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THE EFFECT OF CHILD ENDOWMENT ON FERTILITY CHOICES

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ABSTRACT

Does the intellectual endowment of born children affect their parents' future fertility choices? We study the effect of positive or negative shocks to child endowment on the intensive margin of fertility using data on intellectually gifted and intellectually disabled children. Because families with an exceptional-endowment child differ from those without, we propose quasi-experiments that exploit differences in the child's birth order to estimate the effect of their birth on further fertility. We find that the birth of a gifted child increases family size. However, parents must be able to recognize the endowment's exceptional ability for it to have an effect. Similarly, the birth of an intellectually disabled child negatively affects family size, but only when the child is of high birth order. Our results point to child endowment as an important factor in determining fertility choices.

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1 Introduction

What affects parents' fertility choices? Economists, sociologists, demographers, and other social scientists have offered various theories and explanations to address this question. Demand for children has been explained by social norms, government policies, and the opportunity cost of women's time, among others (Doepke et al. (2023)).

Starting with Becker (1960), economists suggested that the desired level of child "quality" is a key determinant of fertility choices. If so, how does the quality endowment of children affect parents' decisions about family size? The current paper estimates the effect of child intellectual endowment on the intensive margin of fertility. First, we conceptualize an endowment shock as the birth of a child with an extremely high or low level of intellectual endowment. Then, using a set of quasi-natural experiments, we estimate the reduced-form effect of a positive or negative endowment shock on family size.

As we later show, families with a child with exceptional intellectual endowment differ from those without. For example, families with a gifted child have significantly more educated parents than families without a gifted child. Families with a challenged child have less educated parents than those without. Hence, estimates of the effect of a high- or low-endowment child obtained by comparing families with such a child to those without will likely be biased due to the difference in characteristics between these groups. Therefore, the samples we use to estimate the effect of an exceptional-endowment child include only families with such a child. Within these samples, our identification strategy leverages differences in the birth order of the exceptional-endowment child among families with the same initial number of children. This variation quasi-randomizes the timing at which parents learn about the endowment of their children. The idea is that when the information on child endowment arrives relatively early within childbearing years, it may affect future fertility choices.

We implement quasi-experiments that rely on two identification assumptions. In the first quasi-experiment, we assume that (1) among families with two or more children, whether the first- or the second-born child is of exceptional endowment (i.e., gifted or challenged) is quasi-random; and (2) while the endowment of the first-born child may affect parents' decision to have a third child, it does not affect their decision to have a second child. These assumptions enable us to identify the effect of a first-born exceptional-endowment child on the probability of parents choosing to have a third child. We present evidence supporting these identification assumptions below, separately for families with a gifted child and families with a challenged child. For the second quasi-experiment, we exploit similar assumptions to identify the effect of a second-born exceptional-endowment child on the probability of a fourth child and present evidence supporting these assumptions as well.

To estimate the effect of an endowment shock on the intensive margin of fertility, we use Israeli administrative data on families and their children. In Israel, elementary students are tested and subsequently sorted into regular classes, classes for gifted children, and classes for challenged children. We use detailed data from the Ministry of Education on the type of class each student is placed in to detect gifted and challenged children. We use the population registry to obtain family-level variables, including fertility choices. These data allow us to implement the two quasi-experiments and estimate the effect of a first- or second-born exceptional-endowment child on parents' future fertility choices.

We find that the birth of a gifted child increases the probability of an additional child in both quasi-experiments. We conjecture that as the information on child endowment becomes noisier, parents' ability to recognize the endowment shock becomes a condition for its effect. For this reason, we check if the effect of child endowment on fertility decisions is more evident and more substantial among educated parents. First, educated parents might be more observant and aware of the signs of giftedness in their child. For example, a knowledgeable parent engages their child more with educational games and activities, such as reading books or solving puzzles, which provide more opportunities to notice exceptional talent. Second, an educated parent may prefer quality over quantity of children and respond actively to signs of child giftedness.

Indeed, we show that highly educated families primarily drive the positive effect of a gifted child on further fertility. In this sample, the birth of a first-born gifted child increases the likelihood of a third birth by 8.5 percentage points against a counterfactual of 40 percent. This effect, which does not vary by the gender of the gifted child, implies a 22 percent effect size.

In contrast to this quasi-experimental evidence, we also estimate an OLS regression of fertility choices on the birth of a first- or second-born gifted child while using the entire population of families in our sample. The results show a statistically significant negative relationship between the birth of a gifted child and the family demand for children. The difference between the positive effect of the birth of a high-endowment child on fertility in our quasi-experimental samples and the negative naïve OLS estimate likely reflects the selection bias when comparing families with gifted children to families without such children.

We implement the same quasi-experiments to estimate the effect of a low-endowment child, measured as enrollment in a special education class, on the intensive margin of fertility. We find that the birth of a low-endowment child negatively affects family size. However, this effect exists only in the second quasi-experiment, which estimates the effect of a second-born low-endowment child. There, the birth of a challenged child as a second birth reduces the likelihood of a fourth child by seven percentage points, implying an effect size of 18 percent. In contrast, the regression run on the entire population shows a small and insignificant relationship between the birth of a challenged child and the family demand for children.

A possible explanation of our findings is the quantity-quality (QQ) mechanism (Becker and Lewis (1973), Becker and Lewis (1973)), in which parents trade off the number of children against the desired quality of each child when choosing fertility. Most important for this possible interpretation of our findings is Becker and Tomes (1976), which adds child quality endowment to the QQ model and examines theoretically its effect on fertility choice. In this framework, a positive endowment shock – e.g., the birth of a child with an exceptionally high endowment – will increase parental demand for children. On the other hand, the birth of a child with an exceptionally low endowment will decrease it. We derive these theoretical predictions within a QQ model in Section A1 of the online appendix.

Our findings relate to three strands of the literature. First, we contribute to the growing literature on the economics of fertility (see Doepke et al. (2023)). This literature has advanced several theories explaining fertility choice and its consequences at the micro and macro levels. It has also aimed to accommodate historical and cross-sectional fertility trends, including the global fertility decline in the past few decades (Jones, 2022). More traditional theories explain fertility choice as determined by parents' preferences regarding the trade-off between quantity and quality of children and the opportunity cost of women's time. Recent studies point to the compatibility of having a career and a family as an important factor affecting fertility. The current study highlights child intellectual endowment as an important determinant affecting parents' decisions over the intensive margin of fertility.

Our paper contributes also to the literature on parents' responses to their children's natural endowment. Studies have shown that parents adjust their behavior to various characteristics of their children. For example, parents respond to children who manifest higher cognitive abilities early by providing them with increased cognitive stimulation (Grätz and Torche, 2016). When two children are born with different levels of health endowment, parents respond in an attempt to compensate for these initial differences by investing more in the child with poorer health (Savelyev et al., 2022). In a different context, Aizer and Cunha (2012) study the interaction between child health endowment, parental investment in children, and fertility and show that parents reinforce differences between children's endowments and that this reinforcement is stronger in larger families. We show that the birth of a child with exceptional intellectual endowment causes parents to respond along the axis of decisions on further fertility.

Lastly, our work contributes to the literature on the quantity-quality model of fertility and its empirical testing. A vast literature exists that empirically tests the predictions of the QQ model using micro data.[1] Much of this literature estimates

[1] Starting with Barro and Becker (1989), the QQ model has been used to analyze fertility choice and its effects on the economy as a whole, mainly on economic growth (see Becker et al. (1990)).

the effect of a quantity shock (e.g., the birth of twins) on parents' investment in each child. Generally, the trade-off between quantity and quality of children is found mostly in developing countries (Liu (2015); Doepke et al. (2023)).[2] Two studies have estimated the effect of changes in the price of raising children on fertility. Cohen et al. (2009) found that reduced child subsidy in Israel negatively affected fertility. Bleakley and Lange (2009) find that eradicating hookworm disease in the US, which they interpret as a fall in the price of quality, caused a decline in fertility. However, to our knowledge, no study has examined the effect of a *quality shock* – i.e., the effect of a rise or fall in child endowment – on fertility. Thus, the present study adds to the empirical literature on QQ.

The rest of the paper is organized as follows. Section 2 characterizes gifted and challenged children, and presents the data we use, our explanatory variables, and descriptive statistics. Section 3 outlines the quasi-experimental setting and the empirical strategy. Section 4 presents our estimates of the effect of child endowment on the intensive margin of fertility, distinguishing between positive (birth of a gifted child) and negative (birth of a challenged child) shocks. Section 5 discusses the relationship between our measures of giftedness and birth order. Section 6 concludes.

These developments aided the incorporation of QQ in unified growth models that use the quantity-quality trade-off to explain the demographic transition (Galor and Weil (2000); Delventhal et al. (2021); Moav (2005)).

[2]Rosenzweig and Wolpin (1980) and Rosenzweig and Zhang (2009), using the birth of twins as an instrumental variable, find that an increase in child quantity decreased education in India and China, respectively. Qian (2009) shows that the increase in family size caused by the relaxation in the One Child Policy increased school enrollment of first-born daughters. Black et al. (2005) find that twin birth has a negligible effect on educational attainment in Norway. However, Mogstad and Wiswall (2016) argue that such an effect is non-linear. While there is a substitution between quantity and quality in large families, the two are complementarities in small families. Juhn et al. (2015, 2020) find that the effect of quantity shock on cognitive abilities is derived by birth spacing. Using the same data from Israel that we employ in this study, Angrist et al. (2010) found no effect of a quantity shock on education, using both twin birth and the gender composition of children as instrumental variables.

2 Background and Data

This study focuses on schools and students in the two main sectors of the Israeli education system. In the first sector the language of instruction is Hebrew, and most students are Jewish. In the other sector, the language of instruction is Arabic, and all students are Arab. We exclude from the study a third sector, which includes the Jewish ultra-orthodox population in Israel because most schools in this sector do not follow the national curriculum. We note that schools within the first sector can belong to two distinct segments according to the level of religiosity. “State schools” are secular and serve the secular Jewish population. “State-religious schools” serve mainly the religious Jewish population and, in some subjects, follow a different curriculum. We exclude the “State-religious schools” and focus only on the “State schools” serving the secular Jewish population.

2.1 Gifted and Challenged Children

Gifted children are children with exceptionally high levels of ability. Though no clear and agreed-upon definition of giftedness exists, the convention until recently was that giftedness is a stable and persistent trait independent of circumstances that change across one’s life (Monks and Katzko, 2005). It can manifest within a specific interest or domain, e.g., music, art, mathematics, or as a general ability. In most education systems, children are identified as being gifted if they score above 130 or 135 on an IQ test.

Children who we refer to as being intellectually “challenged” belong to one of two groups: (1) children with mild intellectual disability; or (2) children with severe learning disorders. These children struggle to attain the ability to listen, read, write, conceptualize, or use math. While the environment such a child is situated in may contribute to developing their abilities, intellectual disability and learning disorders are permanent conditions. Like gifted children, children are identified as being challenged by their IQ score, generally between 50 and 70.

