Bank of Israel **Research Department**

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Discussion Paper 2019.16
December 2019

Bank of Israel http://www.boi.org.il
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Abstract

This study examines—for the first time in Israel—the extent to which gender composition of siblings in the family influences their performance in the labor market. In particular, this work compares women with older brothers to women with older sisters, and men with older brothers to men with older sisters. The paper expands the conversation regarding the environment's influence on wages.

Using data on non-ultra-Orthodox Jews born between 1975 and 1985, who were born last after two brothers or two sisters, we found that the gender of previous siblings has a statistically significant effect on wage only in certain population groups. Women of Ashkenazic descent who have two older sisters earn 7.0 percent more than women who have brothers, after controlling for other variables that may have an impact on wage. A similar effect was found for men from Ashkenazic descent. Most of the effect that we found for women was among those with high socioeconomic standing (women who live in localities in socioeconomic clusters 16–20), while for men, the effect was most prominent among those with lower and medium socioeconomic standing (those living in localities in socioeconomic clusters 1–15). We did not find robust results for women or men from Sephardic descent or mixed families.

אחים לעומת אחיות: השפעת מגדר האחים והאחיות על ביצועי הפרט בשוק העבודה

יובל מזר ואורי זילבר

תקציר

מחקר זה בוחן – לראשונה בישראל – עד כמה הרכב המינים של האחאים (אחים ואחיות) במשפחה משפיע על הביצועים של ילדיה בשוק העבודה. בפרט, עבודה זו משווה בין נשים עם אחים בוגרים לנשים עם אחיות בוגרות, וכן בין גברים עם אחים בוגרים לגברים עם אחיות בוגרות. תרומתה היא להעמקת הדיון בסוגיית ההשפעות של הסביבה על השכר.

באמצעות נתונים על יהודים לא־חרדים ילידי 1975—1985, שנולדו אחרונים לאחר שני אחים או שתי אחיות, מצאנו כי השפעת מין האחאים הקודמים על השכר העתידי מובהקת רק בקבוצות מסוימות באוכלוסייה: נשים שהוריהן ילידי אירופה וצפון אמריקה שלהן שתי אחיות מבוגרות יותר מרוויחות שכר גבוה יותר ב-7.0% בהשוואה לנשים שלהן יש אחים, זאת לאחר בקרה על משתנים אחרים העשויים להשפיע על השכר. השפעה דומה נמצאה עבור גברים שמוצא הוריהם מאירופה או מצפון אמריקה. עיקר ההשפעה שמצאנו עבור נשים הייתה בקרב נשים במעמד חברתי־כלכלי גבוה (נשים המתגוררות ביישובים באשכולות חברתיים־כלכליים 16—20) ועבור גברים שמוצא הוריהם מאירופה או מצפון אמריקה במעמד חברתי־כלכלי נמוך ובינוני (גברים שמקום מגורם הוא ביישובים באשכולות חברתיים־כלכליים 1—15). עבור נשים וגברים שמוצא הוריהם מאסיה, מצפון-אפריקה או ממשפחות בהן מוצא ההורים שונה זה מזה לא מצאנו תוצאות עמידות.

1. Introduction and Review of Literature

The environment into which a person is born and raised affects him in a wide range of areas. Research in various social science disciplines distinguishes between heredity and the environment, nature vs. nurture, categorizing the factors that influence the characteristics and achievements of an individual at each stage of his life. It has been estimated in recent years that the impact of the environment is greater (e.g., Bertrand, 2011). The individual's family plays a very significant role in the environmental impact, especially in the early stages of life. Within the family, brothers and sisters—siblings—have a greater impact on the environment in which children grow up than the influence of their peers outside the family (Azmitia and Hesser, 1993). Siblings are sometimes key factors in adulthood as well, providing points of comparison in various areas, influencing motivation, constituting a linking factor for acquiring social norms as well as providing various types of knowledge that influence future choices (Peter et al., 2018).

Despite the great importance of the influence of siblings on achievement in adulthood, the economic literature still presents little evidence of causality in their relationships (ibid.). The present study joins the literature evolving in the field, and in particular regarding the influence of siblings' gender on an individual's achievements. Studies have found different behaviors of parents toward their offspring according to their gender, such as greater support for girls than for boys in the stages of finding a partner and bringing up children (Pollet et al., 2009), or different behaviors of parents toward their offspring according to the gender composition in the family, such as the parenting time division based on gender in cases of different-sex offspring (McHale et al., 2003).

The literature also deals with the direct influence of the siblings' gender on the individual. It has been found that same-sex siblings create a more competitive environment during childhood (Okudaira et al., 2015; Conley, 2000), whose influence on academic choices is greater than siblings of different sexes (Goodman et al., 2015), and in adulthood, the achievements of those who grew up with siblings of the same sex are higher in terms of pay (Peter et al., 2018). Another study found that women's risk aversion decreases when they are in an environment with women, compared to women in a mixed environment (Booth et al., 2014), which in turn is expected to affect their achievements in adulthood (Buser et al., 2014; Bertrand, 2011).

The present study makes several contributions to the professional literature. First, it provides additional evidence of causal relationships between the gender of siblings and achievements as adults, which is lacking in the literature. Second, as will be shown below, this study deals with families with three siblings, while most of the research only compares sibling pairs (Peter et al., 2018; Goodman et al., 2015; Joensen and Nielsen, 2018; Henderson et al., 1997; and more). To the extent that we were able to find studies that do address the number of siblings, for example with reference to the birth order, the gender of the siblings was not addressed (Ernst and Angst, 2012; Courtiol et al., 2009; and more). Israel's unique advantage in the present context is the large sample of families with more than two children, enabling subgroup comparison; and we do detect significant differences in the influence of siblings' gender in different population groups.

This study's contribution is not only in content but also in methodology. It offers a different approach than previous studies that have dealt the challenge of identifying the influence of siblings, using comprehensive comparative testing within the data to identify possible biases. The next section will expand the discussion on the possible separation/distinction in the data and the manner of dealing with it.

The remainder of the paper is structured as follows: Section 2 describes the database, elaborating on the potential problem of identification (causality) and dealing with it from within the data. Section 3 presents the basic model and its findings. Section 4 presents additional robustness and sufficiency tests, and discusses the issue of the transmission through which the influence passes, and Section 5 concludes.

2. Data and Methodology

(1) The Database

The database is several files that were processed by the Central Bureau of Statistics (CBS) regarding individuals born in Israel from 1975 to 1985: the Residents' Register, Tax Authority employee-employer files, matriculation exam and psychometric exam files and population censuses.[1] The database includes demographic, educational and economic information. The relevant demographic information includes gender, year of birth, country of birth of the individual and his parents, year of immigration for

[1] We thank Ze'ev Krill of the Ministry of Finance for consolidating the data. Thanks to the CBS for providing access to the data file.

immigrants, nationality/religion, marital status of the parents when the individual was 17 years old, his locality of residence when he was 17 years old, and the individual's marital status at various ages.

We estimate the socioeconomic background of the individuals through the locality of residence. For this, we used the CBS division into statistical areas of the individual's locality of residence when he was 17. These areas are classified into clusters, ranked from 1 to 20 in ascending order. Other socioeconomic background estimates were based on parental education (years of schooling) and the parents' salary when the individual was 24 years old.

The information on education includes the high school education stream—State-Secular Jewish, State-Religious Jewish or other; eligibility for matriculation and matriculation grades, psychometric exam scores—for those who have been tested—according to each of its sections (quantitative thinking, verbal thinking and English) as well as the year of the exam, and eligibility for an academic degree.

