Peer Gender Composition and Non-Cognitive Outcomes

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Abstract

This paper studies the effect of the gender composition of a student's peers on two non-cognitive skills: sense of belonging and self-worth. Using data from Add Health and exploiting idiosyncratic variation in the share of female peers across grades within schools, I find positive but small effects of a higher share of female peers for male students. I do not find statistically significant effects for female students, but I can rule out practically significant positive effects.

Keywords: Non-cognitive skills, Peer effects, Educational economics

JEL classification: I21, J16

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1. Introduction

Non-cognitive skills are significant determinants of both educational and labor market outcomes, in some settings explaining more variation in these outcomes than cognitive skills (Almlund et al., 2011; Borghans et al., 2008; Bowles et al., 2011). Despite their importance, we are still learning about factors that affect non-cognitive skill development, particularly among adolescents (Kautz et al. 2015). Drawing from existing research on cognitive skill formation, we may expect that an adolescent's peers could affect their own non-cognitive skill formation. This paper investigates the relationship between a particular type of peer effect, peer gender composition, on non-cognitive skills.

Previous studies find that students with a higher share of female peers do better in the classroom (Gong et al., 2016; Hoxby 2000; Lavy and Schlosser 2011), and there are compelling reasons to believe that this relationship exists for non-cognitive skill formation. Being surrounded by similar peers may help a student feel like they belong in their community, make it easier to develop friendships, and improve the student's happiness and mental health. Dweck et al. (2014) and Farrington et al. (2012) provide extended commentary on these non-cognitive skills and how they may relate to peer groups. In two studies that examine the relationship between peer gender and non-cognitive skills directly, Gong et al. (2016) find that male students exhibit a higher life fulfillment and confidence for the future when they have more female classmates and female students report lower levels of unhappiness, and Lavy and Schlosser (2011) find that the self-reported quality of inter-student relationships improves for both male and female students.

This note estimates the causal effect of peer gender composition on two additional non-cognitive skills – sense of belonging and self-worth – using a data set that is ubiquitous in the peer effects literature – the National Longitudinal Study of Adolescent to Adult Health (Add Health). I find that male students report a stronger sense of belonging and self-worth when they have more female peers, but the effects are small in magnitude. The results also suggest that there are no appreciable effects for female students.

2. Data

Add Health is a nationally representative survey of seventh to twelfth graders in the United States (Harris, 2009). The in-school questionnaire provides data on student demographics, peer groups and non-cognitive skills for 90,118 students, and I subset the sample to 60,129 students. The online appendix describes the construction of my subsample and provides a table of descriptive statistics.

I analyze the responses to eight questions (shown in Table 1) that measure sense of belonging and self-worth. Each question was asked on a 5-point Likert scale. Given the ordinal nature of the responses, there is no obvious way to aggregate the individual questions into their broader non-cognitive skill. As my primary specification, I use the count of questions that a student answered "Agree" or "Strongly agree" as my outcome variable. I also consider a specification where I assign a numerical value to each possible response (e.g., Strong disagree = 1, Disagree = 2, … , Strongly agree = 5) and estimate the average numerical response. Histograms for these outcomes are available in the appendix.

Table 1: Non-cognitive outcomes (count "Agree" or "Strongly Agree")

Survey Question	All		Female		Male	
	Mean	SD	Mean	SD	Mean	SD
Sense of belonging	2.59	1.40	2.54	1.42	2.63	1.38
"I feel socially accepted"	0.68	0.47	0.65	0.48	0.71	0.45
"I feel loved and wanted"	0.73	0.45	0.73	0.45	0.73	0.44
"I feel close to people at this school"	0.58	0.49	0.58	0.50	0.59	0.49
"I feel like I am part of this school"	0.60	0.49	0.59	0.50	0.61	0.49
Self-worth	2.74	1.28	2.54	1.33	2.95	1.20
"I have a lot of good qualities"	0.83	0.38	0.80	0.4	0.86	0.35
"I have a lot to be proud of"	0.79	0.41	0.76	0.43	0.82	0.38
"I like myself just the way I am"	0.68	0.47	0.60	0.49	0.76	0.43
"I feel like I am doing everything just about right"	0.44	0.50	0.37	0.49	0.51	0.50
Observations	60,229		31,445		28,684	

3. Empirical Strategy

I employ a similar method as Hoxby (2000) and Lavy and Schlosser (2011) to isolate plausibly exogenous variation in the share of female peers; I assume that variation in the share of female students within a school and across grades is uncorrelated with unobserved determinants of non-cognitive skills. I maintain this assumption is reasonable given the difficulty and cost in switching schools and lack of transparency in the gender composition of other schools. In sections D and E of the appendix, I conduct two checks for violations of the identifying assumption; neither provide evidence that the identifying assumption is invalid.

