

Parents and Peers: Gender Stereotypes in the Field of Study

Michela Carlana (Harvard Kennedy School and LEAP)
Lucia Corno (Cattolica University and LEAP)

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Motivation

- **Gender segregation** in the field of study is still persistently high in most OECD countries with long-term adverse consequences for women, men and development
- This gender gap in educational choices appears early on in educational careers
- Understanding the **role of parents/peers** in creating early gender barriers in field's choices is crucial to enhance equality
- **Research question: Which is the role of parents and peers in affecting gender-stereotypical choices of their children?**

Outline

Data and Experimental Design

Descriptive Evidence

Main Results

Conclusions

Survey in Italian Schools

Data collected in Nov./Dec. 2019 from 14 Italian middle schools (7 provinces, 163 classes, 2511 students)

Participating Schools



Survey divided into 2 sections: i) experiment; ii) questionnaire

Experiment

- Lab-in-the-field experiment
- **Goal:** study whether field choices of students (math vs. literature) are affected in a gender stereotypical way by parents and peers
- **Main outcome:** We simulate the actual track choice by forcing students to choose between a **male-typed (math)** vs. **female-typed (literature)** task
- **Other variables:** friendship network, IAT, explicit gender stereotypes, academic interests
- We also collected an online parent questionnaire, but with low response rate

Experiment ('cont)

We experimentally **activate the influence of parents/peers** by randomly exposed students to different info before choosing the task (Math vs. Literature)

- **Treatment 1: Mother** \Rightarrow think about what would your mother recommend you to choose
- **Treatment 2: Father** \Rightarrow think about what would your father recommend you to choose
- **Treatment 3: Parents** \Rightarrow your choice will be revealed to their parents
- **Treatment 4: Peer Public** \Rightarrow your choice will be observed by your classmates at the end of the survey
- **Treatment 5: Peer Public + Interaction** \Rightarrow you will have to collaborate in an additional task with the classmates that choose your same subject
- **Control:** no additional information

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Math Choice correlates with expected outcomes

- Gender gap in math choice: 63% of boys vs. 43% of girls

Table II. Correlation between students' choice of math and other relevant variables

	(1)	(2)	(3)	(4)	(5)	(6)	
	Panel A: Dep. Variable Students' Choice "Math"						
Variable X		Interest STEM	High-school Classic	Overconfidence Literature	Math	Logic Task	
Girl	-0.201*** (0.021)	-0.214*** (0.052)	-0.153*** (0.044)	-0.197*** (0.033)	-0.185*** (0.028)	-0.128*** (0.028)	
X		0.097*** (0.013)	-0.043*** (0.015)	-0.109*** (0.029)	0.126*** (0.026)	0.421*** (0.027)	
X*Girl		0.018 (0.020)	-0.020 (0.018)	-0.017 (0.039)	-0.003 (0.040)	0.010 (0.037)	
Constant	0.627*** (0.016)	0.376*** (0.039)	0.716*** (0.034)	0.695*** (0.023)	0.562*** (0.021)	0.401*** (0.023)	
Observations	2,511	2,511	2,511	2,511	2,511	2,511	
Mean X var – Boys		2.46	1.93	.63	.51	.54	
Mean X var – Girls		2.23	2.09	.58	.4	.36	
	Panel B: Dep. Variable Students' Choice "Math"						
Variable X		Gender Stereotypes Explicit	Implicit	South	Work Mother	Share Math Friends	Classmates
Girl	-0.201*** (0.022)	-0.205*** (0.022)	-0.173*** (0.029)	-0.257*** (0.039)	-0.169*** (0.044)	-0.269*** (0.069)	
X		-0.017 (0.012)	0.053*** (0.014)	-0.004 (0.032)	-0.010 (0.030)	0.253*** (0.050)	
X*Girl		0.016 (0.020)	-0.082*** (0.020)	-0.056 (0.042)	0.079* (0.047)	-0.007 (0.073)	
Constant	0.628*** (0.016)	0.635*** (0.016)	0.629*** (0.022)	0.634*** (0.027)	0.477*** (0.033)	0.423*** (0.044)	
Observations	2,511	2,511	2,511	2,511	2,412	2,511	
Mean X var – Boys		.16	-.17	.48	.68	.58	
Mean X var – Girls		-.16	.17	.49	.67	.52	

