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Abstract

This study examines how parents' pre-birth gender preferences influence their educational investment decisions. Using longitudinal survey data, we analyze whether parents' stated gender preference before the birth of their first child affects actual spending on education and school selection. We observe parental gender preferences aligned with their own gender: mothers prefer daughters, whereas fathers prefer sons. Our estimation results reveal that pre-birth gender preferences have a stronger impact on parental investment decisions than the child's actual gender. Parents who initially preferred a son allocate significantly more resources to their child's education, whereas those who preferred a daughter systematically invest less, regardless of the child's eventual gender. To uncover the underlying mechanism, we explore the role of caregiving expectations in shaping gender preferences. Our results suggest that mothers who provide or expect to provide elderly care are more likely to prefer daughters, reinforcing traditional gender roles in caregiving. This expectation may contribute to lower educational investment in daughters, as they are perceived more as future caregivers than as primary economic providers.

JEL Classification: I24; J12; J13; J16

Keywords: caregiving; child gender; gender inequality; investment gap

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1 Introduction

Parental investment in children's education plays a crucial role in shaping their future economic and social opportunities. While numerous studies have examined the impact of socioeconomic factors on educational investment, less attention has been paid to the role of pre-birth gender preferences—that is, whether parents' stated preference for a son or daughter before childbirth influences the resources they allocate to their children's education. Understanding this relationship is essential, as pre-birth gender expectations may shape long-term human capital investment and contribute to gender disparities in education.

This study investigates how parents' pre-birth gender preferences influence their educational investment decisions, including both school-related expenditures and school sector choice. Using longitudinal survey data, we analyze whether parents' stated gender preference before the birth of their first child affects actual spending on education and school selection. We observe parental gender preferences aligned with their own gender: mothers prefer daughters, whereas fathers prefer sons. Our estimation results reveal that pre-birth gender preferences have a stronger impact on parental investment than the child's actual gender. Parents who initially preferred a son allocate significantly more resources to their child's education, whereas those who preferred a daughter systematically invest less, regardless of the child's eventual gender. This pattern remains robust across different model specifications and alternative expenditure measures.

Furthermore, we explore the role of caregiving expectations in shaping parental gender preferences and investment behaviors. Our results suggest that mothers who provide or expect to provide elderly care are more likely to prefer daughters, reinforcing traditional caregiving roles. This expectation may lead to lower educational investment in daughters, as they are perceived more as future caregivers than as primary economic providers. These findings highlight a previously overlooked mechanism through which gender norms and expectations influence human capital accumulation.

This study relates to the literature on the parental investment gap (Barcellos et al., 2014; Dizon-Ross and Jayachandran, 2023; Lundberg, 2005; Sakata et al., 2022; Wang et al., 2019). Previous studies have primarily focused on differences in parental investments based on the actual gender of children, while relatively less attention has been paid to the

role of pre-birth gender preferences. By emphasizing how parental gender expectations formed before childbirth influence educational investment decisions, this study extends existing research and highlights that pre-birth gender preferences exert a significant and independent impact on parental investments, thus contributing to gender disparities in human capital accumulation.

Second, this study contributes to the literature on parental gender preference, particularly how cultural and economic factors influence whether parents prefer sons or daughters. Prior research has highlighted the roles of social norms (Almond et al., 2009; Fuse, 2013) and inheritance laws (Bhalotra et al., 2020; Carranza, 2012; Genicot and Hernandez-de-Benito, 2025), yet little is known about how these pre-birth preferences translate into actual educational investment. The findings indicate that parents' gender expectations before birth persist in their financial decisions, affecting both school-related expenditures and school choice. By linking pre-birth gender preferences to concrete educational investment outcomes, this study provides empirical evidence of how parental gender preference significantly influence household resource allocation decisions.

Third, this study contributes to the literature on parental demand for daughters, especially regarding the relationship between caregiving expectations and gender preferences. Prior studies indicate that parents, particularly mothers, often prefer daughters due to expectations that daughters will provide caregiving support in old age (Dizon-Ross and Jayachandran, 2023; Fuse, 2013). Consistent with previous research, our findings demonstrate that mothers who currently provide or anticipate providing elderly care exhibit a stronger preference for daughters, reinforcing traditional gender roles related to caregiving. These caregiving expectations potentially lead to reduced educational investments in daughters, as they may be perceived more as future caregivers rather than primary economic providers.

The remainder of this paper is structured as follows. Section 2 describes the data used in the analysis. Section 3 explores parental preference for same-gender children. Section 4 examines the influence of pre-birth gender preferences on educational investment. Section 5 investigates parental demand for daughters and caregiving expectations. Section 6 presents the conclusion.

2 Data

2.1 Japanese National Fertility Survey (JNFS)

To examine whether female (male) prefers girl (boy), we use data from the Japanese National Fertility Survey (JNFS). The National Fertility Survey is a nationwide survey conducted by the National Institute of Population and Social Security Research in Japan. This survey has been carried out approximately every five years since 1952 and serves as a crucial source of data on marriage, childbirth, and family formation trends. The primary objective of the survey is to analyze marital behavior, reproductive trends, and family-related attitudes among Japanese individuals and households. The survey provides insights into demographic changes, fertility rates, and societal factors influencing marriage and childbearing decisions. It plays a key role in shaping Japan's demographic policies and social welfare programs.

The survey respondents are divided into two categories: singles and married couples. The content of the questionnaires for singles and married couples differs, with only the singles sample being asked about their gender preferences. Therefore, we only use the singles respondents to identify the gender preference. To do so, we use the survey of single respondents, which was started in 1982. The survey asks respondents (which include both female and male) to answer the question for the ideal combination of child gender. We examine whether female (male) prefers a girl (a boy) by using stated preferences by singles who desire to have only one child.

