



Born to move?

Birth order and emigration

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Abstract

This paper studies the interrelation between birth order and emigration adopting a family fixed-effects approach. We use register data on all persons in full-siblings groups born 1970-2002 in the entire Finnish-born population, and observe their first move abroad since age 18 in the period 1987-2020. The total number of siblings is 1,352,908, the total number of sibling groups 549,842, and the total number of first moves abroad 31,192. By comparing siblings in the same family, we effectively adjust for all time-invariant confounding from unobserved or unmeasured time-invariant variables. Emigration is found to be positively associated with birth order. The hazard of emigration for second-born siblings is 1.05 that of first borns, that of third borns 1.07, and that of fourth borns 1.11. The pattern is particularly marked for emigration to countries where there is free mobility, and the association is similar for both sexes. Potential explanations to the birth order pattern may be variation in personality traits, risk-taking behaviours and aspirations between siblings, or differential allocation of resources and opportunities within families. The results highlight the importance of considering birth order within the context of family dynamics and individual mobility patterns, and they need to be extended to broader settings.

Keywords: emigration, birth order, family fixed-effects, welfare states, population register

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Introduction

There have been numerous studies on how people's birth order relate to their later-life prospects. Most of them have been concerned with how birth order relates to health, skills and educational attainment. Generally, they found that later-born siblings perform worse than earlier-born siblings with regard to various health outcomes such as depression, mental distress, psychiatric deviation, anxiety, self-esteem, suicide, and physical fitness (Modin 2002, Mittendorfer-Rutz, Rasmussen, and Wasserman 2004, Riordan et al. 2012, Barclay and Myrskylä 2014, Rostila et al. 2014, Reini and Saarela 2023). Studies on intelligence, cognitive and non-cognitive skills, and educational attainment suggest also that earlier-born siblings are in a more advantaged position than later-born siblings (Blake 1989, Black, Devereux, and Salvanes 2005, Bjerkedal et al. 2007, Kristensen and Bjerkedal 2007, Barclay 2015a, 2015b).

A number of potential explanations to these birth order patterns have been proposed. The confluence hypothesis suggests that siblings are part of a dynamically changing environment that may become less cognitively stimulating when the family grows in size, while the resource dilution model says that the birth order patterns arise because parental resources decrease (Zajonc 1976, Blake 1981, Strachan 1989, Hertwig, Davis, and Sulloway 2002, Riordan et al. 2006, Batty, Deary, and Gottfredson 2007). Another set of explanations relate to the social environment within the family. Offspring may occupy different niches in order to avoid inter-sibling competition, and there could be within-family bullying at the expense of later-born siblings (Zweigenhaft and Von Ammon 2000, Tucker et al. 2013).

A particularly influential theory that relates to such sibling niche differentiation has emphasised how within-family dynamics create more rebellious later-born children (Sulloway 1996). It posits that persons develop interests and abilities that distinguish them from their siblings, in order to avoid direct competition (Barclay 2014). This adaption then leads to consistent variation between siblings within any given family, so that openness to experience, which is one of the Big Five personality traits, is higher among later borns. This would allow them to discover an unfilled niche within the family, meaning that first borns would be more conservative, while later borns are more rebellious and liberal (Sulloway and Zweigenhaft 2010). If this argument holds true, there should be a positive association also between birth order and the risk of emigration, because migration abroad is risky, and inherently associated with uncertainty and openness to experience (Todaro 1969, David 1974, Katz and Stark 1986, Taylor 1986, Heitmueller 2005).

The antecedents of migration, and particularly migration abroad, have been documented in many studies on various contexts (Greenwood 1985, Portes 1999, King 2002). Migration between highly developed countries with modest social disparities is often, but not solely, driven by opportunities and expected outcomes abroad, and relative differences in the expected returns to skills between the home and the destination country (Borjas and Bratsberg 1996, Borjas 1999, Rooth and Saarela 2007). There is also a considerable degree of uncertainty and risk involved in this context (Saarela and Rooth 2012, Saarela, 2015). Household and family characteristics, like marital status, being a parent, or whether a person lives in the parental home, are strongly related to the probability of emigration (Kulu and Milewski 2007, Saarela and Finnäs 2013).

Even though birth order is a fundamental part of the family dynamics in the parental home, the literature has been largely silent on the interrelation between birth order and emigration in modern contemporary societies with small families. There is a historical demographic and economic literature that have looked at the importance of birth order on inheritance and migration of siblings, particularly in agricultural societies (see e.g. Abramitzky, Boustan and

Eriksson 2013), and some research on birth order and migration from Mexico to the United States (see e.g. Bratti, Fiore and Mendola 2020). The overall conclusion from those studies, which analyse large-families settings, is that the association between birth order and emigration relates to what is economically most beneficial for the sending family, meaning that both the size and the sign of the birth order effect depend on the study context.

To the best of our knowledge, there has not been any study of the importance of birth order on emigration from a highly developed contemporary society with modest fertility, which we are concerned with in this paper. As will be discussed next, research on birth order effects from other fields suggests that, for our study context, emigration is likely to be positively associated with birth order. To empirically test this hypothesis, we will compare siblings from the same families in the native-born population in Finland, using a siblings fixed-effects approach.