I estimate a linear-in-means model with school and grade indicator variables to measure the relationship between peer gender composition and non-cognitive skills. Let y_{isg} be a non-cognitive skill for student i in school s and grade g, $\overline{female}_{-isg}$ the share of female peers in student i's school and grade, excluding student i, X_{isg} a vector of student characteristics, ϕ_s a vector of school-specific effects, and ϕ_g a vector of grade-specific effects. The estimating equation is,

$$y_{isg} = \beta\overline{female}_{-isg} + X_{isg}\gamma + \phi_s + \phi_g + \varepsilon_{isg}.$$

The vector of student characteristics includes the student's gender and race, whether the student was above the median age for their grade, if they were born in the United States, and how many other people lived in their household. I use the Add Health adjusted sample weights in all regressions, and I estimate standard errors using a Taylor linearization adjusting for the survey's regional stratification and clustering by school, as prescribed by Chen and Chantala (2014).

4. Results

Table 2 contains the estimated effect of a unit increase in the share of female peers in a student's school and grade on the count of affirmative sense of belonging and self-worth survey responses. Each pair of columns presents results for a different sample: the total sample, female students only, and male students only.

I do not find significant evidence that female students are more or less likely to have a higher sense of belonging or self-worth with an increase in the share of female peers, but the coefficients and standard errors do rule out practically significant positive effects. I do find evidence that male students report both stronger belonging and self-worth, but while the effect is statistically significant, it is not large. A five percentage point increase in the share of female peers, (roughly a one-standard deviation increase) leads to male students reporting 0.036 and 0.032 more affirmative responses to the four belonging and four self-worth questions, respectively. This corresponds to 1.4% and 1.1% of the mean, or 2.6% and 2.6% of the standard deviation. These effect sizes for male students are comparable to those found by Lavy and Schlosser (2011) and Gong et al. (2016). Furthermore, while Gong et al. find that a higher share of female peers results in lower rates of reported unhappiness among female students, they find that only male students report greater life fulfillment, confidence for the future, and private recreation with their classmates.

In the appendix, I examine specifications without individual level controls, using the average numerical response as opposed to the count of affirmative responses, and using probability of an affirmative response for each individual non-cognitive question. Finally, I use simulation methods to test the robustness to measurement error in the share of female peers. Across each specification, the results are similar.

Table 2: Baseline regression estimates

	All		Female		Male	
	Belonging	Self-worth	Belonging	Self-worth	Belonging	Self-worth
	(1)	(2)	(3)	(4)	(5)	(6)
Share female	0.295	0.242	-0.00550	-0.197	0.714*	0.633*
	(0.318)	(0.176)	(0.408)	(0.258)	(0.352)	(0.270)
Female	-0.107***	-0.427***				
	(0.0149)	(0.0173)				
Constant	3.290***	3.115***	3.489***	3.159***	2.883***	2.585***
	(0.160)	(0.104)	(0.211)	(0.145)	(0.189)	(0.169)
Controls	X	X	X	X	X	X
Observations	60,129	60,129	31,445	31,445	28,684	28,684

The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5. Conclusion

Although many researchers have established the importance of non-cognitive skills, the literature on how to improve those skills is still growing. This note finds evidence that a mechanism for cognitive skill development, peer gender composition, is a minor input into the development of two non-cognitive skills, sense of belonging, and self-worth, for adolescent males. While I do not find evidence that peer gender composition is also a determinant of sense of belonging and self-worth for female adolescences, it may play an important role for other non-cognitive skills.

6. References

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Appendix

A. Acknowledgments

This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining Data Files from Add Health should contact Add Health, The University of North Carolina at Chapel Hill, Carolina Population Center, 206 W. Franklin Street, Chapel Hill, NC 27516-2524 (addhealth_contracts@unc.edu). No direct support was received from grant P01-HD31921 for this analysis.

I am grateful to my advisers, Steven Haider and Scott Imberman for their invaluable feedback. I am also grateful to Dylan Brewer, Michigan State University's Department of Economics graduate student workshop participants, and the Missouri Valley Economic Association's 2008 annual conference participants for their comments and suggestions.

