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Does coresidence with grandparents reduce the negative association between sibship size and reading test scores? Evidence from 40 countries

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ABSTRACT

This paper investigates the effect of coresidence with grandparents in three-generation households on the nature and size of the association between sibship size and reading test scores. It also explores whether this interaction changes with the level of socioeconomic development of a society. We argue that coresidence in traditional three-generation households has a protective effect against resource dilution and thus decreases the magnitude of the negative association between family size and test scores. We also suggest that coresidence in more modern contexts magnifies the degree of this negative association, since modern families form three-generation households only when severely destabilized. We apply 3-level regression models to the PISA 2000 data to examine our hypotheses and use the Human Development Index as a measure of development. We find that the negative association between family size and test scores increases at higher levels of development and does so more strongly when students coreside with grandparents. We, however, find no context, in which coresidence would erase the negative consequences of having many brothers and sisters on one's own school test scores. These findings hold even when controlling statistically for the effects of public expenditure on education, public social security expenditure, and crude divorce rate as well as for the interactions of these variables with sibship size.

1. Introduction: family size and educational achievement

The number of siblings (or family size, which is often used as a synonym for number of siblings), has traditionally been one of the exogenous variables in the status attainment model. While various aspects of the sibship configuration have attracted scholarly attention at least since the late 19th century (see examples provided by Steelman, Powell, Werum, & Carter, 2002), family size was not standard part of research on social stratification and mobility until the field entered its 'second generation' (Ganzeboom, Treiman, & Ultee, 1991). Blau and Duncan's classic study *The American Occupational Structure* (1967) showed that men from smaller families attained, on average, more education than men from larger families, presumably due to the dilution of parental resources. A number of later studies (Featherman & Carter, 1976; Featherman & Hauser, 1978; Hauser & Featherman, 1977) were consistent in revealing a negative association

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between number of siblings and educational attainment and attributed this to resource dilution.

The reasons for the negative association between family size and educational achievement are, however, a frequently debated issue in current sociological research (Guo & VanWey, 1999; Jaeger, 2008, 2009; Steelman et al., 2002). The literature offers four alternative explanations. First, the confluence model posits that each additional birth into a family changes the interpersonal dynamics and intellectual level of the family environment. Each child, then, is exposed to more or less advantageous environments for shorter or longer periods of his/her life, which cumulatively produces different cognitive as well as school outcomes (Guo & VanWey, 1999; Jaeger, 2009; Steelman, 1985; Zajonc & Marcus, 1975). Second, the resource dilution model assumes that the family has only a limited amount of economic and non-economic resources that can be used for the benefit of the children. Therefore, the more children there are in the family, the lower the share of available resources each child can claim and the less education he/she obtains (Downey, 1995; Jaeger, 2008, 2009; van Eijck & de Graaf, 1995). Third, the economic literature postulates that both the number of children and the investment per child are chosen by parents and, as a consequence, there is a trade-off between the quality and quantity of children resulting in the observed negative association between sibship size and school outcomes (Angrist, Lavy, & Schlosser, 2010; Becker & Lewis, 1973; Becker & Tomes, 1976). Fourth, some authors propose that the association between family size and schooling is spurious and does not reflect a true causal link, since fertility and children's schooling may be jointly determined by some third variable(s) (Guo & VanWey, 1999). As summarized by Jaeger (2008, p. 217), "it might be that sibship size captures the influence of (. . .) socio-economic or other unmeasured family characteristics indirectly rather than having an independent causal effect on schooling outcomes". Although many different analytical strategies – including fixed-effect models (Guo & VanWey, 1999; Lindert, 1977; Olneck & Bills, 1979) and random-effect models (de Graaf & Huinink, 1992; Sandefur & Wells, 1999; Sieben, Huinink, & de Graaf, 2001) applied to sibling data and/or panel data as well as instrumental variable estimators applied to (quasi)-experimental data on twin-births (Black, Devereaux, & Salvanes, 2005; Cáceras-Delpiano, 2006) or sibship sex composition (Angrist et al., 2010; Conley & Glauber, 2006) – have been employed to assess the validity of this last claim, the literature is still somewhat inconclusive with regards to whether there is indeed a causal effect of family size on school outcomes (Jaeger, 2008).

A further dispute is related to the role of socioeconomic context in shaping the nature and size of the association between number of siblings and socioeconomic outcomes. The existence of this negative association has been robustly and convincingly documented in many populations of Europe and North America (see also Booth & Kee, 2005; Heer, 1985, 1986; Jaeger, 2008; Hirschová & Kreidl, 2012; Kuo & Hauser, 1997; Olneck & Bills, 1979; Park, 2008; van Eijck & de Graaf, 1995; Steelman et al., 2002 offer a comprehensive review of this literature).

The empirical evidence is far less consistent and persuasive when we look beyond the advanced industrialized democracies or look at specific subpopulations. For instance Shavit and Pierce (1991) found that number of siblings has a negative effect on the educational attainment of Jews in Israel, but has no effect on education among the Arabs. The authors argued that, among other things, the Arabs can rely on the help of the extended family (the *hamula*) to share in the cost of child rearing and thus prevent undesirable resource dilution. Then, family size has no detrimental consequences for the child's education. Also Lu (2009) found a negative effect of the number of siblings among whites in South Africa, but no similar effect among the blacks. She offered differences in kin systems and family organization as an explanation. Similarly, Sudha (1997) reported a negative effect of sibship size among the Chinese and Indians in Malaysia, but no effect among the Malays, whose education, as the author pointed out, was subsidized by the state for several decades. Anh, Knodel, Lam, & Friedman (1998) found a negative association only in very large families (with at least 6 children) in Vietnam. Gomes (1984) found a positive effect of family size (particularly among the largest families with 7 or more kids) in Kenya, where parents maintain control over the earnings of the eldest child and can use it for the benefit of the younger siblings (see also Buchmann, 2000). Positive consequences of family size have been similarly reported in Botswana (Chernichovsky, 1985).

The effect of the number of siblings often varies across cohorts within a single society. Maralani (2008), for example, reported a strong positive association between family size and schooling in early urban cohorts in Indonesia, but negative associations in more recent urban cohorts. Moreover, her analysis revealed no association between family size and children's schooling for any cohort of rural children. Similarly, Lu and Treiman (2008) also identified variations in the association between family size and education across cohorts in China.

In this paper, we extend the literature on the varying association between sibship size and educational achievement by comparing 40 countries participating in the 2000 PISA survey of 15-year-old students. After reviewing arguments explaining this cross-country variation, we propose a specific measure: coresidence with a grandparent in a three-generation household that shall modify the relationship between sibship size and standardized test scores. We argue that the association between sibship size and test scores changes in a predictable way with level of socioeconomic development being more negative in the more advanced nations. Furthermore, we propose that there is a three-way interaction between sibship size, three-generation coresidence, and level of development. We suggest that coresidence with grandparents may serve as a buffer against resource dilution in more traditional societies, but does not have this protective effect in more socioeconomically advanced societies, where three-generation households are not formed out of tradition, but out of necessity in response to some serious problem such as teenage pregnancy, criminal activity, drug addiction, and poor health. In doing so, we link two important recent streams of population research – literature on sibship size