Exceptional intellectual ability – high or low – manifests itself early in life, as children show signs of rapid, or very slow, development of cognitive and motor abilities (Davis and Rimm (2004); Renzulli (2002); Silverman (n.d)). For example, gifted children learn new concepts very quickly and generalize them easily, exhibit excellent memory, and grasp the structure of language and its usage much earlier than their peers (Clark (2002), Manning (2006)). They also quickly develop motor skills and can complete complex tasks with relatively little instruction.

On the other hand, children with intellectual and developmental disabilities fail to achieve cognitive milestones in their early years of life, as they struggle with comprehending and processing information, using language, and solving simple problems (Schalock et al. (2021)). In addition, while their peers' behavior changes with age, the behavior of challenged children remains more rigid.

These early signs can appear right after birth for gifted and challenged children. However, the early developmental signals of exceptional endowment tend to be very noisy and unreliable. This complicates the ability of parents and educational institutions to recognize the exceptionality of children's endowment during their first years of life. Instead, at around ages 4 to 7, a more precise identification of a child as having exceptionally high or low intellectual ability is possible. First, reaching this age period ensures the persistence of exceptionality, an important condition for its existence. Second, due to the comparative nature of the exceptional endowment, parents and institutions must observe gifted and challenged children in interaction with other children to notice their uniqueness. Most children attend kindergarten from age 4 and primary school from age 6, where they interact more extensively with their peers. Therefore, despite early developmental signals, the noticeability and salience of exceptionality become clear later. Even if parents do not recognize their child's ability, they will most likely be informed by the child's classroom or kindergarten teachers. Dembinski and Mauser (1978) show based on a survey of families of gifted children that 35% of the parents recognized their child's giftedness between ages three and five. The other 65% were either informed or recognized their child's giftedness after age six.[3]

[3]Robinson (1993) summarizes the evidence from several studies, that suggest that the faster development of gifted children relative to other children is noticeable clearly at age 4-5: "At about

2.2 Classes for Gifted and Challenged Children in Israel

To identify children with an exceptional endowment, we rely on their placement in special classes throughout elementary and high school. In Israel, children can be placed either in a (1) regular class, (2) class for gifted children, (3) class for children with special needs, or (4) other special classes, e.g., classes for immigrant children. Since the sorting of children into classes occurs at an early stage of a child's development, we use the information on the class type of a child as an indicator of their intellectual endowment. In our analysis, class types (2) and (3) function as measures of exceptionally high and exceptionally low endowment, respectively. We lay out the characteristics of these class types below.

In the late 1980s, Israel's Ministry of Education opened special classes in regular schools designed for the education of gifted children. A two-stage procedure determines assignment to such classes within a school. First, all children in grades 2-4 (ages 7-10) are tested in math and comprehension. Next, students scoring in the top 15 percent of these tests can take five additional psychometric tests. These tests are similar to IQ tests. Students who scored in the top 20 percent of these additional tests are eligible to enter a class for gifted children. In addition, schools can recommend that specific students outside the initial 15 percent be put up for psychometric testing. Overall, children identified as gifted and placed into a gifted children class are roughly 3 percent of the original class.

As for challenged children, several kinds of classes exist for children with special needs in Israel. For example, there are unique classes for autistic children, children with cerebral palsy and other severe physical disorders, children with severe mental and behavioral disorders, and classes for blind children. There also exist unique classes for children with mild intellectual disabilities and severe learning disorders

age 6 years, a number of interesting shifts ordinarily take place in the cognitive skills and perspectives of normally developing children. They become much more systematic in their understanding of cause and effect, able to generalize and apply more broadly what were before encapsulated islets of understanding, able to grasp more complex classification systems, and so on. They are also metacognitively more mature, more self-aware, and better at managing their own learning and problem-solving. In all of these areas, cognitively gifted younger children are also advanced, not necessarily so strikingly by age 4, but more often by age 5, and they catch on rather swiftly".

designed to fit these children's needs. Importantly, these special classes for challenged children can exist within a regular school or as part of a school dedicated only to children with special needs. For a child to be placed in a class for children with an intellectual disability or learning disorders within a regular school, the child must have an official diagnosis of their cognitive condition and stand before a professional committee within the school. A child may be placed in a class for challenged students as early as first grade and as late as high school.

2.3 Data

To identify children with a positive or negative intellectual endowment shock, we use data on the classes in which children are placed throughout elementary and high school. As previously explained, children in Israel can be placed either in a regular class, a class for gifted children, or a class for challenged children. As this sorting into classes occurs early in children's life, information on class type for a child's first school years provides a good measure of their intellectual endowment. Therefore, we consider children placed in gifted classes to be intellectually gifted. Similarly, we consider children placed in classes for challenged children in any school year up to grade 5 (age 11) to be intellectually challenged.

In the entire analysis, we only use the special class types located in regular schools, excluding children from our sample who study in special schools. Primarily, we worry that children placed in special schools might have additional kinds of exceptional endowment besides the intellectual one. For example, challenged children in special needs schools might also suffer from a negative medical endowment. Because we focus here on the effect of intellectual endowment only, we wish to isolate that component while putting aside other types of child endowment.

We use three main administrative data sets accessed through Israel's Central Bureau of Statistics (CBS). CBS allows restricted access to these data in their protected research lab. First, we use the population registry data maintained by the Ministry of Interior, which includes an individual ID number, birth year, IDs of parents, marital status, and children's identity. We use this data set to construct our primary outcome variable, family size.

In addition, we use administrative records from the Ministry of Education on the universe of Israeli students from 1992 to 2016. Most importantly, these include information on each student's class type – whether they were placed in a regular class, a class for gifted children, or a class for challenged children as well as information on the school the child attended. These data also contain family background variables such as parental schooling, country of birth, and ethnicity.

Moreover, the Ministry of Education data includes information on students' academic outcomes. First, it includes students' scores on a national test called the "Meitzav". The Meitzav tests are standardized assessments administered in a sample of Israeli schools each school year to evaluate student performance and school effectiveness. These tests are conducted in grades 5 and 8 and cover the core subjects of mathematics, science, English, and Hebrew. For schools selected to take the test, administrating it to students is compulsory. Figure A1 in the online appendix presents the percent of students in each percentile of the average Meitzav test score for three student populations: gifted, challenged, and regular-class students. Gifted children are mostly placed in this 90-100 percentiles, challenged children are mainly in the 0-10 percentiles. The online appendix Table A4 demonstrates further the large gaps in gifted and challenged student's primary and high school academic outcomes relative to regular students.

Lastly, we also use data provided by the Israeli "National Institute for Testing and Evaluation" on students' scores on the University Psychometric Entrance Test (UPET). This is a standardized entrance exam used for admissions to universities and colleges in Israel, taken by students who wish to attend a university or gain eligibility for specific academic programs. Figure A1 in the online appendix presents the distribution of the average UPET scores for gifted, challenged, and regular students. The pattern in this figure is very similar to that of the Meitzav average scores: gifted children at the top and challenged children at the bottom.

CBS matched and merged these files using the individual-level national I.D. number. The matching is perfect, with no loss of observations. Throughout the analysis, we define a family as a unique combination of a man and a woman. Hence, children with one listed parent are excluded from the sample. The entire sample of students includes 2,188,067 observations, coming from 677,060 families. Among these families, as presented in Tables 1 and 2, 5,491 families have a gifted child, and 2,820 families have a challenged child.

In addition to our primary data sources described above, which we access via CBS, we use additional data provided independently by the Ministry of Education. Aside from designing the Meitzav national tests for students, the Ministry also conducts surveys of students, teachers, and school principals each year as part of the Ministry's effort to measure the quality and success of schools. The additional data set we use contains the students' test scores and their answers to the survey questions from 2002-2005.

Primarily, we use the responses of students to three survey questions: (1) does the student have a computer at home; (2) if the answer to the previous question is positive, is the computer connected to the internet; (3) does the student receive private tutoring lessons in each of the school subjects Math, Science, English, or Hebrew, and whether the student receives such lessons in a different school subject. As explained below in Section 5, we use this additional data set to rule out the concern that higher parental investment in human capital drives exceptional endowment. Using these data, we also show that first- and second-born high-endowment children, as well as the families to which they are born, do not differ in parental investment.

3 Empirical Strategy

Families with a child with exceptional intellectual endowment differ from those without. As columns (1) and (2) of Table 1 show, families with a gifted child have significantly more educated parents, with both mother and father averaging above two additional years of education relative to families without a gifted child. The composition of ethnic origin is also different between these two types of families. Differences along these dimensions also exist when comparing families with a challenged child to those without, as shown in Table 2. Families with a challenged child have less educated parents and exhibit a different makeup of ethnic origin. Hence, estimates of the effect of a high- or low-endowment child obtained by comparing families with such a child to those without will likely be biased due to the difference in characteristics between these groups.

Therefore, the samples we use to estimate the effect of an exceptional-endowment child include only families with such a child. Within these samples, our identification strategy leverages differences in the birth order of the exceptional-endowment child among families with the same initial number of children. Specifically, in the first quasi-experiment we use the population of families with at least two children, where the first- or second-born child is intellectually gifted. Within this sample, we then estimate the effect of a firstborn gifted child on the probability of having a third child and on completed family size, such that families with a second-born gifted child serve as the counterfactual. Similarly, in the second quasi-experiment we use the population of families with at least three children, where the second- or third-born child is intellectually gifted. Within this sample, we estimate the effect of a second-born gifted child on the probability of having a fourth child and on completed family size. In this quasi-experiment, a third-born gifted child is the counterfactual. We implement the same two quasi-experiments to estimate the effect of the birth of a challenged child on fertility as well.

The variation in birth order that we exploit quasi-randomizes the timing at which parents learn about the endowment of their children. The idea is that when the information on child endowment arrives relatively early within childbearing years, it may affect future fertility choices. We thus use these quasi-experiments to estimate the causal effect of an endowment shock – the birth of a child with exceptional endowment – on parents' choices on further fertility. Implementing these quasi-experiments for the birth of a gifted child identifies the effect of a positive endowment shock; implementing them for the birth of a challenged child identifies the effect of a negative endowment shock.

In practice, in the first quasi-experiment for the effect of a positive endowment shock, we estimate the following equation using the population of families with at least two children, in which the first- or second-born is a gifted child,

$$C_i = \alpha X_i + \beta t_i + \epsilon_i \tag{1}$$

where t_i indicates family i's firstborn child is gifted, and X_i is a vector that includes mother and father education years and a constant. The outcome C_i is either an indicator for a third child in family i, or the completed number of children in family i.