2.2 Japanese Panel Surveys of Consumers (JPSC)

To test whether parents' gender preferences differ in their educational aspirations and educational expenditure for their children, we use the Japanese Panel Surveys of Consumers (JPSC). The JPSC is a longitudinal survey on female from 1993 to 2021. the JPSC is published by the Panel Data Research Center at Keio University. It is a panel survey of 1,500 females between the ages of 24 and 34 conducted in 1993, when the survey began, and has followed the same female to the present. In addition, the JPSC add new survey samples in the 1997, 2003, 2008 and 2013 surveys. The JPSC asks females about changes

in their life course, such as marriage and childbearing.[1]

There are two advantages to using the JPSC. The first advantage is that the survey asks female who want children about their preferred child gender. Specifically, the survey asked respondents, "Which do you want to have, a boy or a girl?" and the respondents are required to choose either a boy or a girl. This question allows us to identify whether the female want a girl or a boy. Furthermore, the survey also asks about the sex of the realized child gender, thus identifying both the prenatal gender preference and the realized child gender. Figure 1 illustrates the identification method for gender preference. We identify gender preferences using a survey conducted a year before the birth of their first child. And we define the gender preferences identified by the above methods and the realized gender of the child in the following four cases. We construct four dummy variables based on parental gender preferences and the realized gender of their first child:

1. D^{BoyBoy}: equals one if parents desired a boy and had a boy; otherwise zero.
2. D^{BoyGirl}: equals one if parents desired a boy but had a girl; otherwise zero.
3. D^{GirlBoy}: equals one if parents desired a girl but had a boy; otherwise zero.
4. D^{GirlGirl}: equals one if parents desired a girl and had a girl; otherwise zero.

The second advantage is that it asks in detail about educational aspirations and education investment expenditure. In the survey, respondents were asked, "What is the highest level of education you would like your child to achieve?" Respondents selected their answers from several options (e.g., "I would like my child to graduate from university"). This question allows identifying parents' educational aspirations for their child. In addition, the survey asks about total education investment expenditure and school-related expenditure such as school tuition fees. And a unique feature of this survey is that it asks about educational aspirations and educational investment expenditure by the birth order of the children. In this way, even for respondents with more than one child, we are able to identify expenditure for each child.

Figure 2 presents the differences in parental educational aspirations according to their pre-birth gender preferences and the realized gender of their first child. The two bars on the left indicate respondents who initially preferred a boy: the first bar represents those

[1]The literature use the JPSC. For example, using the JPSC, Lise et al. (2014) and Lise and Yamada (2019) measure consumption inequality among households.

who had a boy, while the second bar represents those who had a girl. Conversely, the third and fourth bars from the left represent respondents who initially preferred a girl: the third bar indicates those who had a boy, and the fourth bar those who had a girl. The figure demonstrates that pre-birth gender preferences have a stronger influence on parental aspirations for their child's education compared to the child's realized gender. Specifically, the percentage of respondents aspiring for their children to achieve a university degree or higher consistently decreases from the left side of the figure to the right, indicating that those who initially preferred boys have higher educational aspirations than those who initially preferred girls.

Table 1 complements this analysis by summarizing parental educational aspirations and investments according to gender preference and the actual gender of the child. Panel A details the highest educational aspirations and specific educational investments, while Panel B reports total educational expenditures, including tuition fees and related school expenses. Panel C examines school sector choice, distinguishing between public, private, and national schools.[2] The data across all three panels suggest that parents who initially preferred sons consistently have higher educational aspirations, invest more substantially in education, and are more inclined to choose private or national schools compared to parents who initially preferred daughters. These findings underscore the significant role that pre-birth gender preferences play in parental decisions regarding educational investments and school choices. The subsequent section formally assesses the predictability of stated gender preferences on educational investment behaviors.

3 Parental Preference for Same-Gender Children

The first question in this study is whether parents tend to prefer children of the same sex. To answer the question, we use the two set of the surveys: JNFS and JPSC.

Using the JNFS, we summarize the stated preferences over child gender in Table 2. Female respondents with no children answer that they prefer girls if they have one kid: more than 60% of respondents answer that they want girls. Meanwhile male respondents with no children answer that they prefer boys if they have one kid: 54% of respondents an-

[2]In Japan, private and national schools generally offer distinctive educational programs but require higher tuition fees compared to public schools, which are basically tuition-free up to junior high school.

swer that they want boys. Both differences are statistically significant. The table suggests that mothers prefer girls and fathers do boys.

To check the robustness, we also examine whether mothers prefer having more girls and fathers prefer having more boys. We use the survey of the Japan Household Panel Survey on Consumer Preferences and Satisfaction (JHPS-CPS).[3] The JHPS-CPS in 2023 elicited the ideal number of children from married respondents before the birth of the first child. Table 3 summarizes it. We find that female respondents prefer having more girls, whereas male respondents prefer more boys. Regarding the ideal number of girls, female respondents prefer 0.16 more girls than male respondents. Conversely, regarding the ideal number of boys, female respondents prefer 0.07 fewer boys than male respondents. Both differences are statistically significant. These results suggest that mothers have a stronger preference for girls, both in terms of gender composition and ideal number of children.[4]

4 Gender Differences in Parental Educational Aspirations and Investment

The second question in this study is whether parents have different educational aspirations and investment for their children based on gender. Section 4.1 examine gender differences in parental educational aspirations, while Section 4.2 investigates the impact of pre-birth gender preference on actual educational investment and school sector choices.

[3]The JHPS-CPS is a nationwide longitudinal survey conducted annually by the Institute of Social and Economic Research at Osaka University. The survey aims to track changes in consumer preferences, economic behaviors, and subjective well-being over time. The main objective of the survey is to analyze individual and household economic behaviors, consumption patterns, and life satisfaction in Japan. The survey targets a representative sample of individuals and households in Japan. It collects data from both men and female aged 20 and older, covering a wide range of socio-economic backgrounds. Since it is a panel survey, the same respondents are surveyed annually to observe changes in behavior and preferences over time.

[4]To further check the robustness, we use the JPSC. Table 4 presents basic statistics on gender preference before the birth of the first child and the actual gender of the child. Overall, 34.4% of respondents preferred a son, while 65.6% preferred a daughter. Since all respondents in the JPSC survey are female, the preference for daughters tends to be higher.

4.1 Do Parents Have Different Educational Aspirations for their Children Based on Gender?

Panel (A) in Table 1 suggests that there may be gender differences in parental educational aspirations.[5] More specifically, parents who initially preferred boys have higher educational aspirations than parents who initially preferred girls.

To formally test the gender differences in parental educational aspirations, we regress the realized gender or the gender preference on parental expectations regarding their child's highest level of education. Our estimating equations are as follows:

$$\text{Educational Attainment}_{j,t} = \beta_1 \times D_j^{\text{Girl}} + \mathbf{X}\gamma + \varepsilon_{j,t}, \tag{1}$$

$$\text{Educational Attainment}_{j,t} = \beta_2 \times D_j^{\text{Prefer girl}} + \mathbf{X}\gamma + \varepsilon_{j,t}, \tag{2}$$

$$\text{Educational Attainment}_{j,t} = \beta_3 \times D_j^{\text{GirlBoy}} + \beta_4 \times D_j^{\text{GirlGirl}} + \beta_5 \times D_j^{\text{BoyGirl}} + \mathbf{X}\gamma + \varepsilon_{j,t}, \tag{3}$$

where $\text{Educational Attainment}_{j,t}$ is a dummy variable which represents the expected highest level of education for the first child. Importantly, the four dummy variables ($D_j^{\text{Prefer girl}}$, D_j^{GirlBoy}, D_j^{GirlGirl}, and D_j^{BoyGirl}) explicitly represent parental gender preferences prior to the child's birth. In the JPSC survey, respondents can choose from the following eight options regarding their child's expected educational attainment:

(1) I would like my child to graduate from a prestigious university.
(2) I would like my child to graduate from a university.
(3) I would like my child to graduate from a junior college.
(4) I would like my child to graduate from a vocational school.
(5) I would like my child to graduate from a high school.
(6) It depends on the child's interests and abilities.
(7) My children have completed their schooling or are in the workforce.
(8) Others.

