Do Birth Order Effects on Secondary School Track Placement Differ Between Natives and Migrants? A Within-Family Analysis in the German Educational System

Roth, Tobias; Pforr, Klaus; Mingham, Sandra; Selbach, Meike

This is a pre-copyedited, author-produced version of an article accepted for publication in
European Sociological Review, Vol. 38, 2022, No. 3, pp. 440-454
following peer review.
The version of record is available online at: https://doi.org/10.1093/esr/jcab047
Page numbers have been adjusted to the publishers version, whereby this postprint is fully quotable.

Do Birth Order Effects on Secondary School Track Placement Differ Between Natives and Migrants? A Within-Family Analysis in the German Educational System

Tobias Roth*, Klaus Pforr, Sandra Mingham, and Meike Selbach

Data and Research on Society, GESIS Leibniz-Institute for the Social Sciences, Mannheim 68159, Germany

*Corresponding author. Email: tobias.roth@gesis.org

Submitted February 2020; revised August 2021; accepted September 2021

Abstract

While existing research has found negative birth order effects on competences and educational attainment in various Western countries with different educational systems, it is unclear whether these findings also hold in families with migration background. We argue that in migrant families where children were born in the host country, birth order effects on secondary school track placement should be weak or even reversed. In these families, parents' host country-specific resources and knowledge of the education system are likely to be comparatively low. Consequently, older siblings who were born and educated in the host country can be an important source of information and support on educational matters for their younger siblings. Moreover, parental knowledge of the education system should increase with the educational career of each of their children. Family fixed-effects models based on representative data from the German Microcensus show negative birth order effects on secondary school track placement for native, first-generation migrant, and interethnic siblings, but not for second-generation migrant siblings. The empirical results indicate that negative birth order effects are not necessarily universal, but that children may even benefit from having older siblings under certain conditions.

Introduction

While most research in the sociology of education and social stratification examines the intergenerational transmission of educational success and inequalities between families, there also exists a substantial body of literature on educational differences between siblings within families. As in the education and social stratification literature, research in this field emphasizes the key role of parental support. Scholars commonly argue that first-borns have better chances of obtaining a higher educational level than later-borns, because older siblings receive more attention and resources from their parents and grow up in a more intellectual family environment before their younger siblings are born (Zajonc, 1976; Blake, 1981). Negative effects of birth order on educational success have indeed been proven in numerous studies for various Western countries using not only between-family but also within-family designs (Black,

Devereux and Salvanes, 2005; Kantarevic and Mechoulan, 2006; Booth and Kee, 2009; Kristensen and Bjerkedal, 2010; Barclay, 2015; Grätz, 2018)[1].

However, we still know very little about potential heterogeneity in birth order effects between native and migrant families. This is surprising because transferring the findings from social stratification, education, and migration research on the role of parental and sibling support provides strong theoretical grounds for the assumption that birth order effects in school track placement and educational attainment are less pronounced or even absent in migrant families. In Germany, as in many Western countries, children with migration background face substantial educational disadvantages (Autorengruppe Bildungsberichterstattung, 2018). It is a well-established finding that parental resources are key determinants for the educational career of their children, and the lower educational success of children with migration background can be traced back to a considerable extent to a lack of (host country-specific) parental resources (Diehl, Hunkler and Kristen, 2016). At the same time, during socialization, educational resources can be transferred to a child not only by parents but also by (older) siblings (Bourdieu, 2004; Grgic and Bayer, 2015). This highlights that older siblings not only dilute parents' resources but also provide younger siblings with educational support. While this is generally true for both native and migrant families, the potential positive effects of having older siblings might be more pronounced in migrant families, because many migrant parents have difficulties with the host country language and know less about the educational system. In these families, older siblings can be an important source of information about the educational system, support their younger siblings in school matters, and help to successfully guide them through the educational system (Wallace, 2007; Helbig, 2013; Grgic and Bayer, 2015). This should apply especially to older siblings born in the host country. Moreover, migrant parents should gain knowledge of the education system during the educational career of the older siblings. The few existing studies on this topic indeed indicate that birth order effects diverge along ethnic and racial lines (Smith, 1984; Hurtado-Ortiz and Gauvain, 2007; Alfaro and Umaña-Taylor, 2010).

Against this background, we investigate birth order effects on educational success measured as school track placement in secondary level I in Germany. We contribute to the birth order literature theoretically and empirically. We go beyond a simple distinction between natives and non-natives by theoretically discussing why birth order effects on secondary school track placement might vary between native families, inter-ethnic families with one parent born in the host country and one born abroad, migrant families with both parents and children born abroad, and migrant families in which only the parents were born abroad. To test our theoretical assumptions, we use family fixed-effects models and rely on the German Microcensus, an annual, mandatory, official, and representative survey of 1 per cent of German households. Using a within-family design allows us to compare siblings living in the same family and thus to control between-sibling invariant factors within the family. This is important because, in between-family designs, correlations between birth order and educational attainment can also arise from correlated family characteristics, such as genetic endowment or social class (Page and Grandon, 1979; Rodgers et al., 2000). Moreover, we also contribute to the education, social stratification, and migration literature by highlighting that besides parents (older) siblings can also play a pivotal role in the educational success of migrant adolescents. Our analyses of birth order effects also provide new indications on the role of intergenerational and intragenerational educational transmission processes in native and migrant families and have policy implications.

While we apply our analyses to secondary school students in Germany and cannot easily generalize the results to other countries, our findings nevertheless make an important contribution beyond the German case, because international research has largely neglected potential heterogeneity in birth order effects between native and migrant families. Moreover, our general theoretical considerations on why birth order effects on school track placement might vary depending on a child's migration background, should be relevant for an international audience.

Theory and Previous Findings

General Theoretical and Empirical Background on Birth Order Effects

Parents are usually the primary source of intellectual development and educational success for their children (Blake, 1981). They provide their children with environments and opportunities for educational achievement, such as access to cultural objects like books or music, personal attention, interaction, and teaching. However, parents' resources are limited and shared between all siblings. The resource dilution model argues that children with fewer siblings should be better off because they receive more attention and resources from their parents (Blake, 1981). This model has also frequently been used as a theoretical argument for birth order

effects (Härkönen, 2014; Bu, 2016). When parents' resources are distributed evenly between the siblings, the first child receives more resources than any other child because it has access to the full parental resource repertoire until the second child is born (Blake, 1981). Accordingly, the second child receives more resources than the third child, and so forth.

While parents are undoubtedly crucial to the intellectual development of their children, sibling interaction can also play an important role. The influential Wisconsin model of status attainment (Sewell, Haller and Portes, 1969) sparked a wealth of research on the role of significant others for educational success, overall suggesting that—besides parents—peers also significantly influence children's educational attainment. Since siblings usually spend a lot of time together and have a close emotional bond, they are particularly important peers for many children (Altmejd et al., 2021).

