Diluting or Transmitting Resources?

The Academic Effects of Siblings in Immigrant Families

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ABSTRACT

In this paper, I test whether the relationship linking sibship size and birth order to children’s academic outcomes differs between native and immigrant families. Consistent with the Resource Dilution Model, the literature routinely shows a negative effect of large sibship sizes and later birth rank on test scores and educational attainment in the general population. However, using the recent large-scale “Trajectories and Origins” survey in France, I demonstrate that this finding does not hold for children from immigrant families. I interpret this result as a product of two processes: the more negative selection of native parents who have a high number of children, and the specific socializing role of older siblings in immigrant families in which parents have no direct knowledge of the school system of the country of destination.

INTRODUCTION

A large body of literature has consistently demonstrated the existence of negative correlations between academic outcomes, on the one hand, and larger sibship size and later birth ranks, on the other (see Heer 1985; Steelman et al. 2002, for literature reviews). To explain these negative relationships, the influential “Resource Dilution Model” (Blake 1981; Downey 1995; Downey 2001) posits that the amount of resources transmitted by parents to each of their children decreases with every additional birth. In this paper, I provide evidence that the relationship linking sibship size and birth order to children’s academic outcomes differs between native and immigrant families.

Using the French “Trajectories and Origins” (TeO) survey, I show that the nearly constant finding of a negative effect of large sibship size and later birth ranks on test scores and educational attainment in the general population does not hold for children living in
immigrant families. I account for the specificity of the academic effect of sibling configuration in immigrant families by pointing to two processes: the negative selection of natives who have a high number of children and the specific socializing role of older siblings in immigrant families. First, as recent findings imply (Black, Devereux, and Salvanes 2005; Angrist, Lavy, and Schlosser 2010; De Haan 2010; Åslund and Grönqvist 2010), the negative academic effect of sibship size in the general population is driven less by the number of siblings per se, than by the fact that parents who have a high number of children are more likely to possess unobserved traits that negatively affect their children’s academic success. The parity at which this negative selection starts is likely to depend on the fertility norms that prevail in each country. Because non-Western immigrant parents come from relatively high fertility countries, they will – all things being equal – be less negatively selected than French native parents with the same number of children.

Second, consistent with existing statistical and ethnographic accounts, I argue that, in immigrant families in which parents have not attended school in the country of destination, the flow of academically relevant resources is not only intergenerational (from parents to children), as assumed by the “Resource Dilution Model”, but also and more importantly intragenerational (between siblings, especially from older to younger ones). This is likely to explain why children of immigrants do not suffer academically from being born later in the birth order.

**PREVIOUS EMPIRICAL LITERATURE**

As Steelman and her colleagues stated in a 2002 literature review, “the evidence of a negative relationship between size of sibling group and academic success, at least in the United States […] and Western Europe […] has been virtually unequivocal. The regularity of this
relationship is impressive” (Steelman et al. 2002, p. 248). Until recently, the literature reached overwhelming consensus on the matter, showing that belonging to large sibling groups was detrimental to a child’s academic outcomes (in the US: Blau and Duncan 1967; Blake 1981; Blake 1989; Kuo and Hauser 1997; in Western Europe: Girard and Bastide 1963; Ferrari and Dalla Zuanna 2010; Wolff 2014; Moguérou et al. 2014; as well as some developing countries: Anh et al. 1998; Bougma, LeGrand, and Kobiané 2015). The main empirical difficulty in trying to estimate the causal effect of sibship size on children’s academic and occupational outcomes is the endogeneity of fertility decisions. As Black and her colleagues put it, “is it true that having a larger family has a causal effect on the ‘quality’ of the children? Or is it the case that families who choose to have more children are (inherently) different, and the children would have lower education regardless of family size?” (Black et al. 2005, p. 670). When instruments are used to control for the endogeneity of sibship size, its negative effect substantially decreases and often becomes non-significant (Black et al. 2005; Angrist et al. 2010; Åslund and Grönqvist 2010; Wolff 2014). In this paper, I do not resort to an instrumental variable approach, but instead use the likely endogeneity of fertility decisions as a tool to interpret the finding that children of immigrants do not seem to suffer academically from living in large sibships to the extent that children of natives do.

