter, Statistics Norway has established data sets on family relations, including children, siblings, parents, and grandparents, linked via their ID numbers. The address that each individual has registered as his or her official place of residence is coded at the dwelling level. The same coding system is applied in the Ground Parcel, Address, and Building Register, which includes exact geographical coordinates for each building. Thus, individuals can be assigned to families and households, and their exact place of residence and the distances between the households of family members can be easily identified. Reliable geocoded information is available from 2005.

To study the relationships among fertility, internal migration, and proximity to nonresident family, we selected and tracked a birth cohort of childless women born in 1987 and thus aged 18 on January 1, 2005. Based on annual files, we created a longitudinal data set tracking this birth cohort for 14 years up to January 1, 2018, when they were 31 years old. The data set contains 981,370 repeated observations for 26,745 women and includes annually updated information on the three main components of interest: (1) births, (2) internal migration, and (3) local nonresident family. A birth event refers to a live birth that occurs between January 1 of year t and January 1 of year $t+1$. A migration event involves a change in residential address between January 1 of year t and January 1 of year $t+1$, wherein the distance between the two addresses is at least 20km.[3] Setting this minimum distance threshold, which corresponds to an average travel time of between 30 and 50 minutes by car in Norway, is important in allowing us to separate moves associated with appreciable changes in location as well as proximity to family. Likewise, our binary outcome for the presence of local nonresident family takes the value of 1 if at least one nonresident parent or sibling lives within 20km at $t+1$, and 0 otherwise.[4]

Given our focus on the interrelationships among the three processes, fertility, migration, and proximity to nonresident family also represent key *predictors* of interest. To get a handle on the effect of fertility as a predictor in equations for migration and proximity to nonresident family, we use a lagged indicator recording the number of children (0, 1, or 2+) in the household. We identify the effects of prior migration histories in the fertility and nonresident family equations by recording the number of prior migration events (0, 1, or 2+) undertaken since age 18. To identify how the presence of local nonresident family might influence migration and fertility outcomes, we use a lagged binary indicator for the presence of at least one nonresident parent or sibling living within 20km.

We also include annually updated information on age/time since the previous event, two indicators of household composition (living with parents, living with a coresident partner), ISCED educational attainment (compulsory, intermediate and higher), whether enrolled in education, income after tax relative to the cohort distribution (low = bottom 25%, middle = middle 50%, and high = upper 25%), and a cen-

[3] Defining a shorter (10km) distance threshold produced similar results to those presented here.

[4] Our measurement for the presence of local nonresident family is thus influenced by the (im)mobility behavior of the individuals studied as well as their wider family network. The use of a shorter (10km) proximity for defining local nonresident family results in similar findings to those presented here.

Table 1 Summary statistics (predictor means, outcome events, and total observations) by outcome

	First Birth	Second Birth	Third Birth	First Migration	Second Migration	Third Migration	Local Nonresident Family
Family Living Nearby	0.49	0.73	0.77	0.59	0.30	0.61	
Living With Parent(s)	0.60	0.10	0.05	0.65	0.06	0.21	
Living With Partner	0.17	0.72	0.85	0.20	0.51	0.49	0.28
Compulsory Education	0.28	0.31	0.30	0.32	0.18	0.22	0.29
Intermediate Education	0.37	0.35	0.42	0.40	0.30	0.29	0.37
High Education	0.35	0.34	0.28	0.28	0.52	0.49	0.34
In Education	0.47	0.17	0.15	0.47	0.28	0.23	0.41
Low Income	0.49	0.55	0.60	0.51	0.49	0.50	0.50
Middle Income	0.26	0.16	0.20	0.26	0.20	0.23	0.25
High Income	0.25	0.29	0.20	0.24	0.31	0.27	0.25
Rural or Less Central Municipality	0.14	0.16	0.20	0.16	0.10	0.15	0.15
No Children				0.86	0.75	0.64	0.82
1 Child				0.09	0.17	0.23	0.12
2+ Children				0.05	0.09	0.13	0.06
No Migration	0.76	0.56	0.57				0.72
1 Migration	0.15	0.22	0.20				0.16
2+ Migrations	0.09	0.22	0.22				0.12
Total Events	13,828	6,982	1,282	13,386	4,742	1,731	15,714
Total Observations	273,443	37,983	17,797	240,738	51,475	25,121	334,813

trality index based on the municipality of residence. The latter distinguishes between urban or central locations on the one hand and rural or less central locations on the other; it is used as a proxy for a range of opportunity structures relevant to, for example, access to infrastructure and formal health and care provision, as well as diversity in labor, housing, and educational opportunities.[5] We do not account for immigrant status because most first-generation immigrants do not have parents in Norway, and the majority of second-generation immigrants are still too young for us to have the numbers necessary for a detailed breakdown by background. Summary statistics for the analytical sample are provided in Table 1.

