Sibling Effects on Attitudes Towards Competition

by

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Sibling Effects on Attitudes Towards Competition

Koç University

Graduate School of Social Sciences and Humanities

This is to certify that I have examined this copy of a master's thesis by

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To my beloved mother and father, for their endless love and support towards all of my aspirations; to my dearest brother, for all the positive influences he has had on my preferences, and to both of my wonderful grandmothers, for being beautiful examples of confident women in my life.

ABSTRACT

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Recent research in economics has explored how competition preferences could be a partial explanation for differences in labor outcomes between men and women. This paper investigates how sibling gender compositions can give insights about competition preferences of young students, which may shape their occupational and economic preferences in the future. To understand the mechanisms behind students' competition preferences, we look at whether younger male siblings affect other predictors of competitiveness, such as risk attitude and self-confidence.

For eldest children with a single younger sibling, the gender of the younger sibling is random. Utilizing the random gender assignment, we examine the effect of this on competitive behavior of the eldest child.

Our analysis reveals that for eldest girls, having a younger brother increases competitiveness, while having a younger sisters decrease competitiveness. No significant impact is not observed for eldest boy. Additionally, for youngest girls, older brothers increase competition preferences, whereas older sisters have no noticeable impact on preferences for either gender. Self-confidence, rather than risk attitudes, appears to play a role in these impacts.

ÖZETÇE

Kardeşlerin Rekabete Yönelik Tutumlar Üzerindeki Etkileri

Deniz Hallik

Ekonomi Yüksek Lisansı

Eylül 2024

Ekonomi alanındaki son araştırmalar, rekabet tercihlerinin kadın ve erkekler arasındaki işgücü çıktılarındaki farklılıklar için nasıl kısmi bir açıklama olabileceğini araştırmaktadır. Bu makale, kardeşlerin cinsiyet kompozisyonlarının genç öğrencilerin rekabet tercihlerini nasıl etkileyebileceğini ve bunun da gelecekte mesleki ve ekonomik tercihlerini nasıl şekillendirebileceğini araştırmaktadır. Öğrencilerin rekabet tercihlerinin arkasındaki mekanizmaları anlamak için, küçük kardeşlerin risk tutumu ve özgüven gibi rekabetçiliğin başka belirleyicileri özelliklerini de etkileyip etkilemediğine bakıyoruz.

Tek bir küçük kardeşi olan en büyük çocuklar için, küçük kardeşin cinsiyeti rastgele olmaktadır. Rastgele cinsiyet atamasını kullanarak, bunun en büyük çocuğun rekabetçi davranışı üzerindeki etkisini inceliyoruz.

Analizimiz, en büyük kız çocukları için küçük bir erkek kardeşe sahip olmanın rekabetçiliği artırdığını, küçük bir kız kardeşe sahip olmanın ise rekabetçiliği azalttığını ortaya koymaktadır. En büyük erkek çocuk için bir etki gözlenmemektedir. Ayrıca, en küçük kızlar için, büyük erkek kardeşler rekabet tercihlerini artırırken, büyük kız kardeşlerin her iki cinsiyet için de tercihler üzerinde belirgin bir etkisi bulunmamıştır. Bu etkilerde risk tutumlarından ziyade, özgüvenin rol oynadığı görülmektedir.

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I would like to acknowledge the support, love, and care of our master's cohort. Both my classmates and teachers have made this experience truly valuable, it definitely would not have been the same if we did not have the feeling of community we built, I appreciated every moment we shared.

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Chapter 1

Introduction

Individual preferences may be impacted by various factors, with family structure playing a pivotal role in shaping beliefs and behaviors. Within this context, sibling dynamics may be a critical factor, as interactions among siblings can significantly influence the development of certain beliefs and preferences (Detlefsen et al., 2018). Competition is one such preference that can be shaped by sibling relations, potentially affecting future preferences. This paper examines how the gender composition of siblings may impact competition preferences, primarily using random variation provided by the gender of the younger sibling.

One critical factor influencing the development of competitive attitudes in children may be sibling competition for resources, such as parental attention. Children's preferences may be affected by the gender of their siblings. Sibling rivalry, or attitudes formed when siblings try to differentiate themselves from one another to gain parental attention is observed more in mixed-sex siblings (Sulloway, 1996). Meanwhile, siblings

may try to mimic each other's traits and adopt certain characteristics (Rust et al., 2000). These attitudes are commonly observed in sibling relations, which psychologists have been exploring for decades. More recently, economists have taken an interest in how the gender difference in competition preferences can be explained through sibling relations.

Gender differences in competitive preferences are well-established in the literature, and these preferences may partially explain variation in labor market outcomes for men and women (Bertrand, 2011). Therefore, studying the impact of sibling gender composition can provide insight into the non-cognitive social skills of young students, which may influence their occupational and economic preferences in the future. A critical issue of the gender gap in competition preferences is that more skilled women are opting out of competition with less skilled men: "In terms of money-maximizing choices, low-performing men enter the tournament too much and high-performing women do not enter enough." (Niederle and Vesterlund, 2011). Confidence can play a significant role in these situations, as the best candidates may opt out of competition due to a lack of self-confidence. Therefore, examining confidence alongside competition preferences offers deeper insight into students' beliefs about themselves.

It is important to consider the role of sibling relations while trying to understand the gender differences in competition preferences, as interactions between siblings can influence their economic preferences (Detlefsen et al., 2018). More recently, these effects have begun to be explored through an experimental economics perspective, where students participate in actual competitive games, instead of relying on subjective ratings (Okudaria et al., 2015). However, further research is needed to understand

the possible mechanisms behind the sibling gender impact.