B. Creation of analytic sample and variable definitions

The Add Health in-school questionnaire contains survey responses from 90,118, but I am not able to use all of these responses in my analysis. One student is missing a valid school identifier, 803 students are missing a valid grade, 6,849 students are missing a survey weight, and 17,325 students did not provide a valid answer to at least one of the outcomes or control variable questions. I also exclude 3,767 students who attended schools that required explicit parental consent to take the in-school questionnaire. These schools tend to have lower survey response rates, making the calculation of share of female peers more prone to measurement error. Finally, I exclude 1,144 students who attended schools that were exclusively male or female and 100 students who had fewer than ten total students in their grade. I am left with 60,129 observations.

My explanatory variable of interest is the share of female peers in a student's school and grade, which I calculate by dividing the number of students who answered the question, "what sex are you?" with "female" by the total number of students who answered the question either "male" or "female" in that student's school and grade. To avoid correlations between the student's own gender and the share of female peers in their school and grade, I use a leave-out mean, where I do not include the student in the calculation of their peer group's mean.

I use the following survey questions as individual controls:

- Biological sex
- Hispanic of Spanish ethnicity
- Black or African American and not Hispanic
- Asian or Pacific Islander and not Hispanic
- American Indian or Native American and not Hispanic
- White and not Hispanic

- Other race not listed and not Hispanic
- If the student's age (in years) is above the median age for their grade across all schools
- If the student reported being born in the United States
- Dummy variables for the number of people that live in the student's household: 1, 2, 3, 4-6, and if the student lives in a shelter or group home

C. Descriptive statistics

The below table provides the unweighted and weighted mean of the share of female peers and control variables in the baseline model.