Selecting a cohort of 18-year-old women without children provides both conceptual and methodological advantages. First, we can make inferences based on a clearly defined adult population without a prior childbirth history and at the start of their legal independence, a factor that improves the likelihood of independence in migration decisions, too (i.e., independent of parental decisions on family relocations). Admissions to university in Norway are based on grades obtained during upper secondary school, where students are age 19 upon completion. Permanent moves due to education before age 18 are therefore rare. Our selection is thus useful in avoiding

[5] Rural and less central municipalities have up to 15,000 inhabitants and are not within a commutable distance of regional centers, defined as more than 2.5 hours of travel time (or 3 hours for Oslo).

the initial condition problems associated with left-truncation and left-censoring (see Yamaguchi 1991). Right-censoring occurs at death, emigration, or January 1, 2018, whichever comes first. For the vast majority of women, this means we track migration, fertility, and proximity to nonresident family up to age 31.

Unfortunately, in studying women only up to age 31, we are not able to capture complete female fertility profiles. Although this may be considered a limitation of our research, the average age of women at first birth in 2005–2019 was 28.5. Among women born in 1985, 25.6% had one child by age 30, more than 23% had two children, and 7.5% had three or more children (Statistics Norway 2020b). We therefore capture sufficient numbers of first-, second-, and third-order birth and migration events from which to analyze interrelationships during the defining years of early adulthood. Although it is possible to study the same processes for male members of this cohort, the average age of men at first birth (31.2 years) and for all births (33.5 years) is even later during our observation period (Statistics Norway 2020b), meaning that the limit on follow-up to age 31 will be more problematic. Moreover, only small differences have been identified between men and women in previous studies examining the role of nonresident family on internal migration in the context of birth events (Thomas and Dommermuth 2020). This likely reflects the relatively high degree of gender equality in the Norwegian context (Kravdal 2016).

Administrative register data from Norway are known to be a reliable source for research in various fields (Røed and Raaum 2003), including demography (Poulain and Herm 2013). They also serve as the main source for official statistics delivered by Statistics Norway. Still, these data are not perfect, and Statistics Norway continuously seeks to improve the quality of the data and published statistics. Since 2015, Statistics Norway has published statistics on housing conditions based on these registers.[6] In the development of these new statistics, the agency has assessed the data quality of the underlying registers and specifically checked that registered addresses reflect actual places of residence, given that some people might not register their moves. For example, individuals registered as resident in their parental home but enrolled as full-time students in a university in another part of the country are placed in officially unoccupied student homes near the university. Because these corrected data are available only from 2015, we could not use them in our analysis. However, we compared the information from the corrected data with the official addresses in 2018. Across all age groups, less than 2% of the population were administratively relocated to another municipality, but the proportion is highest among young adults: 19% of those aged 21 years at the beginning of 2018 were administratively relocated to another municipality. We expect that the effect of these incorrect address data will be most relevant to the estimates of the effects of living with parents on transitions to first migrations. More specifically, we expect that it will reduce the strength of the observed positive effect of living with parents on transitions to first migrations because most of these cases will be registered as *nonmigrants* who live at the parental home when they are actually student *migrants* who have already moved away from the parental home. The effects on fertility outcomes should be minimal because fertility risks will be very low for both women at university and women still living in the parental home.

[6] https://www.ssb.no/en/bygg-bolig-og-eiendom/statistikker/boforhold/aar

Methods

The basic event-history model can be formalized as follows:

$$\ln h_j(t) = \alpha(t) + \beta'\mathbf{X}_j(t) + \gamma F_j(t), \tag{1}$$

where $\ln h_j(t)$ denotes the hazard of the first, second, or third birth or migration event for woman j; and $\alpha(t)$ denotes a piecewise-linear spline capturing the baseline log-hazard (age up to first birth or first migration, or time since the previous birth or migration for second- and third-order births and migrations). $\mathbf{X}_j(t)$ is a set of lagged exogenous time-varying controls, and $F_j(t)$ is the potentially endogenous lagged time-varying indicator for the presence of a local nonresident family.