Notes: The dependent variable indicates whether the student chose math vs. literature in our lab-in-the-field experiment, i.e. if she/he believes she/he is better in math compared to literature. For each of the control variables, an indicator controlling for when the answer is missing is included and interacted by the female variable. Robust standard errors, clustered at class level, in parenthesis. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

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Estimation equation

$$Choice_Math_{ic} = \alpha + \beta_1 T1_i + \beta_2 T2_i + \beta_3 T3_i + \beta_4 T4_i + \beta_5 T5_i + \epsilon_{ic}$$

- For robustness, we include controls for:
 - students' characteristics (dummy for immigrant, IAT, index of explicit stereotypes)
 - parents' characteristics (living with both parents, presence of siblings, mother's and father's education/occupation)
 - class fixed effects
- Standard errors are clustered at the class level (lab-in-the-field experiment session)

The influence of parents

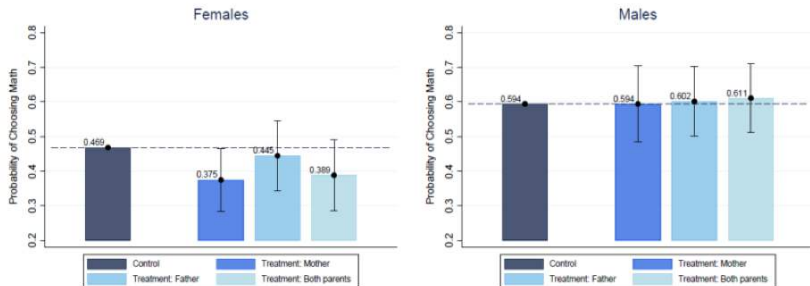
Do girls/boys perceive a gender-stereotypical recommendation from their parents?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A – Dep. Var. Students' Belief of Mother Advice "Math"								
	Full Sample				Matched Sample			
Girl	-0.063*** (0.022)	-0.064*** (0.022)	-0.071*** (0.022)	-0.064*** (0.024)	-0.140** (0.060)	-0.138** (0.059)	-0.090 (0.056)	-0.087 (0.063)
IAT		0.007 (0.015)	0.012 (0.015)	0.015 (0.016)		0.030 (0.042)	0.042 (0.042)	0.038 (0.043)
IAT*Girl		-0.034 (0.021)	-0.032 (0.022)	-0.027 (0.023)		-0.121* (0.062)	-0.125** (0.059)	-0.129** (0.060)
Mother Advice: Math							0.266*** (0.053)	0.258*** (0.057)
Observations	2,511	2,511	2,511	2,511	409	409	409	409
R-squared	0.008	0.010	0.036	0.122	0.019	0.040	0.105	0.176
Mean dep var – Boys	.5	.5	.5	.5	.57	.57	.57	.57
Mean dep var – Girls	.44	.44	.44	.44	.43	.43	.43	.43
Panel B – Dep. Var. Students' Belief of Father Advice "Math"								
	Full Sample				Matched Sample			
Girl	-0.064*** (0.022)	-0.060*** (0.021)	-0.062*** (0.021)	-0.058** (0.023)	-0.083 (0.072)	-0.077 (0.074)	-0.037 (0.071)	-0.016 (0.072)
IAT		0.029** (0.014)	0.032** (0.014)	0.036** (0.015)		0.062 (0.039)	0.053 (0.043)	0.053 (0.056)
IAT*Girl		-0.069*** (0.018)	-0.068*** (0.019)	-0.065*** (0.020)		-0.169** (0.073)	-0.131* (0.071)	-0.127 (0.088)
Father Advice: Math							0.287*** (0.080)	0.293*** (0.078)
Observations	2,511	2,511	2,511	2,511	128	128	128	128
R-squared	0.013	0.020	0.047	0.128	0.027	0.069	0.161	0.354
Mean dep var – Boys	.67	.67	.67	.67	.74	.74	.74	.74
Mean dep var – Girls	.62	.62	.62	.62	.69	.69	.69	.69
Performance	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Controls	No	No	Yes	Yes	No	No	No	Yes
Class FE	No	No	No	Yes	No	No	No	No