For the analysis, $\text{Educational Attainment}_j$ is created based on these eight options. Respondents who selected (1) or (2) were assigned a value of 1. Meanwhile, those who selected

[5] Approximately 40% of all respondents answered, "It depends on the child." However, since this response does not clearly indicate a preference regarding educational attainment, we excluded the sample from the subsequent analysis.

(3), (4) , or (5) were assigned a value of 0. Educational Attainment$_j$ of 1 indicates that the respondent expects their child to attain at least a university degree, while a value of 0 means they expect their child to attain less than a university degree. Following Choi and Hwang (2015), this study focuses on educational aspirations in the first child.[6]

First, we focus on the coefficient β_1 of D^{Girl}, which represents the realized gender for the first child. It is a dummy variable that takes a value of 1 if the parents had a daughter and 0 if they had a son. If β_1 is significantly positive or negative, parents have different educational aspirations for their children based on the realized gender. The vector X includes control variables, such as the number of children in the household, time dummies, and the age, education, and income of both parents.

Column (1) in Table 5 reports the effect of the child's gender (D^{Girl}) on parental educational aspirations. The coefficient for D^{Girl} is -0.08 and statistically significant at the 1% level, indicating that parents of daughters have lower educational aspirations compared to parents of sons. This suggests that, on average, parents are less likely to expect their daughters to attain a university degree or higher than their sons. Additionally, other variables in the model show expected relationships. Both the mother's and father's education levels have significant positive effects, implying that higher-educated parents tend to have higher aspirations for their child's education. The number of children in the household has a negative effect -0.07, meaning that as the number of children increases, parental expectations for each child's education decrease. The father's income is also positively correlated with higher educational aspirations, while the mother's income does not show a statistically significant effect. Overall, the results in Column (1) suggest that parents exhibit a gender bias in their educational aspirations, favoring sons over daughters, and that socioeconomic factors such as parental education and income also play a significant role in shaping these expectations.

Second, we focus on the coefficient β_2 of $D^{\text{Prefer girl}}$, which represents the pre-birth gender preference for girls one year before the birth of the first child. It is a dummy variable that takes a value of 1 if the parents preferred a daughter and 0 if they preferred a son. If β_1 is significantly positive or negative, parents have different educational aspirations for their children based on the pre-birth gender preference.

[6]Choi and Hwang (2015) points out that the gender of later-born children is endogenous. Factors such as a lower birth rate for female infants due to selective abortion and a reduced likelihood of additional births when a son is already present are considered. Therefore, the analysis is restricted to the first child.

Column (2) in Table 5 reports the effect of parental gender preference before childbirth $D^{\text{Prefer girl}}$ on their educational aspirations for their child. The coefficient for $D^{\text{Prefer girl}}$ is -0.11 and statistically significant at the 1% level, indicating that parents who initially preferred a girl tend to have lower educational aspirations for their child compared to those who preferred a boy. This suggests that pre-birth gender preference plays a crucial role in shaping parental aspirations, independent of the actual gender of the child. Similar to Column (1), parental education remains a strong predictor of higher educational aspirations. The coefficients for the mother's and father's education are both statistically significant at the 1% level, reinforcing that highly educated parents are more likely to expect their children to attain a university degree or higher. The number of children in the household again shows a negative relationship, suggesting that parents with more children may distribute resources and expectations differently among them. Overall, the results in Column (2) highlight the importance of pre-birth gender preference in determining parental educational aspirations, showing that parents who initially wished for a daughter tend to expect lower educational attainment for their child compared to those who initially preferred a son. This finding supports the idea that gender bias in parental expectations is shaped even before a child is born.

Column (3) in Table Table 5 a robustness check for the results shown in Columns (1) and (2) by incorporating both pre-birth gender preference and the actual gender of the child. Instead of using a single indicator for gender (D^{Girl}) or pre-birth preference $D^{\text{Prefer girl}}$, this specification introduces four interaction terms: D^{GirlBoy}, D^{GirlGirl}, and D^{BoyGirl}, with D^{BoyBoy} serving as the benchmark category. The results indicate that parents who initially preferred a girl and had a boy (D^{GirlBoy}) exhibit significantly lower educational aspirations for their child, with a coefficient of -0.07. Moreover, the effect is even stronger for parents who preferred a girl and had a girl (D^{GirlGirl}), with a coefficient of -0.17. These findings reinforce the conclusions from Columns (1) and (2), confirming that both pre-birth gender preference and the actual gender of the child influence parental educational aspirations. Meanwhile, parents who initially preferred a boy but had a girl (D^{BoyGirl}) show no statistically significant difference in educational aspirations compared to the benchmark category (D^{BoyBoy}), suggesting that initial preferences for a boy do not lead to lower expectations if the child turns out to be a girl. The results in Column (3) support the robustness of the findings in Columns (1) and (2), demonstrating that gender

bias in parental expectations is driven not only by the actual gender of the child but also by parents' prior gender preferences. These results suggest that parents with a preference for girls systematically expect lower educational attainment for their children, reinforcing the role of gender bias in shaping investment in children's human capital.[7]

4.2 The Impact of Parents' Initial Gender Preference on Child Investment

This subsection analyzes the impact of pre-birth gender preference on actual educational investment and school sector choices.

4.2.1 The Impact on Educational Investment

First, we investigate whether parents invest differently in their children's education based on (pre-birth gender) preference. The JPSC contains information about education-related expenditures, which are classified into four categories: "School-related expenses" - This includes tuition fees, childcare fees, uniforms, and commuting costs (e.g., transportation passes). "Non-school learning expenses" - This covers expenditures for private tutoring, English conversation lessons, and distance learning programs. "Extracurricular activities" - This includes expenses for activities such as piano lessons, swimming, abacus classes, and other similar programs. "Living expenses outside the home" - This includes financial support for children, such as remittances and housing costs. Because school-related expenses account for the largest share of total education expenditures for both boys and girls, we focus our analysis on school-related expenses among the four education-related expenditure categories. As in Equations (1) to (3), we regress school-related expenditures on the dummies for actual gender and pre-birth gender preference.