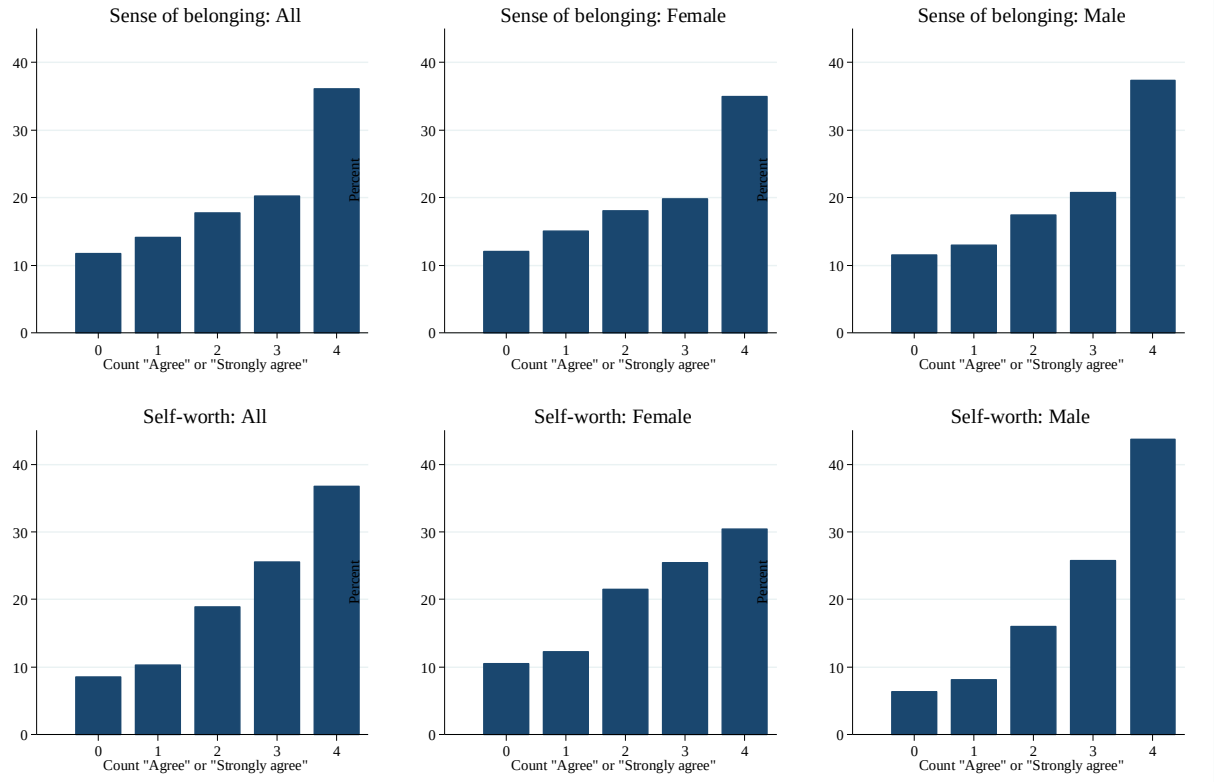
Table A1: Descriptive statistics

	Unweighted		Weighted	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Share female	0.503	0.045	0.503	0.054
Female	0.523	0.499	0.516	0.500
Hispanic or Latino	0.142	0.349	0.107	0.309
Black or African American	0.159	0.366	0.170	0.376
Asian or Pacific Islander	0.059	0.236	0.041	0.199
American Indian or Native American	0.033	0.178	0.037	0.189
Other race	0.024	0.154	0.023	0.150
Above median age	0.338	0.473	0.339	0.474
Born outside the United States	0.086	0.280	0.059	0.235
Household size				
One	0.005	0.071	0.005	0.073
Two	0.053	0.223	0.053	0.224
Three	0.183	0.387	0.185	0.388
Four to six	0.756	0.429	0.754	0.431
Shelter or group home	0.003	0.057	0.003	0.056
Observations	60,129		60,129	

D. Histograms of outcome variables

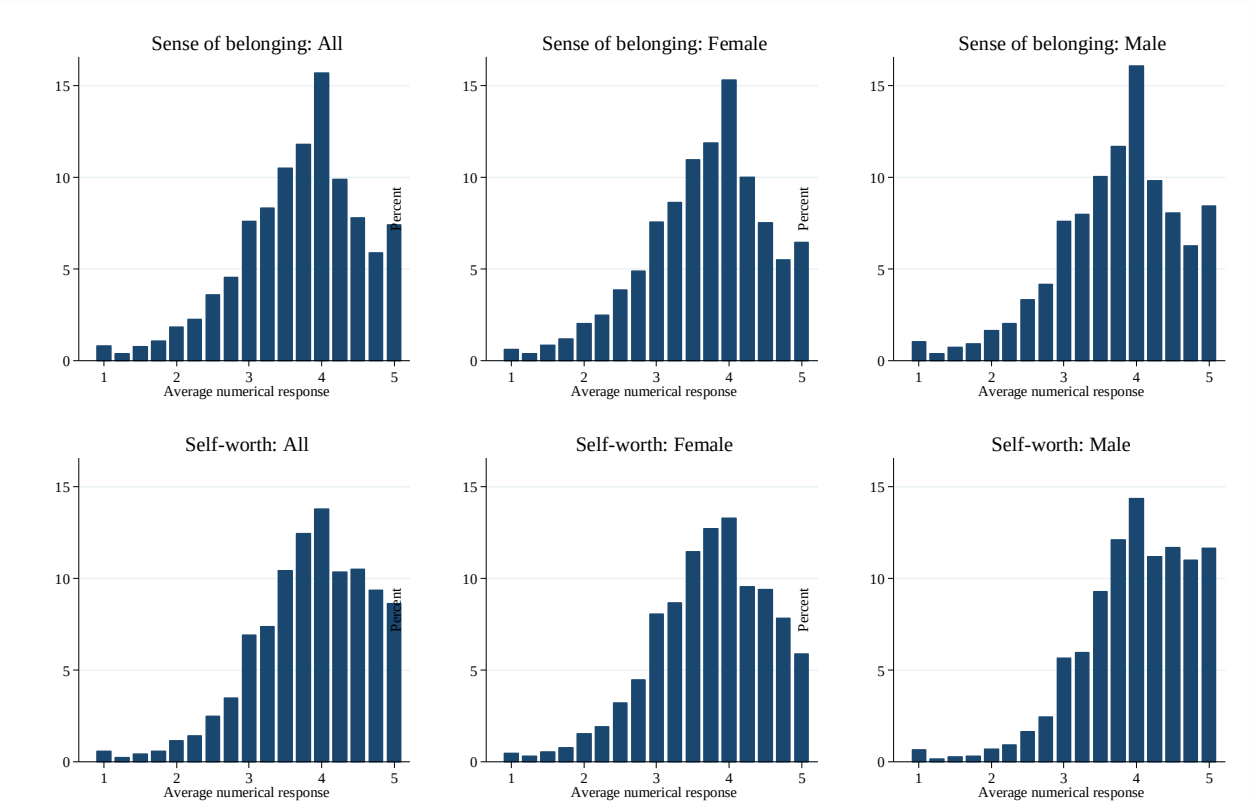
The below figures display the distribution of unweighted responses for the non-cognitive outcomes I study in this paper. The first figure displays the distribution of the count of "agree" or "strongly agree" responses for the four sense of belonging and four self-worth outcomes. The second figure displays the distribution of the numerical average of responses when "Strongly disagree" is assigned a 1, "Disagree" is assigned a 2, "Neither agree nor disagree" is assigned a 3, "Agree" is assigned a 4, and "Strongly agree" is assigned a 5. The final figure shows the distribution of responses for the disaggregated non-cognitive survey questions.