In this thesis, we primarily use the random variation provided by the gender of the next younger sibling for eldest children, although we also analyze other sibling effects. For eldest children with only one younger sibling, the gender of the younger child is random. This allows us to measure the impact of the younger sibling on the eldest child because no matter why or how a family has a second child, once they have another child, the gender of that child is random. Utilizing this random gender assignment, we can examine its effect of the competitive behavior of the eldest children. Since selection issues may arise when focusing on older siblings (e.g., families with more children may differ in certain ways), we primarily rely on the random variation generated by the gender of the younger sibling in two-sibling families.

We also study the association of having older male siblings on younger children's competitive preferences to examine the broader applicability of this effect. In this analysis, we use rich controls that could potentially account for some of the selection effects that may be observed.

To understand the possible mechanisms behind students' competition preferences, we explore whether siblings affect other predictors of competitiveness, such as risk attitude and self-confidence, which is one of the unique contributions of this study. Additionally, this study makes other novel contributions to the literature, including a quite large sample size and to our knowledge, the earliest age in terms of sibling effects focused on within experimental economics.

Chapter 2

Literature Review

The effect of sibling sex composition has been explored in psychology for decades (Sulloway 1996). More recently, economists have taken an interest in these relationships as well. This study seeks to understand how the gender of the next younger sibling can shape an important preference parameter, which may play a significant role in future labor market preferences and outcomes.

From a psychological perspective, two important sibling interactions shape personalities: de-identification and social learning. When a new child is born, siblings compete for parental attention, which may lead them to adopt differing characteristics. This process is called "de-identification," where siblings try to adopt opposite characteristics of their siblings. This effect can be impacted by birth order and is more pronounced in mixed-sex siblings (Sulloway 1996). On the other hand, the interactions of siblings can lead them to learn from each other and adopt similar characteristics. In the literature, this process is known as "social learning". Research

shows that gender norms are less pronounced for younger siblings with an older sibling of the opposite sex (Rust et al., 2000). These psychological foundations of sibling dynamics may be mechanisms that interact with competition preferences of students.

From an economics perspective, extensive research has been conducted to understand why labor outcomes differ for men and women (Goldin et al. 2006). Over the past few decades, studies have increasingly explored how gender differences in competitive preferences may explain these variations. Findings show that while both genders are overconfident, "men are significantly more overconfident than women," and tournament entry is increased with overconfidence (Niederle and Vesterlund, 2011). To understand the reasons behind gender differences in competition, other preferences must also be considered.

We extend the research by exploring whether sibling gender compositions also influence competition preferences, as well as self-confidence, and risk attitudes. We utilize the random assignment of the gender of the next younger sibling, which can be thought of as a "natural experiment that allows for the estimation of causal effects of the next younger sibling's gender" (Dudek, 2022). By investigating sibling relations, we aim to address additional factors contributing to gender differences in competitive behaviors.

One of the first researches that utilized this random assignment to understand sibling effects on student's competition preferences through a game with real incentives in an experimental economics setup, instead of a self-reported survey, was Okudaria et al. in 2015. Their research reveals that older sisters have a negative impact on the competition preferences of younger brothers, while having a positive effect on

younger sisters. However, they did not explore the possible mechanisms behind these competition preferences.

Later, in 2018, Detlefsen et al. examined three main domains of economic preferences, time, risk, and trust, in an experimental setup. Their findings show that second-born children are more risk taking only in same sex-sibling relationships. Additionally, second born students are more trusting, with stronger results for mixed-sex siblings, whereas they are less patient, regardless of sex composition. Although this research did not investigate competition preferences, their study offers valuable insights on how sibling sex composition impacts other economic preferences.

Our study offers new contributions to the literature by focusing on a younger sample with an average age of 10, compared to the previous two studies which focused on adolescent students with an average age of 16. This approach adds a new perspective on how sibling gender compositions may shape competitiveness at an earlier developmental stage. Additionally, we examine possible mechanisms behind competitive preferences of siblings, namely self-confidence and risk attitudes.

The cultural and educational environment may also play a significant role in shaping personalities and non-cognitive social skills of students (Buehren et al., 2016). The World Bank policy research paper demonstrates the change in competitiveness among female students who were treated through a women's empowerment training. The study initially finds that in control communities, "boys surrounded by sisters are less competitive," but in treatment communities, boys with "empowered" sisters exhibit more competitive behaviors (Buehren et al., 2016). This suggests that early interventions can significantly alter the impact of sibling dynamics, particularly in

relation to competition preferences. Therefore, understanding the current state of young students in terms of their competitiveness, self-confidence, and risk attitudes can help shape educational policies that foster environments where all students can thrive and develop essential skills for a successful future.

Chapter 3

Methodology

3.1 Data collection

Our data is collected from a set of public elementary schools, visited for the baseline data collection a large-scale project on educational interventions around Istanbul during May-June 2022. [1] This baseline dataset consists of around 10,000 students with an average age of 10, coming from 140 schools and 419 classes.

We primarily use the behavioral task on competitive preferences and survey data asking about number of siblings to understand sibling effects on competition preferences. Specifically, we have information on how many older and younger male/female siblings a student has, and data from experimental games that allow us to measure students' competition preferences, risk attitudes, and self-confidence levels.

[1] IRB approval was obtained from Koc University, protocol no. 2020.303.IRB3.110.

One shortcoming of this dataset is that we did not collect the birth order or age of siblings. Therefore, we are restricted to using information about children who do not have an elder sibling, and those with only one younger sibling. Since in two-sibling relationships, we can at least be certain of the gender order. So, this paper mainly focuses on the impact of the gender of the second born sibling, on the first born child. Nevertheless, we consider students with more than one sibling, to see if our results carry on even if we do not control for age gaps or sibling orders.

3.1.1 Competition Game

To measure competition preferences, we introduced a "numbers game", where for each question, students had to select the two numbers that added up to 100, out of six possible two-digit options. They played this game for 2 minutes to solve as many of the 20 questions possible. Students were told that they would gain one point for each correct answer in this round.