For the second quasi-experiment we use the population of families with at least three children, in which the second- or third-born is a gifted child. We then estimate an equation similar to (1), where the only difference is that t_i indicates family i's second-born child is gifted, and C_i is either an indicator for the existence of a fourth child in family i, or the completed number of children in i. We implement both quasi-experiments separately on the population of families with a challenged child to estimate the effect of a negative endowment shock.

Each quasi-experiment relies on two identification assumptions. In the first experiment, we assume that (1) among families with two or more children, whether the first- or the second-born child is of exceptional endowment (i.e., gifted or challenged) is quasi-random; and (2) while the endowment of the first-born child may affect parents' decision to have a third child, it does not affect their decision to have a second child. Similar assumptions apply to our second experiment. There, we assume that (1) among families with three or more children, whether the second- or the third-born child is of exceptional endowment is quasi-random; and (2) the endowment of the second-born child does not affect parents' decision to have a third child. We present evidence supporting these sets of identification assumptions below, separately for families with a gifted child and families with a challenged child.

3.1 Families with a Gifted Child

The evidence in Table 1, columns 4-6, shows that the observable characteristics of families with two or more children whose firstborn child is gifted are not statistically distinguishable from those of families with two or more children whose second-born child is gifted. For example, the mean years of schooling of the father in these two groups are 15.075 and 15.097 respectively; the difference, -0.0216 (SE=0.143), is not statistically different from zero. The mothers' respective means are 15.024 and 14.898. The difference, -0.126 (SE=0.137), is also not statistically different from zero. Similar well-balanced characteristics are evident in Table 1, columns 7-9, for families in our second quasi-experiment sample. The mean years of schooling of the father in these two groups are 15.015 and 15.129, respectively, and the difference, -0.114 (SE=0.220), is not statistically different from zero. On the other hand, mothers' respective means are 14.673 and 15.083, with a difference of -0.410 (SE=0.212) statistically significant at the 10 percent level. This evidence supports assumption (1).

However, a puzzle arises when noticing that the number of firstborn children in gifted programs is about 45 percent larger than the number of second-born children in these programs, among families with at least two children. This difference can either reflect a difference in the number of gifted children by birth order or in the enrollment rate of talented children in classes for gifted children by birth order. The first will primarily result from endowment differences at birth and the second from post-birth parental and child behavior. Interestingly, we do not find such a birth order difference when comparing higher birth order children. For example, the number of children enrolled in classes for gifted children is almost the same for second- and third-born children and the same for third- and fourth-order births. Therefore, there might be a concern that families of first- and second-born children enrolled in gifted classes may differ in some unobservable characteristics. In section 6, we present evidence that alleviates the concerns of sample selection that may affect the interpretation of the findings we present in this paper. However, at this point, we only highlight the fact that the evidence we obtain from the second quasi-experiment, where the sample sizes of second- and third-born children are quite the same, yields very similar results to those we obtain in the first quasi-experiment, where the sample of treatment and control are imbalanced.

The second identifying assumption we make is that the talent of a first-born (second-born) child is likely unknown in time to affect the decision about a second (third) child, but that it can affect the likelihood of a third (fourth) child. As reviewed in section 3.1, the psychology literature suggests that while superior ability may manifest in the first years of a child's life, these signals are noisy and mostly hard to identify. Rather, exceptional ability becomes clear and known to parents as a child approaches ages 5-8 and enters kindergarten or school. We show in Figure A1 an average space of 3.75 years between the birth of the firstborn child and the birth of the second among families with a gifted child. Therefore, the firstborn's talent is likely unknown in time to affect parents' decision on a second child. The same can be said regarding the second quasi-experiment, with an average space of 5.19 years between the birth of a second child and the birth of a third among families with a gifted child. Note also that parents' decisions on an additional child precede birth and typically also conception, such that the effective space is smaller. The distributions of the space between births in each quasi-experiment presented in Figure A1 provide additional support for this assumption, as among the mass of families in each sample, the space is below 6 years. Generally, given the spacing between children within a family, it is too early to fix ideas about the giftedness of the first (second) child when deciding on a second (third) one.

In addition, regarding the first quasi-experiment, very few ($\sim 8\%$) families with a gifted child have an only child, the typical pattern being two or more children. This suggests a very inelastic demand for a second child, a finding reported in other studies on fertility in Israel as well (e.g., Manski and Mayshar (2003)). Therefore, the quality signal of the first child could be considered 'irrelevant' to the demand for a second child. Given that parents usually opt to have a second child regardless, their primary fertility choice revolves around whether to have a third child.

3.2 Families with a Challenged Child

Families with a challenged child have different observable characteristics from families without a challenged child, as columns 1-3 of Table 2 show. For example, the mean years of schooling of the father and the mother in the latter group are higher. The father's years of schooling are higher by half a year and the mother's by a third. Interestingly, these means are identical in the sample of families without a challenged child or a gifted child.

In contrast, for families with a challenged child and two or more children, there are no significant observable differences between those whose first-born is challenged and those whose second-born is challenged (columns 4-6). The mean years of schooling of the father in these two groups are 12.132 and 12.202, the difference, -0.0699 (SE=0.152), not statistically different from zero. Mothers' respective means are 12.345 and 12.313; their difference is 0.033 (SE=0.137). The two samples of families with three or more children, with either the second or the third being challenged, are similarly well-balanced. This balance of observable characteristics across the groups in each quasi-experiment supports our assumption that among families with at least two children, whether the first- or second-born child is challenged is quasi-random. The evidence presented in columns (7) and (8) of Table 2 supports our parallel assumption regarding families with at least three children and a second or third-born challenged child.

Similarly to families with a gifted child, our second identification assumption in each quasi-experiment – the fact that a child is challenged does not affect parents' decision on the next child – is supported by the small space between births in our study samples (Figure A1). The distributions presented in Figure 1 again demonstrate that the vast majority of families in each quasi-experimental sample typically do not identify the endowment of their challenged child while the decision to have another child is made.

4 Results

4.1 Positive Endowment Shock

Table 3 presents the main results regarding the effect of high-endowment children on demand for children. Panel A shows the results of implementing the first quasi-experiment; Panel B presents the results of implementing the second quasi-experiment. We run all regressions with two primary outcomes and the two specifications. The outcomes are the probability of having a third child and the completed number of siblings. The first specification includes no controls. In the second specification, we add as controls the parents' years of education.

In columns 1-2, we present the regression estimates where the sample includes all families with at least two children, regardless of having a gifted child. This 'non-experimental' model yields a 'naïve' and potentially biased estimate of the effect of a gifted child on fertility. The estimates in column 1 are negative for both outcomes and experiments. The estimate on the likelihood of a third child in Panel A is -0.134 with a t-ratio over 20. The estimate in the regression of the number of children is -0.698 with a t-ratio of over 40. It implies that having a gifted first child is associated with a decline in fertility of about 0.7 children. The naïve estimates for the effect of a second-born gifted child are similar: having a gifted second child is associated with a 23 percent decline in the likelihood of a fourth child and a reduction in fertility of about 0.8 children. Controlling for parental education somewhat lowers these estimates, but the strong negative association between high child endowment and future births is robust.

In columns 3-4, we present the experimental estimates. Remarkably, the estimates in these two columns are positive, opposite to the negative sign of the simple OLS estimates in columns 1-2. We also note that estimates in columns 3-4 of Panel A are very similar, which is unsurprising given the balance between treatment and control groups. The estimates in column 4 of Panel A imply that having a first-born gifted child increases the likelihood of a third child by 5.3 percent against a benchmark of 51.5 percent. This is a 10 percent effect. We note that the impact of 5.3 percent is similar to the effect size of having same-sex first and second-born children on the probability of having a third child (Angrist and Evans (1998), Angrist et al. (2010)).

The estimated effect on total fertility is an increase of a tenth of a child. The magnitude of this effect depends on the benchmark against which it is evaluated. For example, against a benchmark of an average number of children in the control group, 2.65, it is a small effect size of a 4 percent increase. However, given that all families in the sample have two children, an increase of a tenth child could be evaluated against the average number of additional children beyond the first two in the control group, which is 0.65. In this case, the effect of a gifted child amounts to a 15 percent increase in the number of additional children. To put this estimate in perspective, we note that the effect size of other relevant interventions is in the same ballpark (e.g., van Doornik et al. (2024)).

The experimental estimates reported in Panel B reverse the sign of the estimates in columns 1-2, but they are small relative to Panel A and not precise. However, we note that the likelihood of having a fourth child conditional on having three children is 47 percent. Hence, relative to the baseline probability of having a fourth child, the effect of a second-born gifted child is meaningful despite not being statistically significant.[4]

Note the difference between the two outcomes we consider, the effect on the probability of an additional child and the effect on the total number of children. While the existence of an additional child is the clean experimental outcome of the intervention, we interpret the effect on the number of children as a "policy" parameter or a general equilibrium effect. That is, the effect on family size reflects the size of the impact on the third child, but it also captures the follow-up behavioral responses of the families that experience a higher probability of having a third child. For example, a family with a gifted first child may re-optimize its trade-off between quantity and quality following the birth of a third child (induced by the gifted child). In other

[4]Online appendix Table A2 presents two robustness checks of our above findings. Columns 1-2 show evidence when we restrict the sample to families with a single gifted child. The sample declines somewhat, and the results do not. Columns 3-4 show evidence when we restrict the sample to first-marriage families. The sample declines somewhat, and the results do not.

words, the effect on the number of children reflects the partial effect of the gifted child and the family's endogenous response to that child's effects.

The positive effect of a gifted child on fertility choices is consistent with the results of the theoretical model presented in Section A1 of the online Appendix. In the model, the impact of a positive endowment shock is driven by price and income effects. The price effect is triggered by parents updating their expected common family component of child endowment and responding to it, whereas the income effect reflects parents' dynamic response to the additional income they receive from their child being born closer to their desired level of quality. The findings we present suggest that these dynamic responses by parents indeed take place. Even though we cannot decompose the positive effect on fertility into these two mechanisms, the fact that in both quasi-experiments, parents respond to a gifted child by having more children indicates that they come to believe that additional children are cheaper than they initially expected.

4.1.1 Effect by Parental Education

Table 4 presents the results from the same estimation models of columns 3-4 of Table 3, by two sub-samples defined by parental education. First, we divide the sample based on the median education in the population, which is 12 years of schooling. Then, using both parents' years of schooling, the first group consists of families where the father and the mother are above this median. The second group includes families whose parents' years of schooling are at or below the population's median. We leave out from the sample families whose parental education is missing or if one parent has years of schooling above the median and the other at or below the median.

As noted earlier, our prior is that the effect of child endowment on fertility decisions is more evident and more substantial among educated parents. First, educated parents might be more observant and aware of the signs of giftedness in their child. For example, a knowledgeable parent engages their child more with educational games and activities, such as reading books or solving puzzles, which provide more opportunities to notice exceptional talent. Second, educated parents may be specifically sensitive to their child's cognitive ability, such that they derive higher utility from a gifted child than parents with below-median education. Hence, their fertility will respond more strongly to signals of child giftedness.