For birth order effects, the importance of siblings is highlighted in the confluence model (Zajonc and Markus, 1975; Zajonc, 1976). This theory argues that the average intellectual exposure in a family—calculated as the average intellect of all family members—shapes the intellectual development of children. First-borns benefit exclusively from the intellectual level of their parents until a second child was born. Since parents have a higher intellectual level than children, the average intellectual level of a family decreases with each additional child. As a result, older siblings grow up in a more intellectual environment than their younger siblings. In addition, the confluence model assumes that older siblings act as teachers for their younger siblings. The positive effects of this teacher–learner relationship on intellectual development are assumed to be higher for the older siblings compared to their younger siblings over time. Consequently, both the resource dilution model and the confluence model assume a negative birth-order effect for the intellectual development.

While this assumption should be true for the most part, we argue that under certain conditions this might not be the case. With respect to sibling interaction one has to consider that younger siblings can also benefit from the teacher function of their older siblings for at least two reasons. First, they learn from the knowledge and skills of their older siblings. Second, older siblings shape the emotional and social development of younger siblings (Cicirelli, 1994). Potential positive effects should be more pronounced when it comes to school track placement instead of intellectual development, as older siblings can offer crucial support to their younger siblings, such as sharing information about the educational system or helping with homework, school problems, and interaction with teachers. The accumulated knowledge concerning the educational system acquired during the school career of older siblings can help to guide younger siblings successfully through the educational system. Sibling support should be especially important in families in which parental knowledge and resources are scarce, and older siblings simultaneously have the potential to (partially) compensate for this shortage (Smith, 2020; Altmejd et al., 2021). In addition, in these families parents could acquire skills and knowledge of the educational system through their first child's school attendance, which they could then use to support the younger siblings' educational career. Especially, the type of educational track attended by older children can provide parents with important information about whether they consider the chosen educational path desirable for their younger children as well.

In summary, on the one hand, older siblings dilute parents' resources and decrease the intellectual level of a family, but on the other hand, they can provide resources that are important for the educational success of their younger siblings and parents can gain skills and knowledge through their firstborns' educational careers. Accordingly, the direction of the effect of birth order on educational success depends on which of the two processes prevails. Under most conditions, the former is likely to dominate and numerous studies confirm negative birth order effects for various Western countries (Black, Devereux and Salvanes, 2005; Kantarevic and Mechoulan, 2006; Booth and Kee, 2009; Kristensen and Bjerkedal, 2010; Barclay, 2015; Gra¨tz, 2018) including Germany (Helbig, 2013; Schulze and Preisendo¨rfer, 2013; Härkönen, 2014; Karwath, Relikowski and Schmitt, 2014; Grgic and Bayer, 2015).

Ethnic Differences in Birth Order Effects and Sibling Support

Although Steelman (1985) pointed out more than 30 years ago that birth order effects may vary according to family characteristics, research on differences between migrant groups is scarce and almost exclusively based on between-family designs. The only exception we are aware of is a recent study by Isungset, Lillehagen and Ugreninov (2020), who investigate birth order effects on school marks in native and migrant families in Norway using family fixed-effects models. They find that most migrant groups show similar birth order effects to natives, but effects deviate in families originating from Sri Lanka, Vietnam, and India. As potential explanations, they posit cultural differences in strategic parenting, the fact that students from these countries are

high-achievers in the Norwegian educational system, and that their ethnic communities are conducive to a successful educational career. We consider it a great merit of the study to point out the importance of cultural variations in birth order effects on educational achievement. However, for our specific research question, cultural variation plays a secondary role, and investigating it would go beyond the scope of this paper.[2] Furthermore, we think there are more general mechanisms that can lead to differences in birth order effects on school track placement between natives and different migrant generations.

Research shows that differences in the provision of educational resources by parents are the main reason for differences in educational success, both between older and younger siblings as well as between native children and children with a migration background. Indeed, the parents' lack of (host country-specific) resources explains to a considerable extent the educational disadvantages of children with a migrant background (Diehl, Hunkler and Kristen, 2016). Host country-specific resources of migrant parents can vary between older and younger siblings. The longer the parents live in the host country, the more host country-specific resources they can acquire. In addition, parents can gain knowledge about the German educational system and the importance of secondary school track placement for educational attainment during the school career of their older children. Parents can use these resources and information to promote the educational success of their younger children. Furthermore, in migrant families older siblings are potentially more important for the educational success of younger siblings than in native families, because despite the potential learning effects of migrant parents their possibilities to support their children in school are often restricted for example due to language barriers.

International findings based on Latino adolescents in the United States underline the important role of older siblings—who usually have better English skills than their parents and more experience with the US educational system—for the academic motivation and attainment of their younger brothers and sisters in migrant families (Hurtado-Ortiz and Gauvain, 2007; Alfaro and Umaña-Taylor, 2010). For Germany and Austria, qualitative studies indicate that older siblings in migrant families often support their younger siblings. This includes help with problems in school, provision of information about educational and career options, as well as emotional and financial support (Boos-Nünning and Karakasoglu, 2005; Wallace, 2007; Tepecik, 2012). The importance of siblings in school affairs is underlined by the fact that many migrant parents are not fluent in the German language and have a limited knowledge of and experience in dealing with the German educational system (Esser, 2006; Kretschmer, 2018). In this case, older siblings can substitute parents' educational support. Indeed, girls with a migration background in Germany receive, on average, more help with homework from their siblings than from their mothers. This is particularly true for migrant groups in which a high proportion of parents migrated before the birth of their children. In contrast, the opposite is true for late repatriates from the former Soviet Union, in which all the families surveyed entered Germany when their children were already born and parents had privileged access to language and integration courses (Boos-Nünning and Karakasoglu, 2005).

Migrants in the German Educational System

In the highly stratified German educational system, most students are, by the age of 10, already tracked into the various secondary school types, which differ greatly with respect to curricula, performance standards, years of schooling, and school leaving certificate. Mobility between school tracks, especially at lower secondary level, is comparatively low. The Gymnasium, as the most demanding and prestigious school type, has a distinct position in the German educational system and most of its students acquire a higher education entrance qualification, whereas this is not the case for other secondary school types (Müller, 2005; Kristen and Granato, 2007). Thus, attending a Gymnasium at lower secondary level is a very good predictor of high educational attainment (Roth, 2017).

In Germany, both first- and second-generation migrants come mainly from European countries. Important countries of origin are Turkey, Italy, Poland, the Russian Federation, the nations of former Yugoslavia, and Romania (BAMF and BMI, 2019). About one-third of adolescents have a migration background, and despite many efforts in education policies, these students are still notably less successful in the German educational system than native students (Salikutluk, 2016; Autorengruppe Bildungsberichterstattung, 2018).

