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Sibship size and educational attainment. A joint test of the Confluence Model and the Resource Dilution Hypothesis

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Abstract

Studies on family background often explain the negative effect of sibship size on educational attainment by one of two theories: the Confluence Model (CM) or the Resource Dilution Hypothesis (RDH). However, as both theories – for substantively different reasons – predict that sibship size should have a negative effect on educational attainment most studies cannot distinguish empirically between the CM and the RDH. In this paper, I use the different theoretical predictions in the CM and RDH on the role of cognitive ability as a partial or complete mediator of the effect of sibship size to distinguish the two theories and to identify a unique RDH effect on educational attainment. Using sibling data from the Wisconsin Longitudinal Study (WLS) and a random effect Instrumental Variable model I find that, in addition to a negative effect on cognitive ability, sibship size also has a strong negative effect on educational attainment which is uniquely explained by the RDH.
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1. Introduction

A common finding in the literature on family background and educational success is that sibship size has a negative effect on children's intellectual and educational outcomes (e.g., Cicirelli, 1978; Ernst & Angst, 1983; Heer, 1985; Steelman, 1985; Steelman, Powell, Werum, & Carter, 2002). Two theoretical models are often used to explain this phenomenon: the Confluence Model (CM) and the Resource Dilution Hypothesis (RDH). The CM, originating in psychology, argues that the primary channel through which sibship size has a negative effect on children's educational success is through the cre-

ation of an inferior intellectual environment in families with many children (see Zajonc, 1976, 1983; Zajonc & Markus, 1975). In contrast, the RDH, originating in sociology and demography, argues that the increasing dilution in large families of parents' resources: economic, social, emotional, interpersonal, etc. is the reason why children with many siblings obtain less education than children with few siblings (e.g., Anastasi, 1956; Blake, 1981, 1989; Downey, 1995, 2001).

There is an ongoing debate in the literature on whether the CM or the RDH offers the more correct interpretation of the empirical regularity that sibship size is negatively correlated with children's intellectual and educational outcomes (e.g., Downey, 2001; Ernst & Angst, 1983; Retherford & Sewell, 1991; Steelman, 1985; Steelman et al., 2002). The major problem in this debate is that at face value findings from most empirical studies are equally

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consistent with the predictions from both the CM and the RDH. There is a large literature documenting that sibship size is negatively correlated with children's intellectual ability (for reviews see, e.g., Cicirelli, 1978; Heer, 1985; Steelman, 1985; Steelman et al., 2002). Furthermore, many studies also find that sibship size is negatively correlated with final educational attainment (e.g., Blake, 1989; Conley, 2000; Featherman & Hauser, 1978; Plug & Vijverberg, 2003; Sandefur, Meier, & Campbell, 2006; Steelman et al., 2002). Finally, some studies attempt to explain what the negative effect of sibship size on educational outcomes captures by controlling for other factors such as birth spacing and sibship sex composition (e.g., Powell & Steelman, 1990, 1993), parents' economic investments in children (e.g., Powell & Steelman, 1989, 1995), and parents' interpersonal resources and communication with children (e.g., Cheung & Andersen, 2003; Downey, 1995; Powell & Steelman, 1993). However, these studies do not seek to determine if the CM or the RDH explains the observed negative relationship between sibship size and children's educational outcomes.

But is it possible to distinguish empirically between the CM and the RDH? In this paper, I propose to use a key theoretical difference between the CM and the RDH with respect to the role of cognitive ability as a partial or complete mediator of the sibship size effect to distinguish between the two theories. According to the CM, low cognitive ability caused by being raised in an intellectually poor environment is the principal reason why children from large families obtain less education than children from small families. By contrast, the RDH offers a more comprehensive explanation in which strains on several types of parental resources, and not just strains affecting cognitive ability, is the reason why sibship size has a negative effect on educational attainment. This difference between the two theories has important empirical implications because, according to the CM, the negative effect of sibship size runs *exclusively* through cognitive ability whereas, according to the RDH, there should be an *additional* negative effect of sibship size on educational attainment. Because this additional negative effect of sibship size is uniquely explained by the RDH it becomes possible to distinguish between the two theories.

In addition to proposing a way of distinguishing between the CM and the RDH, this paper also deals with unobserved family characteristics that affect educational outcomes. Though rarely explicated, both the CM and the RDH pertain to the *environmental* and not genetic or physiological effects on educational success of coming from a large family. There is some evidence that parents with low IQ tend to have many children (e.g., Grotevant, Scarr, & Weinberg, 1977) and that certain physiological or health problems are more prevalent in large than in small families (e.g., Belmont & Marolla, 1973). If such relationships exist the effect of sibship size on children's educational outcomes might reflect genetic or physiological influences rather than the environmental effects hypothesized by the CM and the RDH. To deal with this potential problem I use sibling data which allows me to control for unobserved genetic and environmental characteristics shared by siblings (e.g., Lindert, 1977; Olneck & Bills, 1979; Sandefur & Wells, 1999; Sieben, Huinink, & de Graaf, 2001).

Using an Instrumental Variable random effect model and sibling data from the Wisconsin Longitudinal Study my findings are, first, that sibship size has a significant negative effect on cognitive ability, and second, in addition to its effect on cognitive ability, sibship size also has a direct negative effect on educational attainment. My analysis then shows that there is a direct effect of sibship size on educational attainment which is uniquely explained by the RDH and, furthermore, that this direct effect is stronger than the effect of sibship size on cognitive ability.

The paper proceeds as follows. In the next section, I present the theoretical background. Section 3 describes the data and variables, and Section 4 develops the empirical framework. Section 5 presents the results of the empirical analysis, and in Section 6 I consider some avenues for future research.

2. Theoretical background

This section presents the two major explanations of the negative relationship between sibship size and children's educational success: The Confluence Model and the Resource Dilution Hypothesis. Furthermore, the section discusses several important differences between the two theories that I use to distinguish the empirical implications of each theory.

2.1. The Confluence Model

The Confluence Model (CM) was proposed by Zajonc and colleagues (Zajonc, 1976, 1983; Zajonc & Markus, 1975). The core idea in the CM is that a child's intellectual ability is shaped by the total intellectual level in the family of origin. This total intellectual level is calculated as the average of the absolute intellectual level of all family members. Parents have much higher intellectual skills than children, and the arrival of a new child with low initial intellectual skills in the family decreases the