Table 6 presents the estimation results analyzing the impact of actual child gender and pre-birth gender preference on school-related educational expenditure. The findings suggest that parental expectations before birth play a more significant role in shaping educational investment than the actual gender of the child.

[7]We check the robustness by controlling multiple responses from the same household. Table A.1 in Appendix A shows that our benchmark results do not change when observations are by the inverse of the number of responses per household.

Column (1) examines the impact of D^{Girl}, a dummy variable indicating whether the first child is a daughter, on educational investment. The coefficient on D^{Girl} is positive but statistically insignificant, suggesting that the actual gender of the child does not significantly influence school-related expenditure. This implies that parents do not systematically allocate more or less educational resources solely based on whether they have a son or a daughter.

In contrast, Column (2) introduces $D^{\text{Prefer girl}}$, a dummy variable equal to 1 if parents initially preferred a daughter before birth. The coefficient is -3.479 and statistically significant at the 1% level, meaning that parents who preferred a daughter spend approximately 34,790 yen less per year on school-related expenses compared to those who preferred a son. This reduction in educational investment is economically substantial and highlights that pre-birth gender preference is a stronger determinant of parental spending than the child's actual gender.

Column (3) refines the analysis by incorporating three additional dummy variables — D^{BoyGirl}, D^{GirlGirl}, and D^{GirlBoy}— to distinguish between different combinations of pre-birth preference and actual child gender. The results show that the coefficients on D^{GirlGirl} and D^{GirlBoy} are both negative and statistically significant, indicating that parents who initially preferred a daughter invest significantly less in education, whether they ultimately have a son or a daughter. Notably, the impact is even stronger for D^{GirlBoy}, meaning that parents who wanted a daughter but had a son spend the least on education (about 48,510 yen less annually). Meanwhile, D^{BoyGirl}, which captures cases where parents preferred a son but had a daughter, has a negative but statistically insignificant coefficient, suggesting that these parents do not significantly change their investment behavior relative to the benchmark group (D^{BoyBoy}). This asymmetry reinforces the idea that pre-birth gender expectations, rather than actual gender, drive parental spending decisions.

Columns (4) to (6) provide robustness checks by using log-transformed school-related expenditure as the dependent variable, allowing for percentage-based interpretations. The coefficient on $D^{\text{Prefer girl}}$ in Column (4) is -0.237 (statistically significant at 5%), indicating that parents who preferred a daughter spend approximately 23.7% less on education than those who preferred a son. Similarly, Column (6) confirms that parents who preferred and had a daughter (D^{GirlGirl}) spend 26.4% less, while those who preferred a daughter but had a son (D^{GirlBoy}) spend 34.3% less. These findings confirm the robustness of the nega-

tive effect of pre-birth gender preference for daughters on educational spending.

Beyond gender-related variables, several control variables offer additional insights. Educational aspirations are a strong positive predictor, with parents who expect their child to complete university spending approximately 36,410 to 41,300 yen more per year on school-related expenses. mothers' income is also positively associated with investment, with an increase of approximately 8,900 yen per ten-thousand yen increase in income, while fathers' income shows no significant effect, suggesting that mothers' financial resources may play a larger role in shaping educational spending decisions.[8]

4.2.2 The Impact on School Choice

Second, we examine whether parental gender preference affect school choice. Generally speaking, parents need to pay higher tuition fees for private schools than for public ones to provide better education for their children. If so, parental gender preference affects school choice for their children. To test the hypothesis, we regress school choice on actual child gender and pre-birth gender preference.

Table 7 examines the relationship between actual gender and pre-birth gender preference and school sector choice, distinguishing between private/national and public schools. The dependent variable is a binary indicator that takes the value of 1 if the child attends a private or national school and 0 if the child attends a public school.[9]

Column (1) investigates the effect of the actual gender of the child, represented by D^{Girl}. The coefficient on D^{Girl} is positive but statistically insignificant, suggesting that the actual gender of the child does not systematically influence the likelihood of attending a private or national school.

Column (2) introduces $D^{\text{Prefer girl}}$, a dummy variable indicating whether parents initially preferred to have a daughter before birth. The coefficient on $D^{\text{Prefer girl}}$ is negative and statistically significant, implying that parents who preferred a daughter are less likely to send their child to a private or national school. This finding suggests that pre-birth gender expectations may be associated with different educational investment strategies,

[8]We check the robustness by controlling multiple responses from the same household. Table A.2 in Appendix A shows that our benchmark results do not change when observations are by the inverse of the number of responses per household.

[9]In Japan, according to the School Education Act, the term "school" kindergartens, elementary schools, junior high schools, high schools, universities, and other institutions. However, this analysis excludes kindergartens due to the negligible difference in educational costs between public and private institutions for kindergarten children.

regardless of the child's actual gender.

Column (3) further refines the analysis by incorporating interaction terms between pre-birth gender preference and the actual gender of the child. The results indicate that both D^{GirlBoy} and D^{GirlGirl} have negative and statistically significant coefficients, suggesting that parents who initially preferred a daughter are systematically less likely to enroll their child in a private or national school, whether they ultimately have a son or a daughter. In contrast, the coefficient on D^{BoyGirl} is negative but statistically insignificant, indicating that parents who preferred a son but had a daughter do not significantly alter their school sector choice relative to those who preferred and had a son.

Overall, these results indicate that pre-birth gender preferences play an important role in shaping parental decisions regarding school selection. Parents who initially preferred a girl tend to be less inclined to send their child to a private or national school, regardless of the actual gender of their child. This pattern suggests that gender-based expectations before birth may have long-term implications for human capital investment and educational trajectories.[10]

5 Parental Demand for Daughters and Caregiving Expectations

The last question is why parents invest less for a girl. We focus on the motivation for a child as a carer for parents. The literature points out that parents expect their child to provide care when they become old (Dizon-Ross and Jayachandran, 2023; Fuse, 2013). We test whether parents invest less for a girl due to the motivation for a child as a carer for parents by regressing parental gender preference on experiencing or planing care. Our estimating equations is as follows:

$$D_{j,t}^{\text{Prefer girl}} = \beta_1 \times D_{j,t}^{\text{Caring for wife's parens}} + \beta_2 \times D_{j,t}^{\text{Caring for husband's parens}} + \mathbf{X}\gamma + \varepsilon_t^j \quad (4)$$