Expectations

To successfully navigate through the educational system, it is important for children to have a well-informed person in the household who supports and guides them. This could be particularly relevant in the complex German educational system. In native families, these persons are usually the parents. In migrant families, however, parents are not

always able to support and guide their children because they do not have sufficient host country languages skills and knowledge about the education system. This disadvantage should be less pronounced for younger migrant siblings, as migrant parents can gain important information about the school system during their older children's school career. For example, the failure of older children to transition to a Gymnasium could make parents aware of the importance of Gymnasium attendance for the educational career in the German education system. Therefore, they might increase their efforts to ensure that their later-born children attend Gymnasium. In addition, younger migrant siblings might benefit from older siblings taking on the support and mentoring function, because they are more fluent in the host country language and better informed about the educational system than the parents. This should especially be the case if the older siblings, but not the parents, were born, raised, and educated in the host country. In these families, older siblings can provide information and support that would otherwise be difficult to get. If the children were also born abroad, older siblings lack host country-specific knowledge and resources. For this reason, and because older siblings may themselves be occupied coping with life in the host country, one might expect the negative effects for younger siblings to dominate among first-generation children. However, also in these families, migrant parents can gain important information about the school system during the school career of their older children and older siblings could assume the mentoring function if they learn the language of the host country better and become familiar with the educational system more quickly than their parents.[3] In families with interethnic parental constellations, parents should have only slightly less host country-specific resources and information than in families without migration background. For them, we expect similar birth order effects as in native families.

In sum, existing empirical findings and our theoretical considerations lead us to expect negative birth order effects on school track placement in secondary level I for native children and for children with interethnic parent constellations. No clear predictions can be made for first-generation migrant children. In contrast, for second-generation migrant children, we expect a weaker or even reversed birth order effect.

Data and Methods

Data

For the empirical analysis, we use the Scientific Use Files of the German Microcensus from the years 2008 to 2016.[4] The Microcensus is an annual, official, representative survey with mandatory participation, which collects information about all persons living in the same household for 1 per cent of the German population. The Scientific Use Files comprise a subsample of 70 per cent of the original surveys (data provided by Federal and State Statistical Offices, Research Data Centers). Owing to its low levels of non-response bias (which follows from mandatory participation), the large number of cases due to the pooling of nine waves, and the fact that it provides information on the entire household, the Microcensus offers an excellent database for examining our research question.

Analysis Sample

The Microcensus contains no information about parents and siblings who do not live in the same household, which is why we focus on children in the general educational system. We only consider children who have already made the transition from primary to secondary education. Since most students make this transition at the age of 10, we restrict our analyses to those who are at least 10 years old, and exclude the two German federal states Berlin and Brandenburg, in which the transition to secondary education takes place at an older age.[5] While mobility between school tracks is comparatively low in the general educational system in Germany, changes in children's original secondary education placements after secondary level I are nevertheless non-negligible (Blossfeld et al., 2016; Schindler, 2017). To be able to compare our measure of educational success between older and younger siblings, we only consider children until the age of 15, who are normally still attending secondary level I. To compare differences within families, we can only examine families with at least two secondary school children aged 10–15. To be able to clearly separate migrant generations and to make families more comparable, we further restrict the sample to two-parent families without differences in the migration status across children. After having considered those restrictions and item non-response, we are able to analyse a sample with full information on 58,263 children from 28,101 families.[6]

Variables

Our dependent variable measures educational success in secondary level I in the German educational system. We distinguish between attending Gymnasium, which is the most prestigious and challenging school type, and attending any other type of secondary school.

Birth order is the independent variable of main interest. Since only very few families have more than three

children, we collapse third-born children with higher birth orders. This leaves us with a birth order variable with three categories: first, second, and third or younger. Children of the same age with the same parents receive the same birth order. Children older than 15 years are used to determine the birth order of younger siblings but they are not included in the analyses.

The second important independent variable is the children's migration status. We distinguish between native children, interethnic children, and children of the first and second migrant generation. Children are defined as natives if they themselves and both their parents were born in Germany. The first migrant generation comprises children who were born abroad. The second migrant generation includes children born in Germany whose parents were both born abroad. Children born in Germany are defined as second-generation interethnic migrants, if one parent was born in Germany and the other one was born abroad. Our sample contains 43,189 native children, 5,123 interethnic children, 1,204 first-generation migrant children, and 8,747 second-generation migrant children.

Because we use linear regression models with fixed effects at the parent level, we implicitly control for all between-sibling invariant variables. Consequently, only variables that vary across the siblings and affect the educational attainment must be included in the model. To protect us against bias due to varying omitted characteristics, we consider relevant variables at the child level. We control for the gender of the children. We include mother's age at the time of childbirth because on the one hand, biologically, health risks of newborns increase with the age of their mothers, while on the other hand, older mothers could be emotionally and economically better prepared for children (Booth and Kee, 2009). To account for non-linearities, the mother's age at the respective child's birth is included as a categorical variable using the deciles of the distribution as cut points, i.e. we use these groups: younger than 26, 26–27, 28, 29–30, 31, 32, 33, 34–35, 36–37, 38–54. To account for educational expansion and potential differences in the Gymnasium attendance rate across secondary level I, we additionally control for childrens' age, differentiating three age groups: 10–11, 12–13, and 14–15.

Empirical Strategy

To estimate the effect of birth order on the child's educational attainment conditional on its migration background, we use linear regression models with parent-level fixed effects (Brüderl and Ludwig, 2014).[7] Including parent-level fixed effects relaxes the exogeneity assumption regarding the error term of the ordinary linear regression model, because they implicitly control for all possible variables at the parent-level that are constant across the siblings, such as the parents' migration background, socio-demographic background, and parents' genetic endowment. Consequently, fixed-effects models cannot estimate effects of constant independent variables. More specifically, we cannot estimate how migration background affects educational attainment. However, by including the main effect for birth order together with interaction terms between birth order and interethnic children, first-generation migrant children, and second-generation migrant children, we can identify differences in the birth order effects across families with different migration backgrounds. The model equation is as follows:

$$
\begin{aligned}
&\Pr(\text{Child}_t \text{ from parent}_i \text{ attends Gymnasium}) \\
&\quad = \alpha_i + \beta_1 \text{2nd born child}_{it} \\
&\quad + \beta_2 \text{3rd born child or younger}_{it} \\
&\quad + \beta_3 \text{2nd born child}_{it} \times \text{1st gen. migrant}_{it} \\
&\quad + \beta_4 \text{ 3rd born child or younger}_{it} \times \text{1st gen. migrant} \\
&\quad + \beta_5 \text{ 2nd born child}_{it} \times \text{2nd gen. migrant}_{it} \\
&\quad + \beta_6 \text{ 3rd born child or younger}_{it} \\
&\quad \times \text{2nd gen. migrant}_{it} + \beta_7 \text{2nd born child}_{it} \\
&\quad \times \text{interethnic 2nd gen.}_{it} \\
&\quad + \beta_8 \text{3rd born child or younger}_{it} \\
&\quad \times \text{interethnic 2nd gen.}_{it} + \beta_9 \text{ girl}_{it} \\
&\quad + \beta_{10} \text{ child age } 12-13_{it} + \beta_{11} \text{ child age } 14-15_{it} \\
&\quad + \beta_{12} \text{ mother's age at birth } 26-27_{it} \\
&\quad + \beta_{13} \text{ mother's age at birth } 28 \\
&\quad + \beta_{14} \text{ mother's age at birth } 29-30 \\
&\quad + \beta_{15} \text{ mother's age at birth } 31 \\
&\quad + \beta_{16} \text{ mother's age at birth } 32 \\
&\quad + \beta_{17} \text{ mother's age at birth } 33 \\
&\quad + \beta_{18} \text{ mother's age at birth } 34-35 \\
&\quad + \beta_{19} \text{ mother's age at birth } 36-37 \\
&\quad + \beta_{20} \text{ mother's age at birth } 38-54 + \epsilon_{it}
\end{aligned}
$$

With E (ϵ_{it} |α_i, all independent variables) = 0

The term ai captures all unobserved variables at the family level which are invariant across siblings. The interpretation of fixed-effects models is technically similar to ordinary regression models but differs at the substantive level. For both model classes, we interpret the estimated regression coefficients as the expected difference in the dependent variable if one independent variable is changed by one unit and all other covariates are held constant. In the fixed-effects model, this change in the independent variable can be interpreted substantively as a between-sibling (i.e. within-family) change of the respective independent variable holding other variables constant (within-family). An interaction effect of a variable that varies between siblings — like birth order — with

a variable that is constant — like migration background — can be interpreted as difference between families with different migration backgrounds in the expected changes of the dependent variable if birth order changes between siblings within family.

