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One Order Fits All? Birth Order and Education in Immigrant Families

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KEYWORDS: Birth order; immigration; education; school points; grades; siblings;

RUNNING HEAD: One Order Fits All?

APPROX. WORD COUNT: 7 989

ACKNOWLEDGEMENTS: Data for this paper stems from the SEGREGATION project [grant number: RCN project #202479], funded by the Research Council of Norway. The authors thank Torkild Hovde Lyngstad, Gunn Elisabeth Birkelund, Nicolai Topstad Borgen and the research unit Social Inequalities and Population Dynamics (SIPD) at University of Oslo for their helpful comments.

NOTE: The authors would like to print in black and white in the print version of the journal, and in colour in the online version. Both versions have been uploaded to manuscript central

Abstract:

Birth order causes social inequality between siblings. In Western countries, earlier-born perform better than later-born. In non-Western countries however, earlier-born generally perform worse than later-born. We use administrative data to compare birth order effects between the native population and Norwegian-born children of immigrants (450,864 individuals nested within 202,191 families). The outcome is based on lower secondary school points - a combined measurement of all marks at the end of compulsory education. We found negative effects of birth order on school points for Norwegian natives. This finding is in line with previous studies from Western countries using measures of educational achievement. Birth order effects amongst Norwegian-born children of immigrant parents vary according to maternal country of origin, with some displaying similar effects as natives and others displaying no birth order effects. These findings are surprising in light of the main theories on birth order, which are universalistic and do not predict group-differences. We argue that the universalistic theories need to be supplemented to account for our findings, and discuss the potential importance of cultural variation in family related behaviours such as strategic parenting, kindergarten attendance, and peer-influence in high-achieving immigrant groups

Introduction

Birth order effects have received widespread research attention over the last 15 years. Most studies document that earlier-born perform better than later-born in an array of socioeconomic outcomes in Western countries (Barclay, 2014; Barclay, Hällsten, & Myrskylä, 2016; Black, Devereux, & Salvanes, 2005; Black, Grönqvist, & Öckert, 2016; Härkönen, 2014; Kristensen & Bjerkedal, 2007, 2010). This research has shown that birth order effects cause socioeconomic differences within families, an important part of the overall picture of social inequality (Conley, 2005). There are two main theories that attempt to explain birth order effects: the resource dilution theory (Blake, 1981, 1986, 1989) and the confluence theory (R. B. Zajonc, 1976, 1983; R. Zajonc & Markus, 1975). These theories explain birth order effects as arising from parental resource allocation between siblings, and between-sibling differences in the intellectual climate of the family respectively. Both theories explain birth order effects in a universalistic manner; implying that one should expect to find negative birth order differences in nuclear families in any context.

Research based on data from some non-Western countries have provided evidence for negative birth order effects (Abafita & Kim, 2015; Calimeris & Peters, 2017; Fors & Lindskog, 2017). However, many studies find positive birth order effects (De Haan, Plug, & Rosero, 2014; Ejrnæs & Pörtner, 2004; Kumar, 2016; Tenikue & Verheyden, 2010) as well as non-linear or no birth order effects (Dammert, 2010; Dayioğlu, Kirdar, & Tansel, 2009; Seid & Gurmu, 2015) on socioeconomic outcomes. These studies encompass outcomes such as pre-school cognition, school enrolment, school attendance and years of completed education.

These findings contrast those of the studies based on Western data and therefore pose a challenge to the universalistic birth order theories. In some cases the absence of negative birth order effects are likely to be linked to contextual factors such as poverty and child labour that are less relevant in developed countries. On the other hand, the disparity may be related

to differences in family practices across different countries. Importantly, such differences are likely to be exhibited by immigrants in their new host countries.

In this paper, we examine birth order effects in immigrant families in Norway in an attempt to unpack parts of this puzzle. This is important for a number of reasons. First, by studying families that have immigrated we contribute to a better understanding of birth order effects. In particular, we want to investigate whether the universalistic theories hold in this context and whether there is evidence of any cultural variation. Second, to the best of our knowledge, there have been no studies on birth order effects in immigrant families. We do not know if within-family differences in the form of birth order effects actually exist in these families, and within-family differences are an important source of social inequality. Third, most Western populations are characterised by sub-replacement fertility (Goldstein, Lutz, & Testa, 2004; Lesthaeghe, 2010). Population growth is therefore being upheld by immigrants ("Population and population change statistics - Statistics Explained," 2017), who typically arrive at a young age and have higher fertility rates than the native populations (Sobotka, 2008). This difference in fertility rate implies that immigrants and their descendants comprise an increasing proportion of Western populations. A consequence is that immigrant families have more children with higher birth orders, and birth order effects could have a substantial negative impact on later-born children among immigrants. This in turn could influence the average socioeconomic outcomes of minority groups on an aggregated level.

Previous Research and Theory

Birth order has an impact on a range of outcomes such as income (Behrman & Taubman, 1986; Bertoni & Brunello, 2016; Lindahl, 2008), intelligence (Barclay, 2014; Black, Devereux, & Salvanes, 2011; Boomsma et al., 2008; Kristensen & Bjerkedal, 2007; Sundet, 2014) and educational achievement (Barclay, 2015; Black et al., 2005; Booth & Kee, 2009; de Haan, 2010; Härkönen, 2014; Kristensen & Bjerkedal, 2010; Silles, 2010). In the

last 15 years, studies based on rigorous analytical approaches and high quality data have confirmed the existence of birth order effects beyond a reasonable doubt. This contrasts with the period before the 2010s when debates raged over the claim that birth order effects result from statistical designs that cannot differentiate causally between birth order and family size/Flynn-effects (Rodgers, 2001, 2014; Rodgers, Cleveland, van den Oord, & Rowe, 2000; Wichman, Rodgers, & Maccallum, 2007).

Birth order effects are real, but there are still many unanswered questions. The vast majority of birth order studies have used data from Western countries, typically utilizing samples that do not take variation according to immigrant status into account. As Western countries are arguably culturally homogenous, it is perhaps not surprising that theoretical explanations point to general mechanisms and that deriving expectations about group-differences is difficult based on most existing theories.

There are several theories about birth order, but two in particular receive the most scholarly interest: *Resource dilution theory* and *confluence theory*. The starting point of the resource dilution theory is that parents have a finite amount of resources (Blake, 1981, 1986, 1989). The theory refers to three main types of resources: 1) *physical environment* — cultural objects, a home, etc.; 2) *opportunities* — to engage with the outside world, have a walk, etc. and 3) *treatments* — personal attention, teaching, etc. (Blake, 1981). The latter is probably the most important for educational outcomes (Conley, 2005). The amount of available resources varies with birth order, as more children means that parents have more mouths to feed and more brains to train. Relative to their later-born siblings, earlier-born children will have had more of their parents` resources exclusively available and their parents will have spent more quality time with them. This affects their outcomes in later stages of life, where earlier-born children display higher levels of intelligence, educational attainment and income. Some studies have indicated that earlier-born children receive more economic (de Haan, 2010) and

cultural (Price, 2008) resources from their parents. Still, the evidence pointing towards resource dilution as the prime driver of birth order effects is far from conclusive. Other studies find that intra-familiar differences in the allocation of resources do not necessarily explain birth other effects fully, and that other factors need to be taken into account (Monfardini & See, 2012; Workman, 2017).

The confluence theory is built upon the same rationale as the resource dilution theory, with a slight twist. According to this theory, it is not the resources that matter, but the psychological climate in the family (R. B. Zajonc, 1983). Each additional child born implies a lowering of the overall intellectual environment in the family, affecting all siblings (R. Zajonc & Markus, 1975). As in the resource dilution theory, earlier-born children will initially have spent more time in a higher intellectual climate. With the arrival of a second-born sibling the intellectual climate in the family is lowered for the first-born. After the birth of the second sibling, however, the intellectual climate is better for the second-born compared to the first-born. This is because the intellectual climate for the second-born is the average of both parents and the first-born, whereas the intellectual climate for the first-born is the average of both parents and the younger second-born sibling. In addition, a "teaching-effect" is also proposed (R. B. Zajonc & Sulloway, 2007), which implies that older siblings learn more from teaching their younger siblings, than younger siblings benefit from being taught. This "tutoring effect" outweighs that the second-borns experience a more stimulating intellectual climate as the children become older. Therefore first-born excel socioeconomically later in life compared to their younger siblings. Spacing between siblings also matters, and the birth order effects can be nullified or even reversed if the age gaps are big enough (R. B. Zajonc, 1976). This nullification is theoretically predicted to occur if the age gap between siblings is 11 ± 2 years.