The estimates in Table 4 confirm that the effect of child endowment on fertility is driven mainly by educated parents. The estimated impact on the likelihood of a third child in the first experiment is 0.0623 (t ratio of about 3) among educated parents and practically zero among parents with less education years. The effect size implied by this estimate is larger than the average effect, mainly because the counterfactual average probability of such an event is much lower. Therefore, this estimate implies a twice as large effect size compared to the average effect estimated based on the whole sample of two plus births when the first-born is gifted.

The estimates on the number of siblings show the same pattern, with a significant positive effect in the educated sample and a zero effect among the less educated. The estimate of 0.110 relative to the mean number of siblings also implies an effect size larger than obtained from the full sample.

Again, adding parental education as a control in the regressions does not move the estimates in both samples. For example, the estimated effect on the number of siblings is 0.110 in column 1 and in column 2.

In Panel B of Table 4, we present estimates from applying the second quasi-experiment. Beyond providing additional evidence about the effect of child endowment on family size decisions, these results are important because the number of gifted children who are second or third-born is not different in this experiment. Therefore, this alleviates the concern about the birth order effect that shadowed the evidence derived from the first experiment to some extent. While the second quasi-experiment full sample setup did not yield precise estimates, those we obtained from the higher parental education sample are consistent with child endowment's impact on future fertility. The effect of a second-born gifted child on the likelihood of a fourth child is positive and significant, 0.0566 (se=0.0283). The implied effect size is similar to that derived from the first experiment. The effect on the number of siblings is 0.0634 (0.0333). The estimates from the low-education sample are not statistically different than those from the higher-education sample. Still, they are much less precise, likely because the sample size is much smaller.

4.1.2 Effect by Child Gender

Next, we turn to present in Table 5 evidence when we stratify the sample by the experimental gifted child (the first-born in the first quasi-experiment). Again, we note the smaller number of female students enrolled in gifted children's programs. This disparity is not unique to the samples we use in this study as they are evident throughout the years among all participants in gifted children's programs in Israel. The estimates in columns 1-2 are for the boys' sample, and columns 3-4 are for girls. Panel A is based on giftedness defined according to participation in gifted children's programs. The effect of a first child gifted is the same for boys and girls. In both samples, the treatment increases the likelihood of a third child by just over five percentage points. The effect size implied by this estimate is the same, given that the mean counterfactual is the same for boys and girls. The effect on the number of siblings is higher for girls, 0.114 versus 0.087 for boys. Both estimates are statistically significant, for boys at a 5 percent significance level and girls at 1 percent, but they are not statistically different. Adding parental schooling as a control in the regression does not move the estimates in both samples.

We conclude from these results that parents' reaction regarding future fertility to the birth of a gifted child is identical regardless of whether it is a boy or a girl. However, we used a perhaps weaker signal of ability to assess how robust this result is to the strength of the sign about the child's ability. Therefore, we used test scores in 5th and 8th grade in four subjects (English, math, Hebrew, and science) and selected the students in the top percentile of the test score distribution in each subject as having exceptional abilities. The sample included over 5,400 boys and over 6,300 girls. Note that the gender imbalance in the sample of gifted children is reversed, in line with considerable evidence about the superior academic performance of girls in primary and secondary education.

In Panel B, we present evidence when the treatment of first versus second child gifted is based on exceptional talent determined by being at the top percentile of the Meitzav test scores in 5th or 8th grade. This sample is twice the size of the sample based on participation in gifted children's programs. Again, the effect of first-child exceptionally talented is positive and significant in the boys' sample and zero in the girls' sample. This pattern contrasts sharply with that seen in Panel A, where we have seen no gender differences in the treatment effect. A possible explanation for this difference is that the alternative measure based on the Meitzav test score is a weaker signal of exceptional ability than being formally identified as a gifted child. The zero treatment effect of girls is consistent with the stereotypical view of extraordinary academic success: if it is a boy, it is associated with 'genius', and if it is a girl, it is associated with 'hard work' and 'effort'. Such prejudiced thinking is evident among parents (Zhao et al., 2022) and teachers (Storage et al., 2016). However, this bias, denoted in the literature by Gender-Brilliance Stereotype, 'caves in' when the signal is strong and unmistakable.

4.2 Negative Endowment Shock

Table 6 presents the main results from estimating the effect of a low-endowment child on parents' fertility choices. Panel A shows results from implementing the first quasi-experiment, using the sample of families with at least two children and with a first- or second-born challenged child. Panel B shows the results from implementing the second quasi-experiment, where the second- or the third-born child is challenged. In columns 1-2, we present the naïve estimates of the effect of a negative endowment shock, where the sample includes all families with at least two children, regardless of having a challenged child. As discussed above, this 'non-experimental' model yields potentially biased estimates since families with a challenged child differ from those without one, as seen in columns 1-2 of Table 2.

The estimates in column 1 of Panel A are negative for both outcomes but are not measured precisely. Adding parental controls changes the estimated correlation with the probability of a third child and its precision, but it also induces a sample change since some families have missing parental education years. Panel B presents imprecise estimated correlations with the probability of a third child, but strong and significant correlations with family size. Overall, there is no clear pattern in the population-wide association between the birth of a challenged child and fertility.

However, the quasi-experimental sample results in columns 3-4 differ. While the treatment effects in Panel A are close to zero, they are negative and statistically significant in Panel B. The estimate on the likelihood of a fourth child is -0.0763 (se=0.0314),and the effect on the number of siblings is -0.126 (0.0736). The effect size of this estimate reflects a reduction of 18 percent relative to a counterfactual probability of 0.43.[5]

Families that experience the birth of a challenged child at first birth do not reduce their willingness to have a third child even though the quantity-quality mechanism might be at play. The reason might be another mechanism not explicitly incorporated in fertility models, including the Becker QQ model: families whose first child is challenged might want to have a "regular endowment" child, which motivates an increase in the likelihood of a third child and offsets other effects, such as the QQ negative effect in this context. On the other hand, families that experienced the birth of a challenged child at second birth will likely not have this motive of 'replacement' because they already have a regular endowment child, their first-born child. Therefore, the second quasi-experiment of a challenged child captures more cleanly the quantity-quality trade-off when a family experiences a negative endowment shock.

Throughout the analysis of the effect of a gifted child on fertility outcomes, we used a sample that included only the Jewish population in Israel because there are no classes for gifted children in the Arab public education system. However, this is not the case for special education classes for challenged children. Therefore, in columns 5-6 of Table 6, we present evidence based on the population of Arab families with a child in a class for challenged students. The specifications of the regressions are identical to those of columns 3-4 in the same table. Fertility in the Arab sector

[5]Online appendix Table A3 presents two robustness checks of our above findings. Columns 1-2 show evidence when we restrict the sample to families with a single challenged child. The sample declines slightly, and the results are unchanged. Columns 3-4 show evidence when we restrict the sample to first-marriage families. The sample declines by about 50 families, and the results remain unchanged.

is higher, with a total fertility rate of 3.5-4 children. Remarkably, however, the estimates in columns 5-6 are extremely similar to those in Table 6. The effect of a firstborn challenged child is close to zero and not statistically significant. The effect of a second challenge child on further fertility is positive and significant, and the point estimates are similar to those obtained from the Jewish sector. The effect size is slightly lower because of the higher fertility rate in the Arab sector.

Beyond extending the external validity of our findings, the above similarity of findings is interesting as the Arab population is, on average, more traditional, has a lower level of education, and has very low female labor force participation. The negative effect of a challenged child on Arab fertility is consistent with the results of Lavy and Zablotsky (2015) that the increase in child quality played a role in the sharp decline in fertility of the Arab population in Israel during the second half of the 20th century, from about nine children per women to the current rate of just over 3.

4.3 Heterogeneity by Birth Spacing

We have shown that an early positive endowment shock, in the form of a first-born gifted child, positively affects subsequent fertility as reflected in the probability of a third child and completed family size. We have also shown that a late negative endowment shock, in the form of a second-born challenged child, has a negative effect on subsequent fertility, as reflected in the probability of a fourth child and family size. In this section, we address the concern that parents may already be aware of their child's exceptional endowment before deciding to have their next child. Thus, Assumption (2) is violated and the effect of an endowment shock is reflected immediately in subsequent fertility.

We address this concern by applying our main estimated Equation (1) to samples of families with different years of space between their exceptional endowment child and their next child. Specifically, we wish to validate that the effect of an exceptional endowment child is driven by families with a small space between that child and the next one – leaving little time to recognize the exceptional endowment when making the decision to have the immediately subsequent child. Therefore, we estimate Equation (1) separately on samples of families with 1-2, 3-4, 5-6, 7-8, and 9 or more years between the exceptional-endowment child and the next child.

We plot the estimates of the effect of a first-born gifted child on the probability of a third child by space between the first and second children in Figure (2), Panel (a). Indeed, the results show that the positive effect of a first-born gifted child we have found is driven by families with a small space – 1-2 or 3-4 years – between first and second children. This duration likely does not allow for a recognition of the first child's endowment when parents make the decision to have a second child, as discussed in Section 2.1. Note also that the figure presents the estimates by space between first and second *births*, whereas the time between the first child's birth and the *decision* to have a second is shorter.

We also examine heterogeneity by space for the negative effect of a second-born challenged child. The results are presented in Panel (b) of Figure 2. Similar to the results in Panel (a), the effect of a second-born challenged child on the probability of a fourth child is driven by families with a small space between their second and third children. These results indicate that Assumption 2 also likely holds for the families driving the results of applying this quasi-experiment.

5 Giftedness, Birth Order, and Investment in Human Capital

We implemented the first quasi-experiment on the sample of families with gifted children to estimate the effect of a positive endowment shock. However, as we point out in Section 3, the sample of families with a first-born gifted child is approximately 1.8 the size of the sample of families with a second-born gifted child. This imbalance raises concerns about whether classes for gifted children could be used as a measure of giftedness in the first quasi-experiment. Specifically, the concern is that parents might be investing more in first-born talented children compared to talented children born later on, thus creating the over-representation of first-borns in classes for gifted children. Given the implementation of the second quasi-experiment does not suffer from a similar imbalance and yet produces similar results, we do not worry about this problem being a threat to our conclusion. However, in this section we provide further evidence that supports the results from the first quasi-experiment and mitigates the concern stemming from the size imbalance.

To this end, we identify exceptionally talented children based on their 5th and 8th Meitzav test scores and study parents' investment in these children by birth order. We define talented students as those the top percentile in the test score distribution of at least one Meitzav subject. Then, we merge this data with information from the Meitzav student survey that provides information on parental human capital investments in children. We show that parents do not invest differently in talented first-born children compared to talented second-born children.