Main Results

Table 1 shows the summary statistics of all variables for the whole analysis sample, as well as separately for native, first-generation migrant, interethnic, and second-generation migrant children. The fixed-effects approach requires at least some variance in the dependent variable within families.

Table 2 shows the variation of the chosen educational tracks across natives and migrant generations. We find that, in most families, all siblings attend the same type of school. While the proportion of families in which none of the siblings attend *Gymnasium* is higher among first and second-generation migrant children than among native and interethnic children, the opposite is true for the proportion of families in which all siblings attend *Gymnasium*. This reflects the disadvantaged position of first and second-generation migrants in the German educational system. Besides sibling similarity, there is also considerable variation between siblings in all four groups. We find within-family variation for 23% of native, 11% of first-generation migrant, 19% of second-generation migrant, and 21% of interethnic children.

Table 3 shows the estimated birth order coefficients for the whole analysis sample from linear regression models with parent-level fixed effects considering all control variables (coefficients for the control variables can be found in Supplementary Table SA1). Coefficients are interpreted analogously to ordinary regression coefficients, i.e. the coefficient –0.037 for the variable '2nd born child' means that, compared with the reference group of native first-born children, their second-born siblings are 3.7 percentage points less likely to attend Gymnasium. The coefficient 0.045 for the interaction term '2nd born child × 2nd gen. migrants' tells us that, for second-generation migrants, the difference in the likelihood of attending Gymnasium between the second-born and the first-born child is 4.5 percentage points more positive than in native families. As a result, among second-generation migrants, second-born children are 0.8 percentage points (–0.037 þ 0.045 ¼ 0.008) more likely to attend Gymnasium than their first-born siblings.

Key results are additionally illustrated in Figure 1. For native siblings, we find that the average probability of attending Gymnasium is, compared with the first child, about four percentage points smaller for the second child and about 6 percentage points smaller for children with a higher birth order. This mirrors the negative birth order effects found in previous empirical studies. When looking at the interaction effects between migrant status and birth order, we find no statistically significant different birth order effects for first-generation migrant siblings compared to natives. For interethnic siblings, birth order effects between first and second-born children also do not differ significantly, while we find statistically significant positive interaction

Table 1. Summary statistics

	All	**Natives**	**1st gen. migrants**	**Interethnic 2nd. gen. migrants**	**2nd gen. migrants**
Children attending Gymnasium (%)	42.0	45.4	28.7	42.4	26.6
Birth order (mean)	1.7	1.7	1.9	1.7	1.9
1st child (%)	41.8	42.7	37.7	43.5	36.7
2nd child (%)	45.4	46.0	41.4	45.7	43.3
3rd and higher child (%)	12.8	11.3	20.8	10.8	20.0
Female child (%)	49.1	49.1	47.7	47.1	50.1
Child's age 10-11 (%)	27.1	27.1	23.4	28.3	26.7
Child's age 12-13 (%)	36.7	36.5	39.1	36.5	37.2
Child's age 14-15 (%)	36,2	36.3	37,5	35,2	36.6
Mother's age at birth (mean)	29,6	30.3	28.1	28.8	26.6
Total number of parents	28,101	20,923	578	2,481	4,119
Total number of children	58,263	43,189	1,204	5,123	8,747
Average number of children within family	2.7	2.6	2.9	2.7	3.2

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Microcensus, Scientific Use Files, survey years 2008–2016, own calculations.

Table 2. Variation in Gymnasium attendance within families across natives and migrant generations

	Natives	1st generation migrants	Interethnic migrants	2nd generation migrants	2nd gen.	Total
No sibling goes to Gymnasium	18,575	788	2,422	5,558		27,343
	43.0%	65.4%	47.3%	63.5%		46.9%
Variation across siblings	9,945	137	1,054	1,664		12,800
	23.0%	11.4%	20.6%	19.0%		22.0%
All siblings go to Gymnasium	14,669	279	1,674	1,525		18,120
	34.0%	23.2%	32.1%	17,4%		31.1%
Total	43,189	1,204	5,123	8,747		58,263
	100%	100%	100%	100%		100%

The italic values show the percentag points separately for each ethnic group. Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Microcensus, Scientific Use Files, survey years 2008–2016, own calculations.

Table 3. OLS regression of attending Gymnasium with parent-level fixed effects (condensed)

	Main	
	model	**SE**
2nd born child	-0.037***	(0.006)
3rd – 10th born child	-0.056***	(0.013)
2nd born child × 1st gen. migrants	-0.030	(0.018)
3rd-10th born children × 1st gen. migrants	0.046	(0.029)
2nd born child × Interethnic 2nd gen. migrants	0.007	(0.011)
3rd-10th born children × Interethnic 2nd gen. migrants	0.065**	(0.024)
2nd born child × 2nd gen. migrants	0.045***	(0.009)
3rd -10th born children × 2nd gen. migrants	0.095***	(0.017)
N Families		28,101
N Children		58,261

Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Microcensus, Scientific Use Files, survey years 2008–2016, own calculations. Note: Significance level: *P < 0.05 **P < 0.01 ***P < 0.001; family cluster robust standard errors in parentheses; all control variables considered

effects of 0.065 for the siblings of higher birth order. Among second-generation migrant siblings, we find statistically significant positive interaction effects of 0.045 for the second child and 0.095 for siblings of higher birther order. The differences in birth order effects between native and second-generation migrant siblings are also of substantive significance, given that the effect sizes are even larger than the differences between siblings of different sex (0.034). In Figure 1, we can see that, among second-generation migrant siblings, the birth order effects are close to zero for the second child and statistically significant positive for children with birth order 3 or higher. Thus, second-generation children even seem to benefit from having older siblings. In contrast, among first-generation migrant siblings and interethnic siblings, birth order effects are negative for the second child and close to zero for children with birth order 3 or higher. The large confidence intervals for the point estimates of children with birth order 3 or higher show that the point estimates come with a substantive degree of uncertainty, which is why results for third born children should not be overinterpreted.[8] In line with our expectations, the results suggest that negative effects of birth order dominate among native, first-generation migrant, and interethnic children, while this is not the case for second-generation migrant children.