The influence of parents

Experimental Evidence

Figure 1: Treatment Effect - Parent Treatment



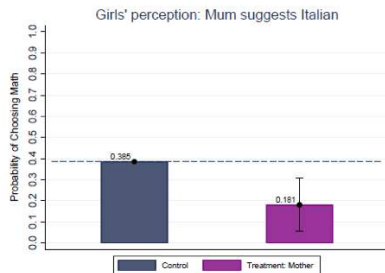
Treatment 1: Mother ⇒ think about what mother recommend you to choose (Math vs. Literature) (9.4 pct/20% reduction)

Treatment 2: Father ⇒ think about what your father recommend you to choose (Math vs. Literature) (no impact)

Treatment 3: Parents ⇒ choice reveale to your parents (no impact)

The Influence of Mothers, by Girls's perception

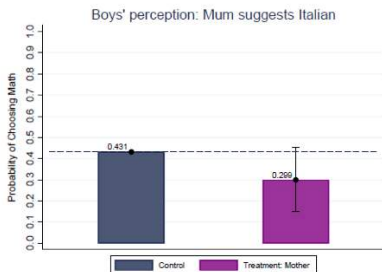
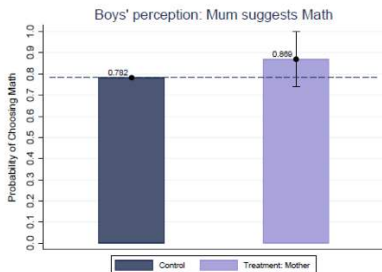
When thinking about their mother's suggestion: 44% of girls think "Math" while others "Literature"



The result is fully driven by girls who believe their mother would recommend "Literature". They decrease their probability of choosing "Math" by 20pp (48%)

The Influence of Mothers, by Boys' perception

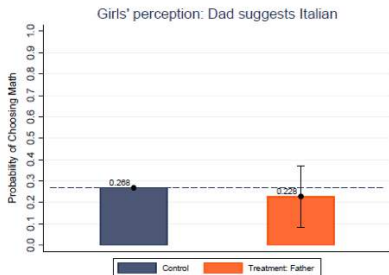
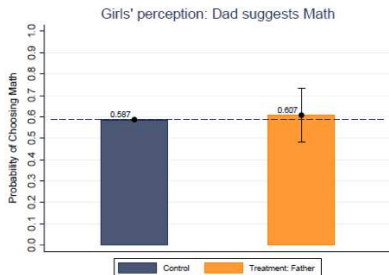
When thinking about their mother's suggestion: 50% of boys think "Math" while others "Literature"



No statistically significant effect for either group

The Influence of Father, by Girls' perception

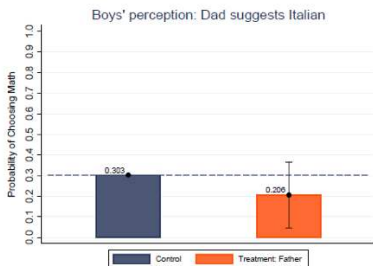
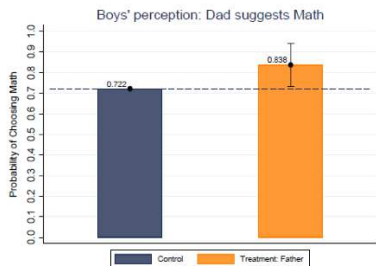
When thinking about their father's suggestion: 62% of girls think "Math" while others "Literature"



No statistically significant effect for either group

The Influence of Father, by Boys' perception

When thinking about their father's suggestion: 67% of boys think "Math" while others "Literature".



The result is hiding some heterogeneity: boys who believe their father would recommend "Math" **increase their likelihood of choosing "Math" by 14 pp (19%)**

The influence of parents

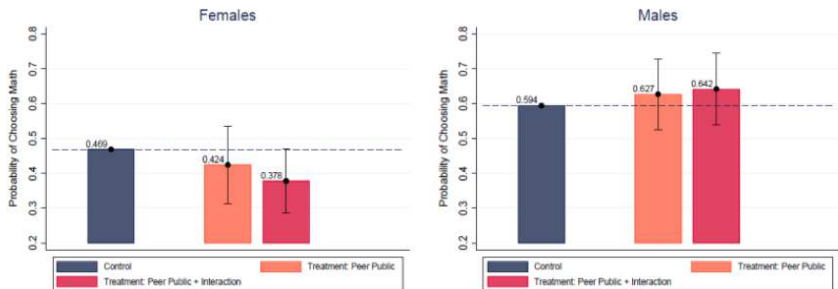
Summary of main result 1

- Children react by choosing the more stereotypical subject when they are prompted to think about same-gender parents (fathers-boys-math and mothers-girls-literature) [Table](#)