Figure A1: Distribution of non-cognitive outcome positive counts



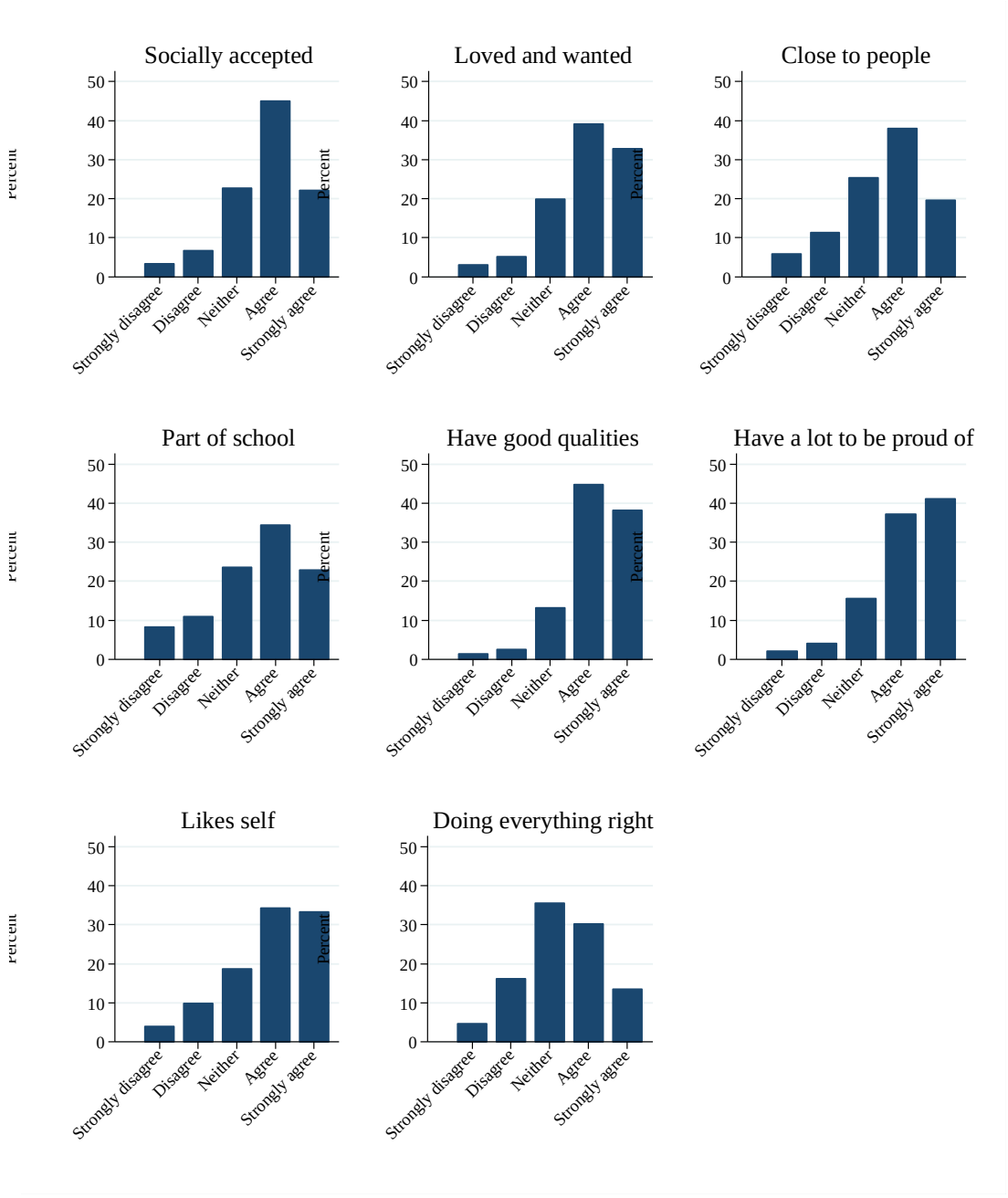
Each cell plots the percentage of students who answered in the affirmative ("Agree" or "Strongly Agree") for zero, one, two, three, or all four of their non-cognitive questions. The top row contains the count of affirmative responses for the four sense of belonging questions: I feel socially accepted, I feel loved and wanted, I feel close to people at this school, and I feel like I am a part of this school. The bottom row contains the count of affirmative responses for the four self-worth questions: I have a lot of good qualities, I have a lot to be proud of, I like myself just the way I am, and I feel like I am doing everything just about right. The left column contains the count of affirmative responses for the entire sample of 60,129 students, the middle column contains the count of affirmative responses for the 31,445 female students, and the right column contains the count of affirmative responses for the 28,684 male students.