Alternative Explanations and Robustness Checks

Although the results are consistent with our theoretical argumentation on the importance of older siblings for

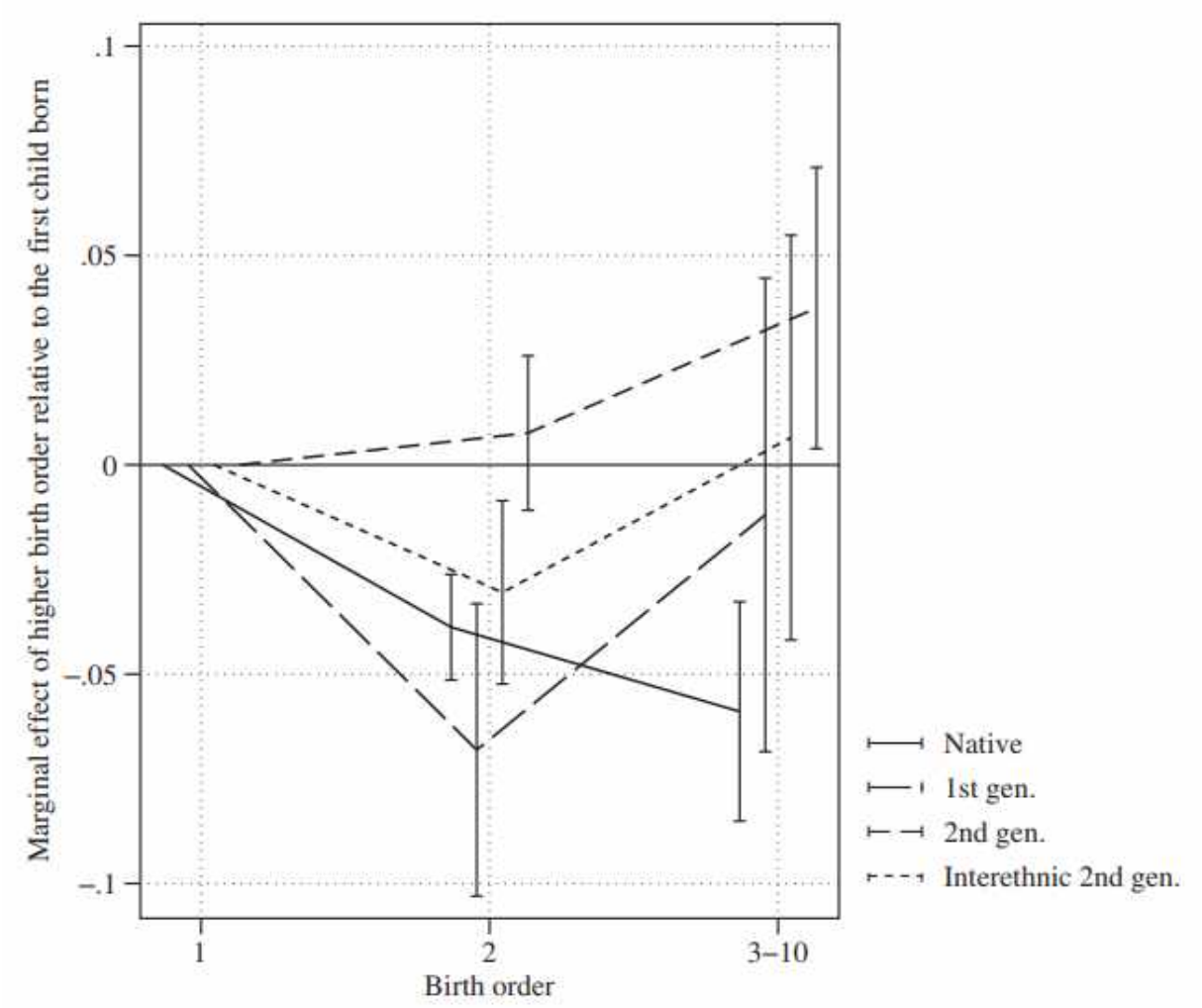

Figure 1. Effect of birth order on attending Gymnasium (FE OLS results, main model) Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Microcensus, Scientific Use Files, survey years 2008–2016, own calculations. Note: 95% confidence intervals shown with family cluster robust standard errors.

the educational success of younger siblings in second-generation migrant families, we are unfortunately not able to test the assumed underlying mechanisms directly. In this section, we therefore discuss potential alternative explanations for the group differences in birth order effects and, if possible, perform additional robustness checks (key results are shown in Figure 2). Since existing research indicates that negative birth order effects diminish with the rank of the birth order (Blake, 1981; Behrman and Taubman, 1986), a higher total number of older siblings among second-generation migrants compared to natives could be partly responsible for our results. However, the fact that this also applies to first-generation children contradicts such an interpretation. Furthermore, while potentially smaller, we would still expect negative birth order effects for second-generation siblings. To ensure that the potential distortion is not substantial, we perform two empirical robustness tests. First, to reduce the probability of unobserved older siblings, we restrict our analysis sample to families in which the mother was younger than 26 years when the oldest analysed child was born. Second, we only consider families with exactly two children living in the household.[9]

Since birth order effects could vary according to the socioeconomic status of the family (Black, Devereux and Salvanes, 2005; Härkönen, 2014; Grätz, 2018) and migrant children more often live in lower status families than native children, group differences could potentially be driven by socioeconomic differences. Therefore, we run analyses in which we interact birth order with three measures of socioeconomic background. To measure the highest parental occupational status, we derived ISEI scores from the ISCO-88 codes for the years 2008 to 2010 and from the ISCO-08 codes for the years 2011 to 2016 (Schimpl-Neimanns, 2018). A dummy variable indicates whether both parents are unemployed. The parents' highest educational degree is measured on a variable with four levels, based on the International Standard Classification of Education (ISCED). The lack of clear theoretical assumptions about differences in the effects of control variables between