Specifically, we present three sets of results. First, we show that talented children receive less investment compared to their siblings and to children from similar backgrounds. Next, we show that first-born talented children receive similar parental investment as second-born talented children. This finding confirms that parental investment is not correlated with birth order among talented children. In addition, we show that families with a first-born talented child invest similarly in their children as families with a second-born talented child. This result further demonstrates that the two types of families are similar.

In Table 7, we present estimates from the following estimated equation,

$$y_{ij} = \delta G_{ij} + \gamma X_i + e_{ij}, \tag{2}$$

where y_{ij} is an indicator for whether child i in family j receives private lessons in one the subjects of mathematics, science, English, and Hebrew, G_{ij} is an indicator for whether the child is exceptionally talented, and X_i denotes family-level controls. We run this regression both on our entire sample of children, and separately on the sample of children from families in which there is variation in child talent; that is, there are at least one child identified as talented and one that is not. When using the latter sample, we also substitute X_i with a fixed effect at the family level.

The results all show that talented children receive fewer private lessons, when compared to their siblings and to other children from similar backgrounds. For example, 17.7 percent of children in our entire sample receive private lessons in mathematics, while among talented children only 8 percent do (column 1). Within families, 12 percent of children receive private mathematics lessons, while 7 percent of talented children do (column 3).[6]

Next, we estimate Equation (2) while defining G_{ij} as an indicator for a first-born talented child, and use only the sample of first- or second-born highly children. The results appear in Table 8. For three measures of parental investment – whether the child has a computer at home, whether that computer has access to the internet, and the number of school subjects in which the child receives private lessons – there are no differences between first- and second-born talented children. This suggests that parental investment does not push first-born children into classes for gifted children more than second-born children.

Finally, we compare families with first-born talented children to families with second-born talented children. This exercise alleviates the concern that families with first-born talented children might be overall investing more in their children, with that investment being responsible for their higher representation in classes for gifted children. In Table 9 we present the results of estimating Equation (2), with the outcome being a measure of parental investment, and G_{ij} an indicator for child j belonging to family i which has a first-born talented child. We estimate this equation on the sample of families with at least two children, in which the first- or second-born are talented. We include all children in such families, and not only the talented children themselves, because we are interested in family-level human capital investment.

The results in Table 9 show no difference in human capital investment between families with a first-born talented child and families with a second-born talented

[6] Table A1 in the online appendix presents estimates of parental investments (whether a child has a private tutor in a subject) based on alternative definitions of child ability. In the top panel, the child is in the top percentile of the test subject taught by the tutor, and in the lower panel, the child is in the top percentile of a test subject other than the subject taught by the tutor. The results are very similar to those presented in Table 7.

child, for families with at least two children. Neither group of families shows a preference for child quality, in a way that could complicate the interpretation of our main results regarding fertility. For example, there is virtually no difference between the number of subjects in which children receive private lessons between families with a first-born talented child and families with a second-born talented child. These results further mitigate the concern that differences in parental investment are driving the effect of positive child endowment on the intensive margin of fertility.

6 Conclusion

This paper studies the effect of child intellectual endowment on parents' fertility choices. To isolate endowment, we focus on intellectually gifted and intellectually disabled children with an endowment level independent of parental investment. Applying quasi-experiments that use the timing of the birth of such children within the family life cycle, we show that parents respond to a positive quality shock by choosing higher fertility and to a negative quality shock by choosing less fertility. The large magnitude of the effects we find, between 10 and 22 percent, suggests the effect of child endowment on family size is important to understanding fertility choice.

In addition, the heterogeneity analysis we present indicates that it is not (necessarily) a child's endowment itself that affects fertility but rather the realization of the child's endowment by the parents that causes this effect. Hence, when the endowment signal of a child is noisy, different biases that can distort the interpretation of the signal become relevant. As such, high-ability girls barely affect parents' fertility choice because girls' ability is typically treated as a result of investment and not as reflective of an endowment. Similarly, the population of educated parents drives the effect of gifted children on fertility, likely because they can recognize their child's giftedness.

Using roughly the same data set as we do in this paper, Angrist et al. (2010) have estimated the effect of an exogenous increase in child quantity on child quality. Their results show no trade-off between quantity and quality occurs following such a quantity shock. However, the results shown in the current study, according to which a quality shock indeed triggers a QQ-induced effect, suggest that different types of shocks may have different effects in reality despite coming from the same model. This difference calls for more research on how quantity shocks and quality shocks compare to each other.

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Table 1: Descriptive Statistics and Balancing Tests for Families with a Gifted Child

	Families without a gifted child	Families with a gifted child	Difference	Families with 2+ children and a firstborn gifted child	Families with 2+ children and a secondborn gifted child	Difference	Families with 3+ children and a secondborn gifted child	Families with 3+ children and a thirdborn gifted child	Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Family Background									
Father Education Years	12.461	14.808	-2.347***	15.075	15.097	-0.0216	15.015	15.129	-0.114
	(4.162)	(4.356)		(4.134)	(4.119)		(4.144)	(3.800)	
Mother Education Years	12.375	14.750	-2.376***	15.024	14.898	0.126	14.673	15.083	-0.410*
	(3.736)	(4.192)		(4.016)	(3.944)		(4.005)	(3.664)	
Ethnic Origin: Asia	0.327	0.280	0.0472***	0.281	0.283	-0.00155	0.193	0.191	0.00198
	(0.469)	(0.449)		(0.450)	(0.451)		(0.395)	(0.393)	
Ethnic Origin: Africa	0.207	0.091	0.117***	0.093	0.083	0.00974	0.122	0.106	0.0163
	(0.405)	(0.287)		(0.290)	(0.276)		(0.328)	(0.308)	
Ethnic Origin: Europe	0.133	0.219	-0.0862***	0.224	0.234	-0.0104	0.243	0.209	0.0340
	(0.339)	(0.414)		(0.417)	(0.424)		(0.429)	(0.407)	
Ethnic Origin: America	0.048	0.067	-0.0191***	0.065	0.076	-0.0117	0.076	0.062	0.0143
	(0.213)	(0.249)		(0.246)	(0.266)		(0.265)	(0.241)	
Ethnic Origin: Israel and Other	0.028	0.343	-0.0587***	0.337	0.323	0.0139	0.366	0.432	-0.0666***
	(0.451)	(0.475)		(0.473)	(0.468)		(0.480)	(0.496)	
Panel B: Family-level Outcomes									
Number of children	3.236	2.708	0.528***	2.745	2.652	0.0930***	3.268	3.234	0.0342
	(1.816)	(0.940)		(0.797)	(0.751)		(0.561)	(0.568)	
Family has at least two children	0.902	0.922	-0.0206***	1	1	0	1	1	0
	(0.298)	(0.268)							
Family has at least three children	0.645	0.581	0.0632***	0.566	0.515	0.0512***	1	1	0
	(0.479)	(0.493)		(0.496)	(0.500)				
Family has at least four children	0.301	0.165	0.137***	0.148	0.115	0.0332***	0.223	0.196	0.0267
	(0.459)	(0.371)		(0.355)	(0.319)		(0.417)	(0.398)	
Family has at least five children	0.141	0.028	0.112***	0.024	0.017	0.00679	0.033	0.025	0.00808
	(0.348)	(0.166)		(0.152)	(0.129)		(0.178)	(0.155)	
Observations	671,569	5,491		2,662	1,481		762	728	

Notes: This table presents means and standard deviations of the variables listed on the left. Except for columns 3, 6, and 9, each column is a different sample, as specified at the top of each column. The unit of observation is a family, defined as a unique combination of two parents. Gifted children are defined by being in a class for gifted children in elementary and high school. Ethnic origin is based on parents' place of birth. If parents were born in Israel, it is based on grandparents' place of birth. Columns 3, 6, and 9 present coefficients from a regression estimated using samples 1-2, 4-5, and 7-8, respectively. The dependent variable in the regression is the variable on the left of the table, and the independent variable is whether the family belongs to sample 1, 4, and 7, respectively. Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table 2: Descriptive Statistics and Balancing Tests for Families with a Challenged Child

	Families without a challenged child	Families with a challenged child	Difference	Families with 2+ children and a firstborn challenged child	Families with 2+ children and a secondborn challenged child	Difference	Families with 3+ children and a secondborn challenged child	Families with 3+ children and a thirdborn challenged child	Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Family Background									
Father Education Years	12.483	11.962	0.523***	12.132	12.202	-0.0699	11.936	11.766	0.169
	(4.173)	(3.015)		(2.338)	(2.506)		(2.417)	(2.257)	
Mother Education Years	12.396	12.073	0.318***	12.345	12.313	0.0330	12.144	12.231	-0.0866
	(3.750)	(2.667)		(2.287)	(2.283)		(2.252)	(2.294)	
Ethnic Origin: Asia	0.327	0.279	0.0482***	0.308	0.285	0.0222	0.271	0.264	0.00734
	(0.469)	(0.449)		(0.462)	(0.452)		(0.445)	(0.441)	
Ethnic Origin: Africa	0.206	0.295	-0.0893***	0.291	0.275	0.0151	0.299	0.292	0.00790
	(0.404)	(0.456)		(0.454)	(0.447)		(0.458)	(0.455)	
Ethnic Origin: Europe	0.134	0.121	0.0127**	0.128	0.140	-0.0119	0.137	0.119	0.0186
	(0.340)	(0.326)		(0.335)	(0.347)		(0.345)	(0.324)	
Ethnic Origin: America	0.048	0.070	-0.0226***	0.056	0.079	-0.0231*	0.068	0.065	0.00265
	(0.213)	(0.256)		(0.231)	(0.271)		(0.252)	(0.247)	
Ethnic Origin: Israel and Other	0.285	0.234	0.0511***	0.217	0.220	-0.00233	0.224	0.261	-0.0365
	(0.452)	(0.424)		(0.413)	(0.414)		(0.417)	(0.439)	
Panel B: Family-level Outcomes									
Number of children	3.231	3.527	-0.296***	3.137	3.036	0.101	3.573	3.712	-0.139**
	(1.812)	(1.687)		(1.313)	(1.134)		(1.053)	(1.165)	
Family has at least two children	0.902	0.946	-0.0443***	1	1	0	1	1	0
	(0.298)	(0.226)							
Family has at least three children	0.644	0.754	-0.110***	0.651	0.659	-0.00829	1	1	0
	(0.479)	(0.431)		(0.477)	(0.474)				
Family has at least four children	0.300	0.410	-0.110***	0.279	0.238	0.0406*	0.362	0.430	-0.0684**
	(0.458)	(0.492)		(0.449)	(0.426)		(0.481)	(0.495)	
Family has at least five children	0.140	0.183	-0.0436***	0.099	0.071	0.0288**	0.107	0.140	-0.0327*
	(0.347)	(0.387)		(0.299)	(0.257)		(0.310)	(0.347)	
Observations	674,240	2,820		764	806		531	614	