The modeling strategy starts by first investigating the transition to first, second, and third births and migrations separately, controlling for several individual and household socioeconomic and demographic characteristics. This initial step allows us to identify the relative contribution of these socioeconomic and demographic characteristics and provides a comparison from which to examine the effects of endogeneity and selection. The full model draws on a multilevel multiprocess statistical framework, incorporating the following:

$$\begin{aligned}
\ln h_j^{B1}(t) &= \alpha^{B1}(t) + \beta'^{B1}\mathbf{X}_j^{B1}(t) + \gamma F_j(t) + u_j^B, \\
\ln h_j^{B2}(t) &= \alpha^{B2}(t) + \beta'^{B2}\mathbf{X}_j^{B2}(t) + \gamma F_j(t) + u_j^B, \\
\ln h_j^{B3}(t) &= \alpha^{B3}(t) + \beta'^{B3}\mathbf{X}_j^{B3}(t) + \gamma F_j(t) + u_j^B, \\
\ln h_j^{M1}(t) &= \alpha^{M1}(t) + \beta'^{M1}\mathbf{X}_j^{M1}(t) + \gamma F_j(t) + u_j^M, \\
\ln h_j^{M2}(t) &= \alpha^{M2}(t) + \beta'^{M2}\mathbf{X}_j^{M2}(t) + \gamma F_j(t) + u_j^M, \\
\ln h_j^{M3}(t) &= \alpha^{M3}(t) + \beta'^{M3}\mathbf{X}_j^{M3}(t) + \gamma F_j(t) + u_j^M, \\
F_{tj}^* &= \Phi^{-1}(\beta'^F \mathbf{X}_{tj}^F + u_j^F),
\end{aligned} \tag{2}$$

where $\ln h_j^{B1}(t)$, $\ln h_j^{B2}(t)$, and $\ln h_j^{B3}(t)$ denote the hazards of the first, second, and third births for woman j, respectively; and $\ln h_j^{M1}(t)$, $\ln h_j^{M2}(t)$, and $\ln h_j^{M3}(t)$ represent the risks of first, second, and third migrations for woman j, respectively. Running alongside the hazard equations is a multilevel probit panel equation, where F_{tj}^* indicates the propensity that woman j is living near family at time t, with Φ^{-1} denoting the inverse of the cumulative standard normal distribution. The family ties probit equation and all migration hazard equations include a variable indicating the number of dependent children, which is an outcome of the birth process, and thus considered potentially endogenous. Similarly, the number of previous migrations is included as a predictor variable in the family ties and fertility equations. Estimates from the multilevel multiprocess model are subject-specific, with coefficients α, β', and γ indicating the effect of a given variable on the probability of a transition for a given woman (Neuhaus et al. 1991; Steele 2011), which differs from the standard population-averaged interpretation of a basic event-history model.

The model includes a woman-specific time-invariant residual for each process, denoted by u_j^B for births, u_j^M for migrations, and u_j^F for family ties. The model can therefore account for time-constant women-level unobserved characteristics that might bear some influence over her fertility and migration behavior and her propensity to live near family.[7] Modeling repeated events through a random-effects approach also means we avoid biases related to the fact that high-risk individuals experiencing an event first will exit the sample sooner, leaving behind a residual group increasingly composed of low-risk individuals (Vaupel et al. 1979). We assume the three residuals follow a trivariate normal distribution:

$$\begin{pmatrix} u_j^B \\ u_j^M \\ u_j^F \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{u^B} & & \\ \rho_{BM} & \sigma^2_{u^M} & \\ \rho_{BF} & \rho_{MF} & \rho^2_{u^F} \end{pmatrix}\right), \tag{3}$$

where $\sigma^2_{u^B}$, $\sigma^2_{u^M}$, and $\sigma^2_{u^F}$ represent the variances of the woman-specific residuals for the birth, migration, and family ties processes, respectively; and ρ_{BM}, ρ_{BF}, and ρ_{MF} denote the correlations between these residuals. A positive value for ρ_{BF}, for instance, suggests that women with an above-average risk of having a child (or another child), net of their observed characteristics, also have above-average propensities to be living near nonresident family.