The empirical literature on the effect of birth order on academic outcomes has repeatedly found that being a later-born child has detrimental effects on education. Evidence comes from a wide range of countries, including the US (De Haan 2010; Hotz and Pantano 2015), France (Desplanques 1981; Gary-Bobo, Picard, and Prieto 2006; Wolff 2014), the UK (Booth and Kee 2009), the Netherlands (Belmont and Marolla 1973), Norway (Black et al. 2005), Italy (Ferrari and Dalla Zuanna 2010), and Kenya (Gomes 1984). In the case of birth order, endogeneity is not directly a problem for analysis. Rather, the main challenge to estimating the causal effect of birth order on academic and occupational outcomes is the fact that, by
definition, birth order and sibship size are strongly correlated. First-born children often belong to smaller families than third, fourth or fifth-born ones, who, by definition, will respectively belong to families with at least three, four or five children. Not infrequently in empirical research estimating the effect of birth order, controls for sibship size are not sufficient. To remedy this problem, I use two strategies in this paper. First, I employ the modified birth order index, proposed by Booth and Kee (2009), which is virtually uncorrelated with family size. Second and more importantly, I use family fixed-effects models that effectively control for all family-constant characteristics, including sibship size.

THEORETICAL BACKGROUND AND HYPOTHESES

In the relevant literature, the negative effects of belonging to large sibling groups and being a later-born child are often interpreted in light of one main theory: the “Resource Dilution Model” (Blake 1981; Downey 1995; Downey 2001). The Resource Dilution Model argues that the amount of resources transmitted by parents to each of their children decreases with every additional birth. Children born into small sibship are thus more likely to receive more resources and achieve more favorable educational outcomes. By the same token, first-born and other early-born children are also predicted to experience more favorable outcomes, since they spend a longer period with fewer siblings than their later-born counterparts.

Although consistent with most empirical findings, the Resource Dilution Model has two theoretical limitations: first, it does not consider the potential endogeneity of fertility decisions and takes as causal the statistical association between sibship size and academic outcomes; second, it assumes that resources are mostly, if not only, transmitted intergenerationally from parents to children, thus disregarding the possible socializing role of older siblings as transmitters of relevant resources.
In this paper, I hypothesize that these two limitations prevent the Resource Dilution theory from providing sound theoretical predictions about the effect of sibship size and birth rank on the academic outcomes of children of immigrants. First, recent research controlling for the potential endogeneity of fertility decisions and academic outcomes has concluded that the negative correlation between sibship size and academic achievement is likely non-causal and explained away by the negative selection of parents who have large numbers of children. In other words, the negative “effect” of having more siblings would not be a product of having to share resources with more siblings (resource dilution), but rather of living in a family in which parents have fewer resources (e.g., less academically favorable attitudes and behaviors) to begin with (negative selection).

Immigrant parents, especially those born in high fertility countries, come from societies in which fertility distributions and norms can be widely different from those prevailing in the country of destination (i.e. France). Therefore, for the same absolute number of children, each mother will have a very different relative position on the fertility distribution of her country of origin. The extent of the negative selection into high fertility is likely to be relative to nationally specific fertility norms and distributions of children per woman. For example, following the negative selection argument, we assume that parents who have more children than do the average parents of the same cohort and country of birth are negatively selected on some unobserved traits, and that the extent of this negative selection increases with number of children. In countries where having seven children is the norm (both statistically and socially), having only five children corresponds to a relatively restrictive fertility behavior, and therefore, we may assume, a non-negative selection. However, the same number of children would correspond to a substantially higher than average number of children for French native parents and could, in their case, be related to negative characteristics. Because they come from countries with different fertility norms, and usually higher fertility than in Western
countries of destination, immigrant parents’ will be less affected by negative selection than
French natives with the same number of children. We can thus expect the following
hypothesis to be true:

**Hypothesis 1 –** There is a strong interaction effect between sibship size and belonging to an
immigrant – as opposed to native – family in explaining children’s academic outcomes.
*Specifically, the negative effect of larger sibship size, detected in the general population, is
substantially less pronounced for children living in immigrant families.*