Notes: This table presents means and standard deviations of the variables listed on the left. Except for columns 3, 6, and 9, each column is a different sample, as specified at the top of each column. The unit of observation is a family, defined as a unique combination of two parents. Challenged children are defined by being in a class for intellectually disabled children, or in a class for children with severe learning disorders, in elementary and high school. Ethnic origin is based on parents' place of birth. If parents were born in Israel, it is based on grandparents' place of birth. Columns 3, 6, and 9 present coefficients from a regression estimated using samples 1-2, 4-5, and 7-8, respectively. The dependent variable in the regression is the variable on the left of the table, and the independent variable is whether the family belongs to sample 1, 4, and 7, respectively. Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table 3: Effect of a Positive Endowment Shock on Fertility Choices

	Population		**Quasi-Experimental Sample**	
	(1)	(2)	(3)	(4)
Panel A: First-Born Gifted Child				
Probability of third child	-0.134***	-0.0996***	0.0512***	0.0529***
	(0.00865)	(0.00921)	(0.0162)	(0.0171)
Number of siblings	-0.698***	-0.514***	0.0930***	0.0983***
	(0.0146)	(0.0171)	(0.0249)	(0.0261)
Observations	610,673	541,778	4,143	3,722
Panel B: Second-Born Gifted Child				
Probability of fourth child	-0.230***	-0.154***	0.0267	0.0193
	(0.0125)	(0.0136)	(0.0211)	(0.0226)
Number of siblings	-0.782***	-0.595***	0.0342	0.0158
	(0.0189)	(0.0238)	(0.0292)	(0.0310)
Observations	382,981	337,794	1,490	1,325
Parents education years		Yes		Yes

Notes: Presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. In columns 1-2, the sample is the entire population of families with two children or more. In columns 3-4, the sample is the population of families with two children or more, who one of them is gifted. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table 4: Effect of a Positive Endowment Shock on Fertility Choices, by Parents' Education

	Parents' Education > 12		**Parents' Education ≤ 12**	
	(1)	(2)	(3)	(4)
Panel A: First-Born Gifted Child				
Probability of third child	0.0618***	0.0623***	0.01000	0.0104
	(0.0217)	(0.0217)	(0.0403)	(0.0405)
Number of siblings	0.110***	0.110***	-0.00700	-0.00404
	(0.0325)	(0.0326)	(0.0689)	(0.0694)
Observations	2,358	2,358	637	637
Panel B: Second-Born Gifted Child				
Probability of fourth child	0.0567**	0.0566**	0.0488	0.0481
	(0.0282)	(0.0283)	(0.0544)	(0.0543)
Number of siblings	0.0636*	0.0634*	0.0629	0.0572
	(0.0333)	(0.0333)	(0.0838)	(0.0859)
Observations	798	798	267	267
Parents' education years		Yes		Yes

Notes: presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. The original sample for this table is the population of families with two children or more, who one of them is gifted. Columns 1-2 include only families in which both parents' education years exceed 12. Columns 3-4 include families in which both parents' education years is below, or equal to, 12. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Table 5: Effect of a Positive Endowment Shock on Fertility Choices, by Gender and Measures of High Endowment

	Boys		**Girls**		**Full Sample**	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Gifted Children						
Probability of third child	0.0573***	0.0526**	0.0415	0.0507*	0.0512***	0.0529***
	(0.0206)	(0.0218)	(0.0260)	(0.0274)	(0.0162)	(0.0171)
Number of siblings	0.0948***	0.0870**	0.0903**	0.114***	0.0930***	0.0983***
	(0.0320)	(0.0339)	(0.0396)	(0.0411)	(0.0249)	(0.0261)
Observations	2,543	2,280	1,600	1,442	4,143	3,722
Panel B: Top Percentile of Meitzav Scores						
Probability of fourth child	0.0470***	0.0478***	0.00211	0.000853	0.0228**	0.0227**
	(0.0133)	(0.0134)	(0.0125)	(0.0125)	(0.00911)	(0.00916)
Number of siblings	0.0578***	0.0575***	0.00306	0.00188	0.0283**	0.0279**
	(0.0203)	(0.0202)	(0.0194)	(0.0193)	(0.0140)	(0.0140)
Observations	5,560	5,429	6,450	6,330	12,010	11,759
Parents' education years		Yes		Yes		Yes

Notes: presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. Each Panel uses a different measure of high endowment. The sample in Panel A is the population of families with two children or more, who one of them is gifted. The sample in Panel B is the population of families with two children or more, where one of them has scored in the top percentile in Israel's national tests. Columns 1-2 include only families in which the high-endowment child is a boy. Columns 3-4 include families in which the high-endowment child is a girl. Columns 5-6 include both boys and girls. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table 6: Effect of a Negative Endowment Shock on Fertility Choices

	Entire Sample		**Quasi-Experimental Sample**		**Quasi-Experimental Sample: Arab Families**	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First-Born Challenged Child						
Probability of third child	-0.00622	0.0368**	-0.00829	-0.00719	-0.00413	-0.000691
	(0.0141)	(0.0151)	(0.0240)	(0.0258)	(0.0194)	(0.0211)
Number of siblings	-0.0716	-0.0574	0.101	0.101	-0.0142	0.104
	(0.0459)	(0.0526)	(0.0621)	(0.0701)	(0.130)	(0.124)
Observations	610,675	541,796	1,570	1,301	908	790
Panel B: Second-Born Challenged Child						
Probability of fourth child	-0.0187	-0.0197	-0.0684**	-0.0763**	-0.0668**	-0.0807***
	(0.0181)	(0.0197)	(0.0289)	(0.0314)	(0.0270)	(0.0296)
Number of siblings	-0.271***	-0.299***	-0.139**	-0.126*	-0.967	-0.165
	(0.0460)	(0.0543)	(0.0656)	(0.0736)	(0.122)	(0.117)
Observations	382,981	337,797	1,145	968	847	752
Parents' education years		Yes		Yes		Yes

Notes: presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. In columns 1-2, the sample is the entire population of families with two children or more. In columns 3-4, the sample is the population of families with two children or more, who one of them is challenged. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$.

Table 7: High Endowment and Parental Investment

Outcome Variable:	Private tutor in Mathematics			Private tutor in Science			Private tutor in English			Private tutor in Hebrew		
	Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Talented Child	-0.0968***	-0.0479***	-0.0459***	-0.0268***	-0.0126***	-0.0134***	-0.0900***	-0.0561***	-0.0558***	-0.0484***	-0.0271***	-0.0276***
	(0.00294)	(0.00683)	(0.00615)	(0.00160)	(0.00330)	(0.00307)	(0.00347)	(0.00946)	(0.00724)	(0.00197)	(0.00424)	(0.00390)
Mean in comparison group	0.177	0.119		0.045	0.027		0.275	0.244		0.070	0.048	
	(0.382)	(0.324)		(0.208)	(0.161)		(0.446)	(0.429)		(0.255)	(0.213)	
Observations	237,048	7,966	7,990	235,164	7,888	7,912	236,932	7,966	7,989	235,383	7,898	7,922
Number of Families	203,200	3,818	3,818	201,776	3,781	3,781	203,117	3,816	3,816	201,918	3,788	3,788
Father education years	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Mother education years	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Father country of birth	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Mother country of birth	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Child birth year	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
City	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Family			Yes			Yes			Yes			Yes

Notes: each column is a separate regression, where the independent variable is specified on the left of the table. The dependent variable is specified at the top of the column, e.g., for columns 1-3 the dependent variable in whether the student has a private tutor in mathematics. The sample used for the regression is specified below the dependent variable. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 8: Parental Investment in First-Born vs Second-Born High Ability Children

Outcome Variable:	Has Computor at Home			Has Computor with Internet at Home			Number of School Subjects with Private Lessons		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First-born Talented Child	-0.00474	-0.00493	-0.00618	-0.0257	-0.0259	-0.0309*	0.0237	0.0240	0.0344
	(0.00580)	(0.00576)	(0.00587)	(0.0176)	(0.0176)	(0.0175)	(0.0359)	(0.0360)	(0.0356)
Mean of dependent variable		0.988			0.865			0.357	
Parents' education years		Yes	Yes		Yes	Yes		Yes	Yes
Parents' country of birth			Yes			Yes			Yes
Observations	1,631	1,631	1,631	1,631	1,631	1,631	1,628	1,628	1,628

Notes: Each column is a separate regression. The sample in all columns contains first- or second-born children whose Meitzav scores are in the top percentile of the respective cohort, and whose families have at least two children. Controls, when used, are specified at the bottom of the table. Robust standard errors are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9: Comparing Parental Investment between Families with First-born and Second-born Meitzav Top Percentile Children

Outcome Variable:	Has Computor at Home			Has Computor with Internet at Home			Number of School Subjects with Private Lessons		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Family with A First-born Talented Child	0.000957	0.000840	0.000641	-0.0123	-0.0120	-0.0121	0.00300	0.00257	0.00332
	(0.00512)	(0.00511)	(0.00511)	(0.0142)	(0.0142)	(0.0141)	(0.0306)	(0.0307)	(0.0306)
Mean of dependent variable		0.982			0.854			0.415	
Parents' education years		Yes	Yes		Yes	Yes		Yes	Yes
Parents' country of birth			Yes			Yes			Yes
Observations	2,569	2,569	2,569	2,569	2,569	2,569	2,562	2,562	2,562

Notes: Each column is a separate regression. The sample in all columns contains children from families with at least two children, and a first- or second-born child whose Meitzav scores are in the top percentile of the respective cohort. Controls, when used, are specified at the bottom of the table. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

