

# Impact of female peer composition on gender norms perceptions and skills formation in secondary school

Martina Querejeta Rabosto

WIDER Development Conference "Reducing inequality. The great challenge of our time"

October 5, 2022 | Bogotá, Colombia

- The analysis of the importance of gender norms on labor market outcomes has received a great deal of academic attention.
- Gender norms comprehend behavioral expectations according to gender. (Pearse & Connell, 2016; Seguino, 2007)
- Norms may become an obstacle to girl's educational achievements and future economic outcomes. (Fortin, 2005; Bertrand, 2020)
- Pioneer theoretical frameworks based on human capital factors explain a decreasing portion of gender gaps. (Blau & Kahn, 2017; Goldin, 2014)
- Emerging literature points to gender norms and stereotypes that could lead to persistent gender inequality. (Bertrand, 2020)

- How gender norms perceptions are formed and what drives its changes over time are still open questions.
- Norms formation process involves many actors. School and peers increasingly important with age.
- Peer gender composition might affect perceptions on gender norms by at least two channels.
  - Affect social attitudes and behaviors between groups due to diversity in class composition. (Rao, 2019)
  - Affect interaction between teachers and students promoting the transmission of gender views. (Carlana, 2019; Alan, Ertac & Mumcu, 2018)

## ¿How gender composition in secondary school affects students' perceptions on gender norms?

### Contribution to peer effects literature.

- Evidence for developed countries is well-established. (Epple & Romano, 2011; Sacerdote, 2011; Paloyo, 2020)
- Literature in developing contexts is scarcer - data requirements. (Izaguirre & Di Capua, 2020; Balsa, Gandelman & Roldán, 2018; McEwan, 2003)
- Even for developed countries literature addressing gendered impacts is still scarce. (Hoxby, 2000; Lavy & Schlosser, 2011; Gong, Lu & Song, 2019)
- Effects on skill formation have been widely studied, little is known about the transmission of gender norms within school contexts. (Angrist & Lang, 2004; Ammermueller & Pischke, 2009; Lavy & Schlosser, 2011; Brenøe & Zölitz, 2020)

## Contribution to gender norms literature.

- The effects of gender norms on economic outcomes has been widely studied. (Vella, 1994; Fortin, 2005; Bertrand, 2020)
- Literature on how are they formed and what drives its changes over time is still scarce.
  - Family transmission. (Farré & Vella, 2013)
  - From teachers to students. (Alan et al., 2018; Carlana, 2019)
  - Only one related work analyzing the school peer effects on gender norms for the Vietnamese case. (Garcia-Brazales, 2021)

## Contribution to public policies.

- Long-term effects at the individual level affecting educational outcomes, career choices and labor outcomes. (Sahoo & Klasen, 2018)
- Effects at the social level by misallocating talents that will affect economic growth. (Hsieh, Hurst, Jones & Klenow, 2019)

- Mandatory basic education in Uruguay includes 14 years of formal schooling.
- At 12 years of age students enter secondary education (7th to 12th grade).
- Admission to public secondary school based mainly on geographic criteria.
- When opting for a private secondary school, can choose school without external restrictions.
- The assignment of students to classrooms is made by the heads of the school.
- Students are (re)assigned to classes every year at the beginning of the school year (March) and share all curricular activities throughout the year.
  - Peer interaction is intense but short.

- Uruguayan survey for evaluation of the educational system (*Aristas*).
- Representative of 9th grade secondary students attending urban schools.
- Novel sampling design: (i) Schools randomly selected, (ii) Classes randomly selected, (iii) All students within classes are interviewed.
- October 2018.

## Estimation sample

- Students from public and private regular secondary schools.
- Non-missing information in the analyzed variables.
- Classes with more than 12 students.
- Schools with two or more classes.
- 60.3% of original sample. Sample selection