Secondly, in immigrant families, the central mechanism posited by the Resource Dilution
Model (intergenerational transmission of rivalrous resources) is likely to be outweighed by
other processes favoring the relative academic success of later-born children compared to
their older siblings. In immigrant families in which parents migrated as adults, older siblings
are the first members of the household to experience the school system in the country of
destination. Therefore, while in native families most educationally relevant resources, such as
information on the school system and knowledge of teachers’ expectations, are possessed by
parents who can transmit these resources to their children through socialization; in immigrant
families, the eldest sibling does not benefit to the same extent from these resources because
their parents’ lack any direct experience of the educational system in the country of
destination. The first-born children of immigrants are those who progressively acquire these
resources as they attend school themselves. They can then transmit them to their younger
brothers and sisters, fostering more successful academic trajectories. This hypothesized
specific pattern of intra-generational resource transmission among siblings in immigrant
families is given credit by quantitative and ethnographic research showing the strong
involvement of older siblings in their brothers’ and sisters’ education within these families (in
France: Lahire 1995, p. 161-166; Santelli 2001, p. 183-184; Moguérou and Santelli 2015; in
other European countries: Crul 1999; Crul 2011; Schnell 2015; Schnell et al. 2015; and in the US: e.g. Bankston 1998; Portes 2008). Hence we posit a second hypothesis:

**Hypothesis 2 –** There is a strong interaction effect between birth order and belonging to an immigrant – as opposed to native – family in explaining children’s academic outcomes. Specifically, the negative effect of being born at a later rank in the birth order, detected in the general population, does not hold for children living in immigrant families.

The rest of the paper presents the data used to test these two hypotheses, shows empirical analyses broadly supporting them, and finally concludes.

**DATA, VARIABLES AND ANALYTICAL STRATEGY**

The analyses presented in this paper rely primarily on the recent large-scale “Trajectories and Origins” survey (Trajectoires et Origines, thereafter referred to as TeO) survey conducted by the French National Institute for Demographic Studies (INED) in collaboration with the French National Statistics Institute (INSEE) in 2008-2009.¹ The survey oversampled immigrants and children of immigrants (from different households). Its sample of more than 21,000 respondents includes a representative sub-sample of about 8,000 immigrants. The size of its samples of immigrants and children of immigrants, its representativeness, and the richness of the face-to-face questionnaire administered makes TeO a unique survey. One especially relevant feature of the survey to test siblings’ effects is that it includes information (including year and country of birth, sex, and educational attainment) for each of the respondents’ children.

In the analyses presented below, the aim is to explain the educational attainment of children of immigrants who attended school in France. Therefore, I restrict the sample to parents with at least one child, whose children were all born in France (or arrived before the age of 3) and were all at least 18 years old at the time of the survey. Since the focus is on immigrant parents who were socialized in their country of origin, I exclude immigrants to France who migrated before the age of 16. Following these restrictions and listwise deletion of missing values, the working sample is 5,061 children.

**Dependent variable: educational attainment**

The dependent variable is a dichotomous measure of children of immigrants’ educational attainment in France. It indicates whether each child holds at least a high school diploma (*baccalauréat*), which is the only educational information available for each child of every respondent.

**Independent variables of interest**

*Sibship size* is a variable that measures the number of children of each respondent.

*Birth order* measures the birth rank of each child, starting with 1 for the first-born, 2 for the second-born and so on. By definition, birth order and sibship size are strongly correlated. In our working sample, this correlation is .623. In some analyses, I use a modified index of birth order, proposed by Booth and Kee (2009). In family $j$, if sibship size is $N_j$ and the birth rank of child $i$ is $R_{ij}$, the Booth and Kee index of child $i$ is $BK_{ij} = \frac{R_{ij}}{(N_j+1)/2}$. The denominator of this expression is the average birth rank in family $j$. In our sample, the Booth-Kee index has a $r=-.042$ linear correlation with sibship size.
**Region of origin** measures the region of birth of immigrant parents. Countries of origin were grouped according to geographical and cultural proximity, with the constraint of forming groups of sufficient size for statistical analysis. The resulting seven-category variable distinguishes children with: one or two parents born in metropolitan France (referred to as children of natives); both parents born in Southern Europe (Portugal, Spain, Italy, or Greece); both parents born in other European countries (Belgium, Germany and Poland being the main countries of birth in this category); both parents born in North Africa (Morocco, Algeria, or Tunisia); both parents born in Sub-Saharan Africa (Senegal and Mali being the main countries of birth in this category); both parents born in Turkey; and both parents born in Southeast Asia (Vietnam, Laos, or Cambodia). The small fractions of children whose parents are immigrants from two different regions of the world are excluded from the analysis.

**Control variables**

Most multivariate models control for: both the mother’s and father’s educational attainment (both variables measured in seven categories ranging from “no education” to “university degree”); both the mother’s and father’s occupational category (in seven categories based on the French PCS scheme); the child’s sex and year of birth; and whether both of his or her parents lived in the household while he or she was a child.

