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Family size and child outcomes: Is there really no trade-off?

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ABSTRACT

We study the impact of family size on intermediate and long-term outcomes using twin births as an exogenous source of variation in family size in an unusually rich dataset. Similar to recent studies, we find no evidence of a causal effect on long-term outcomes and show that not taking selection effects into account will likely overstate the effects. We do, however, find a small but significant negative impact of family size on grades in compulsory and secondary school among children who are likely to be vulnerable to further restrictions on parental investments.

1. Introduction

Social scientists have for a long time been interested in how early experiences determine children's long-term welfare (e.g. Haveman and Wolfe, 1995). One example is the relationship between family size and the outcomes of children, where theory proposes a "quantity–quality trade-off": when increasing the quantity of children parents are forced to decrease their investments per child (e.g. Becker and Lewis, 1973; Willis, 1973; Becker and Tomes, 1976).[1] The seemingly robust empirical finding that increased family size adversely affects children's outcomes (e.g. Björklund et al., 2004; Hanushek, 1992; Holmlund, 1988) has however recently been questioned by studies arguing that more complex empirical strategies are needed to identify causal effects of family size.

We follow the approach study by Black et al. (2005) who used twin births as an exogenous source of variation in family size and found no effect of family size on the amount of education completed. In addition to replicating their findings, we analyze a broader set of outcomes ranging from childhood to adulthood using high quality data on entire Swedish birth cohorts. Intermediate outcomes (such as grades) are interesting as indicators on performance and well-being during adolescence. They also provide a supplementary test of the quantity–quality trade-off hypothesis.

Needless to say, the potential trade-off differs depending on economic circumstances. In developing countries with fertility rates of about six births per woman, malnutrition may be a consequence of sibship size, which could affect long-term economic outcomes. In industrialized countries with fertility rates between one and two, nutrition is in most cases not the issue. Still, parents in richer countries act under a budget constraint (at least in terms of hours available), which may decrease the resources available for each child as family size increases. Even though the effects of family size may work through different mechanisms in different parts of the world, the basic theories suggest there to be universal signs of the trade-off.

Still, it is not hard to come up with explanations as to why the effects may actually go in the other direction. Children may stabilize marriages or keep parents at home, which some presume to be beneficial for the upbringing of children. One could also argue that siblings act as role models or inspire each other to progress at school or in other arenas.

The net effects of family size must therefore be determined empirically. As already mentioned, recent work questions the conclusions from previous studies. The first objection is methodological: the observed correlation may not reflect causation. For instance, parents with preferences for small families might also be the ones who emphasize education and labor market success for their children. The second objection concerns the quality of data used: most studies are

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[1] The original model considers parental investments in their children as being subject to financial constraints. The model has later been extended to take into account time constraints (Lundholm and Ohlsson, 2002). Models of spillover effects have also been used to explain the observed negative relationship between family size and children's attainments (e.g. Zajonc, 1976). In short, these models suggest that adding siblings decreases the average human capital level within the family because young children do not have the same intellectual level as older family members. The hypothesis is that this will hurt the outcomes of children from large families.

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plagued by problems generated by small and often unrepresentative samples, and/or by poor child–parent match rates, making the estimates both imprecise and less reliable.

We use detailed Swedish population micro data covering the entire birth cohorts 1972–79 (843,333 individuals) and twin births to address both of these problems. Because twin births are essentially randomly determined they provide an exogenous source of variation in family size that can be used to distinguish causation from correlation.[2] Our data come from administrative records and include a wide range of educational and labor market outcomes: grades in all subjects ever taken, GPA in compulsory and secondary school, transitions to higher education, highest degree attained, years of schooling, earnings, employment status, welfare dependence etc. We document effects through the educational system and then later in the labor market. Also, there is rich information on parental characteristics that makes it possible for us to directly investigate whether the effect of family size is stronger for parents with limited resources, as suggested by the seminal work by Becker and others.

Judging from recent empirical work, it seems that the jury is still out. Angrist et al. (2006) combine several instrumentation strategies on Israeli data and state that the results are "remarkably stable in showing no evidence of a quantity–quality trade-off".[3] Black et al. (2007a) find negative effects of sibship size on IQ in Norway. Qian (2006) argues that the family size effect on school enrolment varies with birth order in China, and Caceres (2006) finds inconclusive evidence on a number of outcomes in the US. Rosenzweig and Zhang (2006) find negative effects on parental investments in education in China. Grawe (2008) finds evidence of a trade-off between family size and several child outcomes including achievement scores.

Similar to Black et al. (2005) and Angrist et al. (2006) we find no effect of family size on long-term educational attainment or labor market outcomes. The analysis also shows that one risks overstating the impact of family size unless endogeneity is handled; OLS estimations suggest a substantial correlation between sibship size and all the outcomes considered. There is, however, some evidence that family size affects grades in groups that are likely to be vulnerable to reductions in parental investments: in large hosts of siblings, at higher parities and for children to low-educated parents. Furthermore, we find clearer impacts on subjects where parental investments are more likely to be influential.