Figure A2: Distribution of non-cognitive outcome average numerical value



Each cell plots the distribution of the average numerical response for their non-cognitive questions. “Strongly disagree” was assigned a value of 1, “Disagree” a value of 2, “Neither agree nor disagree” a value of 3, “Agree” a value of 4, and “Strongly agree” a value of 5. The top row contains the average numerical response for the four sense of belonging questions: I feel socially accepted, I feel loved and wanted, I feel close to people at this school, and I feel like I am a part of this school. The bottom row contains the average numerical response for the four self-worth questions: I have a lot of good qualities, I have a lot to be proud of, I like myself just the way I am, and I feel like I am doing everything just about right. The left column contains the average numerical response for the entire sample of 60,129 students, the middle column contains the average numerical response for the 31,445 female students, and the right column contains the average numerical response for the 28,684 male students.

Figure A3: Distribution of individual non-cognitive outcomes



Each cell plots the percentage of students who answered each non-cognitive question with each of the five possible answers. Number of observations: 60,129.

E. Balance of share female on controls

The below table provides estimates from a regression of the student's share of female peers in their school and grade on the control variables in the baseline model and a vector of school and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

Only one relationship is statistically significant at the 10% level, which is to be expected even if no true correlations exist in the population due to the number of control variables. Furthermore, the size of the correlation is not of practical significance – students above the median age for their grade have a 0.0020 smaller share of female peers.

Table A2: Balance of share female

	Female		Male	
Share female	Coeff.	Std. Err.	Coeff.	Std. Err.
Hispanic or Latino	0.0012	(0.0016)	-0.0010	(0.0013)
Black or African American	-0.0001	(0.0010)	0.0001	(0.0011)
Asian or Pacific Islander	0.0007	(0.0026)	-0.0002	(0.0019)
American Indian or Native American	0.0008	(0.0028)	0.0003	(0.0025)
Other race	0.0011	(0.0028)	0.0004	(0.0021)
Above median age	0.0016	(0.0013)	-0.0020*	(0.0011)
Born in the United States	0.0006	(0.0015)	-0.0005	(0.0015)
Household size				
One	-0.0295	(0.0363)	0.0062	(0.0084)
Two	0.0037	(0.0024)	0.0025	(0.0037)
Four to six	0.0012	(0.0012)	0.0013	(0.0011)
Shelter or group home	0.0051	(0.0064)	0.0016	(0.0040)
Constant	0.5492***	(0.0084)	0.5599***	(0.0092)
Observations	31,445		28,684	

*p < 0.10, ** p < 0.05, *** p < 0.01

F. Comparing observed variation with simulated variation

While it is impossible to directly test whether variation in the share of female students within a school and across grades is as good as random, I can test whether the variation resembles what we would observe if it were random. To do so, I first regress the share of female students on a vector of school and grade dummy variables to predict the mean share of female students. I then simulate 1,000 cohorts of students for each school and grade using a Binomial distribution and the predicted means. Finally, I compare the resulting standard deviation in the share of female students across grades within a school with the observed standard deviation.