The influence of peers

Experimental Evidence

Figure 2: Treatment Effect - Peers Treatment

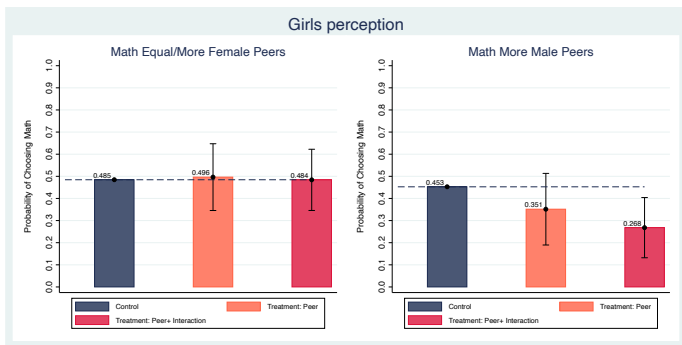


Treatment 4: Peer Public \Rightarrow your choice will be observed by your classmates at the end of the survey (no effect)

Treatment 5: Peer Public + Interaction \Rightarrow collaborate in an additional task with the classmates that choose your same subject (9.1pct reduction for girls)

The influence of peers, by Girls' perception

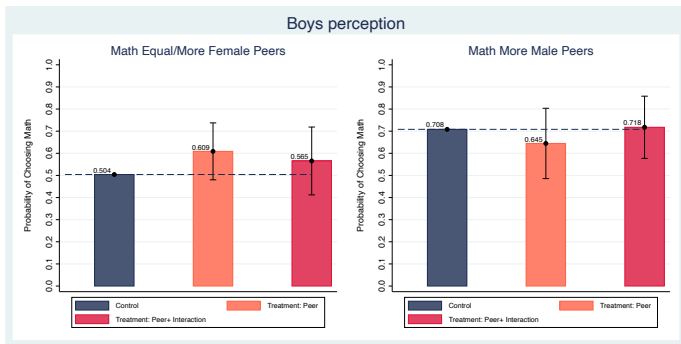
When thinking about their peers, some girls may think more male classmates will choose "Math" while others may think it is more equal or more female classmates



The result is fully driven by girls who want to avoid "Math" if it implies they will be a minority (reduction from 45% to 27%)

The influence of peers, by Boys' perception

When thinking about their peers, some boys may think more male classmates will choose "Math" while others may think it is more equal or more female classmates



No statistically significant effect for either group

The influence of peers

Summary of main result 2

Suggestive evidence that math choice is not affected by publicly informing their peers. However, girls tend to avoid choosing “Math” when they believe they will be a minority in the male-typed field or they have less friends choosing math

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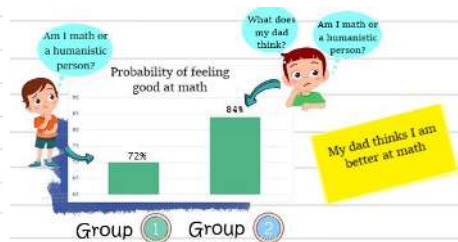
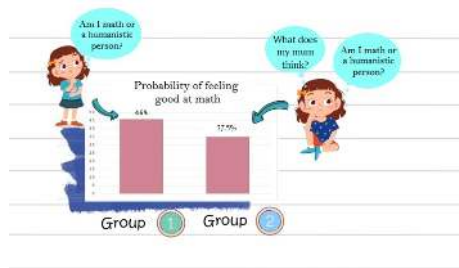
Conclusions and policy implications

- With an experiment, we show that students' choice is influenced by parents and peers
- **Parents:** Girls choose less math and boys less literature compared to what they would have done without pressure from same-gender parents => **mismatch of talents**
 - Is it enough to increase parents' awareness to affect their behavior? **Results**
- **Peers:** matter only for girls when they believe they have to interact with students that choose the same subject
 - Deep implications for high-school track choice since you choose a package (subject you study + who you interact with)
 - Emphasize gender balanced in the application process + different tracks in the same building