**Analytical strategy**

To test the two hypotheses put forward above, this paper employs two kinds of models. To test Hypothesis 1 about the effect on children’s educational attainment of their sibship size, and how this effect differs between immigrant parents’ region of origin, standard binary logit models are used. To test Hypothesis 2 on the effect of children’s birth rank on their
educational attainment, and how this effect differs between immigrant parents’ region of origin, I use conditional logit models, comparable to a family-fixed effects models for binary outcomes. This type of model has the fundamental advantage of comparing children within the same family, instead of unrelated children from different families. In doing so, the conditional logit model effectively controls for all observed and unobserved characteristics of the family that are the same for all siblings. One such essential characteristic is sibship size, whose high correlation with birth rank has been shown to confound the effect of each variable in past research (see Black et al. 2005, for similar models).

**Empirical Analysis**

**Descriptive results**

Figure 1 displays the distribution of sibship size according to the region of origin of the parents. Unsurprisingly, it shows marked differences between regions, which are partly a reflection of fertility rates in these regions. In the TeO survey, three groups can be distinguished. Children whose parents were born in France and the rest of Europe usually belong to relatively small sibships (with a median of 2 children for parents born in France and 3 for European immigrants). Children born to Turkish and Southeast Asian parents usually belong to medium-sized sibships (with a median of 4 children in both cases). Finally, children born to African immigrants (both from North and Sub-Saharan Africa) are those who frequently have the highest number of siblings (with a median of 5 children for North African immigrants and 6 for Sub-Saharan African immigrants).
Figure 1 – Distribution of Sibship Size by Region of Origin

Source: 2008-2009 Trajectories and Origins (TeO) survey, INED-INSEE

Note: In increasing order, the boxplots indicate minimum, first quartile, median, third quartile and maximum sibship size in each region of origin.

The effect of sibship size on educational attainment

The aim of this section is to test the first hypothesis posited above. Before turning to multivariate inferential modelling of children’s educational attainment, Figure 2 provides a first descriptive glance at the variation, according to parents’ region of origin, of the relationship between sibship size and the probability of holding at least a high school diploma. Without controlling for any other family characteristic, the relationship between sibship size
and the indicator of educational attainment seems strongly negative and reasonably linear for children of natives. This same relationship also appears strongly negative among children of Southern European and Southeast Asian immigrants. The same cannot be said for the other groups in which the relationship appears less markedly negative (children of immigrants from North and Sub-Saharan Africa, and Turkey) or even slightly positive in the case of children of European immigrants (other than those born in Southern Europe).

**Figure 2 – Probability of Having at Least a High School Diploma according to Number of Siblings and Region of Origin**

Source: 2008-2009 Trajectories and Origins (TeO) survey, INED-INSEE
However, as has been well documented and is also observable in the TeO data (tables not shown), sibship size is correlated with scores of other family characteristics (such as parents’ education and socioeconomic status) that affect children’s educational outcomes. To take a step further in teasing out the net effect of the number of siblings on children’s educational attainment, a set of multivariate logistic regression models are constructed. The binary dependent variable of the models distinguishes children who hold at least a high school diploma (*baccalauréat*) from the others. The intendent variables of interest are the number of siblings in the family, parents’ region of origin and the interaction terms between these two variables. Control variables include the child’s birth rank, year of birth, sex, both parents educational attainment and occupations, as well as whether both parents were in the household when the child was young. The main results from this model are displayed graphically in Figure 3.

This Figure shows the predictive margins and average marginal effects of sibship size on the dependent variable by parents’ region of origin. Most interaction terms turn out to be significant, indicating a statistically significant difference in the effect of sibship size on educational attainment between most immigrants groups and native families. Consistent with descriptive findings, the effect of sibship size in Southern European and Southeast Asian families appear statistically undistinguishable from the same effect in native families. However, for all other immigrant groups, the effect of the number of siblings on educational attainment is significantly less negative than among French natives. Among Sub-Saharan African, Turkish and other European immigrants, the marginal effect of sibship size is non-statistically different from 0.
Figure 3 – Predictive Margins and Average Marginal Effects of Sibship Size on Holding at least a High School Diploma

Source: 2008-2009 Trajectories and Origins (TeO) survey, INED-INSEE

Note: Dashed lines indicate that the interaction term (log-odds) is non-significant at the 10% threshold, i.e. that the effect of sibship size for this immigrant group in not statistically distinguishable from the same effect among native families.