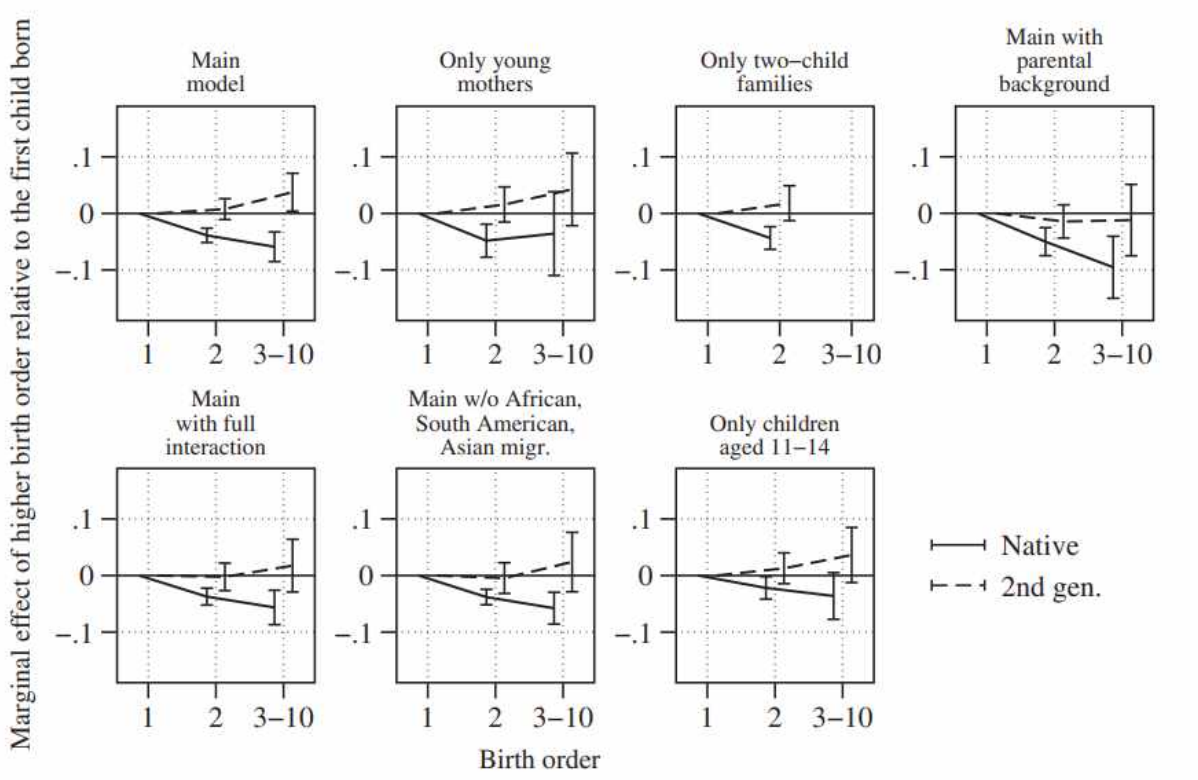

Figure 2. Robustness checks. Source: RDC of the Federal Statistical Office and Statistical Offices of the Federal States, Microcensus, Scientific Use Files, survey years 2008–2016, own calculations. Note: 95% confidence intervals shown with family cluster robust standard errors.

natives and migrants lead us to interact solely birth order across migrant groups, in order to keep our models parsimonious. To check the validity of this effect homogeneity assumption for the control variables, we additionally run a model in which we interact not only birth order but also all control variables with the four categorical migrant status variable (full interaction model). Another potential alternative explanation for our findings could be cultural variation. However, in Germany, most persons with a migration background come from other European countries, and only a small proportion originates from countries for which existing research has found no or positive birth order effects (Isungset, Lillehagen and Ugreninov, 2020). To further diminish the potential impact of cultural variation on our results, we additionally run analyses which include only migrants from Europe, North America, Australia, New Zealand, and Oceania.[10] Lastly, previous research indicates that birth spacing, i.e. the age difference between successive siblings, could moderate the birth order effect (Zajonc, 1976; Grätz, 2018). Thus, *differences in birth spacing* between natives and the different migrant groups could partly drive our results. However, since we analyse only siblings aged 10–15, group differences in birth spacing are limited. As a further robustness check, we run additional analyses in which we restrict our sample to siblings aged 11–14, which means that for all non-twin siblings, birth spacing can only vary between 1 and 3 years.[11] Key results of the robustness checks are illustrated in Figure 2. We focus on native and second-generation migrant siblings, since for these two groups we have the clearest theoretical expectations concerning differences in birth order effects, and the number of cases in the two groups allow for reliable estimates also in the subsample analyses (coefficients for all variables can be found in Supplementary Table SA1). Despite substantive differences in the analysis samples and in the statistical models across the robustness checks, our key results remain stable. In all specifications, we find negative birth order effects for natives, and no or slightly positive birth order effects for second-generation migrant siblings, with all differences between the two groups being statistically significant.

As highlighted in our theoretical considerations, the positive tendency in birth order effects among second-generation siblings could result from both the fact that older siblings support and guide their younger siblings and from the fact that parents' language skills and knowledge of the German educational system increase with the duration of their residency and with each further child. Our data do not allow us to run additional analyses in which we can empirically differentiate between the importance of parental learning and the support function of older siblings. However, substantial effects of parents' acculturation cannot be found for first-generation siblings, although their host country-specific resources should also grow with the duration of their residency, and they should also start to become more involved with the educational system as soon as it becomes relevant to the oldest child. Overall, the empirical results and theoretical considerations suggest that the differences in birth order effects are most likely largely due to the important support function of older siblings in second-generation migrant families.

However, since we are not able to directly test the different possible mechanisms empirically, a final clarification will require further research.

Conclusion

In this article, we investigated whether the well-documented negative birth order effects on educational success also apply to the secondary school placement of children with migration background in Germany. We argue that the input of all family members affects the educational career of a child and that older siblings on the one hand dilute parents' resources but on the other hand they have a guiding and supporting function for their younger siblings and parents can gain knowledge about the education system during the educational career of older siblings. While the negative effects of having older siblings should dominate in native families and in interethnic families, in migrant families with second-generation children, parental learning could counteract the resource dilution. Furthermore, parents are often less fluent in the host country's language and have less knowledge about the educational system than older siblings who were socialized and educated in the host country. In these families, support from older siblings can play a crucial role, which is why older siblings may not only not hinder the school careers of their younger siblings but may even enhance them. For families with first-generation children, no clear theoretical expectations could be derived regarding birth order effects.

Despite good theoretical reasons, existing research has largely neglected potential variation in birth order effects on educational success among natives and different migrant generations. As far as we know, we are the first to investigate birth order effects on secondary school track placement with representative data and a within-family design. Overall, our empirical analyses exhibit negative birth order effects for native, first-generation migrant, and interethnic siblings, but not for second-generation migrant siblings. In addition to its empirical implications, our study is also of theoretical relevance and provides important new insights for birth order, social stratification, education, and migration research, points out directions for future research and has policy implications. On a general level, our theoretical arguments and empirical findings highlight that older siblings do not just decrease the intellectual level of a family and dilute parents' attention and resources but can also provide younger siblings with crucial resources and support. Consequently, the effects of birth order on educational success do not necessarily have to be negative but can be absent or even reversed under certain circumstances. More specifically, the results suggest that, especially in migrant families with second-generation children, older siblings play an important role in supporting and guiding their younger siblings through the educational system. These intragenerational transmission processes should be given more attention in social stratification, education, and migration research. In this respect, the empirical results underline our theoretical argument that it is not sufficient to just compare native and migrant families. Instead, we need to draw a more differentiated picture that accounts for the differences between children of different migration generations.

Our findings also have policy implications. First of all, they underline the importance of policies that educate migrant parents about how the educational system of the host country works and enable them to support their children in their educational careers. Furthermore, for second-generation students, they suggest that in cases in which such policies are hard to implement (for example due to insufficient language skills of the parents) policies which support first-borns might be particularly important, because they lack older siblings who can take on the mentoring function. Moreover, our results, together with current findings on inter-sibling effects on college attendance (Smith, 2020; Altmejd et al., 2021), suggest that such educational interventions could also have positive spillover effects on the school track placement of younger siblings.