[10]We check the robustness by controlling multiple responses from the same household. Table A.3 in Appendix A shows that our benchmark results do not change when observations are by the inverse of the number of responses per household.

where, $D_{j,t}^{\text{Prefer girl}}$ is a dummy variable which represents whether the parent (female) preferred a girl before the birth of their first child. It takes a value of 1 if the parent preferred a girl before the birth of their first child, and 0 if the parent desired a boy. $D_{j,t}^{\text{Caring for wife's parents}}$ is a dummy variable that indicates whether the parent is currently caring for or plans to care for their own parents. It takes a value of 1 if the parent is currently caring for or plans to care for their own parents, and 0 if the parent is not caring for and does not plan to care for their own parents. $D_{j,t}^{\text{Caring for husband's parents}}$ is a dummy variable that indicates whether the parent is currently caring for or plans to care for their husband's parents. It takes a value of 1 if the parent is currently caring for or plans to care for their husband's parents, and 0 if the parent is not caring for and does not plan to care for their husband's parents. The vector X includes control variables, such as the age, education, and income of both parents. Table 8 examines whether parents are more likely to prefer girls before the birth of their first child when they provide care or plan to provide care for elderly relatives.

Column (1) investigates the relationship between caregiving responsibilities and gender preference. The coefficient on $D^{\text{Caring for wife's parents}}$ is positive and statistically significant, indicating that female who care for or plan to care for their own parents are more likely to prefer having a daughter. In contrast, the coefficient on $D^{\text{Caring for husband's parents}}$ is negative but not statistically significant, suggesting that the responsibility of caring for a husband's parents does not systematically influence a woman's gender preference. The results might reflect the possibility that parents may prefer daughters as future caregivers. Column (2) includes region dummies to account for regional variations. The coefficient on $D^{\text{Caring for wife's parents}}$ remains positive and statistically significant, while the coefficient on $D^{\text{Caring for husband's parents}}$ remains statistically insignificant.

Overall, the results suggest that caregiving responsibilities, particularly for one's own parents, are associated with a stronger preference for daughters. This finding is consistent with the idea that daughters are often expected to provide care for aging parents, influencing parental gender preferences even before childbirth. However, the absence of a significant relationship between caring for a husband's parents and gender preference suggests that social norms regarding caregiving responsibilities may differ between maternal and paternal lines.

6 Conclusion

This study investigates the role of pre-birth gender preference in shaping parental investment decisions in education. Using data from multiple panel surveys, we examine how parents' stated gender preferences before the birth of their first child influence their actual financial investment in their child's education. We observe parental gender preferences aligned with their own gender: mothers tend to prefer daughters, whereas fathers tend to prefer sons. Our estimation results reveal that pre-birth gender preference has a stronger influence on educational investment than the child's actual gender, suggesting that parents' expectations formed before birth significantly impact their allocation of resources. We find that parents who initially preferred a daughter tend to invest less in school-related expenditures, regardless of whether they ultimately have a son or a daughter. In contrast, parents who preferred a son allocate more resources to their child's education, reinforcing gender disparities in human capital investment. These results remain robust across different model specifications, including log-transformed expenditure measures and alternative sample selections. Moreover, we demonstrate that pre-birth gender preference also affects school choice. Parents who initially preferred a daughter are less likely to send their child to a private or national school, further indicating that pre-existing gender expectations shape long-term educational decisions. This pattern highlights how parental expectations formed before childbirth can perpetuate gender-based disparities in access to high-quality education.

An additional explanation for why parents may prefer daughters relates to caregiving expectations. In many societies, including Japan, daughters are traditionally expected to provide care for aging parents, particularly in households without strong institutional eldercare support. Our results suggest that female who are currently providing or expect to provide care for their aging parents are more likely to have initially preferred a daughter. This finding aligns with prior research indicating that parents, especially mothers, tend to associate daughters with greater emotional and caregiving support in old age.

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Table 1: Basic statistics on educational expenditure and school category

	Prior preference for			
	Boys		Girls	
	Realized gender		Realized gender	
	Boy	Girl	Boy	Girl
	(1)	(2)	(3)	(4)
Panel (A): High educational aspirations of parents				
Expect the first child to complete univ. or higher	5,354 (82%)		8,657 (73%)	
Observations	6,496		11,919	
Expect the first child to complete univ. or higher	3,011 (84%)	2,343 (80%)	4,336 (74%)	4,321 (71%)
Observations	3,567	2,929	5,829	6,090
Panel (B): Educational expenditure (ten thousand yen)				
All educational expenditure	34.4		30.5	
School-related expenditure	19.2		16.2	
Observations	6,496		11,919	
All educational expenditure	35.0	33.7	29.3	31.7
School-related expenditure	20.1	18.3	16.6	15.9
Observations	3,567	2,929	5,829	6,090
Panel (C): School sector				
Public school	60.4%		67.5%	
Private school	36.1%		29.0%	
National school	3.5%		3.1%	
Observations	962		1,785	
Public school	61.6%	59.0%	67.2%	67.8%
Private school	34.7%	37.6%	29.9%	28.8%
National school	3.7%	3.3%	2.8%	3.4%
Observations	513	449	885	900

Note: Column 1 represents cases where parents desired a boy and had a boy; Column 2 represents cases where parents desired a boy but had a girl; Column 3 represents cases where parents desired a girl but had a boy; and Column 4 represents cases where parents desired a girl and had a girl. These categories reflect the relationship between parental gender preference and actual birth outcomes. High educational aspiration is a dummy variable that indicates parental educational aspirations for their children. The variable takes a value of 1 if parents expect their child to complete university education or higher, and 0 if parents expect a lower level of educational attainment.

Table 2: Ideal gender composition of children by survey year

	1982	1987	1992	1997	2002	2005	2010	2015	1982–2015
Female respondents									
1 girl and 0 boys (%)	40.4	48.2	59.5	61.5	69.6	60.9	72.8	71.4	61.8
0 girls and 1 boy (%)	59.6	51.8	40.5	38.5	30.4	39.1	27.2	28.6	38.2
Difference									23.6^{***} (7.6)
Observations	52	83	126	109	125	110	103	56	764
Male respondents									
1 girl and 0 boys (%)	20.0	30.2	41.8	58.0	52.9	49.0	46.8	47.1	45.4
0 girls and 1 boy (%)	80.0	69.8	58.2	42.0	47.1	51.0	53.2	52.9	54.6
Difference									-9.2^{***} (1.0)
Observations	45	43	79	69	87	98	94	51	566

Note: We use the Japanese National Fertility Survey (The National Institute of Population and Social Security Research). The respondents were single persons under 35 years old, desired only one child and expressed a preference for the gender composition of their child. Standard errors in parentheses. $p < 0.01$.