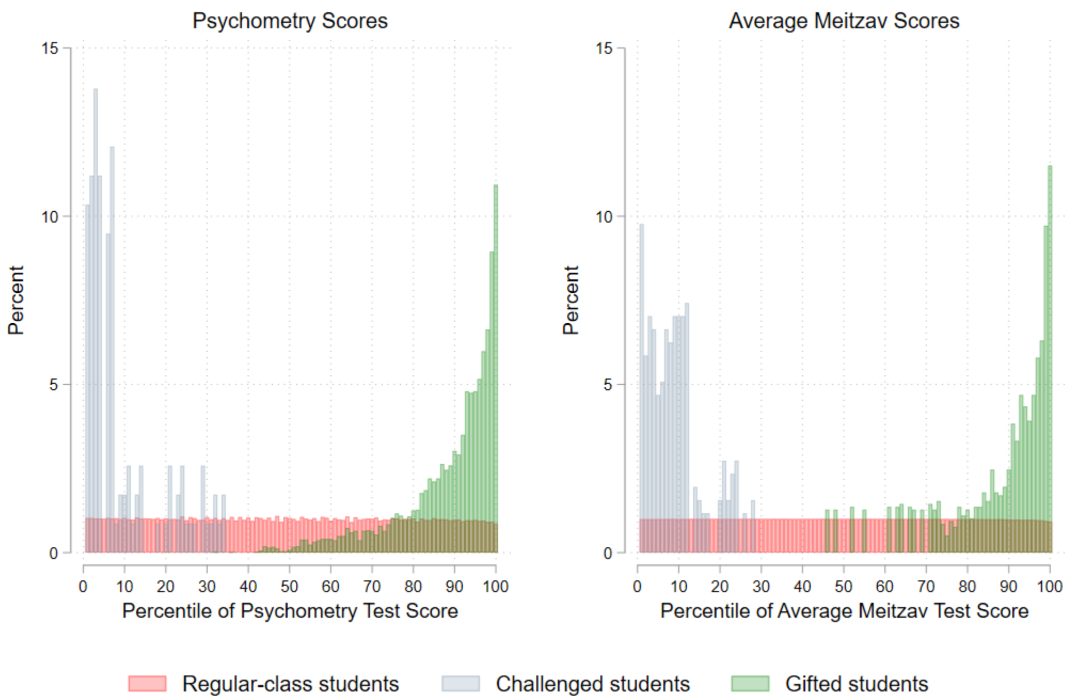
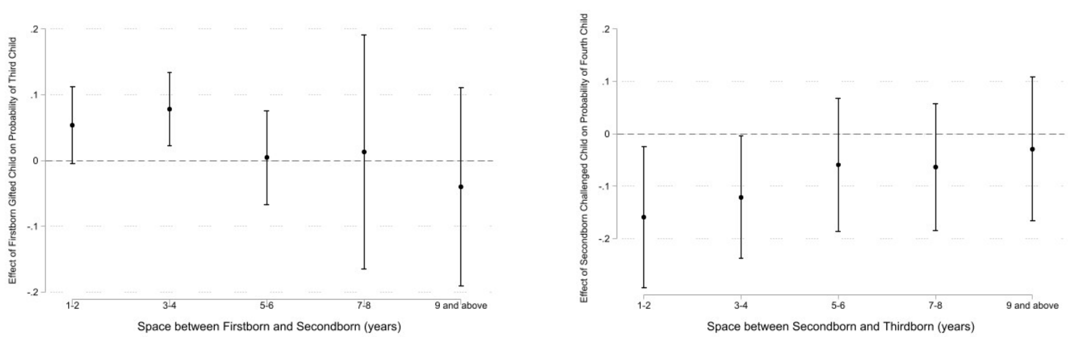


Figure 1: Test Scores: Gifted, Challenged, and Regular-class Students

Notes: Plotted are histograms of UPET scores (left) and average Meitzav scores (right), separately for three groups of students: students in regular classes, challenged students, and gifted students. Due to privacy constraints, only percentiles with sufficient data are presented.



(a) Gifted (b) Challenged

Figure 2: Heterogeneity by Space between Exceptional Child and Next Child

Notes: The figure in Panel (a) presents the coefficient β from Equation (1) when estimated on the first quasi-experimental sample for gifted children, using only families the respective spaces between their firstborn and secondborn children. Panel (b) presents the coefficients, but for the second quasi-experimental sample for challenged children.

On line Appendix - Not for Publication

Table A1: Child Ability and Parental Investment - Additional Definitions of Child Ability

	Private tutor in Mathematics			Private tutor in Science			Private tutor in English			Private tutor in Hebrew		
	Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable		Entire Sample	Families with variation in independent variable	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Child in top percentile of the test subject taught by the tutor	-0.127***	-0.0481***	-0.0424***	-0.0257***	-0.00945	-0.012**	-0.0933***	-0.0537***	-0.0557***	-0.0614***	-0.0418***	-0.0422***
	(0.00737)	(0.0139)	(0.0126)	(0.00308)	(0.00654)	(0.00541)	(0.00435)	(0.0121)	(0.00882)	(0.00530)	(0.00834)	(0.00816)
Mean in comparison group	0.171	0.090	0.090	0.044	0.024	0.024	0.273	0.233	0.233	0.067	0.042	0.042
	(0.377)	(0.286)	(0.286)	(0.205)	(0.153)	(0.153)	(0.445)	(0.423)	(0.423)	(0.250)	(0.202)	(0.202)
Observations	237,048	1,408	1,419	235,164	2,314	2,329	236,932	4,913	4,931	235,383	1,304	1,314
Number of Families	203,200	673	673	201,776	1,120	1,120	203,117	2,355	2,355	201,918	628	628
Child in top percentile of a test subject other than the subject taught by the tutor	-0.0926***	-0.0425***	-0.0424***	-0.0270***	-0.0127***	-0.0133***	-0.0882***	-0.0544***	-0.0539***	-0.0465***	-0.0239***	-0.0239***
	(0.00309)	(0.00726)	(0.00649)	(0.00174)	(0.00346)	(0.00325)	(0.00485)	(0.0129)	(0.00984)	(0.00205)	(0.00447)	(0.00405)
Mean in comparison group	0.176	0.119	0.119	0.045	0.025	0.025	0.272	0.244	0.244	0.070	0.046	0.046
	(0.381)	(0.323)	(0.323)	(0.208)	(0.157)	(0.157)	(0.445)	(0.430)	(0.430)	(0.255)	(0.210)	(0.210)
Observations	237,048	7,216	7,237	235,164	6,612	6,638	236,932	4,441	4,457	235,383	7,236	7,260
Number of Families	203,200	3,464	3,464	201,776	3,168	3,168	203,117	2,129	2,129	201,918	3,471	3,471
Father education years	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Mother education years	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Father country of birth	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Mother country of birth	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Child birth year	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
City	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Family			Yes			Yes			Yes			Yes

Notes: each column is a separate regression, where the independent variable is specified on the left of the table. The dependent variable is specified at the top of the column, e.g., for columns 1-3 the dependent variable in whether the student has a private tutor in mathematics. The sample used for the regression is specified below the dependent variable. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A2: Effect of a Gifted Child on Family Size, Robustness

	Only Families with a Single Gifted Child		Only First-Marriage Families	
	(1)	(2)	(3)	(4)
Panel A: First-Born Gifted Child				
Probability of third child	0.0587***	0.0660***	0.0556***	0.0602***
	(0.0170)	(0.0184)	(0.0164)	(0.0177)
Number of siblings	0.109***	0.116***	0.0949***	0.101***
	(0.0255)	(0.0275)	(0.0253)	(0.0272)
Observations	3,653	3,152	4,045	3,498
Panel B: Second-Born Gifted Child				
Probability of Fourth child	0.0266	0.0322	0.0333	0.0334
	(0.0211)	(0.0231)	(0.0213)	(0.0232)
Number of siblings	0.0314	0.0295	0.0427	0.0345
	(0.0296)	(0.0317)	(0.0296)	(0.0316)
Observations	1,388	1,191	1,463	1,262
Parents education years		Yes		Yes

Notes: presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. In columns 1-2, the sample is the population of families with two children or more and one gifted child who is either the first- or second-born. In columns 3-4, the sample is the population of first-marriage families with two children or more, who one of them is gifted. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A3: Effect of a Challenged Child on Family Size, Robustness

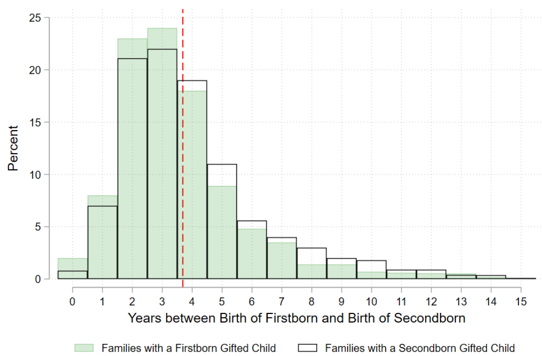
	Only Families with a Single Challenged Child		Only First-Marriage Families	
	(1)	(2)	(3)	(4)
Panel A: First-Born Challenged Child				
Probability of third child	-0.00801	-0.00860	0.00262	0.00433
	(0.0247)	(0.0266)	(0.0244)	(0.0262)
Number of siblings	0.119*	0.119	0.132**	0.131*
	(0.0643)	(0.0726)	(0.0628)	(0.0709)
Observations	1,506	1,245	1,508	1,252
Panel B: Second-Born Challenged Child				
Probability of Fourth child	-0.0670**	-0.0740**	-0.0649**	-0.0679**
	(0.0292)	(0.0317)	(0.0294)	(0.0320)
Number of siblings	-0.112*	-0.0941	-0.145**	-0.124*
	(0.0653)	(0.0732)	(0.0654)	(0.0737)
Observations	1,116	944	1,100	926
Parents education years		Yes		Yes

Notes: presented above are coefficients form regressions in which the dependent variable is listed on the left, and the independent variable is specified in the title of each panel. The unit of observation is a family. In columns 1-2, the sample is the population of families with two children or more and one challenged child who is either the first- or second-born. In columns 3-4, the sample is the population of first-marriage families with two children or more, who one of them is challenged. Controls are indicated at the bottom of the table. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

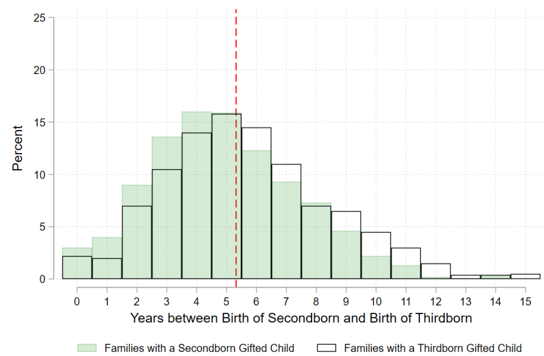
Table A4: Academic Success - Gifted, Challenged, and Regular-Class Students

	Gifted Students	Regular-Class Students	Challenged Students
	(1)	(2)	(3)
Average Meitzav Percentile	82.35	51.79	26.45
	(13.82)	(23.62)	(18.98)
	510	81,677	51
Average Meitzav Math and Science Percentile	83.63	52.02	25.40
	(15.94)	(25.55)	(21.56)
	510	81,677	51
Completed Bagrut Credits	28.53	13.15	2.42
	(7.40)	(13.01)	(6.91)
	6,059	1,350,420	2,900
Bagrut Credits in Math and Science	11.82	4.05	0.88
	(4.99)	(4.36)	(1.42)
	6,059	1,350,422	2,900
Bagrut Advanced Math	0.92	0.37	0.02
	(0.27)	(0.48)	(0.15)
	6,022	1,024,872	1,261
Bagrut Diploma	0.95	0.52	0.11
	(0.21)	(0.50)	(0.31)
	6,059	1,350,422	2,900
UPET Percentile	85.74	50.01	29.13
	(17.59)	(28.74)	(27.13)
	4,879	519,243	98

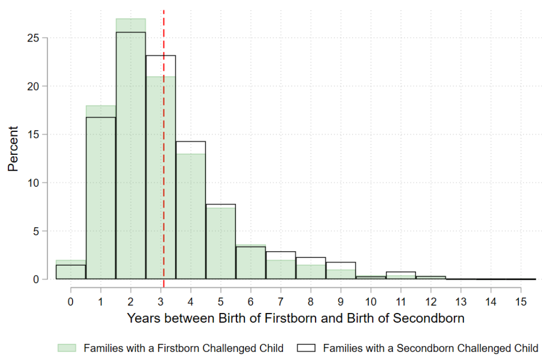
Notes: This table presents means, standard deviations, and number of observations of the variables listed on the left. Each column is a different sample, as specified at the top of each column. Gifted children are defined by being in a class for gifted children in elementary and high school. Challenged children are defined by being in a class for intellectually disabled children, or in a class for children with severe learning disorders, in elementary and high school.