The economic information includes the number of months of work and annual wages in each of the years 2008–15 (i.e., when the graduates were approximately 28–37 years old), taken from the employee-employer files of the Israeli Tax Authority. Wages at current prices were converted to fixed prices based on the Consumer Price Index in the relevant years. The information also includes the employment sectors in different periods.

We identify families through the ID cards of the individual's parents, and in that way we are able to identify the gender of each of the individual's siblings, as long as all the siblings are in the database, i.e., they were also born in 1975–85 – otherwise we only know the number of siblings. A discussion of the data selection problem that may result from this is presented in Section (3) below. In addition to the siblings' gender, we use other data on them, thereby producing additional background variables for each individual.

(2) The Study Population

Since birth patterns in Israel differ in different sectors, the entire population cannot be dealt with using the same criteria. The mode of number of children in the ultra-Orthodox[2] population during the sample period was five children (given that there are children in the family[3]), with approximately 35 percent of the ultra-Orthodox families with children having 4–6 children. In the Arab population, the mode of number of children was also five (given that there are children), and 33 percent of Arab families with children had 4-5 children. In contrast, in non-ultra-Orthodox Jewish population, the mode of the number of children was, and still is, three, and approximately 32 percent of these families had three children. Therefore, in the present study we have focused on the latter group, which is also the largest.

We examine the effect of the older siblings' gender on the younger siblings, as previous studies show that siblings' influence is in this direction in a variety of aspects: in terms of cognitive development (e.g., Dai and Heckman, 2013; Azmitia and Hesser, 1993), in terms of the acquisition of language skills and interpersonal communication (e.g., Havron et al., 2019; Hoff, 2006) and in terms of the acquisition of character traits (e.g., Tucker et al., 1999).

To best identify the effect of the siblings' gender on an individual's achievement, we refer to the extreme cases in the benchmark estimation: the case studies: individuals having same-sex older siblings, i.e., two older brothers or two older sisters. Further testing is done comparing all combinations of the families' gender structure.

In order for us to identify the gender of the siblings, the sample includes only those for which all the siblings are in the sample. Basically, the range of differences between siblings is reduced to ten years (the file includes those born in 1975–85). This is not particularly disturbing as more than 85 percent of the third and last individuals in the file have a gap of up to ten years from the oldest. That is, families with three siblings born in the period of ten years are a good representation of the population of families with three siblings.

Of those where the gap between siblings does not exceed ten years, we do not identify the siblings' gender of 60.9 percent of the individuals because at least one sibling was born before 1975. Therefore,

[2] Identified as Jews who studied in the "other" education stream, except for State-Hebrew and State-Religious Jewish.

[3] The division into families in the database is based on the children, because the observations are of individuals born in 1975-1985, and not of their parents. Therefore, inherently, the database does not have families without children.

we actually include those born at the end of the period, since they are the third, and the oldest in their family was born in 1975 or later.

In conclusion: The study group includes all non-ultra-Orthodox Jewish individuals born between 1975 and 1985 with two older brothers or two older sisters who were also born in the same range of years.

(3) Identification Challenge and Selection Problem

When identifying the influence of siblings' gender on individual achievement, we encounter several problems. First, the decision to have another child may depend on the sex of the previous children. Studies have indeed shown that there are two significant preferences in having children – preference for gender diversity in the family, and preference among some of the population for male children (Hank and Kohler, 2000). The second problem of identification is that the decision to stop having children in the family may depend on the children's gender – with the same preferences as mentioned above.

The concern is that both of these decisions correlate with background characteristics, observable and non-observable, that may affect individual achievement in adulthood. In particular, the concern in Israel is regarding a correlation with traditionalism, with traditionalism being correlated with a lower socioeconomic class (CBS, 2009). In such a situation, the effect that siblings' gender will have on individual achievement may also include the effect of these background characteristics on those achievements—despite control over the observable variables.

Indeed, these trends can be identified in the data. The preference for gender diversity is seen in the sample, where almost 20 percent more families with three children have gender diversity (5,185 families) than those whose children are of the same gender (4,328). This preference is evident both in families where boys were born first and where girls were born first: after two sons, there are more families who stopped when their daughter was born (2,818) than families who stopped when their third son was born (2,284) – a gap of 23.4 percent. In the opposite case, after having two daughters, there are 15.8 percent more families who stopped when a son was born (2,367) than those who stopped at the third daughter (2,044). In terms of the preference for male gender that appears in the literature, the sample actually has more births after two boys (5,102) than births after two girls (4,411), a gap of 15.6 percent. However, in contrast, this may actually indicate a greater preference for male gender, for it is possible that giving birth to boys gives hope for more boys, while giving birth to girls frustrates the parents and discourages them from further pregnancies.

If so, the decision to have another child seems to be related to the sex of the previous children. This characteristic raises concerns regarding the data selection problem. There are several solutions proposed in the literature for dealing with this selection problem. Peter et al. (2018) studied the effect of the siblings' gender on a number of outcome variables, including wages—as was done in this study—and suggested focusing on the influence of the younger siblings on the older siblings. They claim that this method solves the problem of bias arising from the endogeneity of the decision to have another child, because the sex of the younger siblings cannot retroactively influence the decision to have the first child. However, this method has two major problems. First, the literature justifies the assumption that the influence of the sex of the siblings is more relevant from the older to the younger and less in the other direction (Havron et al., 2019; Dai and Heckman, 2013; Tucker et al., 1999; Azmitia and Hesser, 1993; and more). Second, the selection of families in the study population remains the same, because the decision to have another child according to the sex of the oldest may still be correlated with additional characteristics.

Another common solution in the literature is the use of data on twins (Peter et al., 2018; Chen et al., 2016; Dayioğlu et al., 2009; and more), where of course there can be no effect of the sex of one of them on the choice to give birth to the other, or the brother who preceded them, if one exists. Presumably, comparisons between twins best cancel out characteristics, observable and non-observable, that may be correlated with wages, allowing for a cleaner estimation of the effect of the siblings' gender. However, this method also has some drawbacks. First, the effect of these twins on each other does not necessarily resemble the effects of non-twin siblings on one another. This is due to age identity, similarity in genetic traits to even identicalness in some cases and more. Therefore, the projection from a sample of twins to a more diverse sibling population is not easy to justify. In addition, it is more difficult to find comprehensive databases including twin detection, so the sample is significantly smaller making it difficult to use different characteristics for durability testing.

We offer two other solutions to dealing with data selection problems, with the understanding that bias does not bother us as long as it does not correlate with other background characteristics, which may have an effect on the adults' performance in the job market. One is an econometric test of the likelihood that a family will have a third child given that it has two children. The second solution is to compare the observable characteristics between different subgroups.

The background characteristics vector includes the socioeconomic class of the residential locality (according to the CBS division of the residential areas of individuals at age 17); parental education (years of schooling); origin (based on the country of birth of the parents: born in Israel, Ashkenazi [born in Europe, America, Oceania and South Africa], Sephardi [born in Asia or Africa, except Ethiopia and Sudan], mixed origin [one parent is Sephardi and the other is Ashkenazi], and Ethiopians and Sudanese. In cases where only one parent was born in Israel, the origin is determined according to the country of birth of the other parent); was the individual born in the Soviet Union, and the stream of education to which the individual belongs—State-Secular Jewish or State-Religious Jewish. In addition, adult sibling/s are monitored, as well as interactions between this variable and each of the background variables. Table 1 presents the findings.