Birth order, personality, and emigration

Competition for parental investment may cause siblings to adapt their behaviour and develop a personality that would allow them to occupy particular niches within the family (Adler 1928, Sulloway 1996). First borns, and only children, are likely to be more conservative due to the period of time when they were the only child and the sole focus of parental care. This would lead first borns to identify with power and authority, and to become more conservative and socially dominant than their later borns. Later-born siblings, on the other hand, would be more inclined to develop a personality that is questioning of authority, as they are disadvantaged from the very beginning in terms of size and strength. They would then be forced to become more creative, original and risk taking, in order to attract parental investment.

Studies on birth order and personality report that first borns are more conscientious (Paulhus, Trapnell, and Chen 1999, Beer and Horn 2000), and score higher on neuroticism (Cole 2013), while later borns score higher on extraversion (Dixon et al. 2008) and openness to experience (Healey and Ellis 2007). In support, later-born siblings are more likely to choose creative subjects at university, as well as university majors associated with greater variation in expected earnings (Barclay, Hällsten, and Myrskylä 2017). They are thus more likely than earlier-born siblings to choose study pathways that are more risky and offer greater opportunities to express creativity, as such pathways may be characterized by a greater payoff in the event of success. Some analyses, however, have found no personality differences by birth order (Rohrer, Egloff, and Schmukle 2015).

Individuals' personality and their life choices are interrelated, meaning that people choose life paths that match their personality, and that they are more satisfied, and achieve more, when they do so (Holland 1985, 1996). Theories which say that first borns are more conservative (Adler 1928, Sulloway 1996) suggest that they should choose options that are linked to a stable professional career, meaning that they are more risk averse. Any uncertainty related to moving, and particularly migration abroad, would then make them more reluctant to emigration in comparison to their later-born siblings.

First borns are, relative to later borns, more likely also to identify with parents, and thus to professionally follow in the parental footsteps (Jonsson et al. 2009). Parents invest time and money into their children, but also transfer specific skills and abilities. Earlier borns would then have a comparative advantage in such investments and transfers (Laband and Lentz 1983, Grätz and Torche 2016). Parenting strategies towards the first born may also be biased due to a cultural legacy of primogeniture, meaning that undivided bequests are given to the first-born son. Vestiges of this practice may linger in contemporary parental behaviour, even though it is

legally obsolete in modern societies. Another motive that has been suggested for primogeniture is that parents may favour the first born because of a larger generational overlap (Silles 2010). Parents can then help and monitor the career of the first born, and also have a chance to reap the benefits of that investment during their course of life, subject to that they remain geographically proximate.

Primogeniture would nevertheless favour the first-born son at the expense of later-born sons or daughters of any birth order, and would thus not result in a birth order pattern beyond first borns or for women. Furthermore, in gender-equal societies with high levels of economic equality, one cannot expect a substantial socioeconomic divide across siblings within the same family. If emigration is related to birth order in such a context, it is likely due to other factors than variation across siblings in the economic opportunities offered in the family home.

The study context in this paper is Finland, which is a Nordic welfare state that constitutes one of the most gender-equal societies in the world, with a smaller social and economic divide than practically any other western society, largely due to a homogeneous and historically stable population. As an illustration, native Finnish women are twice as likely to emigrate as compared to native Finnish men, and emigration varies only modestly by family background (Weber and Saarela 2019, 2023). Furthermore, we study emigration of native-born persons, meaning that any issues related to integration or other difficulties experienced by first- or later generations of immigrants are circumvented.

The proposed link between birth order and emigration implies that people should be able to migrate freely, while many countries have visa or other requirements that hinder immigration. We will therefore study migration to countries where Finns can immigrate without restrictions, that is, countries in the European Union's Schengen area, separately from migration to countries outside this area, where there are hindrances to immigration.

Based on the above arguments and the study context, we set out to test the following hypotheses:

- (a) Emigration is positively associated with sibling birth order.
- (b) The positive association is most pronounced for free mobility.
- (c) The positive association is similar for women and men.

Data and methods

We use data from the Finnish longitudinal population register, which contains all individuals who had been residing in Finland at any time since 1970. There is information about every registered move from and to Finland in the period 1987-2020, with date of migration and country of destination or departure. These data are linked to registries on births, deaths, education, income, households, and families. Each person born in Finland can be linked to his or her mother and father, subject to that the parent ever had resided in Finland (after 1970). All data access, data preparation and analyses are performed within Statistics Finland's remote access system Fiona, with contract number TK-52-694-18, and in accordance with Statistics Finland's guidelines.

Since we want to study emigration as an individual's own decision, and from the first time in life when this decision is possible, we observe people from the calendar year when they become age 18. The study cohorts are consequently born in the period 1970-2002. We want to study them at young adulthood, when the emigration rate is the highest, and therefore observe them until age 25. We construct full-sibling groups, that is, groups of siblings that have the same mother and father. Included are sibling groups where all siblings were born in the period 1970-2002. Sibling groups in which one more siblings had lived abroad, or died, before age 17 were excluded. With the described setup, foreign-born persons are excluded and the focus is consequently on native-born persons. The total number of siblings that are analysed is 1,352,908, the total number of sibling groups is 549,842, and the total number of (first) moves abroad is 31,192.

To analyse the association between birth order and emigration, we apply Cox proportional hazard models with family fixed effects (cf. Barclay et al. 2016). In these models, siblings share the same baseline hazard (the shared mother plus father ID). By comparing siblings in the same family and not siblings between families, we effectively adjust for all time-invariant confounding from unobserved or unmeasured time-invariant variables (cf. Reini and Saarela 2023). A requirement for these stratified analyses is that there must be at least two siblings in the group, and that at least one must have emigrated.