THANK YOU

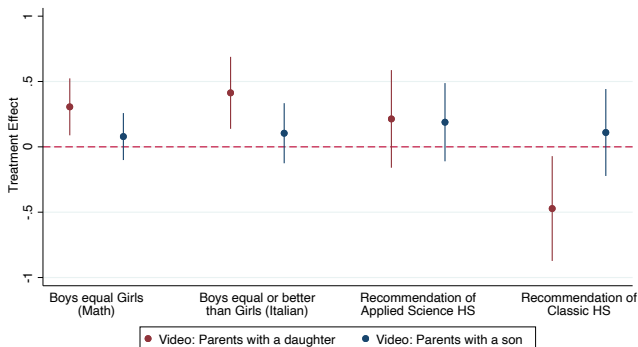
Video experiment

- May 2020: we randomized a 2 minutes-video among parents
- The video shows the results of our intervention separately for girls and boys
- Short survey asking perceptions about ability of boys versus girls in math and Italian



Video experiment ('cont)

- Parents react to information related to their influence on stereotypical choice



THANK YOU

Main results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable: Students' Choice "Math"							
	Female				Male			
Treatment 1 - Mother	-0.071* (0.042)	-0.094** (0.046)	-0.096** (0.046)	-0.101** (0.046)	-0.002 (0.048)	-0.000 (0.056)	0.021 (0.058)	0.009 (0.060)
Treatment 2 - Father	-0.033 (0.048)	-0.024 (0.051)	-0.033 (0.052)	-0.036 (0.051)	0.048 (0.047)	0.007 (0.051)	0.036 (0.052)	0.034 (0.054)
Treatment 3 - Both Parents	-0.064 (0.047)	-0.080 (0.052)	-0.086* (0.052)	-0.098* (0.052)	0.045 (0.047)	0.017 (0.051)	0.019 (0.050)	0.030 (0.053)
Treatment 4 - Peer Public	-0.001 (0.051)	-0.044 (0.056)	-0.043 (0.057)	-0.042 (0.056)	0.047 (0.046)	0.032 (0.052)	0.050 (0.053)	0.064 (0.054)
Treatment 5 - Peer Public+Interaction	-0.079* (0.042)	-0.091* (0.047)	-0.093** (0.046)	-0.087* (0.046)	0.056 (0.047)	0.048 (0.052)	0.038 (0.054)	0.027 (0.053)
Constant	0.469*** (0.032)	0.418*** (0.035)	0.389*** (0.039)	-0.085 (0.230)	0.594*** (0.035)	0.436*** (0.023)	0.417*** (0.026)	0.480** (0.234)
Observations	1,254	1,254	1,223	1,223	1,257	1,257	1,193	1,193
R-squared	0.004	0.209	0.222	0.246	0.002	0.180	0.205	0.224
Class FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Student Controls	No	No	Yes	Yes	No	No	Yes	Yes
Family controls	No	No	No	Yes	No	No	No	Yes

Descriptive Statistics

	Count	Mean	Std. dev.	Min	Max
<i>Panel A: Outcome and Other Experimental Variables</i>					
Student chose Math	2,511	0.526	0.499	0.00	1.00
Student thinks mother would recommend Math	2,511	0.468	0.499	0.00	1.00
Student thinks father would recommend Math	2,511	0.646	0.478	0.00	1.00
Student thinks: More Boys Choosing Math in Class	2,511	0.485	0.500	0.00	1.00
Performance in Math	2,511	1.368	0.849	0.00	3.00
Performance in Italian	2,511	1.345	0.930	0.00	3.00
Overconfidence in Math	2,511	0.456	0.498	0.00	1.00
Overconfidence in Italian	2,511	0.603	0.489	0.00	1.00
Student would choose logic task	2,511	0.446	0.497	0.00	1.00
<i>Panel B: Aspirations</i>					
High-School Interest: Classic/Humanistic	2,511	2.012	1.081	0.00	4.00
High-School Interest: Applied Sciences	2,511	2.345	1.194	0.00	4.00
<i>Panel C: Student Characteristics</i>					
Female	2,511	0.499	0.500	0.00	1.00
Immigrant	2,511	0.141	0.348	0.00	1.00
IAT	2,433	-0.000	1.000	-3.68	7.69
Index of explicit stereotypes	2,478	-0.000	1.000	-0.93	3.32
School in South/Island	2,511	0.486	0.500	0.00	1.00