Table 3: Ideal number of children before the birth of the first child

	Female respondents	Male respondents	Difference
Number of girls	1.26	1.10	0.16***
			(0.03)
Number of boys	1.13	1.20	−0.07**
			(0.03)
Observations	1,113	992	

Note: The data is from the 2023 JHPS-CPS. The respondents are all married. Standard errors in parentheses. p $<$ 0.01; ** p $<$ 0.05.

Table 4: Basic statistics: prenatal gender preferences and realized gender of first children

Gender preference	Realized gender	Frequency	Percentage
Boy		1,926	34.4%
	Boy	1,019	19.2%
	Girl	807	15.2%
Girl		3,476	65.6%
	Boy	1,806	34.1%
	Girl	1,670	31.5%
Observations		5,302	100.0%

Note: We use the JPSC. This table presents basic statistics on gender preference before the birth of the first child and the actual gender of the child.

Table 5: Does parental gender preference affect educational aspirations for child?

	(1)	(2)	(3)
D^{Girl}	-0.083^{***}		
	(0.018)		
$D^{Prefer\ girl}$		-0.109^{***}	
		(0.018)	
$D^{GirlBoy}$			-0.065^{***}
			(0.024)
$D^{GirlGirl}$			-0.167^{***}
			(0.025)
$D^{BoyGirl}$			-0.019
			(0.030)
Wife's education	0.223^{***}	0.231^{***}	0.230^{***}
	(0.018)	(0.019)	(0.018)
Husband's education	0.219^{***}	0.204^{***}	0.209^{***}
	(0.021)	(0.021)	(0.021)
Wife's age	0.005	0.005^{*}	0.006^{*}
	(0.003)	(0.003)	(0.003)
Husband's age	0.006^{***}	0.006^{***}	0.006^{**}
	(0.002)	(0.002)	(0.002)
Wife's income	0.005	0.005	0.005
	(0.003)	(0.003)	(0.003)
Husband's income	0.014^{**}	0.016^{***}	0.017^{***}
	(0.006)	(0.006)	(0.006)
Number of children	-0.070^{***}	-0.065^{***}	-0.072^{***}
	(0.016)	(0.015)	(0.015)
Constant	0.191^{*}	0.217^{**}	0.209^{**}
	(0.102)	(0.101)	(0.103)
Time dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	1,886	1,887	1,887

Notes: $D^{Prefer\ girl}$ is a dummy variable that equals 1 if parents preferred a girl before having their first child. D^{Girl} equals 1 if the first child is a girl. $D^{GirlBoy}$ equals 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$ equals 1 if parents preferred and had a girl. $D^{BoyGirl}$ equals 1 if parents preferred a boy but had a girl. Wife's and Husband's education are dummy variables that equal 1 if they have a university degree or higher. Wife's and Husband's income are logged annual income. Number of children represents the total number of children in the household. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 6: Does parental gender preference affect school-related expenditure

	School-related expenditure			log(School-related expenditure)		
	(1)	(2)	(3)	(4)	(11)	(12)
D^{Girl}	0.145			−0.011		
	(1.048)			(0.100)		
$D^{Prefer\ girl}$		−3.479***			−0.237**	
		(1.220)			(0.107)	
$D^{GirlBoy}$			−4.851***			−0.343**
			(1.693)			(0.140)
$D^{GirlGirl}$			−3.539**			−0.264*
			(1.701)			(0.142)
$D^{BoyGirl}$			−1.651			−0.153
			(2.070)			(0.181)
Educational aspirations	4.130***	3.641***	3.768***	0.150	0.119	0.126
	(1.125)	(1.117)	(1.117)	(0.117)	(0.118)	(0.119)
Wife's income	0.890***	0.881***	0.868***	0.112***	0.111***	0.110***
	(0.188)	(0.188)	(0.186)	(0.020)	(0.020)	(0.020)
Husband's income	−0.223	−0.164	−0.211	−0.031	−0.027	−0.030
	(0.388)	(0.387)	(0.383)	(0.027)	(0.027)	(0.028)
Wife's age	0.247	0.270	0.262	0.075***	0.077***	0.076***
	(0.186)	(0.185)	(0.185)	(0.017)	(0.017)	(0.017)
Husband's age	0.464***	0.454***	0.452***	0.032**	0.031**	0.031**
	(0.139)	(0.139)	(0.140)	(0.015)	(0.015)	(0.015)
Number of children	3.811***	3.754***	3.830***	0.787***	0.785***	0.788***
	(0.908)	(0.905)	(0.905)	(0.084)	(0.083)	(0.083)
Constant	−22.645***	−20.291***	−18.891***	−4.478***	−4.328***	−4.207***
	(6.084)	(5.936)	(5.875)	(0.497)	(0.497)	(0.517)
Time dummy	✓	✓	✓	✓	✓	✓
Region dummy	✓	✓	✓	✓	✓	✓
Observations	1,769	1,769	1,769	1,769	1,769	1,769

Notes: D^{Girl}: 1 if the first child is a girl. $D^{Prefer\ girl}$: 1 if parents preferred a girl before their first child. $D^{GirlBoy}$: 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$: 1 if they preferred and had a girl. $D^{BoyGirl}$: 1 if they preferred a boy but had a girl. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 7: Does parental gender preference affect school sector choice?

	(1)	(2)	(3)
D^{Girl}	0.030		
	(0.023)		
$D^{Prefer\ girl}$		−0.093***	
		(0.028)	
$D^{GirlBoy}$			−0.131***
			(0.037)
$D^{GirlGirl}$			−0.069*
			(0.037)
$D^{BoyGirl}$			−0.011
			(0.046)
Educational aspirations	0.019	−0.006	−0.006
	(0.029)	(0.030)	(0.030)
Wife's education	−0.039	−0.036	−0.038
	(0.024)	(0.025)	(0.025)
Husband's education	0.046*	0.049*	0.046*
	(0.024)	(0.025)	(0.025)
Wife's age	0.014***	0.016***	0.016***
	(0.004)	(0.004)	(0.004)
Husband's age	0.011***	0.011***	0.011***
	(0.004)	(0.003)	(0.004)
Wife's income	0.003	0.003	0.002
	(0.005)	(0.005)	(0.005)
Husband's income	−0.008	−0.008	−0.011
	(0.008)	(0.008)	(0.008)
Number of children	0.088***	0.088***	0.091***
	(0.020)	(0.020)	(0.020)
Constant	−1.100***	−1.047***	−0.995***
	(0.182)	(0.175)	(0.179)
Time dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	719	719	719

The dependent variable is binary: 1 if the child attends a private or national school, 0 if public. $D^{Prefer\ girl}$: 1 if parents preferred a girl before their first child. $D^{GirlBoy}$: 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$: 1 if they preferred and had a girl. $D^{BoyGirl}$: 1 if they preferred a boy but had a girl. Educational aspirations: 1 if parents expect university completion or higher. Wife's/Husband's education: 1 if they hold a university degree or higher. Wife's/Husband's income: Logged annual income. Number of children: Total children in the household. The sample includes children in elementary school, junior high school, high school, technical college, vocational school, junior college, and university, excluding pre-primary education (e.g., kindergarten). Robust standard errors in parentheses. *** p $<$ 0.01; ** p $<$ 0.05; * p $<$ 0.1.