Each sibling is observed from age 18 until first emigration, age 26, death, or the end of 2020, whichever comes first. The failure event is thus emigration, and right-censoring occurs at age 26, death, or the end of 2020. We study emigration to all destinations, and run also parallel models where we distinguish between moves (1) to the neighbouring Nordic countries (Sweden, Norway, Denmark and Iceland), (2) to other countries in the current Schengen area, and (3) to all other countries, where travel restrictions apply. Moves to the three difference country groups are treated as competing events, meaning that right-censoring occurs when a move is to a destination other than the specific country group studied (cf. Saarela and Scott 2020). There has been free mobility between the Nordic countries since 1954. Currently there are 27 European countries in the Schengen area that impose no internal border controls and allow for visa-free residence of their nationals. The Schengen agreement was originally signed in 1985, and Finland entered in 1996. In the study population, there are 19,017 moves to a Nordic country, 6,122 moves to any other Schengen country, and 6,053 moves to a country elsewhere in the world.

Control variables used are each sibling's birth year, sex, family situation at age 17, mother's labour market status at age 17, father's labour market status at age 17, mother's income quintile at age 17, father's income quintile at age 17, and whether the family lived in owner-occupied dwelling at age 17. Since there can be variation between siblings on each of these variables, they can be included in the family fixed regressions. Hence, we control for socioeconomic and

demographic differentials across siblings in the same family. Variable distributions are displayed in Table 1.

To study whether the association between birth order and emigration is similar for men and women, we run regressions where sex and birth order are interacted (cf. Saarela and Kolk 2021).

Secondary level education is usually obtained at age 20 in Finland, hence after ages 18 and 19, when some individuals already had emigrated. To adequately evaluate whether educational attainment affects the patterns observed, we run robustness checks where persons are observed from age 20, instead from age 18. By doing so, we can utilise also a variable that distinguish whether persons have primary level education only, vocational education at the secondary level, or general upper secondary level education. The latter two distinguishes between persons without matriculation examination, and those with matriculation examination, which is a prerequisite for university studies.

Table 1. Descriptive statistics of the study population

Birth order (%)	
1	42.2
2	40.0
3	13.0
4	3.0
5+	1.8
Birth year (%)	
1970-1974	10.6
1975-1979	17.4
1980-1984	19.8
1985-1989	19.5
1990-1994	19.8
1995-1999	11.4
2000-2002	1.3
Sex (%)	
Man	51.1
Woman	48.9
Family situation (lives with...) (%)	
Both parents and sibling(s)	58.3
Both parents but no sibling(s)	10.4
Mother and sibling(s)	10.3
Mother but no sibling(s)	3.4
Father and sibling(s)	2.1
Father but no sibling(s)	1.4
New family with sibling(s)	7.3
New family without sibling(s)	1.7
No parent, parents together	2.0
No parent, parents separated	3.3
Mother's labour market status (%)	
Employed	83.6
Unemployed	7.6
Outside labour market	7.8
Mother not present	1.0
Father's labour market status (%)	
Employed	81.8
Unemployed	7.4
Outside labour market	7.6
Father not present	3.2
Mother's income quintile (%)	
First	20.4
Second	20.5
Third	20.1
Fourth	19.4
Fifth	18.6
Mother not present	1.0
Father's income quintile (%)	
First	19.7
Second	19.9
Third	19.5
Fourth	19.1
Fifth	18.6
Father not present	3.2
Owner-occupied dwelling (%)	
Yes	79.5
No	20.5
Number of moves to	
A Nordic country	19,017
Any other Schengen country	6,122
Any other country	6,053
Number of sibling groups	549,842
Number of siblings	1,352,908
Number of person years	9,999,113

The description refers to the complete cohorts, i.e., full-sibling groups with at least two siblings, in which all siblings were born 1970-2002, observed in 1987-2020, and followed from age 18.

All variables except birth order, birth year and sex refer to the ego's situation at age 17.

Results

We find evidence for a positive association between birth order and emigration, and even a rather clear gradient (Table 2). When only birth year and sex are included as control variables in the stratified Cox regressions, the hazard of emigration for second-born siblings is 1.05 that of first-born siblings, that of third born is 1.07, and that of fourth born is 1.11 (Model 1). Fifth- or higher-born siblings have a lower hazard of emigration, or 0.95 that of first borns, but the number of persons in this category are few (cf. Table 1) and the estimate is not statistically significant.

An even stronger difference by birth order emerges when family situation at age 17, and the socioeconomic control variables, are stepwise added (Models 2-7). When all the control variables are included, the hazard of emigration for second-born siblings is 1.07 that of first borns, that of third borns is 1.09, and that of fourth borns is 1.12 (Model 7). For fifth- or higher-born siblings the hazard ratio is 0.94 and statistically not significant.

Table 2. Hazard ratios for emigration by birth order, with lower and upper levels of 95% confidence intervals

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
Birth order																					
1	1			1			1			1			1			1			1		
2	1.05	1.02	1.09	1.07	1.03	1.10	1.07	1.03	1.11	1.07	1.03	1.11	1.07	1.03	1.11	1.07	1.03	1.11	1.07	1.03	1.11
3	1.07	1.01	1.14	1.08	1.02	1.15	1.08	1.02	1.15	1.08	1.02	1.15	1.08	1.02	1.15	1.09	1.02	1.16	1.09	1.02	1.16
4	1.11	1.01	1.23	1.11	1.00	1.23	1.11	1.01	1.23	1.11	1.01	1.23	1.12	1.01	1.24	1.12	1.01	1.24	1.12	1.01	1.24
5+	0.95	0.82	1.09	0.92	0.80	1.06	0.93	0.81	1.07	0.93	0.81	1.07	0.94	0.81	1.08	0.94	0.81	1.08	0.94	0.81	1.08

Model 1 includes birth year and sex.