After the first round, students were asked the competition preference question, which seeks to understand if students want to gain points "per question" or by "competing". If they choose to gain points "per question," they would gain one point for every correct pair found.

However, if the student chose to gain points by "competing," they would be paired with a random student who played this game before, whose score was recorded. If the student has more correct answers than the other student, they win, and each point from their correct answers is multiplied by 3. But if the student has less correct answers than their opponent, they lose, in which case they collect 0 points for that

task.

As an example, if the randomly matched student had more correct responses, e.g. 7 correct pairings, the student would collect zero points since $7 > 5$ and the loser does not gain any points. But if the random student had less correct pairings, let's say 3, then $5 > 3$, and the student is the winner. In this case, the student's correct responses each get triple the amount of points, and the student gains 15 points.

Therefore, a student who opts into competition has a chance of gaining more points, or not gaining any. Risk attitudes and confidence levels of students may also play a role in their choices, so we explore the impact of these skills on their competition preferences.

3.1.2 Guesses about Self and Others

After the choice, without giving any feedback about their actual performances in the numbers game, we asked students to guess how many correct answers they think they will get, and how many correct answers they think a random student from another school will get. These measures allowed us to gain insight into students' self-confidence levels and views about others. Overall, in line with the literature, we see that all students are overconfident, but male students are more overconfident than female students.

3.1.3 Risk

For this risk game, we introduced a bag with 5 balls inside, of which four balls were yellow and one ball was black. Students had to decide how many of the five

balls they would like to pick from the bag. The caveat was that each selected yellow ball would gain them one point, but if the black ball was in the selection, all other points would be erased, so they would gain zero points.

Students had to decide how many balls they would like to take from the bag with these conditions. They do not select balls one by one, but rather have to select the number from the beginning. So we expected risk takers to select closer to four balls, whereas risk averse students would select closer to one ball.

3.2 Categorizing Sibling Relations

3.2.1 Eldest Siblings

Utilizing the random assignment of the gender of the second sibling, we first assess eldest male and female siblings, who have only one younger male or female sibling. We define these two sibling pairings as: "Next Younger Sibling". This dummy variable contains eldest siblings with a younger male sibling as 1, and those with a female younger sibling with 0. As seen in the "Eldest Siblings" figure, there are 1147 eldest male siblings and 1304 eldest female siblings. Our "next younger sibling" variable contains 833 younger brothers and 701 younger sisters. This setup allows us to investigate the impact of the gender of the single younger sibling on eldest siblings.

Then, we expand our analyses to eldest siblings with more than one younger brother or sister. Here, although we do not know the order of siblings due to our data limitations, we can still observe the impact of having at least one male or female siblings. Here, the dummy variable "any younger male sibling" contains eldest

students with at least one younger brother as 1 and those that only have younger sisters as 0. However, because some eldest siblings might have male and female younger siblings, the value of this dummy variable does not include all eldest siblings with younger sisters. Therefore, we also define the "any younger female sibling" variable, so that we can capture gender impacts properly for each case.

During our analysis, we exclude students who reported having more than 5 younger siblings, as well as more than 5 older siblings, because some students assumed their cousins or neighbours to be their sisters or brothers. This amounts to dropping 407 observations.

3.2.2 Youngest Siblings

Finally, we explore the impact older siblings might have on younger siblings. Here, we assess the impact of next older sibling in two-sibling relations defined as "Next Older Sibling" and then the impact of any older male or female sibling within multiple sibling relations, defined as "Any older sibling of a particular gender", similarly as the prior section.

Throughout our analyses, we control for many variables, such as total number of siblings, to account for possible endogenous decisions of parents to have more or less children based on the gender of their existing children.

Note that the 663 only children in our dataset are omitted in this section, as they are not the main focus of this paper. However, we mention their competition preferences at the end as well.

3.3 Hypotheses

Gender norms in this country especially impact these social skills, as the older sister is seen as more of someone who can be of use to take care of the younger siblings, whereas the eldest male is supposed to "protect" the younger siblings. Sibling rivalry would also be more pronounced for the older sister, as she is supposed to prove herself. Older male siblings may be more likely to cooperate and support the younger siblings, instead of competing for attention, as they do not need to compete for parental attention as much as females do.

Chapter 4

Results

4.1 Eldest Siblings

Initially, we aim to understand the causal effect of the younger sibling's gender on the eldest sibling. Throughout our analysis, "next younger sibling" refers to students with only one sibling, while "any sibling" refers to students with one or more siblings. Although our dataset does not have information on sibling birth order, we extend our analysis to eldest students with multiple younger siblings, controlling for number of total siblings.

4.1.1 Next Younger Sibling

Figure A.1 illustrates the number of eldest siblings by gender, where there are 1,147 eldest male siblings and 1,304 eldest female siblings in total. Of these, 726 older brothers and 808 older sisters have a single younger sibling. Our initial analysis

focuses on the 1,534 students with only one younger sibling, before expanding our analysis to the total population of 2,451 eldest students in our sample.

As shown in Figure A.3, eldest male students with one younger brother opt into competition at a rate of 53.10%, compared to 44.14% of female students with one younger brother, and we observe an even lower rate for female students with a younger sister, at 39.07%.

Initially, we model the competition preference of eldest students with only one younger sibling as follows:

$$Competition_i = \beta younger brother + \gamma X + u \tag{4.1}$$

Where *competition* refers to the competition preference of person i, "*younger brother*" is a dummy variable equal to 1 if the next younger sibling is male and 0 if female, and X is a vector of control variables.

Table A.6: Eldest Siblings, Next Younger Male, shows a strong positive effect of being male on competition preferences. In the full sample, male students are more likely to prefer competition by 6.7 percentage points. This effect of being male increases to 10.4 percentage points when focusing on eldest siblings with only one younger sibling.