Another set of theories explain birth order effects as a result of biological differences arising in the womb (Almond & Currie, 2011; Gualtieri & Hicks, 1985). However, these theories have been dealt a blow in recent years (Barclay, 2015; Black, Devereux, & Salvanes, 2015; Brenøe & Molitor, 2017; Kristensen & Bjerkedal, 2007, 2010).

Other theories include a more general role- or personality-theory (e.g. Conley, 2005; Sulloway, 1996), as well as theories emphasising strategic parenting that lead to differential treatment of children according to birth order (Hotz & Pantano, 2015; Pavan, 2016). Mothers may also display behavioural differences at the pre-natal stage. For example, some studies indicate that mothers are more likely to exhibit potentially detrimental behaviours such as smoking during the pregnancy and breast-feeding less at higher birth orders (Buckles & Kolka, 2014; Lundberg et al., 2009).

Finally, a cultural origin of birth order effects in (parts of) the West has been proposed, as such effects could reflect behaviours associated with a cultural remnant of primogeniture (Barclay et al., 2016; Kristensen & Bjerkedal, 2010; Steelman, Powell, Werum, & Carter, 2002). Earlier-born, and particularly first-born (sons), would benefit most and be prioritised in a form of strategic parenting.

The main theories for the observed negative birth order patterns are not very helpful for explaining variation across groups. The resource dilution and confluence theories in particular are universal in their forms, and one should expect to find the same kind of patterns in immigrant families as in native population families. Still, the last set of theories postulate mechanisms that might vary depending on the social context. Other strands of research, however, point to the importance of a broader set of immigrant-related factors and suggest some reasons why we should expect differences in birth order effects between the immigrant families we study and the native population.

Birth Order and Immigration

The literature on birth order effects and education on natives in non-Western countries is growing. In recent years, important work has considered birth order effects in a range of countries. In a study looking at 12 countries in sub-Saharan Africa (Tenikue & Verheyden, 2010) birth order effects on educational attainment were documented in most of the countries, but they differ from those typically found for Western countries. In poor families there is a positive birth order effect on educational attainment. In rich families there is a negative effect. The authors link this to child labour: The oldest siblings in poor families have to work, which has a detrimental effect on their participation in school and less parental investment in their education. On the other hand, this does not apply to rich families. Additionally, Abafita & Kim (2015) provide evidence for negative birth order effects on education in Ethiopia, whilst Seid & Gurmu (2015) found no such effects in the same country. In Ecuador (De Haan et al., 2014) there is a similar pattern as in sub-Saharan Africa (Tenikue & Verheyden, 2010) with both positive- and negative birth order effects on educational attainment for poor and rich households respectively. A study looking at Nicaragua and Guatemala (Dammert, 2010) found no effects on education, but negative birth order effects on child labour. In the Philippines there is evidence of positive birth order effects on both the amount of schooling and educational attainment (Ejrnæs & Pörtner, 2004). As for Indonesia (Calimeris & Peters, 2017) there are indications of negative birth order effects on cognitive ability, but the trend is not uniform.

All the aforementioned studies use data for countries that are not included in our immigrant sample. However, three of the countries of origin included in our study are covered by studies on birth order and education. In Turkey, birth order effects on school enrolment are non-linear with middle-born children faring worse than their elder siblings, and the effect is more marked in poor families (Dayioğlu et al., 2009). In India, Fors & Lindskog (2017) found

negative birth order effects on grades and parental investment into school quality. However, Makino (2018) and Kumar (2016) found positive birth order effects on school test scores and educational attainment. Anh, Knodel & Friedman (1998) mention that they have performed a sensitivity analysis on birth order and education in Vietnam, but the results are not shown. According to the authors there were no birth order effects on school attendance and educational attainment.

While a few of these studies provide evidence for negative birth order patterns that are closer to the birth order effect found in native Western populations, the majority document a non-existing or positive birth order effect on educational outcomes. This is not in line with the expectation based on the resource dilution and confluence theories. This finding points to the importance of considering institutional settings and a broader cultural context when examining birth order effects. Universal approaches need to consider possible institutional or cultural variations. We note that the aforementioned studies on Turkey, India and Vietnam found non-linear, positive birth effects, or no birth order effects. If there is cultural variation at play in birth order effects in immigration families in Norway, these three studies allows us to theoretically compare if origin effects and Norwegian-born to Turkish-, Indian-, and Vietnamese parents.

Institutional settings and poverty

If the positive or non-existing birth order effects in non-Western countries are driven primarily by families who live in poverty, we do not expect to find the same in immigrant families in Norway. First, while Norwegian immigrants typically earn less than the native population and are more likely to enter lower social strata, the Norwegian welfare system is generous and immigrants are generally much better off in Norway compared to their country of origin. In addition, having a lower socioeconomic status in Norway is not likely to have the same relevance for the order and magnitude of birth order effects as it would have in one`s

country of origin. In line with this, previous studies indicate that there are no differences in birth order effects on education according to parental socioeconomic status in Western countries (Black et al., 2005; Härkönen, 2014). Also, the small subset of studies where differences according to parental socioeconomic status are found do not point in any particular direction. For example, some research provides evidence for larger birth order effects in families with low parental socioeconomic status, while others document the opposite (Barclay et al., 2016; Bonesrønning & Massih, 2011; Grätz, 2018). Second, several studies from non-Western countries also consider different outcomes, such as child labour, that are closely related to poverty as well as institutional arrangements that are far less relevant in Norway and most Western countries. When child labour is the outcome variable, researchers typically document a negative birth order effect, in contrast to the positive association between birth order and educational outcomes in the same samples. The two are likely to be linked, since earlier-born children are required to work to help their families and are unable to attend school (De Haan et al., 2014; Tenikue & Verheyden, 2010). However, child labour is prohibited by law in Norway, and the different economic circumstances makes it less relevant in any case.

To sum up, if institutional settings related to poverty are the main explanation for the different findings in non-Western and Western countries, we do not expect to see any variation according to parental origin. More specifically, we do expect immigrant families to display birth order patterns similar to the native population, as resource constraints are no longer as pressing upon arrival in Norway, and practices such as child labour are both redundant and prohibited.

Cultural variation in family-related behaviours

The negative birth order effects documented in Western countries might have a cultural origin, more specifically related to the practice of primogeniture. The oldest (son) would typically inherit his parent's main property. A cultural remnant of this historical tradition might be relevant for explaining the general preference for first-borns, although there is little evidence indicating that first-born boys are advantaged compared to girls with the same parity (Barclay et al., 2016; Kristensen & Bjerkedal, 2010). Along the same vein, some researchers have proposed explanations of positive birth order effects in non-Western countries that are linked to various cultural practices. For example, De Haan (2014) pointed to the increase of breastfeeding frequency and quality time with birth order. This is the opposite of what is typically found in studies from Western countries (Buckles & Kolka, 2014). Such explanations might be relevant for minority families in Norway as well, since immigrants bring cultural practices, preferences and beliefs from their counties of origin (Almond, Edlund, & Milligan, 2013; Kavli, 2015; Wimmer & Soehl, 2014).