Balance Table

	Control (1)	Diff. Treat. 1 (2)	Diff. Treat. 2 (3)	Diff. Treat. 3 (4)	Diff. Treat. 4 (5)	Diff. Treat. 5 (6)
<i>Panel A: Student Characteristics</i>						
Female	0.469 (0.500)	0.064* [0.089]	0.024 [0.533]	0.040 [0.261]	0.003 [0.943]	0.042 [0.228]
Immigrant	0.144 (0.352)	-0.030 [0.169]	-0.004 [0.871]	-0.014 [0.531]	-0.009 [0.656]	0.003 [0.909]
IAT	-0.043 (1.013)	-0.024 [0.729]	0.012 [0.876]	0.042 [0.566]	-0.006 [0.941]	0.173** [0.027]
Index of explicit stereotypes	-0.027 (1.007)	0.044 [0.543]	0.114 [0.125]	0.009 [0.901]	0.119* [0.085]	-0.011 [0.883]
<i>Panel B: Family Characteristics</i>						
Education level of mum: primary or junior sec.	0.193 (0.395)	-0.024 [0.423]	0.020 [0.417]	0.006 [0.844]	0.016 [0.470]	0.010 [0.697]
Education level of mum: high school	0.393 (0.489)	0.006 [0.883]	-0.020 [0.597]	-0.007 [0.846]	-0.057 [0.136]	-0.006 [0.856]
Education level of mum: university	0.201 (0.401)	-0.044 [0.125]	-0.048 [0.113]	-0.004 [0.865]	-0.023 [0.383]	-0.042 [0.126]
Education level of dad: primary or junior sec.	0.203 (0.403)	0.025 [0.402]	0.025 [0.359]	0.018 [0.538]	0.042 [0.143]	0.033 [0.245]
Education level of dad: high school	0.398 (0.490)	-0.027 [0.447]	0.009 [0.769]	-0.004 [0.913]	-0.024 [0.440]	-0.037 [0.266]
Education level of dad: university	0.168 (0.374)	-0.056** [0.032]	-0.039 [0.162]	-0.056** [0.042]	-0.055** [0.038]	-0.043** [0.084]
Lives with both parents	0.835 (0.372)	-0.002 [0.930]	0.016 [0.519]	0.001 [0.972]	-0.000 [0.989]	0.006 [0.800]
Mother works	0.686 (0.465)	-0.015 [0.683]	0.081** [0.015]	0.045 [0.174]	0.075** [0.010]	0.008 [0.814]
Father works	0.958 (0.200)	0.004 [0.803]	-0.006 [0.714]	-0.021 [0.246]	0.007 [0.651]	0.015 [0.271]
Low skill job - mum	0.373 (0.485)	0.006 [0.890]	0.052 [0.221]	0.018 [0.700]	0.012 [0.787]	-0.044 [0.301]
Medium or high skill job - mum	0.335 (0.473)	-0.038 [0.400]	-0.013 [0.713]	0.006 [0.882]	-0.002 [0.954]	0.030 [0.453]
Low skill job - dad	0.314 (0.465)	-0.023 [0.505]	0.021 [0.585]	0.046 [0.220]	0.015 [0.719]	-0.042 [0.216]
Medium or high skill job - dad	0.351 (0.478)	-0.026 [0.527]	-0.034 [0.396]	-0.068* [0.090]	-0.072* [0.051]	-0.022 [0.577]
<i>Panel C: Other non-baseline characteristics</i>						
High-School Interest: Classic/Humanistic	2.020	0.005	-0.037	0.040	-0.083	0.062