Although having one younger male sibling does not seem to play a significant role in competition preferences of eldest siblings, when we look at this impact by gender, as in Table A.7, it is revealed that having a younger brother positively impacts competition preferences of eldest female students, at a significant 7.3 percentage points. This effect is still observed when we add risk attitudes and confidence levels,

which are both mechanisms that have a significant impact on competition preferences of eldest female students in our observations. Conversely, younger female siblings have a negative impact on eldest female siblings' competition preferences.

No significant effects of younger siblings are found for eldest male students.

These results show that eldest female students that have a younger brother are more competitive than eldest female students with a younger sister, as they may be impacted by the higher competitiveness of the younger sibling.

Table A.8 presents the regression results comparing competitiveness between males in the overall sample, and eldest females with younger brothers in the two-sibling sample. While there is still a statistically significant difference between the competitiveness of females with younger brothers and males, the difference of 5.22 percentage points is less than the difference between boys and girls in the whole sample.

4.1.2 Any Younger Sibling

We now expand the analysis to eldest students with multiple younger siblings. In this section, "any younger sibling" refers to the 2,451 students with up to eight siblings, as previously shown in Figure A.2. Although birth order and age gaps are unknown here, we assess whether our earlier findings persist. We analyze the impact of younger brothers and younger sisters separately, as some students have younger siblings of both genders. Also, it must be noted that there are more older sisters than there are older brothers.

As shown in Table A.9, being male continues to have a stronger impact on com-

petition preferences for eldest siblings, consistent with the findings in two-sibling relationships. However, having at least one younger brother does not have a statistically significant effect.

When we look at this impact on eldest siblings by gender, eldest female students are positively impacted by their younger brother at 5.3 percentage points, but this is not as strong as the impact we saw in the two-sibling relationships, which was at 7.3 percentage points. The impact of younger brothers on competition preferences is also less significant than self-confidence for these students. For eldest male students, however, younger siblings do not significantly impact competition preferences, nor do any of the other mechanisms.

Table A.11 highlights a stronger negative effect of younger sisters. We see that for eldest siblings, having any younger sister has a significantly negative impact on competition preferences, at -5.8 percentage points. In this table, we also see that the number of total siblings has a 3.7 percentage point positive impact on the competitive preferences of students.

The impact of younger siblings is more defined and statistically significant for eldest female siblings, at -7.9 percentage points, as shown in Table A.12. The positive impact of younger brothers for eldest female siblings was at 5.3 percentage points, as shown earlier. For eldest female students, number of total siblings and self confidence also significantly impact competition preferences, at 4.8 and 1.4 percentage points, respectively.

We find no evidence that risk attitudes significantly influence competition preferences of eldest students. In the next section, we examine risk attitudes and

self-confidence in greater detail to understand the role of sibling relations in shaping these preferences.

Overall, we see that female eldest siblings' competitive preferences are very responsive to the gender of the younger sibling(s). To give perspective, if we compare the competition percentages of eldest sisters with only sisters, and eldest sisters with only brothers, we see a negative 6.22 percentage point effect.

4.2 Mechanisms

Risk and self-confidence are important potential mechanisms of competitive choice. In this section, we try to understand whether sibling effects on competitive preference work through their effects on risk attitude and self-confidence.

4.2.1 Risk

We begin by examining the role of sibling composition in shaping risk attitudes, focusing on whether having younger male siblings, the total number of siblings, or being the eldest sibling influences the risk attitudes of male and female students.

The results suggest that having younger male siblings does not significantly affect the risk preferences of either gender. Similarly, being the eldest sibling does not appear to have an impact on risk attitudes. However, for eldest siblings with multiple younger male siblings, the total number of siblings is associated with an increase in risk attitudes, at 7.8 percentage points for females, and 8.9 percentage points for males, both statistically significant at the 5% level.

When we expand the analysis to the full sample, the effect of total siblings remains positive but diminishes slightly in magnitude. The total number of siblings increases risk preferences at 4.2 percentage points for female students and 2.7 percentage points for male students.

4.2.2 Self-Confidence

Next, we assess how sibling composition impacts self-confidence.

Having a younger male sibling does not seem to have a significant impact on self-confidence, for neither gender of eldest siblings. This may be explained by the fact that being male significantly impacts self-confidence, so the younger male sibling's impact could be outweighed, especially for eldest male students.

Interestingly, for eldest females, being the eldest sibling has a strong significant impact on their self-confidence, at 30.9 percentage points. This may explain why the younger male is not impacting the eldest female sibling. Similarly, we observe the positive effect of being the eldest sibling on self-confidence for male students, at 35.2 percentage points.

However, the total number of siblings has a negative effect on self-confidence of male students. Eldest male students with younger brothers experience a decrease in self-confidence, at -36 percentage points. The effect remains significant at -5.3 percentage points for the total population of male students. Female students' self-confidence, in contrast, is not significantly affected by the total number of siblings they have.

To further investigate, we extend the analysis to the full sample to understand

how students' gender, total number of siblings, and birth order impact both risk attitudes and confidence levels.

4.2.3 Mechanisms Overall

We now aim to understand how each mechanism might be impacted within the total population. There are several observations to take note from Tables A.17 and A.18.

First, being male has a significant positive impact on self-confidence, at 45.6 percentage points. Neither risk attitudes nor students' guess about their peers' performances show a significant results. This finding highlights that gender plays a crucial role in shaping confidence levels, which may also explain why male students are more likely to opt into competition, and influence the competition preferences of their female siblings.

Second, being the eldest sibling has a similarly significant positive impact on confidence, with an increase of 34.5 percentage points, as shown in Table A.17.

In contrast, the total number of siblings has a significant negative impact on self-confidence levels at -19 percentage points, which we similarly observed in Table A.16. This result suggests that eldest students, who used to initially received more parental attention when they did not have any siblings, may experience a decline in confidence as they have to share their parents time and resources with additional siblings.

When exploring risk preferences, on the other hand, the total number of siblings significantly increase risk preferences of students by 3.4 percentage points.