Following the recommendation of Lillard and Panis (2003:305), we employed Cholesky-decomposed parameters in the estimation of the covariance matrix, aiding model convergence and preventing nonpositive definite matrices. Model identification was achieved via within-person replication (Lillard et al. 1995; Steele 2011); sufficient numbers of women experienced multiple births and migrations to estimate random effects. All models were estimated via maximum likelihood using aML Version 2.09 (Lillard and Panis 2003).

Results

The results of the full model are presented in Table 2. The results of the separately modeled estimates are presented in the online appendix. In addressing our hypotheses, we refer to results from the separate models only when substantively different effects emerge from those presented in Table 2.

With regards to our first hypothesis, postulating a positive association between local nonresident family and female fertility risks, the results in Table 2 offer partial support. Having nonresident family living nearby appears to have a positive effect on transitions to first births ($b = 0.124$). However, we find no effects on second or third births. There is evidence of a positive, cross-process residual correlation between the family ties and fertility outcomes ($\rho = .345$), wherein women with above-average propensities to be living near family have above-average fertility risks (H5). This implies a selection of women with high fertility risks into the category of women with

[7] The model does not control for time-varying unobserved characteristics, which would require the introduction of instruments. Although it is possible to incorporate instruments, identifying robust instruments is a notoriously difficult endeavor, especially when the focus is on closely related life course events and processes (Rabe and Taylor 2010; Steele 2011).

Table 2 Estimated coefficients and standard errors from a multilevel multiprocess model of birth hazards, migration hazards, and the propensity to be living near nonresident family for women born in 1987

	Coefficient	SE
A. First Birth		
Constant (baseline)	–8.459**	0.604
Age		
18 to <20 years (slope)	2.582**	0.340
20 to <21 years (slope)	–0.839**	0.159
21 to <22 years (slope)	0.531**	0.098
22 to <26 years (slope)	–0.018	0.011
26+ years (slope)	0.075**	0.007
Family living nearby (ref. = no)		
Yes	0.124**	0.024
Living with parent(s) (ref. = no)		
Yes	–0.394**	0.028
Living with partner (ref. = no)		
Yes	1.322**	0.021
Previous migrations (ref. = none)		
1 migration	–0.006	0.026
2 migrations	0.105**	0.027
Educational attainment (ref. = intermediate)		
Compulsory	0.285**	0.023
Higher	–0.083**	0.024
In education (ref. = no)		
Yes	–1.141**	0.029
Personal income (ref. = middle)		
Low	0.644**	0.030
High	0.742**	0.031
Municipality centrality (ref. = urban or central)		
Rural or less central	0.397**	0.024
B. Second Birth		
Constant (baseline)	–8.634**	0.523
Time since first birth		
0 to <2 years (slope)	4.028**	0.289
2 to <3 years (slope)	–1.640**	0.151
3 to <4 years (slope)	0.777**	0.127
4+ years (slope)	–0.177**	0.021
Family living nearby (ref. = no)		
Yes	–0.003	0.035
Living with parent(s) (ref. = no)		
Yes	–0.032	0.049
Living with partner (ref. = no)		
Yes	0.468**	0.039
Previous migrations (ref. = none)		
1 migration	0.001	0.038
2 migrations	–0.029	0.035
Educational attainment (ref. = intermediate)		
Compulsory	–0.288**	0.031
Higher	0.494**	0.029
In education (ref. = no)		
Yes	–0.256**	0.033
Personal income (ref. = middle)		
Low	0.106**	0.038
High	0.046	0.041

Table 2 (continued)