Results shown in Figure 3 are thus broadly consistent with Hypothesis 1, which stated that the negative effect of belonging to larger sibship size would be substantially less pronounced for children living in immigrant families than for children of native parents. This hypothesis is
borne out by the data,\textsuperscript{2} except in the case of immigrants from Southern Europe and Southeast Asia.

**The effect of birth order on educational attainment**

This second section of empirical analysis focuses on testing the second hypothesis put forward above, relating to the interaction effect between a child’s birth rank and their parents’ region of origin in explaining their educational attainment. As in the previous section, descriptive results are presented before findings from multivariate modelling. Figure 4 graphically represents the relationship between a child’s birth order and their probability of obtaining at least a high school diploma, according to the region of birth of their parents. The relationship between birth rank and this indicator of educational attainment is strongly negative among native families, as well as in Southern European immigrant households. However, in all other groups, this relationship seems noticeably less negative, which lends some credibility to Hypothesis 2.

\addcontentsline{toc}{chapter}{The effect of birth order on educational attainment}

\textsuperscript{2} Additional models releasing the assumption of a linear sibship size effect were estimated both by including a quadratic term and by entering number of siblings as dummy variables. The birth rank variable was also introduced as the modified Booth and Kee birth order index. All these alternative specifications provided the same substantive results.
To test Hypothesis 2 properly, multivariate conditional logit models were estimated within sibships. Because these models cancel out any family-constant influence, the only variables included in the model are those that vary between siblings of the same family, i.e. each child’s year of birth, sex and whether both parents were in the household when they were growing up. In addition, the main variable of interest is each child’s birth rank and its interaction with their parents’ region of birth (region of birth, being constant within each family, is only included in the interaction term with birth rank and not as a separate variable, see Allison (2009)).
The results show statistically significant interaction coefficients for all groups of immigrants compared to the native reference group. Concretely, the negative effect of being born later is significantly less marked in immigrant families.

**Figure 5 – Predictive Margins and Average Marginal Effects of Birth Rank on Holding at least a High School Diploma**

Source: 2008-2009 Trajectories and Origins (TeO) survey, INED-INSEE

This set of results is shown graphically in Figure 5 as predictive margins and average marginal effects. The effect of birth rank on holding at least a high school diploma is significantly negative in native families, but not significantly different from 0 in any immigrant group. The difference in effect between every immigrant group and native families
is statistically significant, as indicated by tests on interaction coefficients. Overall, these findings support Hypothesis 2 and show that, unlike children of natives, children of immigrants do not suffer academically from having a later rank in the birth order.  

**Conclusion**

In this paper, I show that the seemingly universal relationship between belonging to a large sibling group, having a later birth rank, and having lower academic outcomes does not apply to children of immigrants. To form theoretical hypotheses predicting these findings, I pointed out that the dominant Resource Dilution Model overlooks two important processes: first, the role of the negative selection of parents on unobserved characteristics in explaining the apparently negative “causal” effect of sibship size on children’s academic outcomes; second, the importance of intra-generational socialization and resource transmission between siblings. Taking these two processes into account, I put forward two hypotheses predicting substantial interaction effects of sibship size and birth rank on educational outcomes between native and immigrant families. The empirical findings support these hypotheses and show that the advantage of smaller families and being first-born are much less marked in immigrant families than in native families, and are in fact indistinguishable from 0 in most immigrant groups.

These findings can be understood by taking into account two characteristics of immigrant families. First, because immigrant parents come from countries with different fertility norms, and usually higher fertility rates than in Western countries of destination, immigrant parents are less affected by negative selection than French natives with the same number of children.

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3 As for sibship size, alternative specifications releasing the assumption of a linear effect of birth rank were carried out, both by including a quadratic term and by entering birth ranks as dummy variables. All these alternative specifications provide the same substantive results.
Second, because eldest children are often the first ones in their household to experience the school system in the country of destination, they do not benefit as much as eldest children in native families from academically effective parental resources. They are, however, uniquely positioned to help their later-born siblings to navigate the educational system more favorably.

To sum up, this paper makes two theoretical contributions. First, it shows that to properly understand the life trajectories of immigrants and their children, one needs to take into account the social conditions and norms prevailing in their country of origin. Second, the paper highlights the importance of intra-generational resource transmission, which is often overshadowed in the study of social stratification processes by the restricted focus of most explanatory theories, notably the Resource Dilution Model, on intergenerational processes.
References


