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Saarela, Jan; Turunen, Jani

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Born to move? Birth order and emigration

Jan Saarela^{a,*}, Jani Turunen^b^a Åbo Akademi University, Strandgatan 2, 65100, Vasa, Finland^b Södertörns Högskola and Stockholm University, Sweden

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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 genders. 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.

1. 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. Many, but not all, have 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 (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 (Black et al., 2005; Bjerkedal et al., 2007; Kristensen and Bjerkedal 2007; Barclay 2015a, 2015b). The findings are nevertheless complex. There is also some evidence which suggests that later-born children have better health endowments at birth, and that the initial health inequalities extend into middle childhood (Björkegren and Svaleryd 2023; Pruckner et al., 2021).

A number of potential explanations to the 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;

* Corresponding author.

E-mail addresses: jan.saarela@abo.fi (J. Saarela), jani.turunen@sh.se (J. Turunen).

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Strachan 1989; Hertwig et al., 2002; Riordan et al., 2006; Batty et al., 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 J, 2000; Tucker et al., 2013). It has also been suggested that, at adolescence, later-born siblings engage in more risky health-related behaviours (Björkegren and Svaleryd 2023).

A particularly influential theory that relates to 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 would then lead 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. That would in turn allow them to discover an unfilled niche within the family, meaning that first borns would be more conservative, while later borns more rebellious and liberal (Sulloway and Zweigenhaft 2010). More recent research has challenged these arguments, and showed that birth order has no effect on risk-taking (Lejarraga et al., 2019). Likewise, effects of birth order on personality are have in some studies been found generally absent or small (Damian and Roberts 2015; Rohrer et al., 2015, 2017).

If the argument about an interrelation between risk-taking and birth order 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 (Taylor 1986). The antecedents of migration, and particularly migration abroad, have been documented in many studies on various contexts (King 2002). Migration between highly economically 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 1999). There is also a considerable degree of uncertainty and risk involved in this context (Saarela and Rooth 2012).

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). However, 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 (Abramitzky et al., 2013), and some research on birth order and migration from Mexico to the United States (Bratti et al., 2020). The overall conclusion from those studies, which analyse large-family 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 our knowledge, there has not been any study of the importance of birth order on emigration from a highly economically 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 may 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.

2. 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 et al., 1999; Beer and Horn 2000), and score higher on neuroticism (Cole, 2014), 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 et al., 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, or small, personality differences by birth order (Damian and Roberts 2015; Rohrer et al., 2015, 2017).

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 (WHO 2024), with a smaller social and economic divide than practically any other western society. This is largely due to a homogeneous and historically stable population. 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 2023). The gender difference likely reflects the independence and opportunities women in Finland are provided, rather than any obstacles or impediments on the labour market. Female labour force participation is at the same level as that of males, and Finnish women are even higher educated than Finnish men. We thus set out to test the hypothesis that, in this context, emigration may be positively associated with birth order.

We will study migration to countries where Finns can immigrate without restrictions, that is, the neighbouring Nordic countries and other countries in the European Union's Schengen area, separately from migration to countries outside this area, where there are hindrances to immigration. This exercise is explorative in nature. On the one hand, one may argue that the proposed link between birth order and emigration would be more visible for destinations where people can migrate freely, simply because there are no hindrances. On the other hand, if emigration to countries with requirements for immigration is riskier and more adventurous, and later borns are more risk-taking and adventurous than earlier borns, the proposed link would be more visible for those countries.

We will evaluate also whether any association between birth order and emigration is similar for women and men. We expect this to be the case, considering that we study a highly gender-equal society with modest social and economic divides. Any issues related to integration or other difficulties experienced by immigrants are circumvented as we analyse native-born persons only.

3. 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).¹

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, also known as stratified Cox models. 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 control for all unobserved time-invariant factors that are shared by siblings within a family (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.

The general hazard function $h_g(t, X)$ that is estimated can be described as

$$h_g(t, X) = h_{0g}(t) \exp[\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p]$$

The stratas, or in our case, families, are given by $g = 1, 2, \dots, k$. The categorical variable birth order is represented by X_1 and its associated coefficients by β_1 . The other (categorical) variables, which are described in more detail below, are referred to as X_2, \dots, X_p . Their associated coefficients are given by β_2, \dots, β_p . We thus estimate different baseline hazard functions $h_{0g}(t)$, while the coefficients $\beta_1, \beta_2, \dots, \beta_p$ are the same for each family.