Model 2 includes variables in Model 1 plus family situation.

Model 3 includes variables in Model 2 plus mother's labour market status.

Model 4 includes variables in Model 3 plus father's labour market status.

Model 5 includes variables in Model 4 plus mother's income quintile.

Model 6 includes variables in Model 5 plus father's income quintile.

Model 7 includes variables in Model 6 plus owner-occupied dwelling.

When moves to different country groups are distinguished, we can see that the positive association between birth order and emigration relates to free mobility, that is, to emigration to the Nordic countries and to the other Schengen countries, but not to emigration to countries that have travel restrictions (Table 3). When effects of all the control variables are adjusted for, the hazard of emigration to a Nordic country is 8 per cent higher for second borns as compared to first borns, that of third borns 9 per cent higher, and that of fourth borns 13 per cent higher. Fifth- or higher-born siblings have a 8 per cent lower hazard of emigration as compared to first borns, but the difference is not statistically significant. The birth order pattern for emigration to any other Schengen country is also distinct. As compared to first borns, the hazard for second, third, fourth, and fifth or higher borns is 1.10, 1.22, 1.22, and 1.27, respectively. For emigration to any other country, where travel restrictions apply, there is no association with birth order.

Table 3. Hazard ratios for emigration by birth order for each country group, with lower and upper levels of 95% confidence intervals

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order												
1	1			1			1			1		
2	1.07	1.03	1.11	1.08	1.03	1.13	1.10	1.02	1.19	1.01	0.93	1.09
3	1.09	1.02	1.16	1.09	1.01	1.18	1.22	1.06	1.41	0.92	0.79	1.06
4	1.12	1.01	1.24	1.13	0.99	1.28	1.22	0.95	1.57	0.99	0.77	1.26
5+	0.94	0.81	1.08	0.92	0.78	1.09	1.27	0.84	1.90	0.91	0.62	1.34

Adjusted for effects of all control variables (cf. Model 7 in Table 2).

Results for men and women are similar (Table 4). For emigration to all countries, estimates for the hazard ratios between second, third, and fourth borns, as compared to first borns, are for both men and women the same as reported for the gender-neutral case, or 1.07, 1.09, and 1.12. Fifth-born men have a hazard of emigration that is 1.23 that of first-born men, while the corresponding estimate for women is 0.80 and statistically not significant.

There are some discrepancies by sex when we distinguish emigration by country groups, but the overall conclusion is the same as before. For both men and women, the positive association between birth order and emigration relates to emigration to the Nordic countries and to the other Schengen countries with free mobility, but not to emigration to countries that have travel restrictions. For second-born men, the hazard of emigration to a Nordic country is 1.07 that of first-born men, for third borns 1.09, for fourth borns 1.17, and for five or higher borns 1.28. Corresponding estimates for women are 1.08, 1.10, 1.10, and 0.74. The hazard of emigration to any other Schengen country is 1.17 for second-born men as compared to first-born men, 1.34 for third borns, 1.03 for fourth borns, and 1.56 for five or higher borns. Corresponding estimates for women are 1.05, 1.15, 1.33, and 1.09. For emigration to any other country, where travel restrictions apply, there is no birth-order pattern for either men or women.

Table 4. Hazard ratios for emigration by birth order and sex for each country group, with lower and upper levels of 95% confidence intervals

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order, Men												
1	1			1			1			1		
2	1.07	1.01	1.13	1.07	0.99	1.15	1.17	1.04	1.33	0.95	0.83	1.08
3	1.09	1.00	1.18	1.09	0.97	1.21	1.34	1.10	1.62	0.86	0.69	1.05
4	1.12	0.97	1.29	1.17	0.98	1.40	1.03	0.72	1.49	0.94	0.65	1.35
5+	1.23	1.03	1.47	1.28	1.05	1.57	1.56	0.93	2.61	0.65	0.35	1.20
Birth order, Women												
1	1			1			1			1		
2	1.07	1.03	1.12	1.08	1.02	1.15	1.05	0.95	1.16	1.04	0.95	1.15
3	1.09	1.01	1.17	1.10	1.00	1.20	1.15	0.97	1.36	0.95	0.80	1.13
4	1.12	1.00	1.27	1.10	0.95	1.28	1.33	1.00	1.77	1.02	0.76	1.35
5+	0.80	0.68	0.93	0.74	0.61	0.89	1.09	0.68	1.74	1.04	0.69	1.57

The estimates come from models with joint effects between birth order and sex, and which adjust for effects of all other control variables.

Estimates for men and women are based on the same model. We have simply switched the reference group to facilitate reading of the birth order effect within in each sex.

Estimates of the control variables are reported in Table A1 in the Appendix. They refer to the models reported in Table 3, and will not be discussed at length. Since effective estimation requires variation on the characteristics between siblings, effect sizes are generally small, and in most cases weaker than those for birth order. Exceptions are sex and birth year. Women are roughly 2.2 times more likely to emigrate than their male siblings, and persons born in the second part of the 1970s or later are more likely to emigrate than their siblings born in the beginning of the 1970s. There is also some evidence to suggest that, even in terms of a between-siblings comparison of this kind, a less beneficial socioeconomic and demographic position at late childhood is associated with a higher hazard of emigration, although most of these effects are weak.