Previous studies indicate that some family related behaviours and preferences of immigrants change little in response to the different institutional incentives present in Norway. This is true for a broad set of family behaviours, for example, related to the distribution of labour inside and outside the household as well as systems of kinship and residence (Heath, Rothon, & Kilpi, 2008). Fertility behaviour is another important example. While there is some evidence that childbirth rates decline somewhat with length of residence (Lappegård, 2006), immigrants` preferences for their children`s sexes do not change much with length of residence in Norway (Lillehagen & Lyngstad, 2018). The same pattern has also been documented in other countries (Almond et al., 2013). Following this line of thought, a cultural persistence of a broad set of family behaviours might influence birth order effects. If there is variation in family-related behaviours between parents with immigrant- and native origin, we expect to find group-differences

The Norwegian Context: Immigration to a Welfare-State

The history of immigration in Norway is similar to several other Western European countries in many respects (Brochmann & Kjeldstadli, 2008). Modern-day immigration to Norway from non-European countries began around 1970 primarily as labour immigration. Moroccan, Pakistani and Turkish men were the largest groups at the time. After the so-called immigration stop in 1975, this large-scale, low-skilled labour immigration came to a halt. High-skilled labour immigration continued to occur, and other types of immigration became more important. Refugees and asylum seekers from conflict areas have immigrated from the 1970s to present day, with the largest groups originating in Chile, Vietnam, Sri Lanka, Iran, the Balkans, Somalia, Iraq and recently, Syria. Family reunification has been important throughout. As a result of these processes, present-day Norway is an ethnically diverse society (Brochmann & Kjeldstadli, 2008). As in many European countries, the number of immigrants from non-European countries and native-born to immigrant parents from non-European countries is rising, reaching 10% in Norway in 2017 (Statistics Norway, 2018).

The emergence of non-European immigration to Norway coincided with the consolidation of what has been known as the Nordic model. Gøsta Esping-Andersen described the Nordic countries as having a social democratic welfare regime (1990). Nordic countries are characterised by low levels of economic inequality, high gender equality and high social mobility (Kautto, 2010). The Norwegian welfare state is universal and provides all citizens with equal social rights, such as near-free health care services, rights to welfare benefits and free access to education. Legal immigrants are granted the same rights as everyone else, and the Norwegian-born children to immigrant parents included in this study have grown up in the same institutional setting as native children from the same cohorts. Some of these rights and duties are directly related to our outcome variable. Educational rights are the same for everyone and are heavily subsidised. All children have a *right* to

kindergarten (ages 1–5), a *statutory duty* to attend primary and lower secondary school (ages 6–16), a *statutory right* to high school (ages 16–19) and all adults have *equal access* to higher education. Another important point is that immigrants in Norway are, comparatively speaking, well-integrated in the education system and labour market. Many groups have levels of education on par with natives and relatively high levels of occupational attainment (Brekke & Mastekaasa, 2008; Hermansen, 2013).

Data and Methods

This study used administrative data encompassing the total population of Norway. We linked information from the Central Population Registry to registries containing educational information. Each individual had an identification number, which made it possible to link parents with their children. To be included in our sample, the identities of both the father and the mother had to be known. We excluded children of plural births, as well as those with only half-siblings, as we are interested in a nuclear family setting. Importantly, only individuals registered with a non-missing value for lower secondary school points from 2001–2014 were eligible for the analytical sample. We performed several sensitivity analyses which clearly indicated that none of these decisions affected our main findings. Our final sample covers the 1985–1998 cohorts, which encompassed the period in which many Norwegian-born children of immigrant parents who arrived in the 1970s and 1980s were coming of age. Furthermore, to meet the data requirements for the family-fixed effects model, only individuals from families in which at least two siblings meet the sample requirements were included in our analysis.

Variables

The outcome variable is lower secondary school points. At the end of compulsory education, pupils are given a combined measurement for all marks, which determines which upper secondary schools he or she will be able to attend. The school points measure is based on a combination of both final assessment marks and examination marks. The grading system was changed in 2007, however. We accounted for this, as well as potential grade inflation, by standardizing the lower secondary school point variable by year.

Birth order was included as a set of dummies with values from one to four, with firstborns as the reference category. We excluded information on individuals with birth orders higher than four, as the low number of observations in these categories for some groups entails privacy issues. Families with more than four children are still included. Fourth borns in this study are therefore not necessarily last-borns, as some of them may have younger siblings which have been excluded. Due to the sample restrictions described above there are more second-borns than first-borns. This is because first-borns more often fall outside the observation period of the outcome variable. This has a similar impact on the number of observations across groups with different origins. We performed a sensitivity analysis in which only families with valid values for first-borns were included (see Table A1 and Figure A1 in Supplementary Appendix). These results are very similar to those from our preferred model.

We divide into groups based on maternal country of origin. The native group encompassed individuals born in Norway to Norwegian-born parents. The immigrant groups consisted of children with two foreign-born parents. We use the mother`s country of birth to measure the country of origin. We exclude children from families with mixed origin, e.g. with one immigrant parent and one native parent or parent from a different country. In addition to children born in Norway, we also include children who immigrated with their parents when they were five years or younger in order to obtain a slightly larger sample and more precise

estimates. This addition is reasonable as it has been shown that childhood immigrants are similar to the native population in terms of later socioeconomic outcomes when arriving before the age of six (Hermansen, 2017; Steinkellner, 2013). In an additional analysis, we split the sample based on age at arrival (see Figure A1 in Supplementary Appendix) and found that the magnitude of the estimates did not depend on whether this group was included or not.

Previous power-tests done by Bjerkedal, Kristensen, Skjeret & Brevik (2007), as well as our own indicated that one needs around 700-900 sibling pairs to be able to detect birth order effects of the magnitude typically found in Norway. After making the necessary sample restrictions, we divide the sample into immigrant groups where there are enough observations left to be in that range. This gives us twelve groups: Natives (Norway), Chile, India, Iran, Iraq, Morocco, Pakistan, Somalia, Sri Lanka, Turkey, Vietnam. We also include those of European origin as a regional group for comparison as these are quite culturally homogenous. Sex was included as a dummy-variable to adjust the birth order coefficients, as there is a difference in school points between girls and boys.

We perform the analysis both with and without for the inclusion of individual year of birth dummies to compare the two results. We do this to see if length of parental residence influences the birth order effects in our immigrant samples, as previous research indicates that this could have a positive effect on children`s educational attainment (Smith, Helgertz, & Scott, 2016). Furthermore, when included in the fixed effects model controls for year of birth serves as an adjustment for other secular trends as well, such as increased maternal and paternal age by birth order. It thereby adjusts for possible changes at the parental level such as (increased) parental income level, general maturation and (decreasing) health as well. This also allows us to investigate whether increasing resources at the parental level matter more in

immigrant families than in native families. This variable is interacted with the origin variable in order to allow the effect of such factors to vary between groups.

Descriptive Statistics

Table 1 provides summary statistics with means and standard deviations for each variable. After making the restriction described above, we are left with 450,864 individuals within 202,191 families.

The school point average varies somewhat between the groups. It is also worth noting that Norwegian-born children of immigrant parents from Europe, India, Sri Lanka and Vietnam perform on par with or better than natives.

Table 1: Descriptive Statistics

Table 1 here

Note: Note: Family size calculated after exclusion of one-child families, but before other sample restrictions. Source: Authors own calculations based on Norwegian registry data.

Higher birth orders are more common in immigrant families from Iraq, Morocco, Pakistan and Somalia.

Method

Our analyses were based on what is considered the most rigorous strategy in the field of birth order: linear regression models with fixed-effects clustered at the family level, i.e., sibling fixed-effect models. Clustering at the family-level removes unobserved heterogeneity between families and therefore corrects for the possible confounding effects of family size. The estimated equation can be specified as:

$$Y_i = \alpha + \alpha_i + \beta X_i + \gamma W_i + \beta^{Fam} X_i^{Fam} + \gamma^{Fam} W_i^{Fam} + \varepsilon_i \qquad (1)$$

Observed ($\beta^{Fam}X_i^{Fam)}$ and unobserved ($\gamma^{Fam}W_i^{Fam}$) traits or behaviours that affect all siblings in the same family equally were factored out. We estimate two main models. Model 1 includes dummies for birth orders one to four, country of origin and a sex. In Model 2 we also include year of birth of each child as a set of dummy variables, which are interacted with the origin dummies to allow for heterogeneity. In both models, the estimates for the birth order effects for each origin group are derived from a pooled model were birth order is interacted with origin. The birth order coefficients for each origin group are plotted in figures 1 and 2, obtained by varying the reference category of the origin variable and otherwise using the same model specification. The number of groups (families) was large, so we used cluster-robust standard errors, based on the assumption that the groups were independent of each other but that the individuals in each group were not.