	Coefficient	SE
Municipality centrality (ref. = urban or central)		
Rural or less central	0.131**	0.033
C. Third Birth		
Constant (baseline)	–8.250**	1.113
Time since second birth		
0 to <2 years (slope)	3.405**	0.624
2 to <3 years (slope)	–1.470**	0.346
3 to <4 years (slope)	0.969**	0.290
4+ years (slope)	–0.122	0.063
Family living nearby (ref. = no)		
Yes	0.033	0.083
Living with parent(s) (ref. = no)		
Yes	0.052	0.123
Living with partner (ref. = no)		
Yes	0.017	0.099
Previous migrations (ref. = none)		
1 migration	–0.029	0.087
2 migrations	–0.072	0.080
Educational attainment (ref. = intermediate)		
Compulsory	0.030	0.069
Higher	0.557**	0.072
In education\ (ref. = no)		
Yes	–0.204*	0.084
Personal income (ref. = middle)		
Low	–0.186*	0.076
High	–0.096	0.087
Municipality centrality (ref. = urban or central)		
Rural or less central	0.113	0.070
D. First migration		
Constant (baseline)	–9.131**	0.469
Age		
18 to <20 years (slope)	3.078**	0.262
20 to <21 years (slope)	–0.960**	0.120
21 to <22 years (slope)	0.378**	0.081
22 to <26 years (slope)	0.127**	0.011
26+ years (slope)	–0.093**	0.011
Number of children (ref. = 0)		
1	–0.409**	0.048
2+	–1.139**	0.100
Family living nearby (ref. = no)		
Yes	0.163**	0.028
Living with parent(s) (ref. = no)		
Yes	0.523**	0.029
Living with partner (ref. = no)		
Yes	–0.868**	0.042
Educational attainment (ref. = intermediate)		
Compulsory	0.037	0.026
Higher	0.405**	0.027
In education (ref. = no)		
Yes	–0.500**	0.020
Personal income (ref. = middle)		
Low	0.355**	0.023
High	0.449**	0.028

Table 2 (continued)

	Coefficient	SE
Municipality centrality (ref. = urban or central)		
Rural or less central	0.443**	0.026
E. Second Migration		
Constant (baseline)	–8.224**	0.525
Time since first migration		
0 to <2 years (slope)	3.606**	0.292
2 to <3 years (slope)	–2.403**	0.175
3 to <4 years (slope)	1.122**	0.149
4+ years (slope)	–0.159**	0.020
Number of children (ref. = 0)		
1	–0.249**	0.060
2+	–0.573**	0.145
Family living nearby (ref.. = no)		
Yes	–0.121**	0.044
Living with parent(s) (ref. = no)		
Yes	0.068	0.064
Living with partner (ref. = no)		
Yes	–0.179**	0.034
Educational attainment (ref. = intermediate)		
Compulsory	0.270**	0.044
Higher	–0.056	0.036
In education (ref. = no)		
Yes	0.311**	0.036
Personal income (ref. = middle)		
Low	–0.182**	0.040
High	–0.278**	0.047
Municipality centrality (ref. = urban or central)		
Rural or less central	0.248**	0.051
F. Third Migration		
Constant (baseline)	–8.306**	0.872
Time since second migration		
0 to <2 years (slope)	3.551**	0.487
2 to <3 years (slope)	–2.461**	0.302
3 to <4 years (slope)	1.307**	0.260
4+ years (slope)	–0.162**	0.039
Number of children (ref. = 0)		
1	–0.487**	0.086
2+	–0.590**	0.166
Family living nearby (ref. = no)		
Yes	–0.440**	0.056
Living with parent(s) (ref. = no)		
Yes	–0.035	0.062
Living with partner (ref. = no)		
Yes	–0.363**	0.064
Educational attainment (ref. = intermediate)		
Compulsory	0.200**	0.071
Higher	–0.111	0.061
In education (ref. = no)		
Yes	0.417**	0.059
Personal income (ref. = middle)		
Low	–0.273**	0.064
High	–0.318**	0.077

Table 2 (continued)

	Coefficient	SE
Municipality centrality (ref. = urban or central)		
Rural or less central	0.276**	0.071
G. Local Nonresident Family		
Constant	–1.005**	0.037
Age		
18 to <20 years (slope)	0.273**	0.022
20 to <21 years (slope)	0.260**	0.021
21 to <22 years (slope)	0.222**	0.017
22 to <26 years (slope)	0.158**	0.003
26+ years (slope)	0.089**	0.002
Number of children (ref. = 0)		
1	0.179**	0.010
2+	0.147**	0.013
Living with partner (ref. = no)		
Yes	0.324**	0.007
Previous migrations (ref. = none)		
1 migration	–1.199**	0.008
2 migrations	–0.637**	0.010
Educational attainment (ref. = intermediate)		
Compulsory	0.143**	0.010
Higher	–0.082**	0.007
In education (ref. = no)		
Yes	–0.105**	0.007
Personal income (ref. = middle)		
Low	0.188**	0.007
High	0.365**	0.008
Municipality centrality (ref. = urban or central)		
Rural or less central	–0.350**	0.008
H. Random Effects		
Sigma fertility	0.080**	0.024
Sigma migration	0.764**	0.027
Sigma family ties	1.491**	0.010
Rho fertility, migration	0.159**	0.041
Rho fertility, family ties	0.345**	0.008
Rho migration, family ties	–0.524**	0.016
Log-Likelihood	–278,715.23	