The estimation of the likelihood of having a third child in a family with two siblings is done by multivariate estimation on a sample of second children who are the last born in the family and third children who are the last born, according to the following model:

$$(1) \qquad P(third)_i = c + \theta' X_i + \gamma Siblings'Sex + \mu' X_i * (Siblings'Sex) + u_i$$

The results of the econometric estimation are that non-ultra-Orthodox Jewish families with observable characteristics correlated with traditionalism—i.e., religious education, Sephardic origin and/or a relatively low socioeconomic class—have a greater tendency to have another child, both after two sons and after two daughters. However, the coefficient of the older siblings is not significant. Most importantly, most interactions of the background characteristics with the gender of the older siblings are not significantly different from zero, and in particular the probability of a third child after having two daughters is not affected by the background characteristics relating to the likelihood of a third child after two sons.

This is with the exception of the socioeconomic cluster indicator of the individual's place of residence at age 17: one cluster drop (out of 20), increases the probability of a third birth after two boys by 0.2 percent, and after two girls—by 0.5 percent. That is, the lower the socioeconomic class, the probability of continuing to a third birth increases when there is no gender diversity, and especially increases when there are no sons. In view of this, we can argue that a finding according to which performance in the labor market of an individual (male or female) born after girls is lower than that of his or her counterparts born after boys may reflect his family's socioeconomic class, since there is a connection between his or her birth and the sex of his older siblings and the socioeconomic background of his or her family.

However, the opposite finding, according to which the performance in the labor market of an individual born after girls is higher than that of his or her counterparts born after boys—would be an underestimation of the degree of influence of the sex of the older siblings, as this is contrary to what is expected in view of his or her socioeconomic background, to which the decision to bring him or her into the world may be related.

Table 1
The probability of a third and last-born child (compared with second and last-born) – as a dependent variable

Older sister or two older sisters	-0.00295
	(0.0348)
Socioeconomic class	-0.00191**
	(0.000930)
Parental education	-0.00409***
	(0.00116)
Ashkenazic origin	0.0699***
	(0.00977)
Sephardic origin	-0.0526***
	(0.00849)
Born in the Soviet Union	-0.173***
	(0.00779)
State-Hebrew education	0.104***
	(0.0136)
Socioeconomic class * Older sister or two older sisters	-0.00312**
	(0.00132)
Parental education * Older sister or two older sisters	0.000671
	(0.00160)
Sephardic origin * Older sister or two older sisters	0.00867
	(0.0282)
Ashkenazic origin * Older sister or two older sisters	0.00387
	(0.0273)
Born in the Soviet Union * Older sister or two older sisters	-0.0152
	(0.0112)
State-Hebrew education * Older sister or two older sisters	-0.00280
	(0.0192)
Number of observations	35,457
R^2	0.058

Notes: The sample includes second and last-born, or third and last-born, non-ultra-Orthodox Jews born from 1975 to 1985 who have only two brothers or two sisters. The dependent variable is the probability that the family will have a third and last-born child (compared to stopping after two children). The base group consists of individuals with older brother/s. The independent variables: socioeconomic class, by cluster according to CBS rating of residential area at age 17 – from 1 to 20; average years of schooling of the parents (if data is lacking for one of them, the data for the other is used); origin according to country of birth of the parents [Israeli born (serves as the base group; not presented), Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi; not presented), and Ethiopian and Sudanese origin (not presented). If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent]; was the individual born in the Soviet Union; was the individual educated in the State-Religious stream (compared with State-Hebrew education). Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

However, it should be noted that there is very little difference between the socioeconomic cluster's contribution to the prospect of a third birth, with a comparison between previous brothers and previous sisters – approx. three-tenths of a percentage point. In view of this and in the absence of significance in all other indicators, we are reinforced in our assumption that even if the sex of previous siblings has an influence on the choice of having another child—it does not correlate with socioeconomic characteristics that may affect the adult individual in the labor market.

As a further test of these selection problems, we compared the observable characteristics among different subgroups mentioned. Assuming a lack of selection according to the estimation findings in Model 1, we estimated that the study population—those born last after two brothers or two sisters – would be similar in their observable characteristics, particularly those indicating a socioeconomic level, to the rest of the population of third and last-born children who have a brother and sister. Table 2 presents this comparison.

In the comparison, the two populations were found to be similar in socioeconomic class, indicating that the preference for diversity is more universal and less likely to cause a selection problem in the sample. This claim is reinforced by most of the findings of Model 1 (Table 1), where it is found that the likelihood of a third birth is almost unaffected by the sex of the previous children. Although the relative parental wages of the individuals in the study population are slightly higher than those who are not in the study population, the difference is not significant.

Because closeness to tradition can also be correlated with the choice of having another child in view of the sex of the previous children—in particular, the choice to continue having children if only girls are born—two indicators that may be correlated were tested: origin (by father's country of birth), and education stream (State-Secular Jewish vs. State-Religious Jewish). It is assumed that a higher Sephardic origin rate would indicate the group's greater closeness to tradition on average. However, it was found that the study group was characterized by a lower Sephardic origin rate, contrary to what was expected to be a selection problem. It was also found that the study group is characterized by a slightly higher Ashkenazi origin rate, also contrary to expectations. Similarly, it is assumed that a population closer to tradition would be characterized by a higher rate of individuals who had a State-Religious Jewish education. However, the rate was found to be very similar between the two groups.

Table 2
Comparison of the study population (having same-sex siblings) with the rest of the population (having different-sex siblings), third and last-born

	Study population	Rest of population	The difference
Rate of men	0.489	0.496	-0.00745
	(0.500)	(0.500)	(0.00731)
Age	31.76	31.73	0.0343
	(1.646)	(1.642)	(0.0240)
Rate of Soviet Union immigrants	0.0285	0.0240	0.00445*
	(0.166)	(0.153)	(0.00234)
Rate of Sephardi origin	0.305	0.325	-0.0208***
	(0.460)	(0.469)	(0.00679)
Rate of Ashkenazi origin	0.259	0.237	0.0221***
	(0.438)	(0.425)	(0.00631)
Rate of mixed origin	0.0340	0.0323	0.00165
	(0.181)	(0.177)	(0.00262)
Rate of State-Religious education	0.103	0.101	0.00210
	(0.304)	(0.301)	(0.00442)
Rate of State-Hebrew education	0.897	0.899	-0.00210
	(0.304)	(0.301)	(0.00442)
Socio-economic cluster	12.34	12.34	-0.00257
	(3.983)	(3.968)	(0.0581)
Father's years of schooling	12.77	12.69	0.0791
	(3.339)	(3.294)	(0.0485)
Mother's years of schooling	12.79	12.73	0.0624
	(3.126)	(3.087)	(0.0454)
Parents' wages	0.341	0.305	0.0359*
	(1.390)	(1.408)	(0.0205)
Siblings' wage decile	5.790	5.774	0.0160
	(2.100)	(2.123)	(0.0309)
No. of observations	9,513	9,195	

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985. The age represents the individual's age in 2015. The origin according to the parents' country of birth [Israeli born (serves as the base group; not presented), Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi; not presented), and Ethiopian and Sudanese origin (not presented). If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent]. The socio-economic cluster ranges between 1 and 20, according to the CBS division into clusters of the residential areas of individual at age 17. The parents' wages are presented with an indicated standard, representing the average real wages compared to the average in the year the individual was 24 years old. The siblings' wage log decile is calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40).
Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

So far, the assumption is that the choice **to have another child**, even if influenced by the preference for diversity, does not correlate with any socioeconomic characteristics. Because these are third and last-born individuals, there is still concern that **the individual is the last-born** because he or she "managed to break away" from the sexual uniformity that existed until he or she was born, and if they had been born the same sex as their predecessors – the parents would have decided to have more children. This kind of bias should also concern us as long as it correlates with some socioeconomic background characteristics, just as we examined above that the universal preference for diversity is not correlated

with such characteristics. For this purpose, a comparison, presented in Table 3 below, was conducted between those with two older brothers and those with two older sisters, separately for women and men.