Balance Table - Continued

	Control (1)	Diff. Treat. 1 (2)	Diff. Treat. 2 (3)	Diff. Treat. 3 (4)	Diff. Treat. 4 (5)	Diff. Treat. 5 (6)
High-School Interest: Applied Sciences	(1.082) 2.325	[0.948] -0.017	[0.646] 0.058	[0.658] 0.037	[0.321] 0.046	[0.440] 0.062
Student thinks mother would recommend Math	(1.236) 0.450	[0.843] 0.040	[0.472] 0.000	[0.657] -0.008	[0.557] 0.008	[0.457] -0.026
Student thinks father would recommend Math	(0.498) 0.665	[0.263] -0.025	[0.995] -0.074**	[0.809] -0.043	[0.833] -0.004	[0.485] -0.020
Student thinks: More Boys Choosing Math in Class	(0.473) 0.467	[0.491] 0.015	[0.045] 0.010	[0.252] 0.022	[0.907] 0.036	[0.584] 0.033
Performance in Math	(0.500) 1.443	[0.580] -0.176**	[0.747] -0.034	[0.488] -0.130**	[0.284] -0.043	[0.270] -0.080
Performance in Italian	(0.870) 1.438	[0.009] -0.106	[0.572] -0.120*	[0.042] -0.077	[0.492] -0.148**	[0.207] -0.085
Overconfidence in Math	(0.927) 0.428	[0.119] 0.049	[0.053] 0.006	[0.233] 0.062*	[0.022] -0.009	[0.160] 0.023
Overconfidence in Italian	(0.495) 0.587	[0.187] 0.074**	[0.873] 0.006	[0.070] 0.027	[0.788] -0.004	[0.557] -0.030
	(0.493) 	[0.034] 	[0.863] 	[0.435] 	[0.906] 	[0.396]

Notes: Column (1) presents the mean of the variable for the control group with respective standard deviation in parentheses. Column (2) to (6) presents the difference between the mean by treatment arm and the control group. Treatment 1 is "Treatment:Mother", Treatment 2 is "Treatment: Father", Treatment 3 is "Treatment:Both Parents", Treatment 4 is "Treatment: Peer Public", while Treatment 5 is "Treatment: Peer Public+ Interaction". P-value for the two-sided test of equivalence in means in square brackets. All columns include fixed effects for the experimental session (class) and standard errors are clustered at the same level. Differently from Table I, we create a category for missing variables. For brevity, the balance on the missing variable is omitted. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

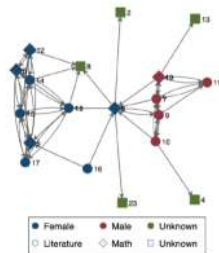
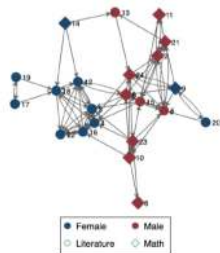
Best friends' math choice, by gender

- Girls are less likely to have close friends who choose math
- The difference can be fully explained by gender homophily

	(1)	(2)	(3)
Dep. Var.: Equal/More Friends Math			
Female	-0.140*** (0.028)	-0.015 (0.030)	-0.025 (0.030)
Share of female friends		-0.211*** (0.046)	-0.172*** (0.045)
Constant	0.566*** (0.040)	0.606*** (0.041)	0.417*** (0.038)
Observations	2,412	2,412	2,412
R-squared	0.060	0.073	0.357
Control num friends	y	y	y
Class FE	n	n	y

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Best friends' math choice, by gender

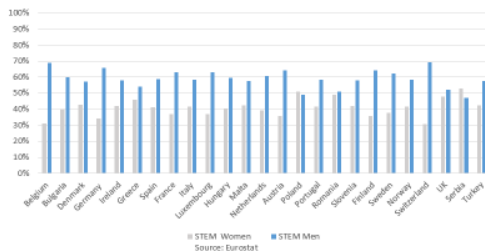


Notes: This figure shows one example of within classroom network of students. The color of the node represents the gender (blue for girls, red for boys, green for missing), while the shape represents the choice in the lab-in-the-field experiment (diamond for math, circle for literature, square for missing).

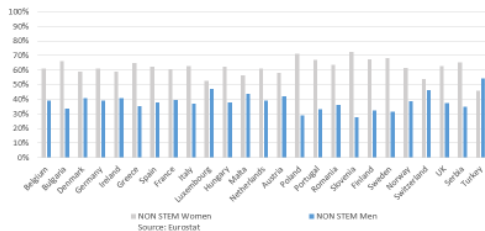
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Gender Segregation in STEM and Non-STEM field

STEM Graduates by Gender in 2018



NON STEM Graduates by Gender in 2018


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Gender-Science IAT

- Intuition: respondents who more rapidly pair female/male names with scientific/humanistic subjects more strongly associated those concepts
- Higher IAT = stronger association bw scientific-male and humanistic-female [Back](#)