* $p < .05$; ** $p < .01$

local nonresident family, which, if not accounted for (see Table A1, online appendix), results in an upward bias in the estimated effect of proximity to family on fertility. Still, the upward bias in the separately estimated models does not appear large enough to produce any appreciable positive association between proximity to family and second or third births. Thus, in line with previous research in the Swedish context, it seems that proximity to family matters most for transitions to motherhood (Kolk 2014). Prior experience of parenting or the effects of the two-child norm in Norway may be factors underpinning the limited effect of proximity to nonresident family on second- and third-order births. However, the limited follow-up to age 31 could also influence this result, given that higher-order births typically occur at later ages.

Our second hypothesis suggests that proximity to nonresident family would generally work to reduce propensities to migrate. This was indeed the case when we estimate the effects using separately estimated models (Table A1, online appendix): we observe a strong negative effect on first-, second-, and third-order migration propensities. However, in modeling the outcomes simultaneously, it becomes clear that migration risks are jointly determined with proximity to nonresident family, as indicated by the relatively strong, negative cross-process correlation (ρ=–.524) (H5). Thus, women with below-average risks of migration tend to have above-average propensities to live near family, suggesting that the separately estimated model results will be biased downward. Once we account for unobserved heterogeneity and selection in the jointly estimated model (Table 2), we observe a small positive effect on first migrations (b=0.163), whereas the negative effects observed for second- (b=–0.121) and third-order migrations (b=–0.440) are reduced in strength (Table 2). For first migrations in early adulthood, similar mechanisms to those associated with nest-leaving may be at play: migration away from the family may prove a necessity as young adults move in pursuit of their own independent residential, educational, and occupational careers. However, as noted earlier, the observed effects of local nonresident family on first migrations may also be influenced by the fact that many individuals are still living at home, with either no local nonresident family (parents and siblings are still coresident) or local family ties that are quite different from those of individuals who have already moved out. We therefore caution against forming any strong conclusions from the small positive effect observed on first migrations.

Regarding the endogenous nature of interrelationships between fertility and migration, our third hypothesis suggests that prior fertility outcomes would affect subsequent migration propensities, such that the presence of children in the household would reduce future propensities to migrate (H3a). The results in Table 2 support this hypothesis, with the presence of a child associated with reduced risks of first- (b=–0.409), second- (b=–0.249), and third-order (b=–0.487) migrations. The negative effects are even stronger when women have two or more children in the home. Mothers also have higher propensities to live near family in the following year compared with women without children (H3b). With previous studies having shown increased propensities for parents and grandparents to move toward one another when young children are present (van Diepen and Mulder 2009; Thomas and Dommermuth 2020), this finding adds further support to the argument that proximity to family is especially valued among those with specific care needs, such as childcare.

In the opposite direction, the number of previous migrations appears to bear little influence over transitions to second- and third-order births. For transitions to first births, we find a small positive effect for those who have undertaken two or more migrations (b=0.105) compared with those who have not migrated since age 18. Although the direct effect of migration on fertility appears limited, previous studies have observed a positive association between the emergence of fertility events and migration events, with families known to migrate in anticipation of, or subsequent to, fertility events (see Kulu 2005). H4 suggests that a positive cross-process correlation would exist between fertility and migration outcomes. The results in Table 2 support this hypothesis (ρ=.159): women with short (long) birth intervals tend to also have short (long) migration intervals.