Finally, we also observe that being the youngest sibling has a negative impact on confidence levels, at -27.6 percentage points, as shown in Table A.18. This finding suggests that birth order and gender composition influences siblings in different ways.

4.3 Youngest Siblings

In this section, we shift our focus to examine sibling relationships from the opposite angle, specifically trying to understand whether the preferences of youngest students are impacted by the gender of their older siblings. While we cannot argue that the gender of the next older sibling is random, as we could in the previous section, we aim to explore the effects of older siblings on youngest students' competition preferences. This perspective is important because older siblings may be more likely to provide role models, and we know that these students have been exposed to these siblings since their birth.

4.3.1 Youngest Siblings, Next Older Sibling

We observe the positive impact of being male on competition preferences for youngest siblings as well, at 8.3 percentage points for students with one older sibling. For female students in two-sibling relationships, having an older brother increases their competition preferences by 9 percentage points. We do not observe any impact on competition preferences for male youngest students. We also do not observe any significant impact of risk attitudes or confidence levels on the competition preferences of youngest siblings of either gender.

4.3.2 Youngest Siblings, Any Older Sibling

When we expand our analysis to youngest female students with at least one older brother, the impact is at a significantly positive 6.4 percentage points, where risk attitudes and self-confidence also partially explains competition preferences, at 2.4 and 0.7 percentage points respectively.

Therefore, having an older brother increases the competition preferences of youngest female student, similar to how younger brothers increased eldest female students competition preferences.

In our sample, we do not observe any significant impact of older sisters on youngest students' competition preferences for either gender.

This result reinforces the result from the previous analysis of eldest siblings: the effect of sibling gender is more pronounced for females, and having older and younger brothers tend to make girls more competitive.

4.4 Only Children

Finally, we take a look at competition preferences of only children. As shown in Table A.5, our sample includes 663 only children, of which 320 are female and 343 are male.

When we look at the effect of being an only child on competition preferences in Table A.23, we see a significant negative impact at 6 percentage points. For male only children, this number is at 7, and 5 for female only children.

For students who have siblings, the effect of total number of siblings is significantly

positive, as shown in Table A.24, at 1.3 percentage points for all students with siblings, 1 percentage points for those who are male and 1.7 percentage points for those who are female. So overall, in line with the rest of our findings, having a sibling can increase competition preferences, with each sibling increasing competitive preference by about 1 to 2 percentage points.

Chapter 5

Conclusions and Future Work

Overall, our results show that female students' competition preferences are more impacted by sibling gender relations, than male students' are. For eldest sisters, younger brothers increase competitiveness, whereas younger sisters decrease competitiveness. For youngest sisters, older brothers are associated with a higher competitive preference, while there are no significant effects of older sisters. Self-confidence, more than risk attitudes, appears to play a crucial role in these impacts. We also find some results that having more siblings increase competitive attitude, which may hint at a resource competition story.

The main limitation of our study is that we do not know the sibling order or age gaps. Still, our results are strong, in the sense that they show that even if we do not differentiate by age, having a younger brother or an older brother is likely to create differential effects for females than not having brothers.

An interesting research question is whether these effects are persistent, that is,

whether the differences in competitive behavior persist, are amplified or mitigated, as the children get older. Further research that collects more data on the family environment, and how much time brothers and sisters interact could also be useful to better understand the mechanisms of these sibling effects. This can also provide guidance for future interventions that aim to empower girls or foster self-confidence in children, to create better labor market outcomes for females.

Appendix A

Figures and Tables

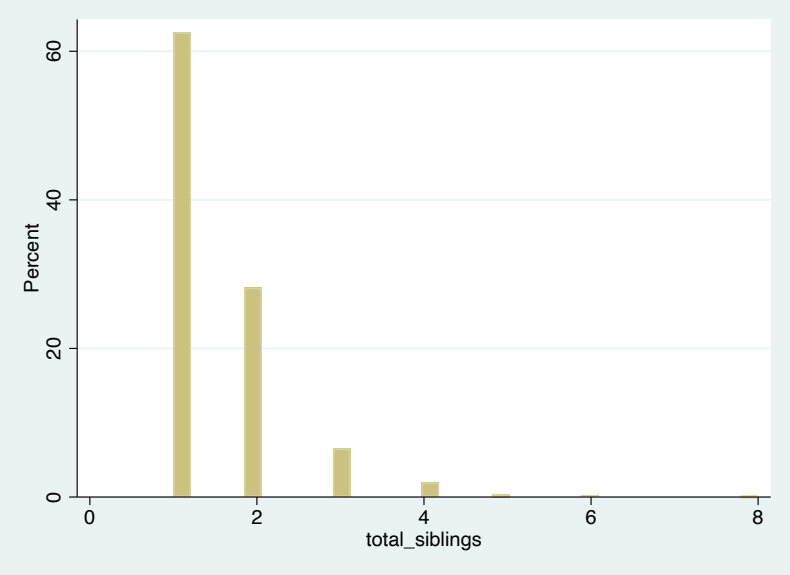

Figure A.1: Total Siblings, percent

A.1 Summary Statistics

Total Sibling

Number of Siblings	Frequency
0	663
1	3,008
2	2,948
3	1,520
4	821
5	457
6	300
7	195
8	153
...	...
Total	10,445

Table A.1: Number of total siblings

Variable	Obs	Mean	Std. Dev.	Min	Max
male	9,379	0.506	0.500	0	1
comp_choice	8,715	0.457	0.498	0	1
risk_n	9,372	3.056	1.050	1	5
guess_own	8,806	8.791	5.305	0	20
guess_other	8,740	7.732	4.819	0	20

Table A.2: Data Collection: Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
next_younger_male	1,534	0.543	0.498	0	1
any_younger_male	2,451	0.639	0.480	0	1
any_younger_female	2,451	0.581	0.494	0	1