Among women, it can be seen that in almost all observed traits, including those correlated with tradition or indicating the socioeconomic class of the family, there are no significant differences between groups: women with older siblings or women with older sisters. An exception to this is the disparity in the level of wages of women's siblings, with the average wages of siblings of those with siblings only lower than the wages of nurses of those with sisters only. This is based on the characteristic of the sibling's wage decile, calculated separately for women and men, according to three different age groups of the siblings: 30-33, 34-37 and 38-40. Another reference to this point appears in the results section.

Another difference among women is the size of the group, as shown above. However, here, too, it was found that gender preference could not be linked to family socioeconomic class (the results are not reported, but are similar to those presented in Table 1).

Among men, the difference in group size is negligible, and no significant differences were found between the groups in any observed parameter, not those correlated with traditionalism or those indicating socioeconomic class.

The comparison of individuals born after brothers and individuals born after sisters (Table 3) has additional importance, as it compares the groups for which study estimation is performed, which will be presented below. The similarity between those born after two brothers and those born after two sisters – a similarity that exists in both women and men – is an additional reinforcement of the findings presented in Table 1. As stated above, this similarity indicates that the study group does not suffer from a bias stemming from the gender structure in the family, at least not such that is reflected in the observable background characteristics, which may be factors influencing the individual's achievements in the labor market.

To this point we have dealt with the study group. To deal with a possible bias that may be due to the reason for not having more children in the family according to the sex of the child, an additional comparison was made between women and men, separately for those born after two brothers and for those born after two sisters. While these are not the groups we compare in the study, pointing to similarities between women born after two sisters and men born after two sisters, and between women born after two brothers and men born after two brothers, reinforces the claim that in the non-ultra-Orthodox Jewish population, the stop after the third birth – even if it is related to the sex of the third child

based on the gender structure of the family – does not correlate with the socioeconomic characteristics of one group or another. Table 4 presents this comparison.

Table 3
Comparison within the study population (having same-sex siblings) between individuals with only brothers and individuals with only sisters, third and last-born

	Women			*Men*		
	Born after two boys	Born after two girls	The difference	Born after two boys	Born after two girls	The difference
Age	31.80	31.73	0.0726	31.68	31.81	-0.127***
	(1.658)	(1.598)	(0.0474)	(1.620)	(1.696)	(0.0487)
Rate of Soviet Union immigrants	0.0263	0.0264	-0.000159	0.0302	0.0313	-0.00105
	(0.160)	(0.160)	(0.00465)	(0.171)	(0.174)	(0.00506)
Rate of Sephardi origin	0.306	0.295	0.0117	0.302	0.314	-0.0127
	(0.461)	(0.456)	(0.0133)	(0.459)	(0.464)	(0.0135)
Rate of Ashkenazi origin	0.259	0.259	0.000108	0.261	0.255	0.00533
	(0.438)	(0.438)	(0.0127)	(0.439)	(0.436)	(0.0128)
Rate of mixed origin	0.0348	0.0377	-0.00289	0.0359	0.0279	0.00802
	(0.183)	(0.190)	(0.00541)	(0.186)	(0.165)	(0.00515)
Rate of State-Religious education	0.106	0.102	0.00399	0.0998	0.104	-0.00368
	(0.308)	(0.302)	(0.00887)	(0.300)	(0.305)	(0.00887)
Rate of State-Hebrew education	0.894	0.898	-0.00399	0.900	0.896	0.00368
	(0.308)	(0.302)	(0.00887)	(0.300)	(0.305)	(0.00887)
Socioeconomic cluster	12.31	12.31	0.00531	12.42	12.31	0.108
	(4.002)	(3.978)	(0.116)	(4.010)	(3.942)	(0.117)
Father's years of schooling	12.75	12.85	-0.101	12.78	12.71	0.0786
	(3.412)	(3.451)	(0.0996)	(3.329)	(3.157)	(0.0951)
Mother's years of schooling	12.79	12.80	-0.0136	12.84	12.74	0.101
	(3.257)	(3.113)	(0.0929)	(3.113)	(2.990)	(0.0895)
Parents' wages	0.347	0.314	0.0326	0.370	0.328	0.0420
	(1.681)	(1.056)	(0.0422)	(1.579)	(1.014)	(0.0388)
Siblings' wage decile	5.720	5.852	-0.132**	5.822	5.791	0.0309
	(2.120)	(2.139)	(0.0618)	(2.100)	(2.042)	(0.0607)
No. of observations	2,818	2,044		2,284	2,367	

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985. The age represents the individual's age in 2015. The origin according to the parents' country of birth [Israeli born (serves as the base group; not presented), Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi; not presented), and Ethiopian and Sudanese origin (not presented). If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent]. The socioeconomic cluster ranges between 1 and 20, according to the CBS division into clusters of the residential areas of individual at age 17. The parents' wages are presented with an indicated standard, representing the average real wages compared to the average in the year the individual was 24 years old. The siblings' wage log decile is calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40).
Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

Table 4
Comparison within the study population (having same-sex siblings) between women and men,

	Born after two sisters			*Born after two brothers*		
	Women	Men	The difference	Women	Men	The difference
Age	31.73	31.81	0.0767	31.80	31.68	-0.123***
	(1.598)	(1.696)	(0.0499)	(1.658)	(1.620)	(0.0462)
Rate of Soviet Union immigrants	0.0264	0.0313	0.00484	0.0263	0.0302	0.00395
	(0.160)	(0.174)	(0.00507)	(0.160)	(0.171)	(0.00465)
Rate of Sephardi origin	0.295	0.314	0.0198	0.306	0.302	-0.00458
	(0.456)	(0.464)	(0.0139)	(0.461)	(0.459)	(0.0130)
Rate of Ashkenazi origin	0.259	0.255	-0.00412	0.259	0.261	0.00110
	(0.438)	(0.436)	(0.0132)	(0.438)	(0.439)	(0.0124)
Rate of mixed origin	0.0377	0.0279	-0.00979*	0.0348	0.0359	0.00113
	(0.190)	(0.165)	(0.00535)	(0.183)	(0.186)	(0.00520)
Rate of State-Religious education	0.102	0.104	0.00175	0.106	0.0998	-0.00592
	(0.302)	(0.305)	(0.00917)	(0.308)	(0.300)	(0.00856)
Rate of State-Hebrew education	0.898	0.896	-0.00175	0.894	0.900	0.00592
	(0.302)	(0.305)	(0.00917)	(0.308)	(0.300)	(0.00856)
Socioeconomic cluster	12.31	12.31	0.00299	12.31	12.42	0.106
	(3.978)	(3.942)	(0.120)	(4.002)	(4.010)	(0.113)
Father's years of schooling	12.85	12.71	-0.148	12.75	12.78	0.0318
	(3.451)	(3.157)	(0.0995)	(3.412)	(3.329)	(0.0950)
Mother's years of schooling	12.80	12.74	-0.0601	12.79	12.84	0.0540
	(3.113)	(2.990)	(0.0920)	(3.257)	(3.113)	(0.0899)
Parents' wages	0.314	0.328	0.0144	0.347	0.370	0.0239
	(1.056)	(1.014)	(0.0312)	(1.681)	(1.579)	(0.0461)
Siblings' wage decile	5.852	5.791	-0.0613	5.720	5.822	0.102*
	(2.139)	(2.042)	(0.0630)	(2.120)	(2.100)	(0.0594)
Number of observations	2,044	2,367		2,818	2,284	

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985. The age represents the individual's age in 2015. The origin according to the parents' country of birth [Israeli born (serves as the base group; not presented), Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi; not presented), and Ethiopian and Sudanese origin (not presented). If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent]. The socio-economic cluster ranges between 1 and 20, according to the CBS division into clusters of the residential areas of individual at age 17. The parents' wages are presented with an indicated standard, representing the average real wages compared to the average in the year the individual was 24 years old. The siblings' wage log decile is calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40).
Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

Apart from the differences in the size of the groups referred to above, reflecting the preference for gender diversity in the family, no significant differences were found between the groups in almost every observed parameter. An exception to this is the sibling wage characteristics among those born after two brothers, which indicates that the brothers of a third and last-born boy earns more on average than brothers of a third sister. However, due to the great similarity in the other indicators, and the fact that

economically, the difference is small (a standard deviation of only 0.05), it appears that although the size of the groups indicates a preference for gender diversity, and a stronger preference for girls than boys, given the gender diversity preference (the differences in the size of the groups) – these preferences cannot be linked to any socioeconomic characteristics.