To quantify the difference between the observed and simulated variation, I compute the 5^{th}, 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}, and 95^{th} percentiles of the standard deviation in the share of female students in each school across the 1,000 simulations. Then I count the number of schools with an observed standard deviation in the share of female students less than each school-specific percentile. If the observed variation is similar to the simulated variation, I expect to find 5% of schools with an observed variation less than the 5^{th} percentile, 10% of schools with an observed variation less than the 10^{th} percentile, etc. The table below presents the counts of schools that fall within each percentile.

Table A3: Fit of simulated percentiles

Percentile	Actual	Expected	Difference
5^{th}	7	5.7	1.3
10^{th}	9	11.4	-2.4
25^{th}	24	28.5	-4.5
50^{th}	53	57	-4
75^{th}	88	85.5	2.5
90^{th}	105	102.6	2.4
95^{th}	107	108.3	-1.3
Total	114 schools		

G. Baselines estimates with coefficients on control variables shown

Table A4: Baseline regression estimates

	All		Female		Male	
	Belonging	Self-worth	Belonging	Self-worth	Belonging	Self-worth
	(1)	(2)	(3)	(4)	(5)	(6)
Share female	0.295	0.242	-0.00550	-0.197	0.714*	0.633*
	(0.318)	(0.176)	(0.408)	(0.258)	(0.352)	(0.270)
Female	-0.107***	-0.427***				
	(0.0149)	(0.0173)				
Hispanic or Latino	-0.132***	-0.00123	-0.230***	-0.0306	-0.0309	0.0319
	(0.0323)	(0.0333)	(0.0431)	(0.0514)	(0.0413)	(0.0360)
Black or African American	-0.0879**	0.269***	-0.220***	0.336***	0.0655	0.184***
	(0.0334)	(0.0283)	(0.0371)	(0.0336)	(0.0388)	(0.0356)
Asian or Pacific Islander	-0.263***	-0.170**	-0.302***	-0.152*	-0.216***	-0.182**
	(0.0493)	(0.0544)	(0.0769)	(0.0654)	(0.0491)	(0.0566)
American Indian or Native American	-0.379***	-0.167***	-0.350***	-0.126	-0.397***	-0.227***
	(0.0571)	(0.0487)	(0.0705)	(0.0636)	(0.0856)	(0.0621)
Other race	-0.200***	-0.109*	-0.228**	-0.202**	-0.168**	-0.0366
	(0.0451)	(0.0450)	(0.0693)	(0.0765)	(0.0606)	(0.0521)
Above median age	-0.112***	-0.00446	-0.156***	0.00130	-0.0700**	-0.0109
	(0.0172)	(0.0127)	(0.0239)	(0.0203)	(0.0239)	(0.0178)
Born in the United States	-0.0919*	0.0574	-0.0462	0.113**	-0.145**	-0.00229
	(0.0372)	(0.0328)	(0.0511)	(0.0411)	(0.0455)	(0.0394)
Household size						
One	-0.186	-0.224*	-0.301	-0.245	-0.123	-0.223
	(0.111)	(0.0921)	(0.204)	(0.153)	(0.142)	(0.116)
Two	-0.102**	-0.0551	-0.0954	-0.0687	-0.115**	-0.0458
	(0.0333)	(0.0366)	(0.0525)	(0.0483)	(0.0434)	(0.0442)
Four to six	0.0861***	0.0803***	0.0789**	0.0881***	0.0977**	0.0733**
	(0.0201)	(0.0168)	(0.0253)	(0.0248)	(0.0292)	(0.0224)
Shelter or group home	-0.455***	-0.635***	-0.327*	-0.244	-0.550**	-0.869***
	(0.133)	(0.147)	(0.162)	(0.231)	(0.200)	(0.196)
Constant	3.290***	3.115***	3.489***	3.159***	2.883***	2.585***
	(0.160)	(0.104)	(0.211)	(0.145)	(0.189)	(0.169)
Observations	60,129	60,129	31,445	31,445	28,684	28,684

The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

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

H. Estimates without controls

Table A5: Regression estimates without controls

	All		Female		Male	
	Belonging	Self-worth	Belonging	Self-worth	Belonging	Self-worth
	(1)	(2)	(3)	(4)	(5)	(6)
Share female	0.335	0.455*	-0.0356	-0.191	0.736*	0.635*
	(0.317)	(0.177)	(0.423)	(0.267)	(0.348)	(0.273)
Constant	3.211***	2.799***	3.503***	3.223***	2.900***	2.626***
	(0.162)	(0.102)	(0.219)	(0.147)	(0.188)	(0.165)
Observations	60,129	60,129	31,445	31,445	28,684	28,684