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 that are part of the current Schengen area, and (3) to all other countries, where travel restrictions apply. The latter group is admittedly heterogeneous, and consists of countries around the world with varying degrees of economic

¹ 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.

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
Gender (%)	
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	6122
Any other country	6053
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 gender refer to the ego's situation at age 17. The number of emigrants among first, second, third, fourth, and fifth or higher borns is 13,092, 12,623, 3,942, 909, and 626, respectively.

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 gender.

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.

development. Moves to the three different 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. 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, 6122 moves to any other Schengen country, and 6053 moves to a country elsewhere in the world.

Control variables used are each sibling’s birth year, gender, 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 gender and birth order are interacted.

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 distinguishes 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.

4. 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 gender 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.

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). Estimates for different country groups do not generally differ from one another, however. 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.

Results for men and women are in most cases 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. However, in the study population there are few persons with such high birth orders, meaning that at the population level, the consequences of this specific gender difference are small.

There are some small discrepancies by gender when we distinguish emigration by country groups, but the overall conclusion is the

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).

P-values from tests for whether the estimate for second borns for Any Nordic country (1.08) is statistically different from that for second borns for Any other Schengen country (1.10) is 0.67, for third borns 0.19, for fourth borns 0.58, and borns 0.21. Corresponding numbers for comparisons between Any Nordic country for fifth or higher and Any other country are 0.13, 0.03, 0.33, and 0.97, and for comparisons between Any other Schengen country and Any other country 0.12, 0.01, 0.24, and 0.27.

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
p-value for difference												
2				0.73			0.17			0.23		
3				0.87			0.25			0.42		
4				0.58			0.29			0.73		
5+				0.00			0.33			0.19		

The estimates come from models with joint effects between birth order and gender, 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 gender. p-value for difference refers to tests for whether each estimate for men is statistically different from that for women.

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.

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 gender 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.

5. Discussion

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. Some research has indicated that later-born children may exhibit more adventurous and independent traits compared to their first-born counterparts (Sulloway 1996; Sulloway and Zweigenhaft 2010). These characteristics may influence their inclination to explore new horizons and take risks, increasing the likelihood of emigration. Birth order would then intersect with individual characteristics, shaping the emigration decisions of later-born individuals. However, more recent research has challenged these arguments, and showed that birth order has no effect on risk-taking (Lejarraga et al., 2019), and only small effects on personality (Damian and Roberts 2015; Rohrer et al., 2015, 2017).

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. From the administrative data used here, we cannot determine what are the underlying causes behind these country group differences. It is plausible that the less consistent findings for emigration to countries outside the current Schengen area is because the group is very heterogeneous. Countries in this category span from highly economically developed countries, like the United States, to various less economically developed countries. The number of moves to specific such countries is too small for facilitating any rigorous analysis of the type undertaken here.

Considering gender 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 suggests that birth order seem to affect emigration decisions irrespective of gender. The only exceptions are for fifth or higher borns, for whom the estimates for emigration to any country and to any Nordic country, respectively, are largely positive for men and largely negative for women. In the study population, there are nevertheless few persons with such high birth orders, meaning that at the population level, the consequences of this gender difference are small.

Although this study contributes valuable findings to the understanding of birth order and emigration, some important limitations need to be acknowledged. The data used did not contain any direct measures of personality or risk-taking, which would have been necessary to truly understand the causal mechanisms behind birth order and emigration. Furthermore, the findings are based on data from native-born individuals in Finland, which is a Nordic welfare state with modest social disparities. 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.

6. Conclusions

In conclusion, this study provides some evidence of a positive association between birth order and emigration among native-born individuals in Finland. The findings suggest that birth order might play an important 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, and data with measures of personality and risk aversion, 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.

Ethics in publishing

This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

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CRediT authorship contribution statement

Jan Saarela: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Jani Turunen:** Writing – review & editing, Project administration, Funding acquisition.

Declaration of competing interest

None.

Appendix

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
Gender												
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
Gender (%)	
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	5533
Any other country	5399
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 gender 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 gender.