Note that we utilize statistical significance tests and present confidence intervals even though we have information on the complete population due to our use of registry-based administrative data. We base this on statistical arguments which are well presented in Aaberge and Laake (1984) and Hoem (2008). Additionally, this is standard practice in social science research based on administrative data. When using stochastic models, the population can be seen as one of many possible realizations of the underlying mechanisms that are studied. In other words, individual life stories should be seen as realizations of stochastic processes subject to random variation, and that such variation should be taken into account even when the set of observations contain all members of a population (Hoem 2008:439).

Results

Figure 1 displays the main results for all eleven origin groups based on the within-family regression (full regression tables are available in Supplementary Appendix, Table A2) without individual controls for year of birth. The lower secondary school point average of first-borns serve as a reference, marked by the black solid horizontal line. The plotted coefficients for the native population are displayed in red/grey[PLEASE CHANGE ACCORDING TO ONLINE/PRINT VERSION] with a round point and are presented in each panel for comparison. In the native population, there is a negative relationship between birth order and lower secondary school points.

Figure 1: Birth order and z-scores for lower secondary school points by maternal country/region of origin. Without control for cohort

Figure 1 here

Note: Fixed effect regression models with clustering at the family level and controls for sex

Many groups of immigrant families (India, Pakistan, Turkey, Vietnam) display statistically significantly weaker negative effects of birth order on lower secondary school points compared to the native families. Meanwhile, other groups display birth order effects similar to the native population (Chile, Europe, Iran, Iraq, Morocco, Somalia).

In Figure 2 individual controls for year of birth for each child is included in the models and interacted with the origin variable to allow for heterogeneity between groups (for full regression tables, see Supplementary Appendix, Table A3). This enables us to adjust for variation which could be linked to time-varying factors such as (increasing) family income, (decreasing) parental health, as well as inter-sibling differences in parental length of residence, which is only relevant for immigrant families. Previous research utilizing a family

fixed effects design indicates that parental time of residence is positively associated with the school success of immigrant children in Sweden, but that there is heterogeneity between groups of different origin (Smith et al., 2016). Therefore this model allows us to isolate mechanisms that are specific to birth order to a greater extent.

Amongst natives, the average difference between firstborns and second-borns is approximately 2 school points (22 % of a standard deviation), and 3,2 (36 % of a standard deviation) and 4 school points (46 % of a standard deviation) for third-borns and fourth-borns compared to first-borns, respectively. This negative relationship is consistent with findings from previous studies on birth order and education in Norway (e.g., Black et al., 2005; de Haan, 2010; Kristensen & Bjerkedal, 2010), although different measures of schooling outcomes were used. Our results provide further evidence that differences in educational achievement by birth order are present in adolescence and in the formative years of lower secondary school for the native population. The difference between first-borns and fourth-borns is of a magnitude similar to that of the sex gap in our sample, where girls outperform boys by approximately 4 school points (48 % of a standard deviation) on average. The difference between birth orders one and four is, in other words both statistically and substantially significant. However, our main interest is birth order effects in immigrant families.

Figure 2: Birth order and z-scores for lower secondary school points by parental region/country of origin. With control for cohort.

Figure 2 here

Note: The red/grey[PLEASE CHANGE ACCORDING TO ONLINE/PRINT VERSION] round points mark birth order effects in the native population. Fixed effect regression models with clustering at the family level and controls for cohort and sex.

Adjusting for year of birth provides us with a slightly different picture. The estimates for the native population changes somewhat, with the negative effects of having a higher birth order becoming slightly more marked. Immigrants originating in Chile, Europe, Iran, Iraq, Morocco and Somalia still show negative birth order effects that are not statistically discernible from those of the native population (with high statistical uncertainty for some groups).

Immigrant families of Turkish origin now display negative birth order effects that are similar to those of natives. Children in immigrant families of Pakistani origin still display significantly weaker negative birth order effects compared to natives, but the effects are now statistically different from zero. These changes are consistent with individual year of birth controls adjusting for parental time of residence and other cohort-related factors that affect the educational success of later born siblings within the same family positively. Importantly, immigrant families originating in Sri Lanka and Vietnam display no birth order effects. Children from families of Indian origins display a positive (though not statistically significant) relationship between birth order and school points when controls for year of birth are included. Additionally, results from an alternative specification, where linear birth order was interacted with origin (with native families as the reference category), confirms that the overall trend in the birth order effects families originating in Pakistan, Sri Lanka, India and Vietnam are significantly less negative than those found in native families (See Table A4 in the supplementary materials).

Discussion

In previous research indicating birth order effects on educational achievement in Western countries, later-born children are more likely to have lower educational achievement

compared to older siblings (Barclay, 2014, 2016; Black et al., 2005; Härkönen, 2014; Kristensen & Bjerkedal, 2007, 2010). In this study, we examined birth order effects in immigrant families. Using high quality data, our results indicated a negative birth order effect for the native population in Norway, which corresponds well with previous research. Among Norwegian-born children of immigrant parents, the picture is more complicated. Many groups of immigrant families have birth order effects similar to the native population, but there are important exceptions. Notably, the results for India, Turkey and Vietnam in our immigrant sample is quite similar to the findings in studies on natives in these countries (Anh et al., 1998; Dayioğlu et al., 2009; Kumar, 2016; Makino, 2018), suggesting that there is cultural variation in birth order effects according to cultural origin. While we are not aware of any previous studies covering the native population of Sri-Lanka, our findings for this country could also point in the same direction.

Most of the findings for the non-Western immigrant groups are consistent with what we previously referred to as the universalistic assumptions of the resource- and dilution theory, meant to cover all (nuclear) families. In our preferred model, displayed in Figure 2, five of the nine non-Western immigrant groups have birth order estimates which are nearly identical to the native population of Norway. Some of our findings, however, seemed to contradict the universalistic implications of the resource theory and the confluence theory, as these theories predict similar effects across all groups. Our findings therefore indicate that one or more of these assumptions are less general than these theories imply. We would like to address this theoretical inconsistency by theorizing further on why this may be the case. Our suggestions are relevant for many immigrant families, but less so for the native population, and may therefore explain the group-differences we documented.

Resource dilution theory

According to the resource dilution theory, parents possess a finite amount of resources that they distribute among their young. Each birth adds more mouths and brains to feed, and this lays the groundwork for differences between siblings. Later-born children receive fewer resources than earlier-born children, as there are less available (Blake, 1981, 1986, 1989). In many immigrant families, this assumption may not be valid, as the amount of resources available to the parents could increase rapidly during the first few years after immigration (Sandnes, 2017). A rapid increase of family resources after immigration could therefore lead to a birth order pattern that is the opposite from that found for native populations. The amount of economic resources and cultural resources linked to knowledge about the new country of residence would increase with the birth order in this case, thereby providing younger siblings with more family resources than earlier-born children. If this process is particularly strong for some immigrant groups, as opposed to for natives, this could potentially explain our findings for India, Sri Lanka, and Vietnam. We investigated whether this was the case in different ways. First, by using a within-family estimation strategy and controlling for individual year of birth-dummies interacted with origin, thereby allowing for heterogeneity (Figure 2). In doing this we were able to adjust for at least some of the variations linked to increased economic and cultural resources over birth orders at the parental level. We also tested this assumption more directly by an analysis that uses total family income in the year of birth of each sibling as the outcome, and birth order as the main explanatory variable which is interacted with origin (See Table A5 in the appendix). While there were some differences in the income trajectory by birth order between families of different origins, these do not match up with the differences in birth order effects from our main results. This evidence indicates that differences in the income trajectories over time for families of different origins do not explain group differences in birth order effects.

Instead, the difference in birth order effects between children of immigrant parents from different countries suggest that the variation is linked to group-specific factors (e.g., cultural or country-specific) rather than explanations linked to immigrant status itself.