Table A.3: Eldest Siblings: Summary

Number of Total Siblings, of the Eldest Children

	Eldest Siblings		Eldest Male Siblings		Eldest Female Siblings	
# of total siblings	Male (Older Brothers)	Female (Older Sisters)	Male (Younger Brother)	Female (Younger Sister)	Male (Younger Brother)	Female (Younger Sister)
1	726	808	381	345	452	356
2	315	376	247	218	286	301
3	75	86	67	65	77	78
4	21	27	19	19	21	24
5	5	5	5	5	5	5
6	4	2	4	4	2	2
7	0	0	0	0	0	0
8	1	0	1	1	0	0
Total	1147	1304	724	657	843	766

next_younger_sibling_male

any_younger_sibling_male

any_younger_sibling_female

Figure A.2: Eldest Siblings

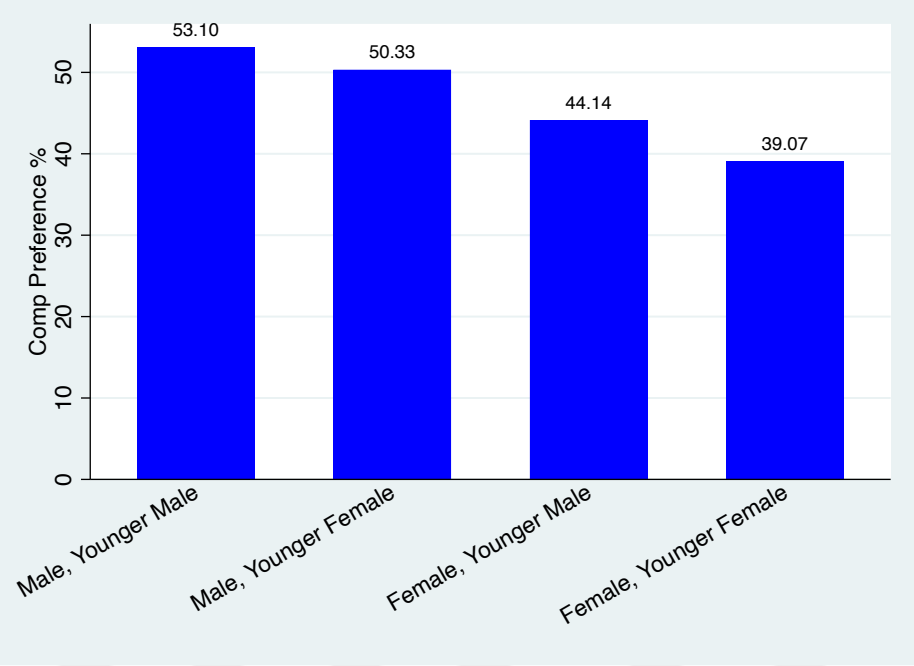

Figure A.3: Eldest Students' Competition Preferences.

Variable	Obs	Mean	Std. Dev.	Min	Max
next_older_male	1,474	0.530	0.499	0	1
has_older_male	3,401	0.690	0.463	0	1
has_older_female	3,402	0.648	0.478	0	1

Table A.4: Youngest Siblings: Summary

Gender	Number
Female	320
Male	343
Total	663

Table A.5: Only Children, by gender.

A.2 Eldest Siblings

A.2.1 Next Younger Sibling

Eldest Siblings, Next Younger Male

	(Full Sample)	(Eldest Sibling)	(Eldest Siblings)
male	0.067***	0.104***	0.099***
	(0.01)	(0.03)	(0.03)
next_younger_sibling_male		0.033	0.035
		(0.03)	(0.03)
risk			0.021
			(0.01)
guess_own			0.008**
			(0.00)
guess_other			-0.009**
			(0.00)
Constant	0.423***	0.381***	0.321***
	(0.01)	(0.02)	(0.05)
R-squared	0.00	0.01	0.02
N	8715	1450	1433

* p<0.1, ** p<0.05, *** p<0.01.

Table A.6: Eldest Siblings, Next Younger Male

Notes: This table shows competition preferences of eldest siblings.

Eldest Siblings, Next Younger Male (by Gender)

	Male	Male	Female	Female
next_younger_sibling_male	-0.010	-0.004	0.073**	0.065*
	(0.04)	(0.04)	(0.03)	(0.03)
risk		0.001		0.035**
		(0.02)		(0.02)
guess_own		-0.002		0.018***
		(0.00)		(0.00)
guess_other		-0.006		-0.013***
		(0.01)		(0.00)
Constant	0.508***	0.573***	0.358***	0.202***
	(0.03)	(0.07)	(0.03)	(0.07)
R-squared	0.00	0.01	0.01	0.03
N	687	680	763	753

* p<0.1, ** p<0.05, *** p<0.01.

Table A.7: Eldest Siblings, Next Younger Male (by Gender)

Notes: This table compares competitiveness between eldest males and females with only one younger sibling. The results indicate that eldest females' competition preferences are influenced by their younger brother, at a statistically significant 7.3 percentage.

Females with Younger Brothers and All Male Students

	(1)
comp_choice	-0.0565**
	(-2.93)
N	5204

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A.8: Gender difference between males and females with younger brothers

Notes: This table presents the t-test results comparing competitiveness between males and eldest females with younger brothers. The statistically significant result indicates that females with younger brothers are 5.65 percentage points less likely to choose competitive options compared to the total population of males.

A.2.2 Any Younger Sibling

Eldest Siblings, Any Younger Sibling Male

	(Full Sample)	(Eldest Siblings)	(Eldest Siblings)
male	0.067***	0.104***	0.099***
	(0.01)	(0.02)	(0.02)
any_younger_sibling_male		0.028	0.029
		(0.02)	(0.02)
total_siblings		0.022	0.021
		(0.01)	(0.01)
risk			0.013
			(0.01)
guess_own			0.009***
			(0.00)
guess_other			-0.007**
			(0.00)
Constant	0.423***	0.361***	0.293***
	(0.01)	(0.03)	(0.05)
R-squared	0.00	0.01	0.02
N	8715	2302	2270

* p<0.1, ** p<0.05, *** p<0.01.