Additional Observations

Some additional insights, mostly in line with the results from previous studies, also emerge from the estimated effects of our control variables. As we would expect, those still living with parents have a lower risk of transitioning to parenthood ($b = -0.394$). For second and third births, this effect diminishes, with wide standard errors reflecting the rarity of cases where young mothers remain in the parental home (see Table 1). In terms of partnership status, having a coresident partner clearly increases the intensity of transitions to first- ($b = 1.322$) and second-order ($b = 0.468$) births. Relative to women with intermediate-level educations, the risk of a first birth is shown to be higher among low-educated mothers (with compulsory education; $b = 0.285$) and lower among highly educated mothers (with tertiary education; $b = -0.083$). For second- and third-order births, the relationship reverses, such that women with higher educational attainment have higher fertility risks. This pattern fits with previous studies that show how more-educated women tend to delay first births, temporarily prioritizing other life domains, such as education and occupational progression (Kravdal 2001). However, differences in the total number of children by education at age 40 have decreased and are no longer visible among women born in 1970–1974, particularly because the number of children among the lower-educated has declined steadily across birth cohorts in Norway. This shift is also visible with regards to childlessness among women at age 40, which is highest among low-educated women in the cohort born in 1970–1974. In older cohorts, childlessness was more prevalent among women with high educational attainment (Jalovaara et al. 2019). Unsurprisingly, for young women who are enrolled in education, the risk of first ($b = -1.141$), second ($b = -0.256$), or third births ($b = -0.204$) is relatively low. Regarding personal income, the picture is less consistent. Those in the low- and high-income brackets appear to have higher risks of transitions to first births than those in the middle-income group; for transitions to second and third births, there is little variation according to income. In terms of the broader regional context, young women in less central and rural municipalities have higher risks of fertility, although the effect on third births comes with relatively wide standard errors.

Regarding migration, and in line with the literature on nest-leaving, young women still living in the parental home exhibit higher risks of migration than those who are already living independently ($b = 0.523$). Fitting with the notion that migration functions as a means through which people can maximize returns to human capital (Sjaastad 1962), the risk of a first migration is higher among women with high educational attainment ($b = 0.405$). For those who have already experienced a first migration event, the relationship with education appears to reverse. Women with low educational attainment have higher risks of subsequent migration, and women with high educational attainment have lower relative risks of migration. The higher risks of second-order migrations among those with low educational attainment could reflect onward migration in search of further educational opportunities at a university. However, researchers from the United States have also identified associations between lower education and return migration, which usually takes place as a correction to an initial move that did not work out (DaVanzo 1983; DaVanzo and Morrison 1981). With highly educated individuals typically enjoying more spatially extensive labor market opportunities and greater pecuniary returns to migration, there is perhaps a greater likelihood that their first migration was successful in meeting their various locational, educational, and/or employment-related needs. Enrollment in education is also an important predictor of subsequent migration risks. The risk of a first migration is lower among those who are already enrolled in education ($b = -0.500$), but those who are enrolled in education and have a history of migration (i.e., as student migrants) have a higher propensity for further migration than equivalent individuals not in education (i.e., nonstudent migrants).

The presence of coresident partners appears to reduce first- ($b = -0.868$), second- ($b = -0.179$), and third-order ($b = -0.363$) migration intensities, whereas the migration patterns associated with variations in personal income appear to vary depending on the migration event studied. For first migrations, women with low ($b = 0.355$) and high incomes ($b = 0.449$) have higher migration intensities than women with middle-level incomes; for second and third migrations, women with middle-level incomes appear to have the highest relative migration intensities. With better and more diverse housing, employment, and educational opportunities tending to be clustered in the more central, urban regions of Norway, we observe higher relative risks of migration among those living in rural and less central municipalities. That is, higher risks are observed among those who stand to gain the most from relocating to areas with better opportunity structures.

Conclusions

Several previous studies have highlighted important links between fertility and internal migration along the life course. Migration propensities are known to increase around the time of childbirth, and the presence of children in the home is known to reduce subsequent propensities to migrate. More recently, researchers have started to consider the role of wider nonresident family networks on these important demographic outcomes, positing that proximity to family is useful in facilitating better-quality contact, care, and support exchange. From this perspective, studies have examined how proximity to familial support systems can influence migration and fertility behaviors separately. However, in studying the effects on these outcomes separately, we gain little understanding of the links that exist across the demographic processes, let alone how unobserved sources of selection and endogeneity may affect our estimates of these interrelationships.