Confluence theory

The confluence theory states that differences in the overall intellectual climate in the family across siblings of different ages cause socioeconomic differences according to birth order. Earlier-born children experience longer exposure to a higher intellectual climate and have a positive "tutoring effect" of teaching younger siblings, and fare better in socioeconomic terms later in life as a result. Spacing between siblings is important, and a spacing gap of around 11 years will nullify birth order effects (R. B. Zajonc, 1976, 1983). Although birth order theories are silent on variations based on immigrant background, one possibility is that the well-documented differences is fertility rates between natives and immigrants of different origins (Lappegård, 2006) leads to differences in birth intervals between groups, which could in turn affect the magnitude and direction of birth order effects. We investigated this in two ways. First, Table 1 includes the average birth interval for each origin group. While there are some differences in birth intervals, there seems to be no systematic co-variation between birth intervals and the birth order effects displayed in figure 2 for immigrant groups. Second, we carried out an additional analysis with the number of years since the last sibling was born as the main independent variable, otherwise using the same specification as in our main models with family fixed effects (but excluding first borns). We interacted this spacing variable with origin. The results of this analysis (presented in Table A6 of the appendix) show that the effects of spacing does not differ across origin groups. Taken together, these two sources of evidence strongly suggest that differences in birth spacing between groups cannot explain our overall findings.

Sex Preferences and Strategic Parenting

Many non-Western countries may have different cultural practices than Western, such as sex preferences e.g. (De Haan et al., 2014; Lillehagen & Lyngstad, 2018). Previous research from Norway has indicated that some immigrants typically display a preference for boys (Lillehagen & Lyngstad, 2018). If cultural remnants of primogeniture lead native parents to invest more in earlier-born children regardless of sex, whereas non-Western immigrants primarily invest in (older) boys, this could lead to weaker overall birth order effects on education in the latter group. We tested this by interacting birth order with sex for all groups. There is a minuscule positive interaction-effect of being later-born female amongst natives. Also, for later-born children of Sri Lankan and Turkish descent there is a positive interaction-effect of being a later-born female. It should be noted, however, that these groups are very small (see Table A7 in Supplementary Appendix for details). Due to the high number of tests, some of these might be false positives, but in any case the significant interactions provide no systematic evidence for boys being favoured. Differences in sex preferences are therefore not likely to explain our results.

A more general form of cultural variation could be linked to strategic parenting. For Western populations, studies have suggested that parents are more lenient toward later-born children, as indicated by lower levels of breast-feeding, higher levels of smoking during the pregnancy, etc. (Hotz & Pantano, 2015). On the other hand, studies from non-Western countries find that mothers tend to breastfeed later-born children longer and push their earlier-born children into the child labour market more often than their later-born children (De Haan et al., 2014; Seid & Gurmu, 2015; Tenikue & Verheyden, 2010). This could be an indication of a form of strategic parenting that may play out differently for immigrant parents compared to parents in the native population.

Kindergarten

Cultural family orientations might cause different adaption to educational institutions among earlier- and later-born children, which is highly relevant for policymakers. The Norwegian welfare-state promotes kindergarten as one of the most important tools for the development of language skills and cultural integration for immigrants in particular and reduces social differences and income poverty in general. In Norway, 77% of children aged 0–5 attend kindergarten (Statistics Norway, 2017). Immigrant mothers from non-European countries are more likely to be full-time homemakers and are more sceptical of sending their children to kindergarten (Nadim, 2014). Earlier-born children in immigrant families may attend kindergarten at a later age than their younger siblings for a number of reasons. First, the parents may be more receptive of kindergarten education after earlier-born children have attended. Second, if earlier-born children are already attending kindergarten, parents may decide to enrol their younger siblings for practical and time-saving reasons, thus enrolling later-born children at a younger age than their older siblings. Third, children with siblings already enrolled in a particular kindergarten are prioritised over children without siblings enrolled, thus children with (older) siblings "skip the line". Fourth, there is a sibling discount with which the (already subsidized) fee is lowered by 30% for a second child and 50% for each subsequent sibling. Quasi-experiments have shown that kindergartens can have a particularly important role in immigrant children's language formation and subsequent educational outcomes (Drange & Telle, 2015). This difference is likely to be more pronounced for children of immigrant parents than those with native parents. The question of how family policy arrangements influence birth order effects has been raised previously, in particular, whether parents are more "effective" than to day-care in influencing child development. If parents are (Bonesrønning & Massih, 2011). In the case of immigrant parental "effectiveness", we argue that kindergarten is more effective in native language formation as well as cultural adaptation, and is a possible explanation for the empirical

variation documented in this study. Unfortunately, we do not have data on kindergarten attendance. If our assumptions about kindergarten use and birth order patterns are correct, future studies should look into difference in kindergarten use in general, and in particular for whether different immigrant groups display different behaviour in regards to kindergarten use.

India, Sri Lanka and Vietnam

Resource dilution theory, confluence theory, strategic parenting and kindergarten attendance are general mechanisms, whereas we found that only some groups displayed less negative birth order effects compared to those found in native families. There are however, some more specific arguments for the relevance of these mechanisms in these cases. The three countries that stand out in our study are India, Sri Lanka and Vietnam (abbreviated ISV from here on), as Norwegian-born to immigrant parents from these countries display no negative birth order effects even after controlling for length of residence-related resources at the parental level (via the proxy-variable year of birth at the individual level). Notably, ISV are also the only parental background countries where pupils display school results similar to the native population, as shown in descriptive statistics (Table 1). Norwegian-born to immigrants originating in ISV are known to be high-achievers (Heath et al., 2008; Hermansen, 2016) and have high aspirations for further education. This may be related to a different family-environment and, in turn, different peer-environments for these groups. If parents expect high achievers of all their offspring, they may perform a form of strategic parenting to achieve this, making all siblings perform equally well in the school system. It may also be the case that the language- and kindergarten explanations we proposed earlier is only valid for immigrant families with high-achieving expectations, thus making the birth order effects in ISV stand out from the others.

Equally, it may be that being Norwegian-born to ISV-parents in Norway is linked to different educational norms, expectations and human capital resources at the peer-group level,

as has been proposed for the Indian groups in Norway (Fekjær, 2007). If this is correct, the earlier-born advantage may not be as prevalent in ISV-communities, if the human capital resources has grown with length of residence for the ISV-groups as a whole. It is well known that ISV-communities in Norway organize extracurricular activity regularly, which would counter the within-family mechanism of birth order effects.

Limitations

Several limitations remain. First, our sample included more second-borns than first-borns, thus introducing a possible between-family comparison in which second-borns (with valid comparisons made to his/her own third-born) from one family are compared to first-borns from a different family. However, sensitivity analyses show that this did not affect our results (see Table A1 and Figure A1 in Supplementary Appendix). Second, we have not considered the potential for interactions between age at arrival and birth order, which can be expected to work in opposite directions. Future research should use a sample that includes immigrant children arriving at different ages to investigate this issue in more detail. Third, older siblings who were born abroad before their parents migrated, but who did not themselves migrate are not included in our sample. As our sample includes children who migrated with their parents up until the age of six, any remaining older siblings must be at least six years old. Given a typical fertility span of around 20 years for a woman, older siblings may have been left in the origin country between ages of 0-14. We find it unlikely that this practice is very common, and in any case that they influence our results. Fourth, we have argued that there may be cultural variation in birth order effects, as we found variation in birth order effects according to country of origin. However, we did not have direct measurements of individuals' ethnicities and related cultural variables, but instead relied on information on individuals' maternal countries of birth. Country of birth is a somewhat imprecise proxy of cultural variation, as in many countries there are many different groups

that could have been divided according to other cultural traits, such as religion, ethnicity and more. This has limited our ability to directly test our claims that birth order effects are partially contingent on cultural variation. Fifth, we did not measure strategic parenting, differences in adaptation to institutions such as kindergarten, or peer effects, which we proposed as explanations. The mechanisms we suggest are theoretical propositions and need further empirical testing.