Results of the robustness check in which we observe persons from age 20, and thus can control also for obtained educational level at this age, corroborate the above findings. As an illustration, the hazard of emigration to all countries is 1.09 for second-born siblings as compared to first-born siblings, 1.12 for third borns, 1.14 for fourth borns, and 0.98 for fifth or higher borns, when all control variables plus educational level have been included. These hazard ratios are thus similar in size to those reported for emigration from age 18, based on models without any control for educational level. Descriptive statistics of these restricted data, and results of the parallel analyses based on them, are found in Tables A2-A6 in the Appendix.

Conclusion

This study has offered insights into the association between birth order and emigration among native-born individuals in Finland. By adopting a family fixed-effects approach and analysing sibling groups, we were able to effectively control for unobserved time-invariant variables and examine within-family dynamics. The results revealed a positive relationship between birth order and emigration, indicating that individuals who are later born within their families are more likely to emigrate compared to their first-born siblings. These findings contribute to our understanding of the factors influencing emigration decisions and shed light on the role of birth order in shaping individual mobility patterns.

The observed gradient in the association between birth order and emigration highlights an intriguing pattern. Second-born individuals exhibit a slightly higher hazard of emigration compared to first borns, and this hazard increases further for third-born and fourth-born individuals.

One potential explanation for the positive association between birth order and emigration is the differential allocation of resources and opportunities within families. First-born children often receive more attention and resources from their parents, providing them with greater stability and opportunities within their home country. This advantage may contribute to a lower likelihood of emigration. In contrast, later-born children may face relatively fewer resources and opportunities, prompting them to seek prospects outside their home country. Thus, birth order could serve as a proxy for differential resource availability and its impact on emigration decisions.

Furthermore, birth order may also reflect variations in personality traits, risk-taking behaviours, and aspirations among individuals. Research has indicated that later-born children often exhibit more adventurous and independent traits compared to their first-born counterparts. These characteristics may influence their inclination to explore new horizons and take risks, increasing the likelihood of emigration. Hence, birth order may intersect with individual characteristics, shaping the emigration decisions of later-born individuals.

Our analysis further revealed that the association between birth order and emigration is primarily driven by moves to Nordic countries and other Schengen countries with free mobility. This finding suggests that birth order might have a more pronounced influence on emigration decisions within regions where individuals enjoy greater ease of movement. In contrast, no significant birth-order pattern emerged in relation to emigration to countries with travel restrictions, indicating that factors beyond birth order might drive emigration to such destinations.

Considering sex differences, the overall patterns of the association between birth order and emigration remain consistent for both men and women, even though women, or girls in the family, are much more likely to emigrate than men, or boys in the same family. This implies that birth order affects emigration decisions irrespective of gender. However, some discrepancies emerge when examining specific country groups. The hazard ratios for emigration to Nordic countries and other Schengen countries show slight variations between men and women, suggesting potential gender-specific factors influencing emigration patterns. Exploring these nuances could provide further insights into the interplay between birth order, sex, and emigration decisions.

Although this study contributes valuable findings to the understanding of birth order and emigration, some important limitations need to be acknowledged. The findings are based on data from native-born individuals in Finland, which is a Nordic welfare state with modest social

disparities, and the lion's share of all emigration in the study population was to other Nordic welfare states with similarly low levels of social stratification. This setting certainly limits the generalisability of the results to many other contexts, such as, for instance, emigration from Mexico to the United States. At first instance, future research can therefore tentatively encompass similar low-fertility and economically developed societies like the one studied here. Register-based analyses conducted on any other Nordic country would make it possible to assess how robust our findings are for somewhat different population compositions and cultural settings.

In conclusion, this study provides evidence of a positive association between birth order and emigration among native-born individuals in Finland. The findings suggest that birth order plays a key role in shaping individuals' decisions to emigrate, with later-born individuals exhibiting a higher likelihood of emigrating. These findings contribute to our understanding of the factors influencing emigration decisions and highlight the importance of considering birth order within the context of family dynamics and individual mobility patterns. Further research, encompassing diverse population, cultural and migration contexts is warranted to deepen our understanding of the underlying mechanisms. This study is to our knowledge the first that has been concerned with differences in emigration risks between siblings within the same family, for a welfare state with modest fertility. It therefore needs to be extended to broader settings. Such research endeavours will enhance our knowledge of the complex interplay between birth order, family dynamics, and migration behaviour in an increasingly mobile world.

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Appendix tables

Table A1. Hazard ratios for emigration for each country group, with lower and upper levels of 95% confidence intervals, estimates for effects of all variables (cf. Table 3)