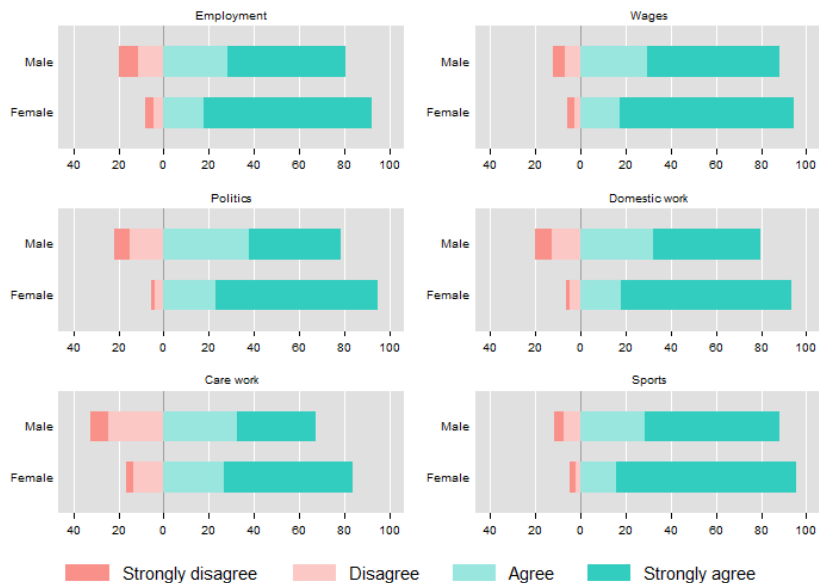
**Table:** Descriptive statistics by sex

	<b>Males</b>		<b>Females</b>	
	Mean	SD	Mean	SD
<b><i>Student characteristics</i></b>				
Age	14.90	1.49	14.78	1.12
Only child	0.25	0.44	0.23	0.42
Live w/both parents	0.69	0.46	0.68	0.47
Live w/grandparents	0.18	0.38	0.15	0.35
40% lower SE	0.33	0.47	0.39	0.49
Age above median	0.16	0.37	0.12	0.32
Previous repetition	0.26	0.44	0.20	0.40
<b><i>Main independent variable</i></b>				
Share female	0.52	0.10	0.51	0.09
Observations	2547		2790	



# Gender norms descriptives

Figure: Students' views on gender norms, by sex



Linear-in means model:

$$y_{ics} = \alpha + \beta_1 \text{ShareFem}_{ics} + \beta_2 X_{ics} + \beta_3 \bar{X}_{ics} + \lambda_s + \epsilon_{ics} \quad (1)$$

- $\text{ShareFem}_{ics}$  leave-one-out proportion of female peers in the class.
- $X_{ics}$  ( $\bar{X}_{ics}$ ) vector of student control variables (peers).
- $\lambda_s$  school-level fixed effects.
- $\epsilon_{ics}$  standard errors clustered at the class level.

The empirical strategy exploits the quasi-random variation in the percentage of female peers across classrooms within school for the identification of causal effects.

# Validity of the identification strategy

- School level fixed-effects.
- Assignment of students to classes as-good-as random.
  - Random simulation of students to classes [Simulation](#)
  - Balance test of student characteristics by proportion of female peers [Balance test](#)
- Variation in share of female peers among classes within schools [Table](#) [Graph](#)

**Table:** Effects of the proportion of female peers on gender norms

	Gender norms	Employment	Wages	Politics	Domestic work	Care work	Sports
Share female	0.384* (0.23)	0.470** (0.22)	-0.495* (0.30)	0.542*** (0.19)	0.723*** (0.21)	0.478** (0.24)	-0.139 (0.24)
Female	-0.003 (0.03)	0.013 (0.03)	-0.021 (0.03)	0.002 (0.03)	0.014 (0.03)	0.001 (0.03)	-0.022 (0.03)
Obs.	5337	5337	5337	5337	5337	5337	5337
R-squared	0.110	0.083	0.062	0.070	0.087	0.073	0.061

*Notes:* The table shows the results of regressing each outcome variable on the share of female peers in the group, student and peers characteristics controls, and school fixed effects. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

# Heterogeneous effects: by sex

**Table:** Effects of the proportion of female peers on gender norms, by students' sex

	Employment	Wages	Politics	Domestic work	Care work	Sports	Gender norms
<b>Panel A: Male students</b>							
Share female	0.648** (0.29)	-0.828** (0.41)	0.907*** (0.27)	0.846*** (0.27)	0.770** (0.33)	-0.677** (0.30)	0.405 (0.32)
Obs.	2547	2547	2547	2547	2547	2547	2547
R-squared	0.106	0.099	0.117	0.122	0.093	0.102	0.136
<b>Panel B: Female students</b>							
Share female	0.326 (0.30)	-0.337 (0.33)	0.139 (0.27)	0.634** (0.32)	0.186 (0.34)	0.116 (0.31)	0.259 (0.32)
Obs.	2790	2790	2790	2790	2790	2790	2790
R-squared	0.120	0.088	0.097	0.124	0.125	0.094	0.158