Conclusion

In closing, we would like to emphasise some of our key findings and conclusions. We provide what is to the best of our knowledge the first evidence for birth order effects in immigrant populations. There was variation according to parental origin. In most immigrant groups there are birth order effects similar to those in the majority population. Here, the resource dilution- and confluence theory are compatible with our findings. In other groups, in particular Norwegian-born to immigrants from India, Sri Lanka and Vietnam, birth order effects are non-existing or positive. Universalistic theories such as the resource dilution theory and confluence theory appears unable to explain this variation in birth order patterns. We have therefore suggested that these theories need to be supplemented by other perspectives that account for cultural and institutional settings, at least in the context of immigrant families. We indicated that early childhood language formation, differences in kindergarten use, culturally rooted strategic parenting, and peer-influences may be potential explanations. Multiple mechanisms may operate simultaneously, however. For example, the processes proposed in the universalistic theories may interact or work in the opposite direction of the other mechanisms that we have discussed. We leave it to further research to address these issues further.

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Online Appendix for "One Order Fits All? Birth Order and Education in Immigrant Families"

Figure A1: Valid first born in every family

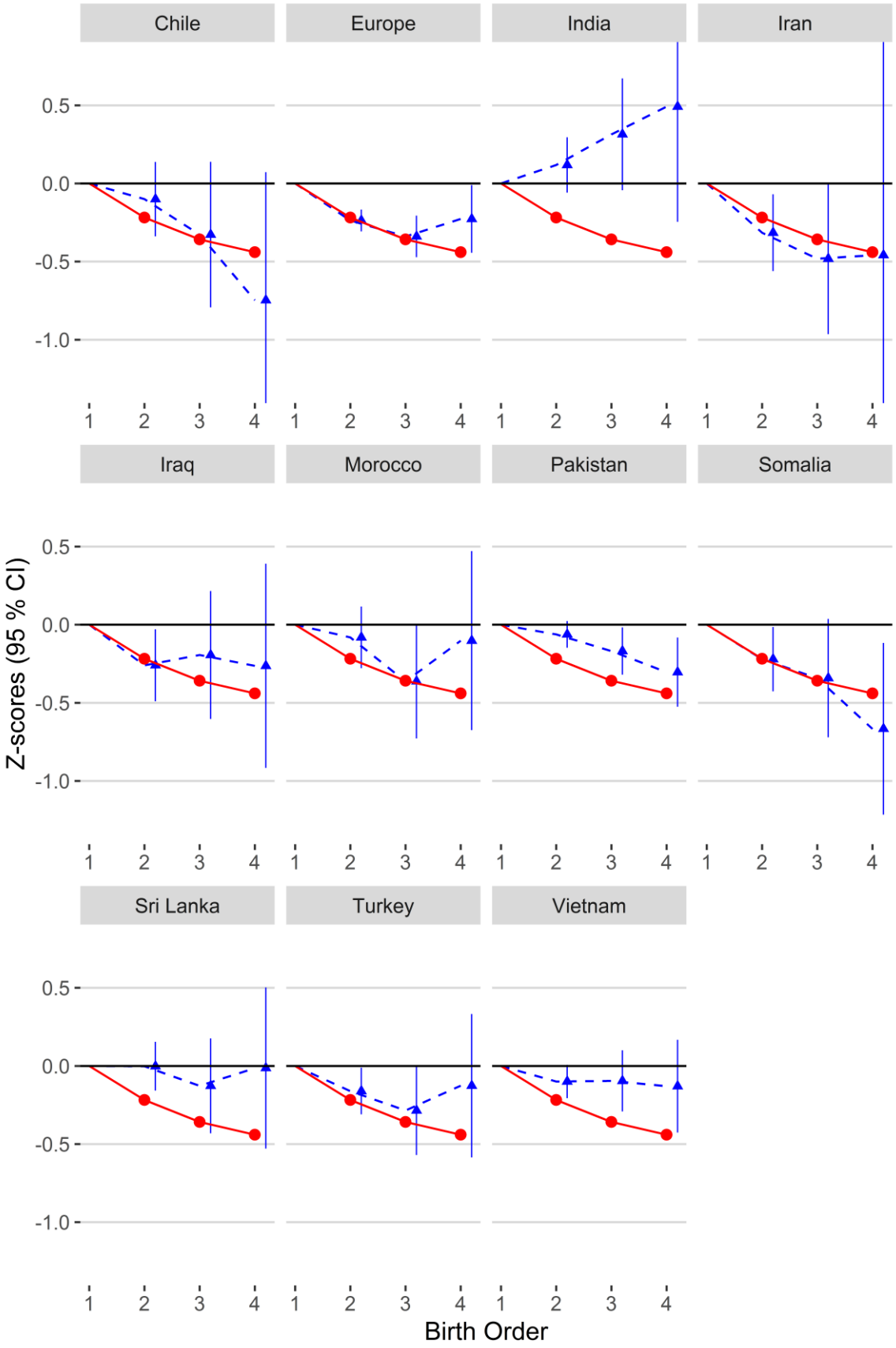

Table A1: Valid first borns in every family – Regression table

	Z-scores - Lower Secondary School Points					
	Native	**Chile**	**Europe**	**India**	**Iran**	**Iraq**
2nd born	-0.22***	-0.10	-0.24***	0.12	-0.32*	-0.26*
	(0.005)	(0.12)	(0.04)	(0.09)	(0.13)	(0.12)
3rd born	-0.36***	-0.33	-0.34***	0.31	-0.48	-0.19
	(0.01)	(0.24)	(0.07)	(0.18)	(0.25)	(0.21)
4th born	-0.44***	-0.75	-0.23*	0.49	-0.46	-0.26
	(0.02)	(0.42)	(0.11)	(0.38)	(0.93)	(0.33)
Female	0.48***	0.27**	0.43***	0.39***	0.40***	0.35***
	(0.003)	(0.08)	(0.02)	(0.06)	(0.09)	(0.09)
Observations	377,145	538	5,247	770	581	488
	Z-scores - Lower Secondary School Points					
	Morocco	**Pakistan**	**Somalia**	**Sri Lanka**	**Turkey**	**Vietnam**
2nd born	-0.08	-0.06	-0.22*	-0.002	-0.16*	-0.10
	(0.10)	(0.04)	(0.10)	(0.08)	(0.08)	(0.05)
3rd born	-0.36	-0.17*	-0.34	-0.13	-0.28	-0.10
	(0.19)	(0.08)	(0.19)	(0.15)	(0.15)	(0.10)
4th born	-0.10	-0.30**	-0.67*	-0.01	-0.13	-0.13
	(0.29)	(0.11)	(0.28)	(0.26)	(0.23)	(0.15)
Female	0.42***	0.42***	0.38***	0.47***	0.30***	0.46***
	(0.07)	(0.03)	(0.08)	(0.05)	(0.05)	(0.04)
Observations	630	3,153	606	1,364	1,373	2,063

Note: Cluster-robust standard errors reported in parenthesis *p **p ***p<0.001

Figure A2 – Age at arrival: The most liberal sample (1) includes all childhood immigrants up until the age of 18 with no further restrictions. The next sample (2) restriction is the one we use in our main analysis, excluding childhood immigrants arriving at the age of six and over. A more stringent sample definition is to exclude all *families* with any childhood immigrants who arrived at the age of six or over (sample 3). The most strict sample restriction implies that only children of immigrants who were born in Norway are included (sample 4). All of these sample definitions yields very similar overall findings, albeit with higher statistical uncertainty as the number of observations in each group is lower. Note: Results from a reference sample from the majority population plotted with a red solid dot.