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order (%)												
1	1			1			1			1		
2	1.07	1.03	1.11	1.08	1.03	1.13	1.10	1.02	1.19	1.01	0.93	1.09
3	1.09	1.02	1.16	1.09	1.01	1.18	1.22	1.06	1.41	0.92	0.79	1.06
4	1.12	1.01	1.24	1.13	0.99	1.28	1.22	0.95	1.57	0.99	0.77	1.26
5+	0.94	0.81	1.08	0.92	0.78	1.09	1.27	0.84	1.90	0.91	0.62	1.34
Birth year (%)												
1970-1974	1			1			1			1		
1975-1979	1.40	1.30	1.50	1.40	1.28	1.53	1.61	1.34	1.93	1.23	1.03	1.47
1980-1984	1.29	1.18	1.42	1.31	1.17	1.47	1.46	1.16	1.84	1.14	0.91	1.43
1985-1989	1.12	1.00	1.27	1.10	0.95	1.28	1.35	1.01	1.80	1.07	0.80	1.42
1990-1994	1.19	1.03	1.38	1.10	0.92	1.33	1.61	1.13	2.29	1.18	0.83	1.68
1995-1999	1.32	1.11	1.59	1.19	0.95	1.49	1.83	1.20	2.80	1.43	0.93	2.20
2000-2002	0.84	0.64	1.11	0.65	0.46	0.92	1.78	0.95	3.33	0.96	0.48	1.90
Sex (%)												
Man	1			1			1			1		
Woman	2.21	2.14	2.28	2.19	2.10	2.28	2.04	1.90	2.20	2.47	2.29	2.66
Family situation (lives with...) (%)												
Both parents and sibling(s)	1			1			1			1		
Both parents but no sibling(s)	0.87	0.82	0.92	0.84	0.78	0.90	0.88	0.77	1.00	0.98	0.85	1.12
Mother and sibling(s)	1.20	1.07	1.33	1.02	0.88	1.18	1.29	1.03	1.63	1.64	1.30	2.07
Mother but no sibling(s)	1.00	0.89	1.13	0.84	0.72	1.00	1.02	0.78	1.32	1.44	1.11	1.87
Father and sibling(s)	1.14	0.96	1.35	1.08	0.86	1.35	1.14	0.78	1.68	1.31	0.91	1.88
Father but no sibling(s)	1.00	0.85	1.19	0.73	0.58	0.92	1.47	1.04	2.08	1.38	0.98	1.95
New family with sibling(s)	1.09	0.98	1.22	0.97	0.84	1.13	1.15	0.92	1.46	1.39	1.09	1.76
New family without sibling(s)	1.04	0.89	1.21	0.93	0.76	1.15	1.08	0.80	1.48	1.26	0.91	1.75
No parent, parents together	1.17	1.03	1.33	1.09	0.92	1.29	1.29	0.97	1.73	1.32	1.01	1.72
No parent, parents separated	1.39	1.21	1.61	1.22	1.00	1.49	1.23	0.91	1.67	2.09	1.55	2.81
Mother's labour market status (%)												
Employed	1			1			1			1		
Unemployed	1.09	1.00	1.18	1.10	0.98	1.22	1.08	0.89	1.30	1.07	0.89	1.29
Outside labour market	1.05	0.97	1.15	1.04	0.94	1.16	1.16	0.95	1.40	0.98	0.81	1.19
Mother not present	0.95	0.72	1.27	0.89	0.59	1.32	1.24	0.70	2.19	0.74	0.39	1.39
Father's labour market status (%)												
Employed	1			1			1			1		
Unemployed	0.97	0.88	1.06	1.04	0.92	1.17	0.77	0.62	0.94	0.97	0.80	1.18
Outside labour market	0.99	0.90	1.08	0.95	0.84	1.06	1.00	0.81	1.23	1.13	0.93	1.39
Father not present	1.13	0.94	1.37	0.97	0.75	1.26	1.49	1.00	2.23	1.19	0.81	1.76
Mother's income quintile (%)												
First	1			1			1			1		
Second	1.01	0.94	1.08	0.99	0.90	1.08	1.06	0.89	1.25	1.05	0.89	1.24
Third	0.92	0.85	1.00	0.93	0.84	1.03	0.95	0.79	1.15	0.88	0.73	1.06
Fourth	0.88	0.81	0.96	0.90	0.81	1.01	0.95	0.77	1.16	0.80	0.65	0.98
Fifth	0.96	0.87	1.06	0.99	0.88	1.13	0.98	0.78	1.23	0.88	0.70	1.10
Mother not present	n.a.			n.a.			n.a.			n.a.		
Father's income quintile (%)												
First	1			1			1			1		
Second	1.01	0.94	1.09	1.06	0.96	1.16	0.88	0.74	1.05	1.02	0.86	1.22
Third	1.01	0.93	1.10	1.02	0.92	1.13	0.98	0.81	1.19	1.01	0.83	1.22
Fourth	0.94	0.86	1.03	0.97	0.87	1.09	0.85	0.69	1.04	0.97	0.79	1.18
Fifth	0.96	0.87	1.06	1.00	0.88	1.13	0.88	0.70	1.10	0.94	0.76	1.17
Father not present	n.a.			n.a.			n.a.			n.a.		
Owner-occupied dwelling (%)												
Yes	1			1			1			1		
No	0.94	0.88	1.01	0.94	0.85	1.03	0.96	0.82	1.12	0.95	0.81	1.11

Table A2. Descriptive statistics of the study population when observed from age 20