The rest of this paper is structured as follows. In Section 2 we discuss data and the institutional background concerning Sweden's educational system and family policies. Section 3 presents our empirical strategy. Estimation results can be found in Section 4. Concluding remarks are given in Section 5.

2. Data

Our data come from the IFAU database, which builds on population-wide registers from Statistics Sweden. Combining information from several registers gives standard individual characteristics (earnings, place of residence, etc) as well as detailed information on performance in the educational system. A "multi-generation" register provides links between children and their biological parents, and thereby to their siblings. Below we describe the sampling strategy and the information used.[4]

The sample consists of all individuals born in the years 1972–79. This means that we have information on 8 cohorts containing a total of 843,333 individuals. As described below, we use various subsamples of these individuals in the empirical analysis. The reason for choosing these cohorts is that we can observe their final grades in compulsory school; the educational registers start in 1988 and people typically graduate at age 16. Individuals who are not alive or not living in Sweden at age 16 are not included in the data. The data end in 2004 and thus the youngest cohort is followed to age 25.

We link each of these individuals to their biological parents and siblings through a unique parental identification number. We use the mother to link siblings to each other, but also connect each child to his/her biological father. In the register it is possible to observe the mother's total number of children up to and including 2004. Considering the cohorts studied it is likely that the observed number of children in 2004 is also the completed family size. The register contains information on year and month of birth, which makes it possible to identify twins. We also have information on the exact birth order of each child. It is important to note that the information on birth order and number of children is not conditional on having found the siblings in the other parts of the dataset (restricted to the population age 16–65 in the years 1985–2004). This information is directly recorded for each mother. Thus, we avoid the problem of poor match rates inherent in many previous studies.

Our instrument is a dummy variable set to unity for twin births at the nth birth ($n=\{2,3,4\}$) and zero otherwise.[5] We restrict the sample to families with at least n births and study the outcomes of children born before the nth birth. Separate estimations are thus performed for kids from families with (potential) twin births at the second, third, and fourth birth respectively. We use twins only to construct the instrument and exclude all twins from the empirical analysis. The reason for not studying the outcomes of these children is that twin births are often premature resulting in e.g. low birth weight, which is known to affect children later in life (e.g. Black et al., 2007b).

Parental variables can first be measured in 1985, and then annually through 2004. For two reasons we measure parental education in 1991: (i) there was a quality update based on the 1990 census; (ii) later observation makes it more likely that education is completed.[6] About 96.5% of the mothers are present in the data from 1991. For fathers, the corresponding figure is 92%. Those not in the data are older than 65, have emigrated or deceased. We include these parents and control for missing data in the regressions.[7] We also create measures of parental "permanent" income calculated as annual earnings (measured in 1985 prices) averaged over the observation years. Permanent income better captures parents' ability to invest in their children and current income has been shown to be a poor proxy of life-time income, especially at young ages (e.g. Böhlmark and Lindquist, 2006; Haider and Solon, 2006).[8]

Table 1 displays the distribution of family sizes (number of children) for all mothers who gave birth at least once from 1972 through 1979. We see that somewhat more than half of the mothers give birth to one or two children, whereas having more than five births is quite uncommon.

Table 2 gives some descriptive statistics on the children included in the estimations. The first two columns show means and standard deviations for first-born in families with two or more children. We see that the average child in this sample has about 13 years of schooling, and that as much as 92% has a high school degree. The university enrolment rate of 47% further signals that this is not a completely representative sample of Swedish youth.[9] Educational attainment is relatively high, which is not so

[2] Rosenzweig and Wolpin (1980) were the first to use twin births as an instrument for family size.

[3] Another instrument that has been used in recent studies is sibling sex composition (e.g. Lee, 2007; Conley and Glauber, 2006; Angrist et al., 2006). The argument for this approach is that parental preferences for mixed sex of their children encourage parents to have another child if their preferences are not satisfied at the latest attempt. However, the instrument has been criticized since research has shown that sex composition may have a direct effect on child outcomes (e.g. Butcher and Case, 1994).

[4] All registers are not available in all years, as discussed below. Table A1 presents all variables and which primary register they are taken from.

[5] Triplets and quadruplets are excluded from the analysis because they constitute extremely rare and unusual events.

[6] As mentioned in Section 4.2 our results are not sensitive to the inclusion of this variable.

[7] Note that we have complete information on demographic characteristics for all parents and children (e.g. number of children and year of birth) from the multi-generation register. Thus, missing data is only an issue for the information on parents' socioeconomic status.

[8] This variable is defined both separately for each parent and combined as family permanent income. Note, though, that we do not condition on parental earnings in the main analysis, but use it to investigate the potentially heterogeneous effects of family size and to check whether parental characteristics are related to twin births.

[9] Further details on our measures of educational attainment are given below in the description of the institutional background and in Table A1 presenting the contents of the variables.