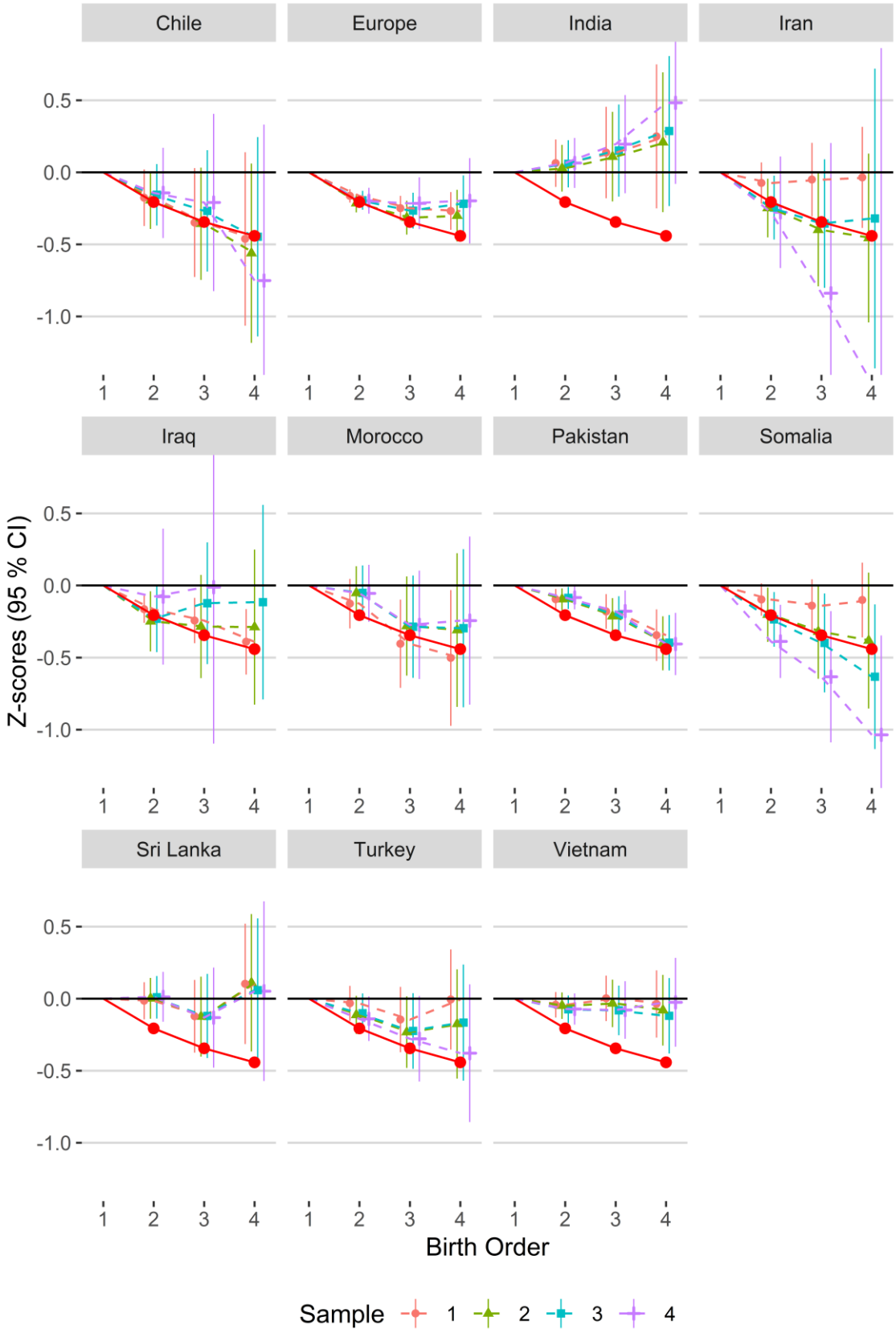

Table A2: Regression table - Figure 1

	Z-scores - Lower Secondary School Points					
	Native	Chile	Europe	India	Iran	Iraq
2nd born	-0.13***	-0.09	-0.11***	-0.004	-0.20**	-0.11
	(0.002)	(0.06)	(0.02)	(0.05)	(0.06)	(0.07)
3rd born	-0.18***	-0.16	-0.12***	0.04	-0.30**	-0.16
	(0.004)	(0.09)	(0.03)	(0.09)	(0.11)	(0.09)
4th born	-0.19***	-0.23	0.004	0.14	-0.32	-0.07
	(0.01)	(0.17)	(0.05)	(0.17)	(0.20)	(0.12)
Female	0.48***	0.23**	0.43***	0.41***	0.38***	0.36***
	(0.003)	(0.07)	(0.02)	(0.06)	(0.07)	(0.07)
Observations	428,311	687	6,378	885	783	776

	Z-scores - Lower Secondary School Points					
	Morocco	Pakistan	Somalia	Sri Lanka	Turkey	Vietnam
2nd born	-0.06	0.04	-0.13	-0.05	-0.03	-0.03
	(0.06)	(0.03)	(0.07)	(0.04)	(0.04)	(0.03)
3rd born	-0.24**	0.09**	-0.14	-0.19**	-0.03	0.03
	(0.08)	(0.03)	(0.08)	(0.06)	(0.06)	(0.04)
4th born	-0.24*	0.08*	-0.16	0.01	0.14	0.02
	(0.11)	(0.04)	(0.11)	(0.15)	(0.10)	(0.06)
Female	0.37***	0.40***	0.42***	0.47***	0.32***	0.46***
	(0.07)	(0.03)	(0.07)	(0.05)	(0.05)	(0.03)
Observations	788	4,424	807	1,471	1,684	2,695

Cluster-robust standard errors reported in parentheses. | *p < 0.05. ** < 0.01, ***p < 0.001

Table A3: Regression table – Figure 2

	Z-scores - Lower Secondary School Points					
	Native	**Chile**	**Europe**	**India**	**Iran**	**Iraq**
2nd born	-0.22***	-0.17	-0.22***	0.08	-0.26*	-0.24*
	(0.004)	(0.10)	(0.03)	(0.09)	(0.11)	(0.11)
3rd born	-0.36***	-0.41*	-0.32***	0.19	-0.43*	-0.37*
	(0.01)	(0.20)	(0.06)	(0.16)	(0.21)	(0.18)
4th born	-0.46***	-0.61	-0.30**	0.30	-0.48	-0.35
	(0.01)	(0.31)	(0.09)	(0.26)	(0.31)	(0.27)
Female	0.48***	0.24**	0.43***	0.38***	0.38***	0.36***
	(0.003)	(0.07)	(0.02)	(0.06)	(0.08)	(0.07)
1986	0.03***	-0.15	0.02	0.12	0.40	0.38
	(0.01)	(0.18)	(0.09)	(0.21)	(0.22)	(0.42)
1987	0.07***	0.04	0.07	0.22	0.46*	0.71
	(0.01)	(0.17)	(0.08)	(0.22)	(0.23)	(0.37)
1988	0.10***	0.02	0.01	0.27	0.44	0.28
	(0.01)	(0.19)	(0.08)	(0.20)	(0.23)	(0.36)
1989	0.13***	-0.04	0.05	-0.04	0.49*	0.44
	(0.01)	(0.19)	(0.09)	(0.21)	(0.24)	(0.36)
1990	0.16***	-0.14	0.23**	0.03	0.32	0.50
	(0.01)	(0.20)	(0.09)	(0.21)	(0.23)	(0.37)
1991	0.17***	0.07	0.19*	0.31	0.40	0.38
	(0.01)	(0.23)	(0.09)	(0.23)	(0.24)	(0.38)
1992	0.21***	-0.13	0.16	-0.09	0.39	0.42
	(0.01)	(0.23)	(0.10)	(0.24)	(0.26)	(0.38)
1993	0.23***	0.28	0.28**	0.11	0.48	0.68
	(0.01)	(0.25)	(0.10)	(0.25)	(0.26)	(0.39)
1994	0.24***	0.10	0.26*	0.07	0.52	0.54
	(0.01)	(0.26)	(0.11)	(0.27)	(0.28)	(0.41)
1995	0.28***	0.36	0.34**	0.10	0.63*	0.36
	(0.01)	(0.28)	(0.11)	(0.28)	(0.29)	(0.42)

1996	0.32***	-0.06	0.34**	-0.07	0.54	0.74
	(0.01)	(0.30)	(0.12)	(0.31)	(0.31)	(0.44)
1997	0.37***	0.40	0.47***	-0.13	0.39	0.59
	(0.02)	(0.34)	(0.13)	(0.33)	(0.33)	(0.46)
1998	0.38***	0.51	0.37**	-0.20	0.45	0.86
	(0.02)	(0.36)	(0.14)	(0.34)	(0.36)	(0.50)
Observations	428,311	687	6,378	885	783	776