Table A.9: Eldest Siblings, Any Younger Sibling Male

Notes: This table compares competitiveness between eldest students with one or more brother(s).

Eldest Siblings, Any Younger Sibling Male (by Gender)

	Male	Male	Female	Female
any_younger_sibling_male	-0.000	0.006	0.053*	0.045
	(0.03)	(0.03)	(0.03)	(0.03)
total_siblings	0.019	0.015	0.027	0.025
	(0.02)	(0.02)	(0.02)	(0.02)
risk preference		0.006		0.018
		(0.02)		(0.01)
guess_own		0.002		0.014***
		(0.00)		(0.00)
guess_other		-0.005		-0.008*
		(0.00)		(0.00)
Constant	0.487***	0.491***	0.338***	0.219***
	(0.04)	(0.07)	(0.04)	(0.06)
R-squared	0.00	0.00	0.01	0.02
N	1081	1061	1221	1209

* p<0.1, ** p<0.05, *** p<0.01.

Table A.10: Eldest Siblings, Any Younger Sibling Male (by Gender)

Notes: This table compares competitiveness between eldest males and females with one or more brother(s).

Eldest Siblings, Any Younger Sibling Female

	(Full Sample)	(Eldest Siblings)	(Eldest Siblings)
male	0.067***	0.103***	0.098***
	(0.01)	(0.02)	(0.02)
any_younger_sibling_female		-0.058***	-0.057**
		(0.02)	(0.02)
total_siblings		0.039***	0.037**
		(0.01)	(0.01)
risk			0.014
			(0.01)
guess_own			0.009***
			(0.00)
guess_other			-0.007**
			(0.00)
Constant	0.423***	0.388***	0.321***
	(0.01)	(0.03)	(0.05)
R-squared	0.00	0.02	0.02
N	8715	2302	2270

* p<0.1, ** p<0.05, *** p<0.01.

Table A.11: Eldest Siblings, Any Younger Sibling Female

Notes: This table compares competitiveness between eldest males and females with one or more sister(s).

Eldest Siblings, Any Younger Sibling Female (by Gender)

	Male	Male	Female	Female
any_younger_sibling_female	-0.038	-0.042	-0.079***	-0.071**
	(0.03)	(0.03)	(0.03)	(0.03)
total_siblings	0.025	0.023	0.053**	0.048**
	(0.02)	(0.02)	(0.02)	(0.02)
risk		0.007		0.019
		(0.02)		(0.01)
guess_own		0.002		0.014***
		(0.00)		(0.00)
guess_other		-0.005		-0.008*
		(0.00)		(0.00)
Constant	0.499***	0.506***	0.379***	0.256***
	(0.04)	(0.07)	(0.03)	(0.06)
R-squared	0.00	0.00	0.01	0.03
N	1081	1061	1221	1209

* p<0.1, ** p<0.05, *** p<0.01.

Table A.12: Eldest Siblings, Any Younger Sibling Female (by Gender)

Notes: This table compares competitiveness between eldest males and females with one or more sister(s).

A.2.3 Mechanisms

Risk Preferences, Female

	Two-Siblings	Multiple Siblings	All
next_younger_sibling_male	-0.075		
	(0.08)		
any_younger_sibling_male		-0.016	
		(0.06)	
total_siblings		0.078**	0.042***
		(0.04)	(0.01)
eldest_siblings			0.072**
			(0.04)
Constant	3.062***	2.964***	2.935***
	(0.06)	(0.08)	(0.04)
R-squared	0.00	0.00	0.00
N	808	1303	4627

* p<0.1, ** p<0.05, *** p<0.01.

Table A.13: Risk Preferences, Female

Risk Preferences, Male

	Two-Siblings	Multiple Siblings	All
next_younger_sibling_male	-0.050		
	(0.07)		
any_younger_sibling_male		-0.087	
		(0.06)	
total_siblings		0.089**	0.027***
		(0.04)	(0.01)
eldest_siblings			0.014
			(0.04)
Constant	3.003***	2.954***	2.978***
	(0.05)	(0.07)	(0.03)
R-squared	0.00	0.00	0.00
N	726	1146	4743

* p<0.1, ** p<0.05, *** p<0.01.

Table A.14: Risk Preferences, Male

Self Confidence, Female

	Two-Siblings	Multiple Siblings	All
next_younger_sibling_male	0.394		
	(0.30)		
any_younger_sibling_male		0.391	
		(0.25)	
total_siblings		0.223	-0.004
		(0.18)	(0.04)
eldest_siblings			0.309**
			(0.15)
Constant	0.613***	0.398	0.685***
	(0.22)	(0.29)	(0.13)
R-squared	0.00	0.00	0.00
N	757	1225	4328

* p<0.1, ** p<0.05, *** p<0.01.

Table A.15: Self Confidence, Female

Self Confidence, Male

	Two-Siblings	Multiple Siblings	All
next_younger_sibling_male	-0.131		
	(0.33)		
any_younger_sibling_male		-0.014	
		(0.28)	
total_siblings		-0.360**	-0.053*
		(0.14)	(0.03)
eldest_siblings			0.352**
			(0.16)
Constant	1.916***	2.222***	1.403***
	(0.25)	(0.29)	(0.12)
R-squared	0.00	0.01	0.00
N	680	1072	4399

* p<0.1, ** p<0.05, *** p<0.01.