In summary, we performed three tests to identify relationships between parental preferences for the child's gender according to the gender of previous children and socioeconomic background characteristics that may affect wages, and found that:

1. The probability of having a third and last-born child versus a second and last-born child is not correlated with any socioeconomic characteristics (except for a quantitatively negligible finding regarding the relationship with the socioeconomic cluster of the residential area).
2. The choice to stop at the third child (as opposed to continuing to have children) is biased due to the preference for gender diversity in the children. This is based on the number of families who stopped at the third birth after gender diversity was achieved compared to the number of families who stopped at the third child with gender uniformity in the children. However, no statistical relationship was found between this bias and the socioeconomic background characteristics of the family.
3. Among those who stopped at the third birth, the population with which the study is concerned, there are no differences in background characteristics between those born after brothers and those born after sisters – both men and women, so that gender diversity preferences cannot be linked with these characteristics.

In addition, in the multivariate estimation we monitor all of the observable variables presented below, including those that reflect to some extent the individual's socioeconomic background, and use the PSM model to strengthen the causal relationship.

C. The Model and Findings

(1) The Dependent Variables

The main dependent variable in the present study is the average annual real wage of the individual in the years 2013–15. As part of the data cleansing, we omitted 12 observations where wages were negative, and we also removed from the sample the observations below the 0.5 percentile and above the 99.5 percentile (lower than NIS 529 or higher than NIS 454,794 per year at 2015 prices; total: 621 observations).

We also examined the rate of employment of the individual over these three years, both as a dependent variable and as an independent variable in the same period. The employment rate is the rate of months in which the individual worked during those three years. That is, we examined how much of the wage gap between individuals, if any, was influenced by gaps in employment rates; and also, as mentioned, the employment rate directly as a dependent variable. Similarly, we examined the probability of eligibility for an academic degree (at least a bachelor's degree); the probability of being eligible for a high school matriculation certificate and the overall score in the psychometric exam, and in the quantitative section in particular; and the probability of employment in the IT industry (refers to the employment sector in 2015, and is defined as: manufacture of computer, electronic and optical equipment; communication services; computer programming, computer-related consulting and other related services, and information services).

(2) The Model

The basic model we estimated is the OLS model, as follows:

(2) $$w_i = c + \alpha L_i + \beta' X_i + \delta' F_i + \theta Pre\_male_i + \varepsilon_i$$

Where w_i is the dependent variable and represents the average annual real wage (standardized in 2015 prices) of individual i in the years 2013–15. L_i represents the employment rate of individual i in 2013–15, which is defined as the rate of months he worked in those years.

X_i is a set of demographic and social characteristics of individual i: age in 2015 and age squared; marital status (whether the individual was ever married and whether he ever divorced); origin based on the parents' country of birth (born in Israel, Ashkenazi [born in Europe, America, Oceania and South Africa]; Sephardi [born in Asia or Africa, except Ethiopia and Sudan]; mixed origin [one parent is Sephardi and one is Ashkenazi], born in Ethiopia [Ethiopia and Sudan]. In the case where only one parent was born in Israel, the origin is determined by the country of the second parent's birth), and the age differences between the siblings: between the first-born and the next, and between the second and the individual in the study.

F_i includes socioeconomic background information on the family of individual i: the socioeconomic cluster of the residential area where the individual resided at age 17, according to the CBS division into statistical areas and with an ordinal rating rising from 1 to 20; parents' income when the individual was 24 years old (real wages, average of the parents, indicating relative standards each year to deal with increasing real wages over the years), and the older siblings' wage decile (average of the siblings, with

deciles calculated separately for women and men, and separately for three age groups: 30-33 , 34-37 and 38-40).

In addition, we monitor the sex of the older siblings Pre_male_i —this is the interesting variable—did individual *i* have older brothers (1) or older sisters (0). The estimate for the coefficient of this variable, θ, represents the difference in the percentages of predicted wages between those born after two sisters and those born after two brothers. (As mentioned, the sample only includes individuals that have two older brothers or two older sisters).

(3) The Results

Table 5 presents the main results: A **woman** who has only older brothers earns an average of 3.0 percent less than a woman who has only older sisters. No significant effect was found among women of Sephardi or mixed origin. Among women of Ashkenazi origin there was a significant difference of 7.0 percent in favor of a woman who has only older sisters. The main finding maintains its direction in the two main streams of education: State-Secular Jewish and State-Religious Jewish (not significant). In terms of the division by class, it can be seen that the impact is found in the relatively high class, that is, those who live in localities in the five highest socioeconomic clusters, where there is a significant 7.6 percent difference between women born after sisters and women born after brothers.

Another test we performed, presented in columns 8 and 9, is the model estimation using the Propensity Score Matching (PSM) method. This method simulates a kind of natural experiment, where we define participation in the "experiment" as individuals with older brothers, and non-participation (the control group) as individuals with older sisters. The estimation compares the wage gap, the outcome variable, between the "experiment" group and the control group, but only for the observation pairs for which there is a similar probability of participation in the "experiment" according to the background characteristics controlled in the estimation. The calculation of the probability of correlation with the Probit method yields a similar finding to the benchmark estimation, in particular: women with sisters earn 4.3 percent more than women with brothers (with significance). In the Logit method, the finding maintains its direction (-2.7 percent), but loses its significance.

Table 5

Main results – Influence of the older siblings on wages, third and last-born with same-sex siblings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Benchmark	Sephardi	Ashkenazi	-State Hebrew Educatio	-State Religious Educatic	-Low Middle Class	Upper class	Model *PSM (Logit)*	Model *PSM (Probit)*
					Women				
Older brothers	-0.0301*	-0.0440	-0.0702**	-0.0236	-0.0494	-0.0127	-0.0756**	-0.0274	-0.0431**
	(0.0160)	(0.0297)	(0.0325)	(0.0171)	(0.0464)	(0.0179)	(0.0350)	(0.02334)	(0.02324)
No. of	4,278	1,348	1,092	3,770	459	3,226	1,052	4,278	4,278
R^2	0.697	0.714	0.684	0.696	0.721	0.705	0.677	-	-
					Men				
Older brothers	-0.0355**	-0.0360	-0.0695*	-0.0373*	-0.0458	-0.0498**	0.00566	-0.0038	-0.0357
	(0.0173)	(0.0309)	(0.0356)	(0.0183)	(0.0527)	(0.0196)	(0.0366)	(0.0260)	(0.02338)
No. of	4,423	1,467	1,117	3,840	472	3,335	1,088	4,423	4,423
R^2	0.654	0.672	0.627	0.645	0.752	0.657	0.652	-	-

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985 with same-sex siblings. The dependent variable is the average real wage log in the years 2013-2015, in the years that the individual worked. The benchmark group is individuals with older sisters. Other controlled variables (not presented): the rate at which the individual worked in 2013-2015, age and age squared, socioeconomic cluster from 1 to 20 according to the CBS division into clusters of the residential areas of individual at age 17, indicated standard of the parents' average real wages relative to the average in the year the individual was 24 years old, was the individual ever married, was the individual ever divorced, the siblings' average wage log decile calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40), origin according to the parents' country of birth [Israeli born, Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi), and Ethiopian origin (Ethiopia and Sudan); If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent], was the individual born in the Soviet Union, and the difference in years between the first-born and the next, and between the middle child and the individual. The low, middle and upper class are clusters 1-5, 6-15 and 16-20, respectively.

Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

Similar to the findings for women, a **man** who has older brothers earns less than his counterpart with only sisters – an average gap of 3.5 percent. The finding is significant among Ashkenazi men (6.9 percent), among those in the State-Secular Jewish education system (3.5 percent), and among those from the lower and middle class localities (5.0 percent). In this respect, it is the opposite from the case with women. In the PSM estimation, no significant effect was found in either of the two estimations.

Therefore, the main effect seems to be found among individuals of Ashkenazi origin. Furthermore, most of the influence in women of Ashkenazi origin is in the upper class, while in men – in the lower classes.

Figures 1 and 2 depict the distributions of the conditional wage of older brother born after two boys or two girls for women and men, respectively.

Figure 1 – Predicted wage distribution of <u>women</u> whose parents are from North America or Europe, by gender of older siblings

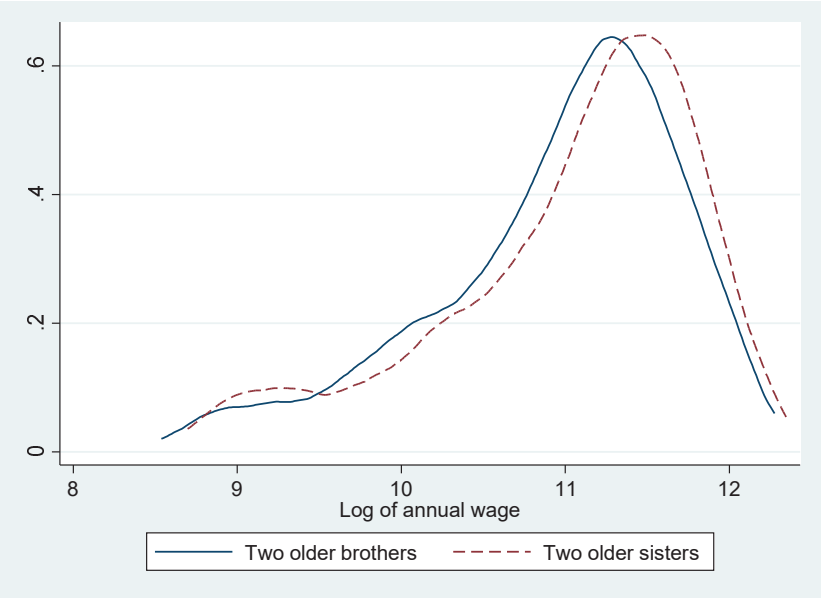

Figure 2 – Predicted wage distribution of <u>men</u> whose parents are from North America or Europe, by gender of older siblings

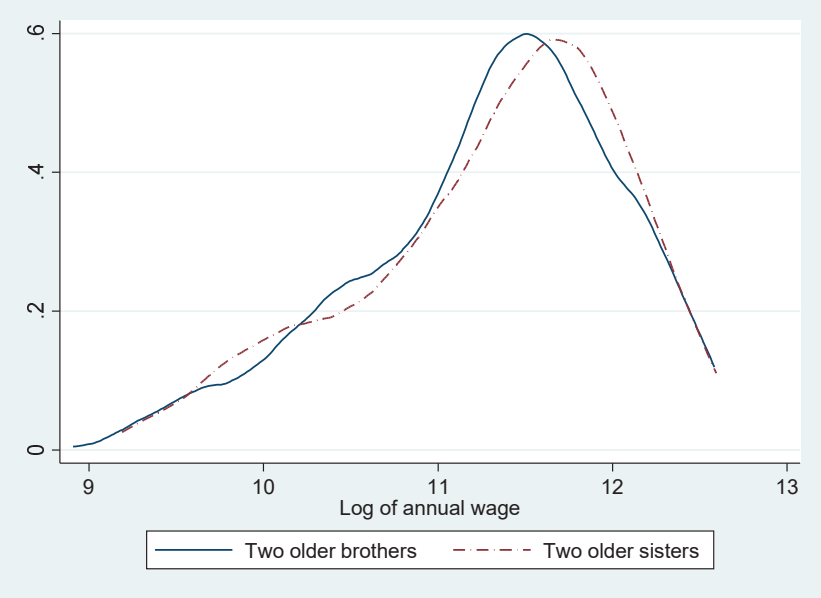

Table 6 presents the benchmark model findings, with OLS estimation and PSM estimation, for individuals of Ashkenazi and Sephardi origin only, separately for women and men. These tests confirm the conclusion that the effect of the siblings' gender on women is mainly found in relatively strong

families, i.e., upper socioeconomic class. However, for women of Sephardi origin, an effect was found in the PSM (Logit) model, and combined with the main findings from Table 5, it appears that although the main effect, and the stronger effect, is among upper-class Ashkenazi families, there may be some effect on women of Sephardi origin. Among men, the effect appears to be less durable in the various tests, so that in the PSM estimations hardly any effect is found at all.

Table 6

Ashkenazi vs. Sephardi – Influence of the sex of the older siblings on wages, third and last-born with same-sex siblings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
			Ashkenazi					*Sephradi*		
	Benchmark	-Low Middle Class	Upper class	Model *PSM (Logit)*	Model *PSM (Probit)*	Benchmark	-Low Middle Class	Upper class	Model *PSM (Logit)*	Model *PSM (Probit)*
Women										
Older brothers	-0.0702**	-0.0302	-0.164**	-0.099**	-0.124**	-0.0440	-0.0350	-0.0625	-0.088*	-0.0637
	(0.0325)	(0.0364)	(0.0681)	(0.0466)	(0.0487)	(0.0297)	(0.0318)	(0.0732)	(0.0467)	(0.0443)
No. of	1,092	778	314	1,092	1,092	1,348	1,124	224	1,348	1,348
R^2	0.684	0.693	0.682	-	-	0.714	0.718	0.698	-	-
Men										
Older brothers	-0.0695*	-0.0836**	-0.0267	-0.0682	-0.0557	-0.0360	-0.0326	-0.0343	-0.0176	-0.0360
	(0.0356)	(0.0408)	(0.0738)	(0.0417)	(0.0470)	(0.0309)	(0.0333)	(0.0878)	(0.0415)	(0.0405)
No. of	1,117	830	287	1,117	1,117	1,467	1,247	220	1,467	1,467
R^2	0.627	0.625	0.645	-	-	0.672	0.678	0.655	-	-

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985. The age represents the individual's age in 2015. The origin according to the parents' country of birth [Israeli born (serves as the base group; not presented), Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi; not presented), and Ethiopian and Sudanese origin (not presented). If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent]. The socio-economic cluster ranges between 1 and 20, according to the CBS division into clusters of the residential areas of individual at age 17. The parents' wages are presented with an indicated standard, representing the average real wages compared to the average in the year the individual was 24 years old, was the individual ever married, was the individual ever divorced, the siblings' wage log decile is calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40), was the individual born in the Soviet Union, and the difference in years between the first-born and the next, and between the middle child and the individual. The low, middle and upper class are clusters 1-5, 6-15 and 16-20, respectively.

Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

It could be that the reason a woman born after two brothers earns less than her counterpart born after sisters is that she works less. When the employment rate L_i is not monitored, the coefficient increases for women born third and last – 3.6 percent. That is, the effect of the siblings' gender found above passes partially through the employment rate, increasing the baseline estimate of sisters by 0.6 percentage points compared to the unmonitored employment rate estimate. However, the coefficient loses its significance.

For men, there is a smaller increase of 0.2 percentage points (from 3.5 percent to 3.7 percent), and here too, the significance is slightly impaired.

These findings are consistent with psychology studies conducted on the subject. For example, Havron et al. (2019), in their study based on a representative sample of children in France[4], noted the significant contribution that older sisters have compared with older brothers on language acquisition and interpersonal communication skills. Their research suggests two main mechanisms for this: one, young girls are more talented than boys at a young age in language skills, usually up to ages 5-6 (Peyre et al., 2016), and therefore, given that older siblings contribute to language skills (Hoff, 2006), younger siblings with older sisters will benefit more. The other is that first-born girls compete less for parental attention than first-born boys (Havron et al., 2019), and therefore, parents' investment in younger children with older sisters is higher. A positive influence of sisters on academic achievement has been found in additional studies (e.g., Qureshi et al., 2017; Stoneman et al., 1986; Minnett et al., 1983). However, these findings did not examine the differences between different population groups. The size of the sample in Israel makes it possible to identify that the main effect is found among families of Ashkenazi origin, and serves as an opening for further research that can address this point and better understand its origins in Israel, and the degree of heterogeneity of the samples elsewhere in the world.

As mentioned, we found in the previous chapter that sisters of women are stronger than brothers of women in terms of the salary decile (Table 3). It appears that there is an indication that a female homogeneous environment is beneficial for women in certain populations. Although we are examining the influence of older siblings on their younger siblings, the literature also deals with influences in the opposite direction (e.g., Peter et al., 2018; Chen et al., 2016; and more), and it is possible that here too, positive reciprocal effects may also be indicated between the three sisters in the family. The claim that a female homogeneous environment is beneficial for women is consistent with findings from similar studies (Okudaira et al., 2014; Booth et al., 2014; Minnett et al., 1983).

In all durability tests (not included in this paper), in both men and women, the estimation of the influence of the siblings' gender on the salary of the adult maintains the direction, and in most tests – also the size and significance. For example, when the dependent variable is only the salary in the past year, the estimate decreases for women and increases for men, but in both cases the model's explanatory capacity is significantly impaired. In addition, when instead of the siblings' wage decile their other achievements

[4] "EDEN Cohort".

are monitored, in order to deal with the fact that wages are relatively "noisy" data compared to others: employment rates, matriculation eligibility rates, academic degree eligibility rates, and average math matriculation score, the results are similar and the estimation always maintains a negative sign with similar strength. Estimations are particularly notable when monitoring the brothers' employment rates or math matriculation scores, where the estimate of the sisters' influence averages 3.9 percent for women with stronger significance and an average of 3.3 percent for men with weaker significance than the benchmark estimation.

(4) Other Outcome Variables

In order to try to identify mechanisms through which the impact on wages passes, we examined the effect of the older siblings' gender on other non-wage outcome variables. Table 7 presents the effect of the siblings' gender on the likelihood of obtaining a matriculation certificate, on the psychometric exam score, on the score in the quantitative section of the exam, on the likelihood of an academic degree, the probability of being employed in the IT industries and the probability of being employed (calculated on the basis of the percentage of months in which the individual worked in the years 2013–15). All of these variables are positively related to the older siblings' wages.

It was found that the influence of older brothers, compared with older sisters, on women is significant only for the rates of eligibility for a matriculation certificate –significantly positive for women of Ashkenazi origin and significantly negative for women of Sephardi origin. In addition, when adding the matriculation eligibility variable to the estimation of the wage log according to Model 2, the finding regarding the sex of older siblings loses its significance (Column 8). No significant relationship was found in women between the siblings' gender and other variables.

Among men, no significant relationship was found in any of the dependent variables, except for the negative influence of male siblings on the likelihood of obtaining a matriculation certificate among individuals of Sephardi origin. The inclusion of these variables in the estimation as independent variables (Column 8) results in a zeroing out of the older siblings' sex estimation.

When these outcome variables were tested separately for individuals of Ashkenazi and Sephardi origin, we found that an estimate that includes all the additional variables (Column 8) has a significant influence on **women** of Sephardi origin (-0.063, p Value 0.13) and of Ashkenazi origin (-0.066, p Value 0.11). For **men** the coefficient in this estimation zeroed out.

Table 7

Other outcome variables – Influence of the older siblings' gender on various outcome variables, third and last-born with same-sex siblings

	(1) Employment rate	(2) Eligibility for matriculation certificate	(3) Psychometric score	(4) Psychometric : score quantitative section	(5) Eligibility for academic degree	(6) Employment in IT industries	(7) Vocational education	(8) All outcome variables, as independent variables
					Women			
Older brothers	-0.00796	-0.0430***	-4.214	-0.748	-0.0185	0.000232	-0.0261	-0.0285
	(0.00658)	(0.0137)	(3.679)	(0.693)	(0.0161)	(0.00143)	(0.0217)	(0.0219)
No. of	4,278	3,861	2,438	2,438	2,438	4,408	2,340	2,340
R^2	0.231	0.096	0.163	0.142	0.111	0.001	0.668	0.660
					Men			
Older brothers	0.000218	-0.0196	3.882	0.290	0.0227	0.000836	-0.0111	-0.00918
	(0.00698)	(0.0155)	(4.013)	(0.759)	(0.0200)	(0.00327)	(0.0261)	(0.0266)
No. of	4,423	3,546	1,980	1,980	1,980	4,666	1,889	1,889
R^2	0.195	0.077	0.116	0.104	0.131	0.002	0.660	0.648

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985, third and last-born with same-sex siblings. The dependent variables: (1) the rate of employment defined as the percentage of months in which the individual worked in the years 2013-2015; (2) the likelihood of obtaining a matriculation certificate; (3) the psychometric score, in this estimation, the year of the test is also monitored; (4) the score in the quantitative section of the psychometric exam, in this estimation, the year of the test is also monitored; (5) the likelihood of obtaining an academic degree; (6) the likelihood of employment in the IT industries (refers to the employment industry in 2015, and is defined as: manufacture of computer, electronic and optical equipment; communication services; computer programming, computer-related consulting and other related services, and information services); (7) likelihood of obtaining education in a vocational school; (8) the average real wage log in the years 2013-2015. In this estimation, all of the dependent variables in estimations (1)-(7) are monitored. The benchmark group is individuals with older sisters. Other controlled variables in all the estimations: age and age squared, socio-economic cluster from 1 to 20 of the residential areas at age 17, indicated standard of the parents' average real wages relative to the average in the year the individual was 24 years old, was the individual ever married, was the individual ever divorced, the siblings' average wage log decile calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40), origin according to the parents' country of birth [Israeli born, Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi), and Ethiopian origin (Ethiopia and Sudan); If one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent], was the individual born in the Soviet Union, and the difference in years between the first-born and the next, and between the middle child and the individual. Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

(5) Homogenous vs. Heterogeneous Environment

The study population includes only individuals with same-sex siblings, i.e., only older brothers or only older sisters, since we chose to focus on the extreme cases. However, it is also appropriate to examine the influence of the same-sex siblings' compared with a heterogeneous population, as the gaps may represent only the difference between the extreme groups: same-sex older siblings. In this section, we will compare the older siblings' wages with those that have older brothers and sisters. For this purpose, we expanded Model 2 to include a categorical variable for individuals with only older brothers, only

older sisters, or an older brother and sister. Table 8 lists the results of this model, for third and last-born women and men.