*Notes:* The table shows the results of regressing the gender norms index on the share of female peers in the group, student and peers characteristics controls, and school fixed effects separately by student's own gender. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

**Table:** Heterogeneous effects of the proportion of female peers on gender norms

	Repeater		40% lower SE		Mother tertiary		Capital city	
	Yes	No	Yes	No	Yes	No	Yes	No
Share female	1.211** (0.51)	0.388 (0.24)	0.995*** (0.38)	0.031 (0.27)	-0.046 (0.50)	0.422 (0.28)	-0.475 (0.38)	0.560** (0.27)
Observations	1021	4316	1772	3565	1258	3451	1371	3966
$R^2$	0.206	0.101	0.162	0.110	0.178	0.127	0.121	0.123

*Notes:* The table shows the results of regressing the gender norms index on the share of female peers in the group, student and peers characteristics controls, and school fixed effects separately by student's predetermined characteristics. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

## Further outcomes: time use

**Table:** Effects of the proportion of female peers on gendered behaviours, by students' sex

	Cooking	Clothing	Cleaning	Caring	Index
<b>Panel A: Male students</b>					
Share female	-0.182 (0.25)	0.204 (0.29)	-0.074 (0.25)	0.154 (0.25)	0.035 (0.27)
Obs.	2538	2538	2538	2538	2538
R-squared	0.093	0.102	0.094	0.132	0.114
<b>Panel B: Female students</b>					
Share female	-0.436 (0.27)	-0.111 (0.25)	-0.301 (0.29)	-0.601* (0.31)	-0.499* (0.28)
Obs.	2782	2782	2782	2782	2782
R-squared	0.095	0.133	0.146	0.143	0.161

*Notes:* The table shows the results of regressing each outcome variable on the share of female peers in the group, student and peers characteristics controls, and school fixed effects separately by student's predetermined characteristics. Standardized values for the ordered response on frequency the student helps (i) Cooking for the family; (ii) Washing of clothes; (iii) House cleaning; (vi) Caring for siblings or other family members. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

## Further outcomes: cognitive skills

**Table:** Effects of the proportion of female peers on cognitive skills, by sex

	Male		Female	
	Mathematics	Language	Mathematics	Language
Share female	0.194 (0.33)	-0.098 (0.29)	0.460* (0.27)	0.064 (0.40)
Obs.	2416	2381	2640	2571
R-squared	0.310	0.226	0.321	0.285

*Notes:* The table shows the results of regressing Mathematics and Language standardized scores on the share of female peers in the group, student and peers characteristics controls, and school fixed effects separately by student's own gender. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.



- Teacher and class controls Teacher Morning
- Sample attrition Outcome Control
- Probability of random assignment Random
- Dropping schools one by one Schools

# Conclusions

- This paper investigates how gender composition in secondary school affects students' perceptions on gender norms in the Uruguay context.
- Robust significant and positive effects of higher exposure to female peers.
- Reduction of traditional gender norms perceptions.
  - Effects mostly driven by male students and low socioeconomic background.
- Changing actual behavior.
  - Reduction in domestic work assumed by female students.
  - Improvement in academic math performance for female students.
- Even short interactions in secondary school (one year) may have substantial effects in reducing gender stereotyped perceptions and behaviors among students.

**Thank you!**

[martinaquerejeta@gmail.com](mailto:martinaquerejeta@gmail.com)

Table: Sample selection

	Total			Final		
	Mean	SD	Obs.	Mean	SD	Obs.
<b><i>Student characteristics</i></b>						
Female	0.49	0.50	8845	0.52	0.50	5337
Age	15.09	1.63	8423	14.84	1.31	5337
Only child	0.25	0.43	7792	0.24	0.43	5337
Live w/both parents	0.67	0.47	7792	0.68	0.46	5337
Live w/grandparents	0.17	0.38	7791	0.16	0.37	5337
40% lower SE	0.39	0.49	8845	0.36	0.48	5337
Age above median	0.25	0.44	8845	0.14	0.34	5337
Previous repetition	0.28	0.45	7833	0.23	0.42	5337
<b><i>Main independent variable</i></b>						
Share female	0.49	0.13	8845	0.51	0.10	5337
<b><i>Outcome variables</i></b>						
Employment	3.38	0.90	7799	3.44	0.87	5337
Wages	3.52	0.78	7798	3.55	0.77	5337
Politics	3.35	0.84	7798	3.39	0.82	5337
Domestic work	3.40	0.86	7798	3.44	0.83	5337
Care work	3.12	0.93	7798	3.16	0.92	5337
Sports	3.56	0.75	7798	3.58	0.74	5337
Observations	8845			5337		