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 8 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 gender, 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 gender.

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
Gender												
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

References

Abramitzky, R., Boustan, L.P., Eriksson, K., 2013. Have the poor always been less likely to migrate? Evidence from inheritance practices during the age of mass migration. *J. Dev. Econ.* 102, 2–14.
 Adler, A., 1928. Characteristics of the first, second, and third child. *Children* 3, 14–52.

- Barclay, K.J., 2014. "The Long-Term Impact of Birth Order on Health and Educational Attainment." Stockholm Studies in Sociology New Series 59. Department of Sociology, Stockholm University. Doctoral Thesis.
- Barclay, K.J., 2015a. Birth order and educational attainment: evidence from fully adopted sibling groups. *Intelligence* 48, 109–122.
- Barclay, K.J., 2015b. A within-family analysis of birth order and intelligence using population conscription data on Swedish men. *Intelligence* 49, 134–143.
- Barclay, K.J., Hällsten, M., Myrskylä, M., 2017. Birth order and college major in Sweden. *Soc. Forces* 96, 629–660.
- Barclay, K., Myrskylä, M., 2014. Birth order and physical fitness in early adulthood: evidence from Swedish military conscription data. *Soc. Sci. Med.* 123, 141–148.
- Batty, G.D., Deary, J.J., Gottfredson, L.S., 2007. Premorbid (early life) IQ and later mortality risk: systematic review. *Ann. Epidemiol.* 17, 278–288.
- Beer, J.M., Horn, J.M., 2000. The influence of rearing order on personality development within two adoption cohorts. *J. Pers.* 68, 789–819.
- Bjerkedal, T., Kristensen, P., Skjeret, G.A., Brevik, J.I., 2007. Intelligence test scores and birth order among young Norwegian men (conscripts) analyzed within and between families. *Intelligence* 35, 503–514.
- Björkegren, E., Svaleryd, H., 2023. Birth order and health disparities throughout the life course. *Soc. Sci. Med.* 318, 115605.
- Black, S.E., Devereux, P.J., Salvanes, K.G., 2005. The more the merrier? The effect of family size and birth order on children's education. *Q. J. Econ.* 120, 669–700.
- Blake, P.E., 1981. Family size and the quality of children. *Demography* 18, 421–442.
- Borjas, G.J., 1999. The economic analysis of immigration. In: Ashenfelter, O., Card, D. (Eds.), *Handbook of Labor Economics*, 3A. North Holland, Amsterdam, pp. 1697–1760.
- Bratti, M., Fiore, S., Mendoza, M., 2020. The impact of family size and sibling structure on the great Mexico-USA migration. *J. Popul. Econ.* 33, 483–529.
- Cole, E.M., 2014. Birth Order: an Examination of its Relationship with the Big Five Personality Theory and Trait Emotional Intelligence. University College London.. Doctoral Thesis.
- Damian, R.I., Roberts, B.W., 2015. The associations of birth order with personality and intelligence in a representative sample of US high school students. *J. Res. Pers.* 58, 96–105.
- Dixon, M.M., Reyes, C.J., Leppert, M.F., Pappas, L.M., 2008. Personality and birth order in large families. *Pers. Individ. Differ.* 44, 119–128.
- Grätz, M., Torche, F., 2016. Compensating or reinforcing? The stratification of parental responses to children's early ability. *Demography* 53, 1883–1904.
- Healey, M.D., Ellis, B.J., 2007. Birth order, conscientiousness, and openness to experience: tests of family-niche model of personality using a within-family methodology. *Evol. Hum. Behav.* 28, 55–59.
- Hertwig, R., Davis, J., Sulloway, F., 2002. Parental investment: how an equity motive can produce inequality. *Psychol. Bull.* 128, 728–745.
- Holland, J.L., 1985. *Making Vocational Choices: A Theory of Vocational Personalities and Work Environments*. Prentice Hall, Englewood Cliffs, NJ.
