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The birth order paradox: Sibling differences in educational attainment

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ABSTRACT

This study uses population register data to examine the relationship between birth order and educational attainment in Sweden, and demonstrates that while the net effect of birth order on educational attainment is negative, later-born children often spend longer in education. The explanation for this finding is due to educational expansion in Sweden in the 20th century, which outweighs the negative causal effect of birth order for the affected cohorts. This is particularly true for women due to the fact that the rate of increasing educational enrolment has been greater for women than for men. These results also show that later-borns in large families particularly benefit from educational expansion due to the longer average birth interval between the first and last child in large families, meaning that the supply of educational opportunities increased to a greater extent in the intervening period. However, in periods where education is not expanding, later-born siblings continue to fare worse than first-borns.

1. Introduction

The influence of birth order on a range of later life outcomes, including educational achievement, intelligence, and personality, has been the subject of scholarly interest for over a century (Black, Devereux, & Salvanes, 2005; Blau & Duncan, 1967; Ernst & Angst, 1983; Galton, 1874; Gini, 1915; Sulloway, 1996). Partly because of the long history of research on this topic, the study of birth order has been approached from every conceivable research angle, from psychiatrist case studies, to qualitative interviews, to quantitative analysis of large data (Black et al., 2005; Conley, 2004; Toman, 1961). Much of the research on this topic has been criticised for a lack of methodological care and rigour (Ernst & Angst, 1983; Rodgers, 2001; Schooler, 1972). Literally hundreds of studies have been conducted on the relationship between birth order and almost any conceivable outcome, with a lack of consensus on the correct study design leading to wide variation in the reported results (Ernst & Angst, 1983), from first-borns performing best, to last-borns performing best (Blake, 1989a), to middle-borns performing worst (Blau & Duncan, 1967; Conley, 2004), while others have concluded that birth order has no consistent influence on attainment (Ernst & Angst, 1983; Steelman, Powell, Werum, & Carter, 2002).

Despite this history, the past decade has seen econometricians converge upon the conclusion that the net effect of birth order on educational attainment is negative. This more recent research has attempted to isolate the net effect of birth order by using a fixed effects study design, comparing siblings to one another within the same family (e.g. Black et al., 2005). Because these siblings share the same biological parents and the same family environment and background, after adjusting for variables that are not constant amongst the siblings, primarily birth year, it has been argued that the causal relationship is identified. Research using these sibling comparisons has consistently found that later-born siblings have lower educational attainment than first-borns across Europe (Barclay, 2015a; Black et al., 2005; Härkönen, 2014; Kalmijn & Kraaykamp, 2005), as well as in the United States (Kantarevic & Mechoulan, 2006). Where the data has allowed this question to be examined in more detail, it has been shown that this negative monotonic relationship exists across the most common family sizes, and that the last-borns in large families particularly fare the worst (Barclay, 2015a; Black et al., 2005).

Although this recent body of literature has consistently shown that later-borns have worse educational outcomes than first-borns, these studies have neglected to consider the role of macro-level trends in educational expansion and how that shapes relative educational attainment between siblings. Within a family, there is a mechanical relationship between birth order and birth year, with later-born siblings always born into a later calendar year. In a context where there is a secular increase in high school completion and tertiary enrolment, those born into a later birth year will be more likely to achieve greater educational attainment and to benefit from that higher level of educational attainment due to the increase in the supply of educational

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opportunities. The purpose of this study is to show that although recent research has shown that the net effect of birth order on educational attainment is negative, due to educational expansion across Western Europe and the United States since the end of the second world war, later-born siblings exposed to periods of educational expansion have, on average, spent longer in the educational system than first- and other earlier-born siblings.

I illustrate this pattern using Swedish population register data, but due to educational expansion across Western Europe and the United States since the end of the second world war (Breen, 2010; Breen & Jonsson, 2007; Breen, Luijkx, Müller, & Pollak, 2009), the point is likely to generalize to other contexts where the supply of educational opportunities has also been expanding. While identifying causal effects is an important enterprise, I argue that it is equally important to simultaneously consider the broader descriptive picture. Increased educational attainment is likely to have a substantive impact on the lives of later-borns, due to the beneficial effects of education on opportunities for social mobility (Breen, 2010), earnings (OECD, 2013), and health (Lager & Torssander, 2012). Furthermore, I contend that improving environmental conditions over time may explain why some researchers examining birth order effects during periods of educational expansion who have not applied a sibling comparison design have found that later-born siblings tend to have more favourable outcomes than first-borns.