Table 8: Are parents more likely to prefer girls when they provide care or plan to provide care for elderly relatives?

	(1)	(2)
$D^{\text{Caring for wife's parents}}$	0.061**	0.057*
	(0.031)	(0.031)
$D^{\text{Caring for husband's parents}}$	−0.046	−0.044
	(0.031)	(0.030)
Wife's education	−0.049*	−0.046
	(0.028)	(0.028)
Husband's education	−0.016	−0.023
	(0.027)	(0.027)
Wife's age	0.116*	0.117*
	(0.059)	(0.059)
Husband's age	0.059*	0.052*
	(0.030)	(0.031)
Wife's age squared	−0.002*	−0.002*
	(0.001)	(0.001)
Husband's age squared	−0.001**	−0.001**
	(0.000)	(0.000)
Wife's income	−0.000	−0.000
	(0.000)	(0.000)
Husband's income	0.000***	0.000**
	(0.000)	(0.000)
Constant	−2.095**	−1.979**
	(0.937)	(0.938)
Time dummy	✓	✓
Region dummy		✓
Observations	1522	1522

Notes: This table shows the estimation results from Equation (4). The dependent variable is a dummy: 1 if the respondent preferred a girl before their first child's birth, 0 if they preferred a boy. $D^{\text{Caring for wife's parents}}$: 1 if the wife is caring for or plans to care for her own parents, 0 otherwise. $D^{\text{Caring for husband's parents}}$: 1 if the wife is caring for or plans to care for her husband's parents, 0 otherwise. Wife's/Husband's education: 1 if they hold a university degree or higher. Wife's/Husband's income: Annual income. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

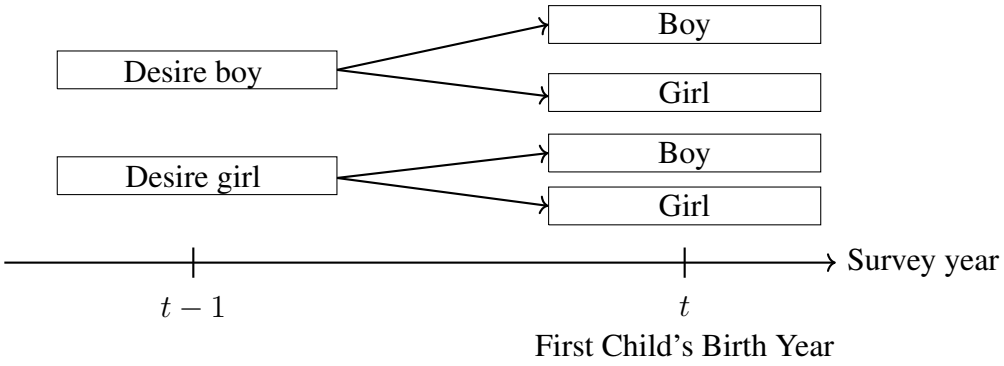

Figure 1: The identification method for gender preference

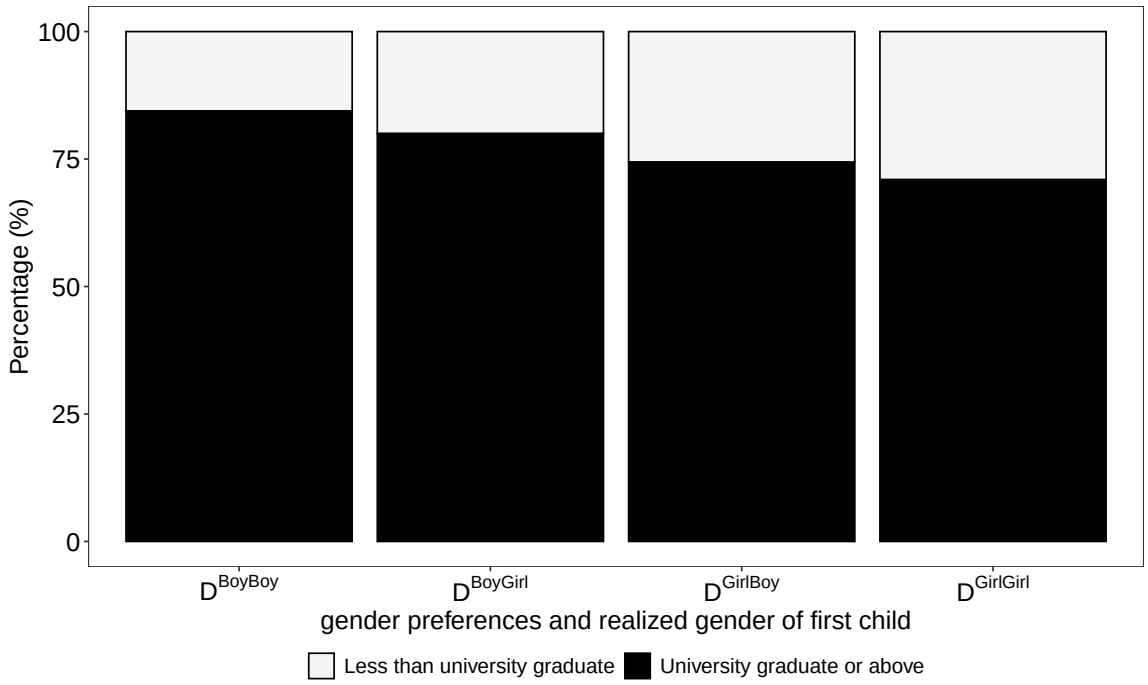

Figure 2: Parental educational aspirations by gender preference and realied gender of first child. $D^{GirlBoy}$ represents cases where parents desired a boy and had a boy; $D^{BoyGirl}$ represents cases where parents desired a boy but had a girl; $D^{GirlBoy}$ represents cases where parents desired a girl but had a boy; and $D^{GirlGirl}$ represents cases where parents desired a girl and had a girl.