- Holland, J.L., 1996. Exploring careers with A typology: what we have learned and some new directions. *Am. Psychol.* 51, 397–406.
- Jonsson, J.O., Grusky, D.B., Di Carlo, M., Pollak, R., Brinton, M.C., 2009. Micro-class mobility: social reproduction in four countries. *Am. J. Sociol.* 114, 977–1036.
- King, R., 2002. Towards a new map of European migration. *Int. J. Popul. Geogr.* 8, 89–106.
- Kristensen, P., Bjerkedal, T., 2007. Explaining the relation between birth order and intelligence. *Science* 316, 1717.
- Kulu, H., Milewski, N., 2007. Family change and migration in the life course: an introduction. *Demogr. Res.* 17, 567–590.
- Laband, D.N., Lentz, B.F., 1983. Like father, like son: toward an economic theory of occupational following. *South. Econ. J.* 50, 474–493.
- Lejarraga, T., Frey, R., Schnitzlein, D.D., Hertwig, R., 2019. No effect of birth order on adult risk taking. In: *Proceedings of the National Academy of Sciences*, pp. 6019–6024, 116.
- Paulhus, D.L., Trapnell, P.D., Chen, D., 1999. Birth-order effects on personality and achievement within families. *Psychol. Sci.* 10, 482–488.
- Pruckner, G.J., Schneeweis, N., Schober, T., Zweimüller, M., 2021. Birth order, parental health investment, and health in childhood. *J. Health Econ.* 76, 102426.
- Reini, K., Saarela, J., 2023. Birth order and sickness absence: register-based evidence from Finland. *PLoS One* 18, e0280532.
- Riordan, D.V., Morris, C., Hattie, J., Stark, C., 2012. Family size and perinatal circumstances as mental health risk factors in a scottish birth cohort. *Soc. Psychiatr. Psychiatr. Epidemiol.* 47, 975–983.
- Riordan, D.V., Selvaraj, S., Stark, C., Gilbert, J.S.E., 2006. Perinatal circumstances and risk of offspring suicide. *Br. J. Psychiatry* 189, 502–507.
- Rohrer, J.M., Egloff, B., Schmukle, S.C., 2015. Examining the effects of birth order on personality. *Proc. Natl. Acad. Sci. USA* 112, 14224–14229.
- Rohrer, J.M., Egloff, B., Schmukle, S.C., 2017. Probing birth-order effects on narrow traits using specification-curve analysis. *Psychol. Sci.* 28, 1821–1832.
- Rostila, M., Saarela, J., Kawachi, I., 2014. Birth order and suicide in adulthood: evidence from Swedish population data. *American Journal of Epidemiology* 179, 1450–1457.
- Saarela, J., Rooth, D.-O., 2012. Uncertainty and international return migration: some evidence from linked register data. *Appl. Econ. Lett.* 19, 1893–1897.
- Silles, M.A., 2010. The implications of family size and birth order for test scores and behavioral development. *Econ. Educ. Rev.* 29, 795–803.
- Strachan, D.P., 1989. Hay fever, hygiene, and household size. *Br. Med. J.* 299, 1259–1260.
- Sulloway, F.J., 1996. *Born to Be Rebel: Birth Order, Family Dynamics, and Creative Lives*. Little, Brown, and Company, London, United Kingdom.
- Sulloway, F.J., Zweigenhaft, R.L., 2010. Birth order and risk taking in athletics: a meta-analysis and study of major league baseball. *Pers. Soc. Psychol. Rev.* 14, 402–416.
- Taylor, J., 1986. Differential migration, networks, information and risk. In: Stark, O. (Ed.), *Research In Human Capital And Development*, Volume 4, Migration, Human Capital, and Development. JAI Press, Greenwich, CT, pp. 147–171.
- Tucker, C.J., Finkelhor, D., Turner, H., Shattuck, A., 2013. Association of sibling aggression with child and adolescent mental health. *Pediatrics* 132, 79–84.
- Weber, R., Saarela, J., 2023. Who migrates and who returns in a context of free mobility? An analysis of the reason for migration, income and family trajectories. *Eur. J. Popul.* 39, 17.
- WHO, 2024. *Gender Inequality Index (GII)*. World Health Organization. <https://www.who.int/>.
- Zajonc, R.B., 1976. Family configuration and intelligence. *Science* 192, 227–236.
- Zweigenhaft, R.L., Von Ammon, J., 2000. Birth order and civil disobedience: a test of sulloway's "born to rebel" hypothesis. *J. Soc. Psychol.* 140, 624–627.