Table A.16: Self Confidence, Male

Mechanisms Overall, Eldest

	Risk	Guess_Own	Guess_Other
male	-0.011	0.465***	-0.140
	(0.02)	(0.12)	(0.11)
total_siblings	0.034***	-0.190***	-0.162***
	(0.01)	(0.03)	(0.03)
eldest_siblings	0.043	0.345**	0.022
	(0.03)	(0.14)	(0.12)
Constant	2.964***	8.946***	8.205***
	(0.03)	(0.13)	(0.13)
R-squared	0.00	0.01	0.00
N	9370	8804	8739

* p<0.1, ** p<0.05, *** p<0.01.

Table A.17: Mechanisms Overall, Eldest Siblings

Mechanisms Overall, Youngest

	Risk	Guess_Own	Guess_Other
male	-0.011	0.466***	-0.144
	(0.02)	(0.12)	(0.11)
total_siblings	0.029***	-0.235***	-0.160***
	(0.01)	(0.03)	(0.03)
youngest_sibling	-0.022	-0.276**	0.072
	(0.02)	(0.12)	(0.11)
Constant	2.995***	9.250***	8.180***
	(0.03)	(0.15)	(0.13)
R-squared	0.00	0.01	0.00
N	9370	8804	8739

* p<0.1, ** p<0.05, *** p<0.01.

Table A.18: Mechanisms Overall, Youngest Siblings

A.3 Youngest Siblings

A.3.1 Youngest Siblings, Next Older Sibling

Youngest Siblings, Next Older Sibling Male

	Full Sample	Two-Siblings	Two-Siblings
male	0.067***	0.083***	0.078***
	(0.01)	(0.03)	(0.03)
next_older_sibling_male		0.040	0.040
		(0.03)	(0.03)
risk			0.018
			(0.01)
guess_own			0.005
			(0.00)
guess_other			-0.004
			(0.00)
Constant	0.423***	0.361***	0.296***
	(0.01)	(0.02)	(0.05)
R-squared	0.00	0.01	0.01
N	8715	1399	1375

* p<0.1, ** p<0.05, *** p<0.01.

Table A.19: Youngest Siblings, Next Older Sibling Male

Notes: This table shows competition preferences of youngest siblings.

Youngest Siblings, Next Older Sibling Male (by Gender)

	Male	Male	Female	Female
next_older_sibling_male	-0.003	-0.008	0.090**	0.094**
	(0.04)	(0.04)	(0.04)	(0.04)
risk		0.022		0.013
		(0.02)		(0.02)
guess_own		0.007		0.002
		(0.00)		(0.01)
guess_other		-0.003		-0.005
		(0.00)		(0.01)
Constant	0.466***	0.356***	0.333***	0.312***
	(0.03)	(0.07)	(0.03)	(0.07)
R-squared	0.00	0.01	0.01	0.01
N	748	736	651	639

* p<0.1, ** p<0.05, *** p<0.01.

Table A.20: Youngest Siblings, Next Older Sibling Male (by Gender)

Notes: This table shows competition preferences of youngest siblings, by gender.

A.3.2 Youngest Siblings, Any Older Sibling

Youngest Siblings, Any Older Sibling Male

	Has Older Brother	Has Older Brother	Has Older Brother
male	0.058***	0.058***	0.054***
	(0.02)	(0.02)	(0.02)
has_older_brother_youngest	0.021	0.017	0.020
	(0.02)	(0.02)	(0.02)
total_siblings		0.006	0.003
		(0.01)	(0.01)
risk			0.021**
			(0.01)
guess_own			0.006***
			(0.00)
guess_other			-0.008***
			(0.00)
Constant	0.387***	0.379***	0.327***
	(0.02)	(0.02)	(0.04)
R-squared	0.00	0.00	0.01
N	3196	3196	3145

* p<0.1, ** p<0.05, *** p<0.01.

Table A.21: Youngest Siblings, Any Older Sibling Male

Notes: This table shows competition preferences of youngest siblings, with older brothers.

Youngest Siblings, Any Older Sibling Male (by Gender)

	Male	Male	Female	Female
has_older_brother_youngest	-0.010	-0.010	0.051*	0.057*
	(0.03)	(0.03)	(0.03)	(0.03)
total_siblings	-0.001	-0.002	0.012	0.009
	(0.01)	(0.01)	(0.01)	(0.01)
risk		0.018		0.023**
		(0.01)		(0.01)
guess_own		0.005*		0.007*
		(0.00)		(0.00)
guess_other		-0.007**		-0.008**
		(0.00)		(0.00)
Constant	0.467***	0.422***	0.343***	0.283***
	(0.03)	(0.05)	(0.03)	(0.05)
R-squared	0.00	0.00	0.00	0.01
N	1702	1668	1494	1477

* p<0.1, ** p<0.05, *** p<0.01.

Table A.22: Youngest Siblings, Any Older Sibling Male (by Gender)

Notes: This table shows competition preferences of youngest siblings, with older brothers, by gender.

A.4 Only Children

Comp, Only Children (by Gender)

	(Only Children)	(Only Children, Male)	(Only Children, Female)
only_child	-0.061***	-0.070**	-0.052*
	(0.02)	(0.03)	(0.03)
male	0.066***		
	(0.01)		
Constant	0.424***	0.490***	0.423***
	(0.01)	(0.01)	(0.01)
R-squared	0.01	0.00	0.00
N	9351	4720	4631

* p<0.1, ** p<0.05, *** p<0.01.

Table A.23: Comp, Only Children (by Gender)

Notes: This table shows competition preferences of only children.

Comp, Not Only Children (by Gender)

	(Not Only Children)	(Not Only Children, Male)	(Not Only Children, Female)
total_siblings	0.013***	0.010**	0.017***
	(0.00)	(0.00)	(0.00)
male	0.066***		
	(0.01)		
Constant	0.390***	0.463***	0.381***
	(0.01)	(0.02)	(0.02)
R-squared	0.01	0.00	0.00
N	8713	4411	4302

* p<0.1, ** p<0.05, *** p<0.01.

Table A.24: Comp, Not Only Children (by Gender)

Notes: This table shows competition preferences of students with any number of siblings.

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