Birth order (%)	
1	42.1
2	40.2
3	13.0
4	3.0
5+	1.7
Birth year (%)	
1970-1974	11.2
1975-1979	18.3
1980-1984	20.8
1985-1989	20.3
1990-1994	19.9
1995-1999	9.3
2000-2002	0.3
Sex (%)	
Man	51.2
Woman	48.8
Family situation (lives with...) (%)	
Both parents and sibling(s)	58.3
Both parents but no sibling(s)	10.5
Mother and sibling(s)	10.2
Mother but no sibling(s)	3.4
Father and sibling(s)	2.0
Father but no sibling(s)	1.4
New family with sibling(s)	7.2
New family without sibling(s)	1.7
No parent, parents together	2.0
No parent, parents separated	3.2
Mother's labour market status (%)	
Employed	83.6
Unemployed	7.6
Outside labour market	7.8
Mother not present	1.0
Father's labour market status (%)	
Employed	81.7
Unemployed	7.5
Outside labour market	7.6
Father not present	3.3
Mother's income quintile (%)	
First	20.6
Second	20.9
Third	20.3
Fourth	19.2
Fifth	17.9
Mother not present	1.0
Father's income quintile (%)	
First	20.0
Second	20.3
Third	19.5
Fourth	18.9
Fifth	18.1
Father not present	3.3
Owner-occupied dwelling (%)	
Yes	79.4
No	20.6
Educational level at age 19	
Primary	30.9
Secondary, no matriculation examination	25.1
Secondary, matriculation examination	44.0
Number of moves to	
A Nordic country	15,647
Any other Schengen country	5,533
Any other country	5,399
Number of sibling groups	515,057
Number of siblings	1,262,416
Number of person years	7,107,672

The description refers to the complete cohorts, i.e., full-sibling groups with at least two siblings, in which all siblings were born 1970-2002, observed in 1987-2020, and followed from age 20.

All variables except birth order, birth year and sex refer to the ego's situation at age 17.

Table A3. Hazard ratios for emigration by birth order, with lower and upper levels of 95% confidence intervals, when observed from age 20

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7			Model 8		
Birth order																								
1	1			1			1			1			1			1			1			1		
2	1.06	1.02	1.10	1.06	1.03	1.10	1.07	1.03	1.10	1.07	1.03	1.11	1.07	1.03	1.11	1.07	1.03	1.11	1.07	1.03	1.11	1.09	1.05	1.13
3	1.07	1.00	1.14	1.07	1.00	1.15	1.07	1.01	1.15	1.07	1.01	1.15	1.08	1.01	1.15	1.08	1.01	1.15	1.08	1.01	1.15	1.12	1.04	1.19
4	1.10	0.98	1.23	1.09	0.98	1.22	1.09	0.98	1.22	1.09	0.98	1.22	1.10	0.98	1.23	1.10	0.99	1.23	1.10	0.99	1.23	1.14	1.02	1.28
5+	0.94	0.80	1.10	0.92	0.79	1.07	0.92	0.79	1.08	0.92	0.79	1.08	0.93	0.79	1.09	0.93	0.80	1.09	0.93	0.80	1.09	0.98	0.84	1.15

Model 1 includes birth year and sex.

Model 2 includes variables in Model 1 plus family situation.

Model 3 includes variables in Model 2 plus mother's labour market status.

Model 4 includes variables in Model 3 plus father's labour market status.

Model 5 includes variables in Model 4 plus mother's income quintile.

Model 6 includes variables in Model 5 plus father's income quintile.

Model 7 includes variables in Model 6 plus owner-occupied dwelling.

Model 8 includes variables in Model 7 plus educational level.

Table A4. Hazard ratios for emigration by birth order for each country group, with lower and upper levels of 95% confidence intervals, when observed from age 20

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order												
1	1			1			1			1		
2	1.09	1.05	1.13	1.10	1.05	1.15	1.16	1.07	1.25	0.99	0.91	1.08
3	1.12	1.04	1.19	1.14	1.04	1.24	1.31	1.13	1.53	0.87	0.74	1.02
4	1.14	1.02	1.28	1.14	0.99	1.31	1.34	1.03	1.74	0.95	0.73	1.24
5+	0.98	0.84	1.15	0.98	0.81	1.19	1.28	0.83	1.98	0.83	0.55	1.26

Adjusted for effects of all control variables (cf. Model 10 in Table A3).

Table A5. Hazard ratios for emigration by birth order and sex for each country group, with lower and upper levels of 95% confidence intervals, when observed from age 20

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order, Men												
1	1			1			1			1		
2	1.09	1.03	1.16	1.10	1.02	1.19	1.25	1.10	1.43	0.92	0.80	1.05
3	1.11	1.02	1.22	1.13	1.00	1.27	1.42	1.16	1.74	0.81	0.65	1.01
4	1.17	1.00	1.37	1.23	1.02	1.49	1.18	0.80	1.73	0.91	0.61	1.34
5+	1.29	1.06	1.56	1.32	1.05	1.66	1.84	1.07	3.15	0.65	0.33	1.26
Birth order, Women												
1	1			1			1			1		
2	1.09	1.04	1.14	1.10	1.03	1.17	1.09	0.98	1.21	1.04	0.94	1.16
3	1.12	1.03	1.21	1.15	1.03	1.27	1.24	1.04	1.48	0.91	0.76	1.09
4	1.12	0.98	1.28	1.09	0.92	1.29	1.43	1.05	1.94	0.98	0.72	1.33
5+	0.82	0.68	0.98	0.80	0.64	0.99	0.97	0.58	1.64	0.93	0.59	1.46

The estimates come from models with joint effects between birth order and sex, and which adjust for effects of all other control variables.

Estimates for men and women are based on the same model. We have simply switched the reference group to facilitate reading of the birth order effect within in each sex.