**Table:** Identification validity: Random simulation of class assignment

	Proportion
Female	.9044118
Age above median	.9338235
Only child	.9338235
Live w/both parents	.9191176
Live w/grandparents	.9191176
40% lower SE	.9411765
Previous repetition	.8897059
Early attendance (< 3)	.875
Mother tertiary	.8897059
Father tertiary	.9705882

*Notes:* The table shows the proportion of schools with observed standard deviation within the 90% interval for each predetermined characteristic. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

Back

Table: Identification validity: Balancing tests

	Coef	SE
Female	0.006	0.020
Age above median	0.149**	0.073
Only child	0.078	0.079
Live w/both parents	-0.061	0.083
Live w/grandparents	0.137	0.085
40% lower SE	-0.063	0.097
Previous repetition	0.292**	0.116
Early attendance (<3)	0.051	0.086
Mother tertiary	0.034	0.078
Padre tertiary	0.127*	0.072

Notes: The table shows the results of separate regression for each corresponding predetermined characteristic on the share of female peers in the group and school fixed effects. For female dummy the regression also controls for the share of female peers in the school. Robust standard errors clustered at class level. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEED.

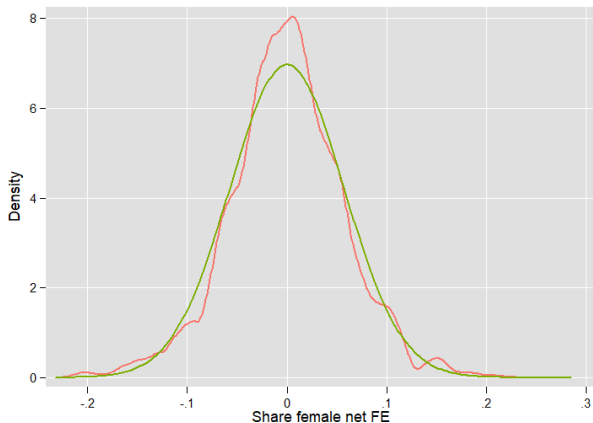
**Table:** Identification validity: Variation in percentage and number of female peers

	<i>Male</i>				<i>Female</i>			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Share female	0.516	0.096	0.231	0.818	0.506	0.094	0.154	0.773
Share female net FE	0.016	0.055	-0.181	0.266	-0.015	0.055	-0.214	0.206
Num. female	11.993	3.253	3.000	23.000	11.792	3.351	2.000	22.000
Num. female net FE	0.361	1.275	-5.062	6.145	-0.339	1.263	-5.970	5.145

*Notes:* The table shows summary statistics for the share and number of female peers before and after removing school fixed effects. Results net of fixed effects from a regression of share female peer on student, peers controls and school fixed effects. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEED.

Back

**Figure:** Identification validity: Distribution of the percentage of female peers.



*Notes:* The figure shows the distribution of residuals from a regression of share of female peers on student and peers controls, and school fixed effects. The normal distribution is also plotted. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.



**Table:** Robustness check: Teacher controls

	Gender norms	Employment	Wages	Politics	Domestic work	Care work	Sports
Share female	0.339 (0.24)	0.597** (0.25)	-0.665** (0.32)	0.548*** (0.21)	0.786*** (0.22)	0.633** (0.25)	-0.504** (0.24)
Female	-0.000 (0.04)	0.024 (0.04)	-0.020 (0.04)	0.001 (0.04)	0.016 (0.04)	0.012 (0.04)	-0.034 (0.03)
Obs.	4833	4833	4833	4833	4833	4833	4833
R-squared	0.114	0.087	0.067	0.073	0.090	0.078	0.063

*Notes:* The table shows the results of regressing each outcome variable on the share of female peers in the group, student and peers characteristics controls, teacher's controls and school fixed effects. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