A Appendix: Tables

Table A.1: Robustness check: educational aspirations

	(1)	(2)	(3)
D^{Girl}	-0.077^{***}		
	(0.020)		
$D^{Prefer\ girl}$		-0.083^{***}	
		(0.021)	
$D^{GirlBoy}$			-0.021
			(0.028)
$D^{GirlGirl}$			-0.134^{***}
			(0.030)
$D^{BoyGirl}$			0.010
			(0.036)
Number of children	-0.062^{***}	-0.057^{***}	-0.064^{***}
	(0.018)	(0.018)	(0.018)
Wife's education	0.241^{***}	0.247^{***}	0.247^{***}
	(0.021)	(0.021)	(0.021)
Husband's education	0.195^{***}	0.184^{***}	0.188^{***}
	(0.023)	(0.023)	(0.023)
Wife's age	0.003	0.004	0.003
	(0.003)	(0.003)	(0.003)
Husband's age	0.005^{*}	0.006^{**}	0.006^{**}
	(0.003)	(0.003)	(0.003)
Wife's income	0.006	0.006	0.006
	(0.004)	(0.004)	(0.004)
Husband's income	0.017^{***}	0.019^{***}	0.020^{***}
	(0.006)	(0.006)	(0.006)
Constant	0.111	0.113	0.099
	(0.114)	(0.114)	(0.116)
Time dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	1,886	1,887	1,887

Notes: $D^{Prefer\ girl}$: 1 if parents preferred a girl before their first child's birth. $D^{GirlBoy}$: 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$: 1 if they preferred and had a girl. $D^{BoyGirl}$: 1 if they preferred a boy but had a girl. Wife's/Husband's education: 1 if they hold a university degree or higher. Wife's/Husband's income: Logged annual income. Number of children: Total children in the household. The sample includes children in compulsory (elementary, junior high), upper secondary (high school, technical college), and tertiary education (vocational, junior college, university), excluding pre-primary education. To account for multiple responses from the same household, observations are weighted by the inverse of the number of responses per household. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.2: Robustness check: school-related expenditure

	School-related expenditure		
	(1)	(2)	(3)
D^{Girl}	−0.230		
	(1.004)		
$D^{Prefer\ girl}$		−3.186***	
		(1.173)	
$D^{GirlBoy}$			−4.848***
			(1.639)
$D^{GirlGirl}$			−3.729**
			(1.621)
$D^{BoyGirl}$			−2.457
			(1.985)
Educational aspirations	2.718*	2.372*	2.538*
	(1.433)	(1.433)	(1.424)
Number of children	3.426***	3.392***	3.462***
	(0.891)	(0.886)	(0.887)
Wife's education	0.627	0.841	0.737
	(1.269)	(1.269)	(1.276)
Husband's education	1.305	1.129	1.153
	(1.151)	(1.171)	(1.154)
Wife's age	0.339*	0.363**	0.358*
	(0.183)	(0.184)	(0.183)
Husband's age	0.404***	0.392***	0.388***
	(0.135)	(0.135)	(0.135)
Wife's income	0.880***	0.862***	0.849***
	(0.185)	(0.185)	(0.184)
Husband's income	−0.079	0.001	−0.034
	(0.363)	(0.361)	(0.361)
Constant	−21.69***	−20.00***	−18.36***
	(5.882)	(5.832)	(5.848)
Time dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	1,769	1,769	1,769

Notes: $D^{Prefer\ girl}$: 1 if parents preferred a girl before their first child's birth. $D^{GirlBoy}$: 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$: 1 if they preferred and had a girl. $D^{BoyGirl}$: 1 if they preferred a boy but had a girl. Educational aspirations: 1 if parents expect their child to complete university or higher. Wife's/Husband's education: 1 if they hold a university degree or higher. Wife's/Husband's income: Logged annual income. Number of children: Total children in the household. The sample includes children in compulsory (elementary, junior high), upper secondary (high school, technical college), and tertiary education (vocational school, junior college, university), excluding pre-primary education. To account for multiple responses per household, observations are weighted by the inverse of the number of responses per household. Robust standard errors in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A.3: Robustness Check: School Sector Choice

	(1)	(2)	(3)
D^{Girl}	0.023		
	(0.024)		
$D^{Prefer\ girl}$		−0.091***	
		(0.029)	
$D^{GirlBoy}$			−0.133***
			(0.039)
$D^{GirlGirl}$			−0.076*
			(0.041)
$D^{BoyGirl}$			−0.031
			(0.051)
Educational aspirations	0.007	−0.013	−0.009
	(0.030)	(0.031)	(0.031)
Number of children	0.064***	0.065***	0.066***
	(0.022)	(0.021)	(0.021)
Wife's education	−0.034	−0.031	−0.037
	(0.024)	(0.025)	(0.025)
Husband's education	0.022	0.024	0.023
	(0.025)	(0.025)	(0.025)
Wife's age	0.011**	0.013***	0.012***
	(0.004)	(0.004)	(0.004)
Husband's age	0.010**	0.009**	0.009**
	(0.004)	(0.004)	(0.004)
Wife's income	0.000	0.000	−0.001
	(0.005)	(0.005)	(0.005)
Husband's income	−0.006	−0.006	−0.008
	(0.009)	(0.008)	(0.009)
Constant	−0.870***	−0.814***	−0.747***
	(0.174)	(0.170)	(0.181)
Time dummy	✓	✓	✓
Region dummy	✓	✓	✓
Observations	719	719	719

Notes: $D^{Prefer\ girl}$ is a dummy variable that equals 1 if parents preferred a girl before having their first child. $D^{GirlBoy}$ equals 1 if parents preferred a girl but had a boy. $D^{GirlGirl}$ equals 1 if parents preferred and had a girl. $D^{BoyGirl}$ equals 1 if parents preferred a boy but had a girl. Educational aspirations equals 1 if parents expect their child to complete university education or higher. Wife's and Husband's education are dummy variables that equal 1 if they have a university degree or higher. Wife's and Husband's income are logged annual income. Number of children represents the total number of children in the household. The sample includes children in elementary school, junior high school, high school, technical college, vocational school, junior college, and university, excluding pre-primary education (e.g., kindergarten). To account for multiple responses from the same household, observations are weighted by the inverse of the number of responses per household. Robust standard errors in parentheses. *** p $<$ 0.01; ** p $<$ 0.05; * p $<$ 0.1.