This paper also has limitations, which should be addressed in future research. First, while the data at

hand allows us to use a within-family design, we were not able to test the assumed underlying mechanisms. While the key findings are largely in line with our theoretical considerations, further analyses are needed that offer empirical insights into the processes leading to different birth order effects in families with second-generation children. For this purpose, data is needed that includes information on parents' and children's language proficiency and knowledge of the educational system, as well as on the educational support children receive from parents and older siblings. Secondly, our results are restricted to the highly stratified German educational system, which comprises several secondary school types that differ strongly with respect to requirements, curricula, years until graduation, and types of school-leaving qualification (Müller, 2005). The guiding and teaching function of older second-generation siblings is likely to be more important in the complex German educational system, with its long-lasting effects of early educational decisions, than in countries with a less stratified system. Thirdly, while we focus on educational success in terms of secondary school track placement, much of the literature on birth order effects deals with their impact on intelligence and competencies. While it is theoretically plausible that for second-generation children, the teaching and guidance of older siblings is more beneficial for the younger siblings' school track placement and educational attainment than for the older siblings themselves, the advantages in intelligence and competence development might actually be higher for the older siblings who perform the teaching function. Thus, results for educational competencies may be different from those presented here. The open research questions outlined here show that we are still at the beginning of the investigation of potential effect heterogeneity in birth order effects on educational success between natives and migrants. We hope that our theoretical and empirical contribution is a first step towards a better understanding and that it stimulates future research on this issue to fill the remaining research gaps.

Notes

1. However, there also exist studies conducted in African, Central/South American, and South/East Asian countries that show no or even positive birth order effects. As possible explanations for these deviations, different institutional settings, poverty, and cultural variation in family-related behaviours are mentioned. A recent Norwegian study finds negative birth order effects on school marks for most migrant groups except for immigrant families originating from Sri Lanka, Vietnam, and India. These findings also highlight the potential importance of cultural differences (Isungset, Lillehagen and Ugreninov, 2020). Robustness analyses in which we exclude migrants from these world regions indicate that our results are not substantially distorted by cultural variation.
2. In Germany, the number of migrants from non-Western countries is low, and both first-generation and second-generation migrants are significantly less successful in the educational system compared to natives (Olczyk et al., 2016; BAMF and BMI, 2019). Robustness analyses in which we exclude migrants from African, South American, and Asian countries confirm our results.
3. Especially those first-generation older siblings who have completed all or at least most of their schooling in Germany may be able to support their younger siblings nearly as well as secondgeneration older siblings. Due to small case numbers of children who migrated at such young ages (the mean age at arrival of first-generation migrant children in our analysis sample is 12.3 years), our data unfortunately do not enable a closer examination.
4. In the years before 2008, information on the attended school type was not collected.
5. In Mecklenburg-Western Pomerania, many children attend an orientation course that is independent from school type (schulartunabhängige Orientierungsstufe) in grade 5 and grade 6. Rerunning our analyses without Mecklenburg-Western Pomerania did not change results substantially.
6. Our target population for which our object of interest is defined are two-parent families with at least two secondary school children aged 10–15. In the gross sample, we have 29,310 such families which encompass 60,885 children. Of those children, 2,605 live with siblings from different migrant generations, and an additional 17 children are lost due to item non-response.
7. We use linear regression models because, in contrast to non-linear regression models with fixed effects, they allow an interpretation at the level of predicted probabilities instead of odds ratios (Chamberlain, 1984: p. 1277). Moreover, nonlinear regression models can lead to misleading interaction effect estimates (Mood, 2010). To check if our results are an artefact of the estimation technique, we also estimate binary logit models and

a structurally similar multinomial logistic regression (Pforr, 2014) with parent-level fixed effects, in which we also distinguish Hauptschule, Realschule, and comprehensive schools. The main results of the sensitivity analyses are similar to those of linear regression models (see Supplementary Tables SA2 and SA3).

8. The Microcensus is a rotating household panel survey with 4-year rotation intervals. Until 2012 the household identifiers across waves are anonymized, i.e. we cannot identify identical households across years. Therefore, clustering at the household-panel level could deflate our standard errors. For a backof-the-envelope calculation of this potential design effect, we expect that about one-third of all households change each year due to normal rotation and relocation, and about 30% (40% in the robustness analyses with age range 11–14) of all children in our sample leave or newly enter the observation window due to our age restriction each year. Therefore, the effective sample size is reduced by about 40% (30%). If all variables were perfectly correlated across waves, this would imply a maximum artificial deflation of our standard errors by about 25% (by about 15% in the robustness checks with age range 11–14). Such a deflation does not affect our main results substantially.
9. When counting the total number of children, we also consider children living in the household who are older than 15 and younger than 10.
10. Supplementary Table SA4 lists all countries included. Due to small case numbers, our data unfortunately do not allow us to analyse differences in birth order effects between single countries of origin.
11. We cannot control for spacing between siblings, because this would necessarily limit our analysis sample to families with at least three children between 10 and 15.

Supplementary Data

Supplementary data are available at ESR online.

References

Alfaro, E. C. and Umana-Taylor, A. J. (2010). Latino adoles- ~ cents' academic motivation: the role of siblings. Hispanic Journal of Behavioral Sciences, 32, 549–570.

Altmejd, A. et al. (2021). O Brother, where start thou? Sibling spillovers on college and major choice in four countries. The Quarterly Journal of Economics, 136, 1831–1886.

Autorengruppe Bildungsberichterstattung (Ed.) (2018) Bildung in Deutschland 2018. Bielefeld: wbv Media.

BAMF and BMI (2019) Migrationsbericht der Bundesregierung 2016-2017. Nürnberg/Berlin: BAMF/BMI.

Barclay, K. J. (2015). Birth order and educational attainment: evidence from fully adopted sibling groups. Intelligence, 48, 109–122.

Behrman, J. R. and Taubman, P. (1986). Birth order, schooling, and earnings. Journal of Labor Economics, 4, 121–145.

Black, S. E., Devereux, P. J. and Salvanes, K. G. (2005). The more the merrier? The effect of family size and birth order on children's education. The Quarterly Journal of Economics, 120, 669–700.

Blake, J. (1981). Family size and the quality of children. Demography, 18, 421–442.

Blossfeld, H.-P., Buchholz, S., Skopek, J. and Triventi, M. (Eds.) (2016) Models of Secondary Education and Social Inequality: An International Comparison. Cheltenham, UK: Edward Elgar Publishing.

Boos-Nünning, U. and Karakasoglu, Y. (2005) Viele Welten Leben: Zur Lebenssituation von Ma¨dchen und Jungen Frauen mit Migrationshintergrund. Münster: Waxmann Verlag.

Booth, A. L. and Kee, H. J. (2009). Birth order matters: the effect of family size and birth order on educational attainment. Journal of Population Economics, 22, 367–397.

Bourdieu, P. (2004) Meditationen: Zur Kritik der Scholastischen Vernunft. Translated by Russer, Achim. Frankfurt am Main: Suhrkamp.

Brüderl, J. and Ludwig, V. (2014) Fixed-effects panel regression. In Best, H. and Wolf, C. The SAGE Handbook of Regression Analysis and Causal Inference. London: SAGE, pp. 327–358.

Bu, F. (2016). Examining sibling configuration effects on young people's educational aspiration and attainment. Advances in Life Course Research, 27, 69–79.