1.1. Birth order and educational attainment: mechanisms and empirical evidence

Two main theories have been developed to explain why later-borns should have lower educational attainment, which are the confluence hypothesis (Zajonc, 1976) and the resource dilution hypothesis (Blake, 1981). The confluence hypothesis argues that the average degree of intellectual stimulation within the household influences the cognitive development of children. Until the birth of the second child, a first-born will interact exclusively with his or her parents, and this degree of cognitive stimulation is likely to be beneficial for development. A second-born, however, interacts not only with the parents, but also with the older sibling, who is much less cognitively stimulating, and the average degree of stimulation decreases as more children enter the household. The confluence hypothesis also makes a case for the importance of sibling peer effects in the cognitive development process. In the long-run older siblings are thought to benefit intellectually from having to tutor younger siblings, while the latter suffer as the opportunity to solve problems for themselves is pre-empted (Blake, 1989b; Zajonc, Markus, & Markus, 1979). This disadvantage is particularly exaggerated amongst last-born children, who have no younger sibling to tutor.

The resource dilution hypothesis also states that later-borns should be disadvantaged relative to first-borns. Until the birth of later siblings, the first child benefits from complete access to parental attention and investment. Although few children suffer from material deprivation in Sweden, and parents typically accumulate greater socioeconomic resources as they age, a resource that is certainly finite is parental time. Later-born children are likely to receive less attention from the parents than a first-born would during the first years of life, as the parents must also attend to the older children. This could lead to birth order differences in exposure to language and reading opportunities at early ages, which may in turn affect language development and vocabulary expansion (Sénéchal & LeFevre, 2002; Sénéchal, Lefevre, Thomas, & Daley, 1998; Weisleder & Fernald, 2013). Although a last-born child will have exclusive access to parental resources at older ages, after the older siblings have left the home, the benefits of parental investment and language exposure at early ages are likely to have cumulative effects on subsequent academic performance (Stanovich, 1986), and a growing body of evidence suggest that there are diminishing returns to investment on cognitive development with increasing age (Cunha, Heckman, Lochner, & Masterov, 2006; Heckman, 2006, 2007; Reynolds, Temple, & Ou, 2003).

Although the resource dilution hypothesis suggests that resource dilution should be a function of birth order and birth spacing, recent research using a sibling fixed effects design to study how the length of the birth interval before and after the index person affects long-term educational attainment suggests that the net effect of birth spacing itself is negligible, while the commonly observed pattern that later-borns achieve lower attainment that earlier-born siblings persists (Barclay & Kolk, 2017). Since the length of birth intervals should be at least partially capturing the amount of time spent with parents, this finding suggests that the inequitable resource distribution by birth order may not only be a function of the number of children and time between births. Another possibility is that parents treat children differently by birth order in ways that are not necessarily conditional on the number of children or the spacing between births. Although reports that parents spend more time with first-borns (Price, 2008), are consistent with the resource dilution hypothesis, studies also indicate that parents are more likely to restrict television watching for first-borns in comparison to later-borns (Hotz & Pantano, 2015), and that parents are more likely to punish first-borns than later-borns if they have poor grades in school (Hotz & Pantano, 2015). Furthermore, the rates of breastfeeding decrease with higher parity, mothers are less likely to seek prenatal care for later-born children (Buckles & Kolka, 2014), and in Sweden parents take more parental leave time for first-borns than they do for later-born children (Sundström & Duvander, 2002). It is possible that at higher parities parents behave differently because of a fatigue effect, where ideals about the right way to raise a child are more likely to bend in response to conflicting demands. Higher parity childbearing is also likely to be accompanied by a decrease in the novelty of the experience, and a decrease in anxiety about the childrearing process.

These studies suggest that, even in a country such as Sweden where access to education is free at all levels, relative differences between siblings could be produced by differences in early life investment and parental treatment by birth order. Indeed, in a context where structural educational opportunities are held constant, first-borns consistently have greater educational attainment than later-borns. However, in a context where those born into a later birth year have systematically greater opportunities for educational progression because of an increase in the supply of educational opportunities, these secular trends may counterbalance or even outweigh the negative effect of birth order on attainment.

1.2. The Swedish education system and educational expansion

Education in Sweden is state funded at all levels, and tertiary education is free for Swedish and European Union citizens (Halldén, 2008; Högskoleverket, 2012). To give an idea of the relative burden that university tuition fees place on students in different countries, average tuition fees as a percentage of GDP per capita in 2006/07 were 2.7% in Norway, 0.0% in Sweden, 3.1% in the Netherlands, 1.3% in Germany, and 25.5% in the United States (Willemse & De Beer, 2012). Students in tertiary education are eligible for financial support from the Swedish state for living costs in the form of study grants and student loans with low interest rates (Högskoleverket, 2012), minimising the need for reliance on family resources for maintenance. This has meant that family resources in Sweden are not crucial for the transition to tertiary education in the same way that they are in other contexts, such as the United States. This does not mean that there is no socioeconomic stratification in educational attainment in Sweden, but that the choice to continue in the education system is not affected by the direct costs of tuition. Nevertheless, indirect costs, such as foregone earnings, are likely to influence the decision-making processes of high and low socioeconomic status individuals to differing extents.

The Swedish education system today is divided into three sections: grundskolan, which is 9 years of compulsory schooling, gymnasium,