	Morocco	**Pakistan**	**Somalia**	**Sri Lanka**	**Turkey**	**Vietnam**
2nd born	-0.09	-0.09*	-0.22*	-0.02	-0.13	-0.05
	(0.09)	(0.04)	(0.10)	(0.07)	(0.07)	(0.05)
3rd born	-0.33	-0.22***	-0.34	-0.14	-0.25	-0.02
	(0.17)	(0.06)	(0.17)	(0.14)	(0.13)	(0.09)
4th born	-0.41	-0.41***	-0.44	0.06	-0.19	-0.06
	(0.27)	(0.10)	(0.25)	(0.24)	(0.19)	(0.13)
Female	0.40***	0.40***	0.43***	0.47***	0.31***	0.46***
	(0.07)	(0.03)	(0.07)	(0.05)	(0.05)	(0.03)
1986	0.09	0.14	0.13	0.07	0.13	-0.10
	(0.24)	(0.08)	(0.29)	(0.19)	(0.15)	(0.11)
1987	0.21	0.26***	0.63*	0.14	0.24	-0.01
	(0.22)	(0.08)	(0.31)	(0.18)	(0.15)	(0.11)
1988	0.25	0.23**	0.12	0.20	0.11	0.13
	(0.22)	(0.08)	(0.34)	(0.20)	(0.15)	(0.11)
1989	0.08	0.32***	0.24	0.23	0.44**	0.002
	(0.24)	(0.09)	(0.32)	(0.20)	(0.15)	(0.12)
1990	0.22	0.33***	0.44	0.15	0.16	-0.003
	(0.24)	(0.09)	(0.35)	(0.19)	(0.16)	(0.12)
1991	0.13	0.54***	0.43	0.24	0.13	0.03
	(0.26)	(0.10)	(0.35)	(0.20)	(0.17)	(0.12)
1992	0.54*	0.47***	0.55	0.05	0.26	0.07
	(0.27)	(0.11)	(0.38)	(0.21)	(0.17)	(0.13)

1993	0.57	0.61***	0.58	0.17	0.32	-0.01
	(0.29)	(0.12)	(0.39)	(0.22)	(0.19)	(0.14)
1994	0.15	0.67***	0.62	0.17	0.30	0.09
	(0.31)	(0.12)	(0.41)	(0.23)	(0.19)	(0.15)
1995	0.28	0.70***	0.61	0.03	0.35	0.09
	(0.34)	(0.13)	(0.44)	(0.25)	(0.21)	(0.16)
1996	0.42	0.73***	0.70	0.003	0.48*	0.05
	(0.35)	(0.14)	(0.47)	(0.26)	(0.22)	(0.17)
1997	0.38	0.82***	0.70	0.12	0.48*	0.08
	(0.38)	(0.15)	(0.49)	(0.29)	(0.24)	(0.18)
1998	0.23	0.88***	0.78	0.08	0.54*	0.12
	(0.40)	(0.16)	(0.53)	(0.30)	(0.25)	(0.19)
Observations	788	4,424	807	1,471	1,684	2,695

Cluster-robust standard errors reported in parentheses. Reference categories: 1st born, cohort = 1985 | *p < 0.05. ** < 0.01, ***p < 0.001

Table A4: Linear birth order interacted with parental country of origin

	Dependent Variable Z-scores - Lower Secondary School Points
Linear Birth Order (Natives)	-0.19***
	(0.004)
Chile	0.001
	(0.09)
Europe	0.04
	(0.03)
India	0.25**
	(0.08)
Iran	-0.03
	(0.08)
Iraq	0.07
	(0.08)
Morocco	0.05
	(0.08)
Pakistan	0.07*
	(0.03)
Somalia	0.04
	(0.07)
Sri Lanka	0.15*
	(0.07)
Turkey	0.09
	(0.05)
Vietnam	0.17***
	(0.04)
Sex	0.48***
	(0.003)
Observations	449,689

Note: Cluster-robust standard errors reported in parentheses | *p < 0.05. ** < 0.01, ***p < 0.001

Table A5: Family income interacted with birth order

	Dependent Variable Total Family Income (Kroner)
Linear Birth Order X Origin (Ref. = Natives)	
Chile	23594.69*** (5819.862)
Europe	13874.74*** (2185.341)
India	24304.2*** (5136.504)
Iran	40601.94*** (7092.927)
Iraq	12918.36* (4175.657))
Morocco	125,7049 (4060.336)
Pakistan	15417.41*** (1301.362)
Somalia	18820.94*** (2424.413)
Sri Lanka	44160.02*** (3419.157)
Turkey	3629,384 (3475.705)
Vietnam	21807.37*** (2089.242)
Observations	433,395
Note:	*p**p***p<0.001

Table A6: Spacing/Birth interval interacted with parental country of origin

	Dependent Variable Z-scores - Lower Secondary School Points
Linear Birth Interval X Origin (Ref. = Natives)	
Chile	0,0032222 (0.0161708)
Europe	-0,0055154 (0.0056554)
India	-0,0153775 (0.0162175)
Iran	-0,0075606 (0.0177622)
Iraq	-0,0071474 (0.0128217)
Morocco	0,019055 (0.0196301)
Pakistan	-0,0070856 (0.0056906)
Somalia	-0,0137562 (0.0140912)
Sri Lanka	-0,0201342 (0.0160023)
Turkey	-0,0135433 (0.0124783)
Vietnam	-0,0098636 (0.008291)
Observations	276,525
Note:	*p **p ***p<0.001

Table A7: Birth Order and sex interacted

	Z-scores - Lower Secondary School Points					
	Native	**Chile**	**Europe**	**India**	**Iran**	**Iraq**
2nd born	-0.22***	-0.13	-0.22***	0.05	-0.23	-0.25
	(0.01)	(0.13)	(0.04)	(0.11)	(0.14)	(0.13)
3rd born	-0.38***	-0.42*	-0.31***	0.33	-0.32	-0.40*
	(0.01)	(0.21)	(0.07)	(0.18)	(0.23)	(0.20)
4th born	-0.47***	-0.59	-0.27**	0.10	-0.43	-0.52
	(0.02)	(0.34)	(0.10)	(0.27)	(0.36)	(0.29)
Female	0.47***	0.26*	0.43***	0.37***	0.45***	0.27*
	(0.004)	(0.12)	(0.04)	(0.10)	(0.13)	(0.14)
2nd born x female	0.01	-0.08	0.02	0.07	-0.04	0.05
	(0.01)	(0.17)	(0.05)	(0.14)	(0.18)	(0.17)
3rd born x female	0.03***	0.05	-0.02	-0.28	-0.23	0.06
	(0.01)	(0.19)	(0.06)	(0.18)	(0.24)	(0.20)
4th born x female	0.02	-0.004	-0.07	0.97*	-0.09	0.35
	(0.02)	(0.34)	(0.10)	(0.37)	(0.40)	(0.23)
Observations	428,311	687	6,378	885	783	776

	Z-scores - Lower Secondary School Points					
	Morocco	**Pakistan**	**Sri Lanka**	**Somalia**	**Turkey**	**Vietnam**
2nd born	0.01	-0.09	0.001	-0.28*	-0.24**	-0.09
	(0.12)	(0.05)	(0.09)	(0.13)	(0.09)	(0.06)
3rd born	-0.21	-0.25***	-0.29	-0.39	-0.43**	-0.06
	(0.20)	(0.07)	(0.16)	(0.20)	(0.14)	(0.10)
4th born	-0.24	-0.40***	-0.13	-0.49	-0.24	-0.04
	(0.29)	(0.11)	(0.30)	(0.27)	(0.22)	(0.14)
Female	0.57***	0.39***	0.42***	0.35**	0.14	0.42***
	(0.12)	(0.05)	(0.07)	(0.13)	(0.08)	(0.06)

2nd born x female	-0.21	0.001	-0.03	0.12	0.23*	0.08
	(0.16)	(0.07)	(0.10)	(0.17)	(0.12)	(0.09)
3rd born x female	-0.24	0.07	0.35**	0.09	0.38**	0.07
	(0.18)	(0.08)	(0.14)	(0.19)	(0.14)	(0.10)
4th born x female	-0.34	-0.01	0.33	0.10	0.14	-0.04
	(0.23)	(0.09)	(0.31)	(0.23)	(0.20)	(0.13)
Observations	788	4,424	1,471	807	1,684	2,695

Note: Cluster-robust standard errors reported in parentheses | *p < 0.05. ** < 0.01, ***p < 0.001