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Does sibling and twin similarity in cognitive ability differ by parents’ education?

Abstract:
Stratification scholars predominantly investigate how differences among children from different families emerge and tend to neglect differences among children from the same family. I study sibling similarity in cognitive ability and examine whether their similarity varies by parents’ education. Although economic approaches and their extensions argue that disadvantaged parents reinforce differences while advantaged parents compensate for differences, I argue that parents may also make equal investments and thus accept differences among their children. I refer to the literature on stratified parenting that demonstrates that parents are engaged differently in child-rearing and their children’s skill formation processes. Because advantaged parents foster children’s talents more individually compared with disadvantaged parents, I propose that sibling similarity is lower in advantaged than in disadvantaged families. Previous studies based on sibling correlations provide conflicting evidence. To account for observable and unobservable differences among siblings, I extend the established sibling correlation approach and study dizygotic and monozygotic twins in addition to siblings. The analyses draw on novel data from a population register-based study of twin families. I find that young adult siblings and twins are less alike in cognitive ability in highly educated families than in less educated families. Hence, my results support the hypothesis concerning equal investments and indicate that stratified parenting has a long-lasting influence on children’s cognitive ability.

Key words: intergenerational transmission; educational inequality; cognitive ability; sibling correlations; twins; Germany

1. Introduction

The link between family background and children’s education is well established in the literature (e.g., Breen 2010; Breen/Jonsson 2005; Torche 2015). Most of what we know about the impact of family background influences derives from studies that examine children from different families. Yet, a smaller body of literature studies differences that emerge among children from the same family. These studies highlight that shared family background influences, such as parents’ education, occupation or income, do not affect siblings equally. Indeed, for most stratification outcomes, including education, siblings
correlate at about 0.5 (e.g., Downey 1995; Hauser/Wong 1989; Sieben/Huinink/De Graaf 2001). Thus, stratification mechanisms run not only between families but also within the family itself: despite being exposed to fairly similar family conditions, siblings end up with different levels of education. This challenges the common – though mostly not explicitly stated – assumption that shared family influences affect children in similar fashion (e.g., Conley 2008; Diewald et al. 2015).

An emerging scholarship investigates whether the similarity of siblings varies depending on parents’ social background (e.g., Conley 2008; Conley/Glauber 2008; Conley/Pfeiffer/Velez 2007; Grätz 2018). Despite excellent research in this field, studies do not explicitly take into account the fact that differences among siblings are not only the result of parents’ social background and associated resources but are also driven by differences in genetic make-up. Behavioral genetics provides consistent evidence that genes are an important source of individual differences and that they can shape reactions to and from the social environment (e.g., Freese 2008; Polderman et al. 2015). To understand why differences among siblings emerge, it is therefore important to consider genetic heterogeneity as well. I build on previous studies on a possible stratification of sibling similarity and study sibling and twin similarity in cognitive ability, which is highly predictive of educational success and is strongly influenced by genes (e.g., Polderman et al. 2015).

Current explanations for within-family differences are mainly rooted in economic perspectives that model parents’ investment decisions within the household (Becker/Tomes 1976; Behrman/Pollak/Taubman 1982). Adding a stratification aspect, Conley (2004, 2008) proposes that advantaged parents are more likely to invest in a way that compensates for differences among their children, whereas disadvantaged parents reinforce differences due to efficiency considerations. I argue, however, that parents might also invest equally in their children and thus accept differences among them. I draw on the literature on stratified parenting, which originally emphasized the role of parenting in the emergence of differences between families and propose that differences in parenting also influence the extent to which siblings resemble one another (e.g., Cheadle/Amato 2011; Kalil/Ryan/Corey 2012; Lareau 2011; Lareau/Weininger 2003). Lareau differentiates between two logics of parenting (2011). Disadvantaged parents are engaged in a parenting concept referred to as “natural growth” and intervene little in their children’s skill formation processes. Because resources are limited, parents more often invest primarily to meet the basic needs of their children. Advantaged parents, by contrast, have more resources and can afford investments in addition to those needed fundamentally. They engage in a parenting concept referred to as “concerted cultivation” and intend to further skills and behaviors typically found in higher class families. Importantly, parents embrace an active parenting strategy that shapes developmental processes of their children. Over and above “concerted cultivation” in accordance with higher class habits such active investments can also address children’s individual potentials and needs. Such investments are more child-specific. Because children develop depending on their unique interests, talents, and related specific inputs, I expect them to end up being less alike in their cognitive ability than siblings from disadvantaged backgrounds. Hence, I propose a competing hypothesis – namely, that siblings are less similar in terms of cognitive ability in advantaged families than in disadvantaged families.

Previous research on sibling similarity (i.e., sibling correlations) in cognitive skills is limited and provides conflicting evidence (Anger/Schnitzlein 2017; Conley/Pfeiffer/Velez...
2007; Grätz 2018). Yet, findings on sibling correlations have recently been criticized (e.g., Björklund/Jäntti 2012): First, (full) siblings differ in age and, because family contexts are not necessarily stable over time, might grow up in different family environments. Second, (full) siblings differ in their genetic make-up. Consequently, findings concerning the link between parents’ social background and the similarity of siblings might be influenced by developmental differences, genetic differences, and/or a combination of the two – and are not necessarily the direct consequence of varying parental resources.

To address this shortcoming, I study the similarity of (full) siblings, dizygotic (DZ), and monozygotic (MZ) twins. DZ twins are born at the same time and thus share much more of the family influences than (full) siblings do. However, DZ twins differ in their genetic make-up, which also affects the degree of similarity. MZ twins, by contrast, are genetically alike. The similarity between MZ twins therefore captures family influences most comprehensively. MZ twins allow one a) to accurately differentiate between shared family and child-specific influences and b) to rigorously test whether the similarity changes if parents’ education increases.

Sibling and twin similarity is estimated with multilevel models. I draw on the newly collected dataset from the TwinLife study. TwinLife is a population register-based sample of more than 4,000 twins and their families residing in Germany (Diewald et al. 2017). Unlike many observational twin studies, TwinLife has applied a probability-based sampling strategy. These data make it possible to investigate, for the first time for Germany, sibling and twin similarity in cognitive ability and a possible stratification covering a broad range of the social spectrum (Lang/Kottwitz 2017).

I contribute to the literature by acknowledging that family influences comprise both social resources and genetic transmission. In addition, I control for the relationship of siblings and twins, which addresses a major limitation of studies analyzing within-family stratification. This enables me to model family influences more comprehensively and to analyze systematic differences in the similarity of siblings that are not influenced by differences in the rearing environment, genetic influences or even the sibling relationship. Finally, I extend current theoretical explanations based on economic investment and emphasize the role of stratified parenting instead.

2. Theoretical background

How can we explain differences in cognitive ability among children from the same family? And do differences vary according to parents’ social background? To address these questions, I apply a within-family perspective and link parents’ investments and parenting to sibling similarity. I then refer to the sibling correlation framework, which is widely applied to test the proposed mechanisms indirectly. Incorporating findings from behavioral genetics, I argue that twins as opposed to siblings provide a more suitable unit of analysis to test whether a change in similarity is associated with parents’ social background.