Back

**Table:** Robustness check: Morning control

	Gender norms	Employment	Wages	Politics	Domestic work	Care work	Sports
Share female	0.444** (0.21)	0.540** (0.22)	-0.468 (0.31)	0.595*** (0.18)	0.756*** (0.20)	0.534** (0.24)	-0.130 (0.24)
Female	0.000 (0.03)	0.017 (0.03)	-0.019 (0.03)	0.005 (0.03)	0.016 (0.04)	0.004 (0.03)	-0.021 (0.03)
Obs.	5337	5337	5337	5337	5337	5337	5337
R-squared	0.111	0.083	0.062	0.070	0.087	0.074	0.061

Notes: The table shows the results of regressing each outcome variable on the share of female peers in the group, student and peers characteristics controls, morning hour control and school fixed effects. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

Back

**Table:** Robustness check: Sample attrition

	Gender norms	Time domestic work	Mathematics	Language
Share female	0.067 (0.07)	0.053 (0.07)	0.001 (0.07)	0.066 (0.06)
Female	0.006 (0.01)	0.005 (0.01)	0.008 (0.01)	0.011 (0.01)
Observations	5909	5909	5909	5909
$R^2$	0.061	0.061	0.056	0.064

*Notes:* The table shows the results of regressing a dummy variable indicating missing value in the outcome variable on student gender, the share of female peers in the group and school fixed effects. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.

Back

**Table:** Robustness check: Missing control variables treatment

Gender norms	
Share female	0.379* (0.23)
Female	-0.000 (0.03)
Observations	5342
$R^2$	0.113

*Notes:* The table shows the results of regressing each outcome variable on the share of female peers in the group, student and peers characteristics controls (imputed when missing), school fixed effects, and dummy variables indicating missing value in the control variables. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. Sample drawn from Aristas's survey, INEEd.

Back

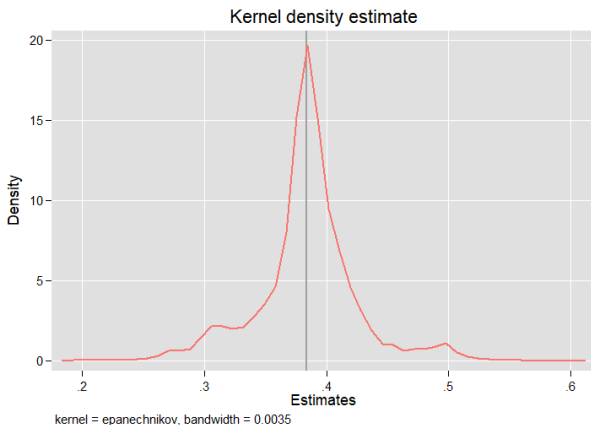
**Table:** Robustness check: Further test to randomization

	Gender norms	Employment	Wages	Politics	Domestic work	Care work	Sports
Share female	0.359 (0.28)	0.550* (0.31)	-0.657* (0.36)	0.545** (0.23)	0.669*** (0.25)	0.708** (0.28)	-0.338 (0.26)
Female	0.001 (0.04)	0.024 (0.04)	-0.027 (0.04)	0.006 (0.04)	0.020 (0.04)	0.012 (0.04)	-0.029 (0.04)
Obs.	4223	4223	4223	4223	4223	4223	4223
R-squared	0.119	0.083	0.069	0.070	0.093	0.080	0.065

*Notes:* The table shows the results of regressing the gender norm index on the share of female peers in the group, student and peers characteristics controls, and school fixed effects for the sub-sample of schools with grater probability of random assignment of students to classes. Robust standard errors clustered at class level reported in parentheses. \*\*\*significant at the 1% level, \*\*5% level, \*10% level. Sample drawn from Aristas's survey, INEEd.

Back

Figure: Robustness check: Distribution of estimates after randomly dropping schools.



Notes: The figure shows the distribution of the coefficient associated to the share of female peers from 9,180 regressions that each time randomly drop two schools from the main sample. Regression of the gender norm index on the share of female peers in the group, student and peers characteristics controls, and school fixed effects. The sample includes students from public and private regular secondary schools, with non-missing information in analyzed variables, in classes with more than 12 students, and in schools with two or more classes. Sample drawn from Aristas's survey, INEEd.