Chamberlain, G. (1984) Panel data. In Griliches, Z. and Intriligator, M. D. (Eds.), Handbook of Econometrics. New York, NY: Elsevier, pp. 1247–1318.

Cicirelli, V. G. (1994). Sibling relationships in cross-cultural perspective. Journal of Marriage and Family, 56, 7–20.

Diehl, C., Hunkler, C. and Kristen, C. (Eds.) (2016) Ethnische Ungleichheiten im Bildungsverlauf: Mechanismen, Befunde, Debatten. Wiesbaden: Springer VS.

Esser, H. (2006) Migration, Language and Integration. AKI Research Review 4. Berlin: Programme on Intercultural Conflicts and Societal Integration (AKI), Social Science Research Center Berlin (WZB).

Grätz, M. (2018). Competition in the family: inequality between siblings and the intergenerational transmission of educational advantage. Sociological Science, 5, 246–269.

Grgic, M. and Bayer, M. (2015). Eltern und geschwister als bildungsressourcen? Der beitrag von familialem kapital für bildungsaspirationen, selbstkonzept und schulerfolg von kindern. Journal of Family Research, 27, 49–68.

Härkönen, J. (2014). Birth order effects on educational attainment and educational transitions in West Germany. European Sociological Review, 30, 166–179.

Helbig, M. (2013). Der positive und negative Einfluss von Geschwistern auf den Gymnasialübergang. KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie, 65, 623–644.

Hurtado-Ortiz, M. T. and Gauvain, M. (2007). Postsecondary education among mexican american youth: contributions of parents, siblings, acculturation, and generational status. Hispanic Journal of Behavioral Sciences, 29, 181–191.

Isungset, M. A., Lillehagen, M. and Ugreninov, E. (2020). One order fits all? Birth order and education in immigrant families. European Sociological Review, 36, 16–31.

Kantarevic, J. and Mechoulan, S. (2006). Birth order, educational attainment, and earnings an investigation using the PSID. Journal of Human Resources, XLI, 755–777.

Karwath, C., Relikowski, I. and Schmitt, M. (2014). Sibling structure and educational achievement: how do the number of siblings, birth order, and birth spacing affect children's vocabulary competences? Journal of Family Research, 26, 372–396.

Kretschmer, D. (2018). Explaining differences in gender role attitudes among migrant and native adolescents in germany: intergenerational transmission, religiosity, and integration. Journal of Ethnic and Migration Studies, 44, 2197–2218.

Kristen, C. and Granato, N. (2007). The educational attainment of the second generation in germany: social origins and ethnic inequality. Ethnicities, 7, 343–366.

Kristensen, P. and Bjerkedal, T. (2010). Educational attainment of 25 year old Norwegians according to birth order and gender. Intelligence, 38, 123–136.

Mood, C. (2010). Logistic regression: why we cannot do what we think we can do, and what we can do about it. European Sociological Review, 26, 67–82.

Müller, W. (2005). Education and youth integration into European Labour Markets. International Journal of Comparative Sociology, 46, 461–485.

Olczyk, M. et al. (2016) Migranten und ihre Nachkommen im deutschen Bildungssystem: ein aktueller Überblick. In Diehl, C., Hunkler, C., and Kristen, C. (Eds.), Ethnische Ungleichheiten im Bildungsverlauf: Mechanismen, Befunde, Debatten. Wiesbaden: Springer Fachmedien, pp. 33–70.

Page, E. B. and Grandon, G. M. (1979). Family configuration and mental ability: two theories contrasted with U. S. data. American Educational Research Journal, 16, 257–272.

Pforr, K. (2014). Femlogit—implementation of the multinomial logit model with fixed effects. The Stata Journal, 14, 847–862.

Rodgers, J. L. et al. (2000). Resolving the debate over birth order, family size, and intelligence. American Psychologist, 55, 599–612.

Roth, T. (2017). Interpersonal influences on educational expectations: new evidence for Germany. Research in Social Stratification and Mobility, 48, 68–84.

Salikutluk, Z. (2016). Why do immigrant students aim high? Explaining the aspiration–achievement paradox of immigrants in Germany. European Sociological Review, 32, 581–592.

Schimpl-Neimanns, B. (2018) The International Socio-Economic Index of Occupational Status (ISEI).

Schindler, S. (2017). School tracking, educational mobility and inequality in German secondary education: developments across cohorts. European Societies, 19, 28–48.

Schulze, A. and Preisendörfer, P. (2013). Bildungserfolg von Kindern in Abhängigkeit von der Stellung in der Geschwisterreihe. KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie, 65, 339–356.

Sewell, W. H., Haller, A. O. and Portes, A. (1969). The educational and early occupational attainment process. American Sociological Review, 34, 82–92.

Smith, C. M. (2020). In the footsteps of siblings: college attendance disparities and the intragenerational transmission of educational advantage. Socius, 6, 1–14.

Smith, T. E. (1984). School grades and responsibility for younger siblings: an empirical study of the 'teaching function'. American Sociological Review, 49, 248–260.

Steelman, L. C. (1985). A tale of two variables: a review of the intellectual consequences of sibship size and birth order. Review of Educational Research, 55, 353–386.

Tepecik, E. (2012) Schule in der Einwanderungsgesellschaft: ressourcen erkennen und Potenziale fördern. In Fereidooni, K. (Ed.) Das interkulturelle Lehrerzimmer. Wiesbaden: Springer VS, pp. 125–132.

Wallace, C. (2007) Jugendliche MigrantInnen in Bildung und Arbeit: Auswirkungen von Sozialkapital und Kulturellem Kapital auf Bildungsentscheidungen und Arbeitsmarktbeteiligung. Endbericht OeNB Jubiläumsfonds Projektnr.: 11762. Wien: Österreichisches Institut für Jugendforschung.

Zajonc, R. B. (1976). Family configuration and intelligence. Science, 192, 227–236. Zajonc, R. B. and Markus, G. B. (1975). Birth order and intellectual development. Psychological Review, 82, 74–88.

Tobias Roth received his doctoral degree from the University of Mannheim in 2014. Currently, he is researcher at the GESIS Leibniz-Institute for the Social Sciences and External Fellow at the Mannheim Centre for European Social Research. Current research interests comprise social, ethnic, and gender inequalities in education, social capital as well as school-to-work transition. His work has been published in journals such as *European Sociological Review, Social Networks, Research in Social Stratification and Mobility, and Journal of Ethnic and Migration Studies.*

Klaus Pforr received his doctoral degree from the University of Mannheim in 2013. Currently, he is

researcher at the GESIS Leibniz-Institute for the Social Sciences. Current research interests comprise social implications of wealth inequality, survey methodology and econometrics. His work has been published in journals such as *Soziale Welt, Public Opinion Quarterly, The Stata Journal, and Survey Research Methods.*

Sandra Mingham received her master's degree in 2019 in Sociology at the University of Mannheim. She worked as a student assistant at the GESIS—Leibniz-Institute for the Social Sciences.

Meike Selbach received her master's degree in 2020 in Sociology at the University of Mannheim. She worked as a student assistant at the GESIS—Leibniz-Institute for the Social Sciences.