Table A6. Hazard ratios for emigration for each country group, with lower and upper levels of 95% confidence intervals, estimates for effects of all variables, when observed from age 20 (cf. Table A4)

	All countries			Any Nordic country			Any other Schengen country			Any other country		
Birth order												
1	1			1			1			1		
2	1.09	1.05	1.13	1.10	1.05	1.15	1.16	1.07	1.25	0.99	0.91	1.08
3	1.12	1.04	1.19	1.14	1.04	1.24	1.31	1.13	1.53	0.87	0.74	1.02
4	1.14	1.02	1.28	1.14	0.99	1.31	1.34	1.03	1.74	0.95	0.73	1.24
5+	0.98	0.84	1.15	0.98	0.81	1.19	1.28	0.83	1.98	0.83	0.55	1.26
Birth year												
1970-1974	1			1			1			1		
1975-1979	1.37	1.27	1.48	1.38	1.25	1.52	1.54	1.28	1.86	1.22	1.02	1.46
1980-1984	1.18	1.07	1.31	1.17	1.03	1.33	1.35	1.06	1.71	1.10	0.87	1.39
1985-1989	0.99	0.87	1.13	0.94	0.80	1.11	1.23	0.91	1.67	1.02	0.75	1.38
1990-1994	1.06	0.90	1.24	0.94	0.77	1.16	1.44	0.99	2.08	1.18	0.81	1.71
1995-1999	1.12	0.92	1.36	0.96	0.75	1.24	1.51	0.97	2.37	1.39	0.87	2.19
2000-2002	0.62	0.41	0.91	0.55	0.33	0.91	0.90	0.36	2.27	0.64	0.25	1.64
Sex												
Man	1			1			1			1		
Woman	1.96	1.89	2.03	1.90	1.81	1.98	1.84	1.70	1.99	2.35	2.17	2.55
Family situation (lives with...)												
Both parents and sibling(s)	1			1			1			1		
Both parents but no sibling(s)	0.93	0.87	0.99	0.90	0.83	0.97	0.90	0.78	1.03	1.04	0.90	1.20
Mother and sibling(s)	1.18	1.05	1.32	1.03	0.88	1.21	1.25	0.98	1.59	1.52	1.18	1.95
Mother but no sibling(s)	1.06	0.93	1.21	0.89	0.74	1.07	1.06	0.81	1.39	1.50	1.14	1.98
Father and sibling(s)	1.12	0.93	1.35	1.07	0.83	1.37	1.10	0.73	1.65	1.26	0.85	1.87
Father but no sibling(s)	1.03	0.86	1.23	0.77	0.59	0.99	1.40	0.97	2.02	1.34	0.92	1.95
New family with sibling(s)	1.09	0.96	1.23	1.00	0.85	1.18	1.09	0.85	1.40	1.34	1.03	1.74
New family without sibling(s)	1.08	0.92	1.27	1.04	0.83	1.32	1.01	0.72	1.40	1.25	0.88	1.77
No parent, parents together	1.26	1.10	1.45	1.17	0.97	1.41	1.35	0.99	1.84	1.42	1.06	1.90
No parent, parents separated	1.36	1.16	1.60	1.21	0.97	1.52	1.27	0.92	1.77	1.88	1.36	2.61
Mother's labour market status												
Employed	1			1			1			1		
Unemployed	1.08	0.99	1.18	1.09	0.97	1.23	1.06	0.87	1.30	1.07	0.87	1.31
Outside labour market	1.03	0.94	1.12	1.02	0.90	1.15	1.11	0.91	1.37	0.95	0.78	1.17
Mother not present	0.92	0.67	1.27	0.90	0.58	1.40	1.31	0.71	2.44	0.51	0.24	1.08
Father's labour market status												
Employed	1			1			1			1		
Unemployed	0.96	0.87	1.06	1.06	0.93	1.20	0.74	0.59	0.92	0.94	0.76	1.16
Outside labour market	0.99	0.90	1.09	0.95	0.83	1.08	1.04	0.83	1.30	1.08	0.87	1.34
Father not present	1.03	0.84	1.28	0.88	0.66	1.18	1.23	0.78	1.93	1.24	0.80	1.91
Mother's income quintile												
First	1			1			1			1		
Second	1.00	0.93	1.08	0.99	0.90	1.09	1.05	0.88	1.26	1.02	0.86	1.21
Third	0.91	0.83	0.99	0.92	0.82	1.03	0.95	0.78	1.16	0.85	0.70	1.03
Fourth	0.88	0.80	0.97	0.92	0.81	1.04	0.93	0.75	1.15	0.79	0.63	0.97
Fifth	0.96	0.86	1.07	1.02	0.89	1.18	0.95	0.75	1.21	0.85	0.66	1.08
Mother not present	n.a.			n.a.			n.a.			n.a.		
Father's income quintile												
First	1			1			1			1		
Second	1.02	0.94	1.11	1.07	0.96	1.19	0.90	0.75	1.08	1.02	0.85	1.23
Third	1.03	0.95	1.13	1.04	0.93	1.17	1.05	0.85	1.28	1.01	0.83	1.24
Fourth	0.95	0.86	1.04	0.97	0.86	1.10	0.85	0.69	1.06	0.99	0.80	1.22
Fifth	0.96	0.87	1.07	1.00	0.87	1.15	0.89	0.70	1.12	0.94	0.75	1.19
Father not present	n.a.			n.a.			n.a.			n.a.		
Owner-occupied dwelling												
Yes	1			1			1			1		
No	0.94	0.87	1.01	0.95	0.86	1.06	0.92	0.77	1.08	0.93	0.79	1.10
Educational level at age 19												
Primary	1			1			1			1		
Secondary, no matriculation examination	0.83	0.79	0.88	0.89	0.82	0.95	0.77	0.67	0.88	0.70	0.61	0.80
Secondary, matriculation examination	1.32	1.26	1.38	1.30	1.23	1.38	1.46	1.32	1.61	1.27	1.15	1.40

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