Drawing on uniquely detailed geocoded population register data for Norway and following a cohort of women aged 18 in 2005 to 31 in 2018, we were able to identify the presence and location of nonresident family as well as the emergence of birth and migration events, linking the three processes within a multilevel multiprocess statistical framework. The results of our analysis offer support to the notion that linked lives matter, even in early adulthood, and that decisions about fertility, migration, and proximity to family are jointly determined. Having nonresident family (siblings and parents) living nearby is shown to have a positive effect on transitions to motherhood, while the presence of children in the home—itself an outcome of the fertility process—reduces subsequent migration propensities. Mothers also have higher propensities to be living near family in the following year compared with women without children. We found little effect of local nonresident family on transitions to second- and third-order births. Prior experience of parenting and the effects of the two-child norm in Norway may partly explain why we find a limited effect of proximity to nonresident family on second- and third-order births. However, our limited follow-up to age 31 may also bear relevance, given that higher-order births typically take place after this point. Still, the fact that proximity to nonresident family encourages transitions to motherhood in Norway, where high-quality formal childcare is widely available, is an important and potentially policy-relevant finding in the context of the widespread decline in fertility observed across many Western and Asian nations.

After accounting for unobserved sources of heterogeneity and selection, we observe a small positive effect for local nonresident family on first migrations. In line with previous studies, proximity to nonresident family has a negative effect on second- and third-order migration risks. Although the positive effect for first migrations in early adulthood may be driven by similar mechanisms to those we often associate with nest-leaving and the pursuit of independent residential, educational, and occupational careers, we avoid drawing any strong conclusions from this finding. Indeed, many young adults who have not yet migrated are still living in the parental home and so have either no local nonresident family (parents and siblings are still coresident) or nonresident family that constitute different relations (e.g., a separated parent or older nonresident siblings) to those who have left the parental home. Although studying young women from age 18 helps to avoid some of the initial condition problems associated with left-truncation and left-censoring, it adds a degree of complexity to the interpretation of the effects of proximity to nonresident family on first migrations.

There are, of course, other limitations to this study, as well as opportunities for future extensions. With existing data restricting us to an analysis of women up to age 31, we note that 44% of Norwegian women born in 1985 were still childless by this age. It would therefore be useful if future follow-up studies could analyze women with completed fertility profiles (e.g., studying women up to age 45). There might be specific relationships among migration, proximity to nonresident family, and first births among women that delay the transitions to motherhood into their 30s. Analyzing women with completed fertility profiles could also be helpful in checking the robustness of the limited effect we find for proximity to nonresident family on second- and third-order births, which we know typically take place at later ages.

We are also aware that in studying a single birth cohort, we are not able to determine whether our observed effects are cohort-specific or generalizable to prior or subsequent birth cohorts. Although recent decades have seen little change in the average age at which young adults leave the parental home in Norway, we have witnessed an increasing proportion entering higher education, and fertility rates have also declined since 2009, largely because of delayed fertility and fewer women having three or more children (Syse et al. 2020). We also miss the first move to university among some share of our sample (up to 19% if the pattern is like that observed in 2018). Unfortunately, it is possible to account for these incorrect address data from only 2018 onward, and thus we do not yet have enough follow-up years for us to check whether any unexpected biases are large enough to affect our main findings. It is possible that the positive association observed between living with parents and first migration risks is weaker than it would otherwise have been if all address data for students were correct.

Similar analyses undertaken in different national contexts, with different familial and welfare settings, could prove illuminating. For instance, with Norwegian social support and family policies promoting a high degree of gender equality in caregiving and labor market participation, previous work has found little difference between Norwegian men and women in terms of the effect of proximity to family on migration, even in the context of birth events (Thomas and Dommermuth 2020). It is possible, however, that appreciable differences between men and women will emerge in countries with more conservative family and welfare traditions. Finally, in the context of widespread population aging, and with many Western countries implementing policies seeking to increase the role of family in social care (Pavolini and Ranci 2008), the examination of interrelationships between family ties and other important social and demographic outcomes, at different life course stages, would seem appropriate. Examining how the presence and location of wider family networks come to influence the balancing of care responsibilities between adult children and elderly parents, their locational choices, and/or their engagement in the labor market is just one area that has the potential to provide important policy-relevant insights. The combination of detailed geocoded population register data and multilevel multiprocess modeling could make this possible. ■

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