(a) Families with 2+ Children



(b) Families with 3+ Children



(c) Families with 2+ Children

(d) Families with 3+ Children

Figure A1: Distribution of Space between Children in Quasi-Experimental Samples

Notes: Each plot presents the distribution of the space in years between the birth of two adjacent children within a family. Panel (a) does so for the space between first- and second-born children in families with at least two children and either a first- or second-born gifted child; (b) for the of space between the second- and third-born children in families with at least three children and either a second- or third-born gifted child; (c) does so for the space between first- and second-born children in families with at least two children and either a first- or second-born challenged child; and (d) for the of space between the second- and third-born children in families with at least three children and either a second- or third-born challenged child. The dashed vertical lines represent the mean space across all families in each panel.

Appendix: Theoretical Framework

The prime economic framework for analyzing the effect of child endowment on fertility choices is the quantity-quality (QQ) model of fertility, developed by Becker and others (Becker and Lewis (1973); Becker and Tomes (1976); Becker (1991)). The QQ model assumes parents derive utility from the number of their children and from the quality of each child. Hence, when deciding on fertility, parents balance between their demand for children and the investment needed to bring each child to their desired level of child quality. As a result, changes in the quality endowment of their children will affect parents' fertility choices. The current section presents an augmentation of the QQ model in a way that makes explicit the mechanisms underlying this effect of child endowment.[7] Doing so motivates our following empirical analysis and guides our conceptualization and interpretation. We stick to the modeling framework offered by Becker to maintain simplicity.

A person in the model lives for two periods: period t, in which she is a child with parents who invest in her future productivity, and period $t+1$, in which she is an adult who earns income, consumes, and makes decisions regarding her own children. The utility of parents in period t is $U_t(Z_t, n_t, I_{t+1})$, where Z_t is parents' consumption, n_t is the number of their children, and I_{t+1} is the quality of each child, proxied by his future income. As standard in the literature, we assume diminishing marginal utility from each of these goods. The income-generating function for a child i in period t is given by

$$I_{i,t+1} = (y_{i,t} + e_{i,t} + u_{i,t+1})\, w_{t+1}, \tag{3}$$

where $y_{i,t}$ is the parents' investment in the child, $e_{i,t}$ is the endowed ability of the child, and $u_{i,t+1}$ is the child's market luck. The value of human capital in period $t+1$ is denoted by w_{t+1}. Importantly, different children within the family may have

[7] Becker and others have presented several different versions of the QQ model across the years. Here we build on the latest version presented by Becker (Becker, 1991), which we think incorporates child endowment in the most direct way.

different endowments. Specifically, child endowment $e_{i,t}$ is composed of two elements,

$$e_{i,t} = h_t + \epsilon_{i,t}, \tag{4}$$

where h_t is the quality baseline for all children born to the family in generation t, and $\epsilon_{i,t}$ is a child-specific stochastic component with $\mathbb{E}[\epsilon_{i,t}] = 0$. The family endowment benchmark h_t can be thought of as some genetic potential ability shared by all children of a specific couple, where $\epsilon_{i,t}$ is the deviation of child i's actual endowment from that benchmark.

We assume parents do not discriminate between children and wish to bring them all to the same quality level, which we denote I_{t+1}. Parents' budget constraint for period t is

$$I_t = Z_t + \sum_{i=1}^{n} y_{i,t}, \tag{5}$$

where I_t and $y_{i,t}$ are measured in consumption units. After plugging in Equation (3) and rearranging, we get a version of what Becker calls the "family income" equation,

$$I_t + \sum_{i=1}^{n} (e_{i,t} + u_{i,t+1}) = Z_t + n_t \frac{I_{t+1}}{w_{t+1}}, \tag{6}$$

where the left-hand side represents the resources available to the two-generation family, and the right-hand side the way they are used. When deciding on consumption, fertility, and desired level of child quality, parents maximize $U_t(Z_t, n_t, I_{t+1})$ subject to Equation (6). However, when making these decisions, e.g., upon marriage, parents are uncertain regarding the endowment level of their future children. Specifically, in the context of the current paper, parents do not know, before giving birth to their children, what kind of intellectual capabilities their children will have. Hence, they form an expectation of the endowment level of their children $\mathbb{E}[e_{i,t}] = \mathbb{E}[h_t]$, due to the random component of endowment being 0 in expectation. Parents' maximization with respect to child quality and quantity yields the following first order conditions,

$$\frac{\partial U_t}{\partial n_t} = \lambda \left[\frac{I_{t+1}}{w_{t+1}} - \mathbb{E}[h_t] \right], \tag{7}$$

$$\frac{\partial U_t}{\partial I_{t+1}} = \lambda \frac{n_t}{w_{t+1}}. \tag{8}$$

First, note that these two optimality conditions embody the classic quantity-quality trade-off that parents face in the QQ model. On the one hand, choosing a higher level of quality for each child raises the shadow price of having children, as in Equation (7). On the other hand, as the number of children increases, bringing each child to a higher level of quality becomes more expensive, as in Equation (8).

In addition, Equation (7) represents the relationship between parents' demand for children and their expectation of the endowment level of their children. As parents expect their family-level endowment benchmark to be higher, the shadow price of children decreases. Alternatively, expecting a lower family-level endowment induces parents to reduce their demand for children. The intuition here is straightforward: when endowment is high, parents need to invest less resources to bring their children to their desired level of quality. Therefore, children become "cheaper", thus increasing parents' demand for children. We refer to this channel as the "price effect" of a change in endowment on the demand for children.

Furthermore, we assume parents update their expectation of the family-level endowment benchmark $\mathbb{E}[h_t]$ with each child born. That is, parents observe the actualized endowment of the born child and use it as a signal of the family's h_t. As a result, they update their expectation of the family-level endowment benchmark in the direction of the signal. E.g., suppose a child is born with an actualized endowment $e'_{i,t}$ which is higher than expected. Hence, parents update their expectation accordingly, $\mathbb{E}[h_t|e'_{i,t}] \geq \mathbb{E}[h_t]$. However, while parents observe the born child's actual endowment, they do not know what component of it should be attributed to the family-level endowment benchmark common to all their children and what is a result of randomness. To illustrate this point, consider a born child's endowment from the perspective of the parents,

$$e'_{i,t} = \delta_t h_t + (1 - \delta_t)\, \epsilon_{i,t}, \tag{9}$$

where δ_t is the weight parents attribute to the family endowment benchmark in producing child i's realized endowment level. A high δ_t means parents believe the actual endowment of child i is a clean signal of their family common endowment level. I.e., future children will have an endowment level similar to i's. As a result, the updating of the family-level endowment benchmark in the direction of i's actual endowment, $\mathbb{E}[h_t|e'_{i,t}]$, will be stronger. In contrast, parents may believe i's actual endowment is not predicative of the endowment of future children, as it primarily reflects the child-specific stochastic component, $\epsilon_{i,t}$. In such a low δ_t case, the updating of $\mathbb{E}[h_t]$ following the birth of i will be smaller.

Finally, consider the effect of giving birth to a child with an endowment level higher than expected, $e'_{i,t} > \mathbb{E}[h_t]$, i.e., a positive endowment shock. The price effect is activated because parents update their expectations of the family-level endowment benchmark: the shadow price of children is reduced, as future children are expected to be cheaper than previously thought. That raises parents' demand for additional children within period t. Importantly, the magnitude of the price effect depends on δ_t; a higher δ_t entails a more responsive demand with respect to a birth of a child with unexpected endowment. In words, as parents believe the endowment of future children will be more like the endowment of their already-born child, the resulting increase in their demand for additional children will be bigger. In the extreme case of $\delta_t = 0$, i.e., i's actual endowment is completely random, no price effect exists since the shadow price of future children is unaffected by i's birth.

Moreover, the birth of a child with an unexpected endowment also activates an income effect. Observe that the resources available to the family on the left-hand side of Equation (6) directly include the endowment of the family's children. Thus, e.g., giving birth to a child with an unexpectedly high level of endowment raises parental demand for all goods in the model: consumption, children, and quality of children. As before, because fewer resources are needed to bring the high-endowment child i

to the quality level desired by the parents, income is freed-up, which raises demand for all normal goods. Note that in contrast to the price effect, the income effect is independent of the source of the actual endowment, namely, whether it reflects h_t or $\epsilon_{i,t}$. Even if it is completely random, receiving a child with unexpectedly high endowment increases family income and thus parents' demand for goods.

In sum, our revised version of the QQ model predicts that giving birth to an unexpectedly high-endowment child increases demand for additional children, and an unexpectedly low-endowment child decreases it. Two mechanisms drive this effect. The price effect results from parents updating their expectations of the family endowment benchmark, making future children cheaper. Second is an income effect, capturing the change in family resources caused by the birth of a child with an unexpected endowment, which then affects parents' demand for all the goods in the model, including children.

Note that we choose not to model the formation of $\mathbb{E}[h_t]$. Parents may expect the endowment of their children to be some average of their own endowments, the population mean, or some other benchmark of comparison.[8] In addition, we also do not model the process of updating $\mathbb{E}[h_t|e'_{i,t}]$ or offer a functional form for it. We do so primarily to maintain generality. But anyway, since we cannot observe $\mathbb{E}[h_t]$ in our empirical setting, modeling it does not contribute to our empirical analysis. It is worth noting as well that since $\mathbb{E}[h_t]$ is unobserved, we also cannot disentangle the role of the price effect from that of the income effect in driving our empirical results.

While our theoretical framework points to the price and income effects as what drives the impact of child endowment on demand for children, we do not rule out the existence of other mechanisms that may explain the same predictions. For instance, parents may gain direct utility from unexpectedly high- or low-endowment children, such that the effect on their demand for children is simply due to a taste effect. Additionally, parents' utility function may change following the unexpected child endowment. E.g., parents may find out they enjoy having an extremely talented

[8]However, assuming parents form their child endowment expectation based on their own endowment provides a theoretical justification for conditioning on parental education when estimating the effect of an exceptional-endowment child. We return to this point in section 4.

child and therefore want more children, or that having a challenged child is hard and thus want fewer children. A child with unexpected endowment may also affect marriage stability, which in turn will impact future fertility. The QQ model overlooks these mechanisms that may be driving our estimated effects.