Table 8

Additional estimations – Influence of the older siblings' gender on wages, third and last-born with same-sex siblings or mixed-sex siblings

	(1) benchmark	(2) Sephardi	(3) Ashkena	(4) -Israeli born father	(5) -State Hebrew education	(6) -State Religious education	(7) -Low middle class	(8) Upper class
					Women			
Only older brothers compared with only older sisters	-0.0329**	-0.0198	-0.0794***	-0.0154	-0.0314**	-0.0570	-0.0149	-0.0762**
	(0.0143)	(0.0267)	(0.0286)	(0.0224)	(0.0153)	(0.0397)	(0.0185)	(0.0349)
Older brother and sister compared with only older sisters	-0.0153	-0.00297	-0.0828***	0.00898	-0.0135	-0.0496	-0.00202	-0.0209
	(0.0129)	(0.0241)	(0.0254)	(0.0202)	(0.0137)	(0.0379)	(0.0166)	(0.0325)
Only older brothers compared with an older brother and sister	-0.0176	-0.0168	0.00349	-0.0244	-0.0179	-0.00744	-0.0128	-0.0553**
	(0.0121)	(0.0212)	(0.0247)	(0.0191)	(0.0127)	(0.0360)	(0.0157)	(0.0282)
No. of observations	10,330	3,287	2,572	4,057	9,235	1,219	5,916	2,074
R^2	0.684	0.698	0.681	0.679	0.684	0.697	0.689	0.657
					Men			
Only older brothers compared with only older sisters	-0.0255	-0.0436	-0.0424	-0.00298	-0.0293*	0.00181	-0.0414**	0.00642
	(0.0156)	(0.0283)	(0.0318)	(0.0241)	(0.0164)	(0.0448)	(0.0199)	(0.0363)
Older brother and sister compared with only older sisters	-0.000173	0.0227	-0.0182	-0.00412	-0.00697	0.0561	-0.00610	0.0176
	(0.0130)	(0.0222)	(0.0271)	(0.0207)	(0.0137)	(0.0357)	(0.0165)	(0.0324)
Only older brothers compared with an older brother and sister	-0.0253*	-0.0663**	-0.0242	0.00114	-0.0224	-0.0543	-0.0353**	-0.0112
	(0.0139)	(0.0258)	(0.0273)	(0.0218)	(0.0146)	(0.0397)	(0.0178)	(0.0322)
No. of observations	10,579	3,395	2,642	4,121	9,487	1,394	6,149	2,119
R^2	0.652	0.669	0.640	0.642	0.647	0.699	0.663	0.631

Notes: The sample includes third and last-born non-ultra-Orthodox Jews born from 1975 to 1985. The dependent variable is the average real wage log in the years 2013-2015, in the years that the individual worked. Other controlled variables (not presented): the employment rate representing the percentage of months that the individual worked in the years 2013-2015, age and age squared, socio-economic cluster from 1 to 20 according to the CBS division of the residential areas at age 17, indicated standard of the parents' average real wages relative to the average in the year the individual was 24 years old, was the individual ever married, was the individual ever divorced, the siblings' average wage log decile calculated separately for women and men and separately for three age groups (30-33, 34-37 and 38-40), origin according to the parents' country of birth [Israeli born, Ashkenazi (European, American, Oceania and South African born), Sephardi (Asian or African born, except Ethiopia and Sudan), mixed origin (one parent is Sephardi and one is Ashkenazi), and Ethiopia and Sudan origin; if one of the parents is Israeli-born, the origin is determined according to the country of birth of the other parent], was the individual born in the Soviet Union, and the difference in years between the first-born and the next, and between the middle child and the individual. The low, middle and upper class are clusters 1-5, 6-15 and 16-20, respectively.
Standard deviations are presented in parentheses. * Indicates a 10% level of significance. ** Indicates a 5% level of significance. *** Indicates a 1% level of significance.

First, the test results reinforce the previous findings regarding the extreme cases where, as mentioned, the individuals have same-sex siblings. The predicted wage gaps between women with only sisters and women with only brothers remained similar across all specifications, with the benchmark at a significant gap of 3.3 percent, and the results are significant only for women of Ashkenazi origin, among girls with a State-Secular Jewish education, and among upper-class girls. For men the findings are less durable. The wage gap decreases from 3.5 percent ($P < 0.05$) to 2.5 percent ($P < 0.12$), and there are significant findings only among the State-Secular Jewish educated and the lower and middle class – similar to the specifics in the main estimation (Table 5).

This finding is particularly strong among women of Ashkenazi origin, with a woman following two brothers earning 7.9 percent less than a woman following two sisters, while a woman with a brother and sister earns 8.3 percent less than a woman with two sisters – and the difference between these two gaps is not significant. That is, in this subgroup, a female homogeneous environment is preferable by the same extent to both a male homogeneous environment and a heterogeneous environment in terms of earning capacity. For most specifications, the differences between a male homogeneous environment and a heterogeneous environment were not found to be significant, i.e., one brother is "enough" for creating the effect of the reduction in adult woman's achievement in the labor market compared to her achievements if she had grown up in a female homogeneous environment.

Among men, most of the specifics do not indicate significant gaps between the groups, therefore we have received further reinforcement that the findings for men are less strong. That is, the gender composition in the family has less impact on men compared to women in terms of their future wages. However, we note that the direction of influence of older siblings, both with respect to older sisters and with respect to a brother and sister, is negative in most cases, and for some of the specifications this is a significant gap: a man with only brothers earns an average of 2.5 percent less than a man with a brother and sister ($P<0.1$). Among individuals of Sephardi origin, the gap is higher (6.6 percent, $P < 0.05$), and among those in the middle-class (the top ten middle socioeconomic clusters), the gap reaches 3.5 percent ($P < 0.05$).

4. Conclusion

In the present study, we found that a female environment in childhood is beneficial in terms of future wages, especially with women from certain groups in the population: families of Ashkenazi origin, and among girls from high socioeconomic class residential areas. This finding is also durable when the comparison is made to girls with siblings of both genders. Older sisters also influence their younger brothers favorably, but this effect is found to be smaller and less strong in different forms of estimation.

These findings are consistent with the emerging economic literature on this subject, as well as the psychological literature. Possible explanations for this phenomenon are the greater investment of parents in children after sisters, due to the fact that the older sisters require less attention from parents compared to older brothers (Havron et al., 2019), and the fact that sisters contribute more to the cognitive development of their younger siblings in various areas (e.g. Qureshi et al., 2017; Stoneman et al., 1986; Minnett et al., 1983).

This study contributes in a number of ways: it joins the emerging economic literature on the influence of siblings' gender on more advanced stages of life, and provides additional evidence that older sisters are beneficial for women as well as for men to some extent. This study is also the first of its kind in the Israeli context. The study presents a comprehensive comparison that is supported by an econometric model, thereby reinforcing the assumption that the findings found regarding women born after two sisters compared to women born after two brothers can be applied to the other women in the population. For men, this justification is weaker, and in any case the findings are weaker and less consistent. However, the main contribution of the study is that it indicates the heterogeneity of the influence of the siblings' gender. In doing so, the study provides an opening for further research that will deal with the possible mechanisms that cause the differences in the influence found in families based on their origin and socioeconomic class.

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