The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

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

I. Estimates using average numerical response

Table A6: Regression estimates using average numerical response

	All		Female		Male	
	Belonging	Self-worth	Belonging	Self-worth	Belonging	Self-worth
	(1)	(2)	(3)	(4)	(5)	(6)
Share female	0.215	0.134	-0.0790	-0.204	0.561*	0.486*
	(0.196)	(0.128)	(0.246)	(0.169)	(0.248)	(0.186)
Female	-0.107***	-0.349***				
	(0.0116)	(0.0137)				
Hispanic or Latino	-0.101***	0.00212	-0.160***	-0.00800	-0.0392	0.0149
	(0.0222)	(0.0248)	(0.0294)	(0.0371)	(0.0292)	(0.0274)
Black or African American	-0.0436	0.253***	-0.134***	0.301***	0.0631*	0.191***
	(0.0250)	(0.0232)	(0.0272)	(0.0267)	(0.0305)	(0.0306)
Asian or Pacific Islander	-0.161***	-0.111**	-0.188***	-0.0978*	-0.129***	-0.121**
	(0.0322)	(0.0356)	(0.0457)	(0.0416)	(0.0352)	(0.0406)
American Indian or Native American	-0.248***	-0.110***	-0.229***	-0.101*	-0.267***	-0.134**
	(0.0403)	(0.0310)	(0.0481)	(0.0496)	(0.0623)	(0.0426)
Other race	-0.145***	-0.0377	-0.185**	-0.116	-0.108*	0.0243
	(0.0385)	(0.0379)	(0.0548)	(0.0635)	(0.0495)	(0.0447)
Above median age	-0.0873***	-0.00959	-0.137***	-0.0197	-0.0429*	-0.00267
	(0.0125)	(0.0110)	(0.0175)	(0.0139)	(0.0167)	(0.0153)
Born in the United States	-0.0364	0.0438	0.0102	0.106***	-0.0830*	-0.0200
	(0.0260)	(0.0234)	(0.0350)	(0.0274)	(0.0319)	(0.0311)
Household size						
One	-0.180	-0.183*	-0.296*	-0.157	-0.124	-0.192
	(0.0923)	(0.0838)	(0.141)	(0.106)	(0.123)	(0.117)
Two	-0.0551*	-0.0396	-0.0559	-0.0238	-0.0599	-0.0562
	(0.0253)	(0.0276)	(0.0377)	(0.0375)	(0.0334)	(0.0364)
Four to six	0.0708***	0.0649***	0.0745***	0.0732***	0.0711***	0.0581**
	(0.0140)	(0.0129)	(0.0190)	(0.0179)	(0.0188)	(0.0187)
Shelter or group home	-0.571***	-0.735***	-0.386*	-0.423	-0.693***	-0.922***
	(0.137)	(0.169)	(0.159)	(0.244)	(0.202)	(0.215)
Constant	0.645***	0.463***	0.806***	0.495***	0.324*	0.00495
	(0.0985)	(0.0676)	(0.128)	(0.0919)	(0.135)	(0.108)
Observations	60,129	60,129	31,445	31,445	28,684	28,684

The table contains estimates from a regression the average numerical response to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

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

J. Estimates for each survey question

Table A7: Disaggregated regression results for female students

	Female students							
	Socially accepted	Loved and wanted	Close to people	Part of school	Have good qualities	Have a lot to be proud of	Likes self	Doing everything right
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share female	0.0380	-0.129	-0.0914	-0.0816	0.0924	0.0530	-0.461	-0.325
	(0.246)	(0.193)	(0.238)	(0.302)	(0.175)	(0.171)	(0.276)	(0.192)
Hispanic or Latino	-0.0458	-0.111***	-0.161***	-0.216***	-0.0723*	-0.0763*	0.0720	0.0514
	(0.0277)	(0.0286)	(0.0293)	(0.0377)	(0.0284)	(0.0373)	(0.0368)	(0.0364)
Black or African American	0.0723**	0.0465	-0.383***	-0.182***	0.210***	0.202***	0.365***	0.169***
	(0.0217)	(0.0273)	(0.0322)	(0.0362)	(0.0249)	(0.0232)	(0.0310)	(0.0267)
Asian or Pacific Islander	-0.106**	-0.258***	-0.139**	-0.123*	-0.127**	-0.191***	-0.00568	0.0155
	(0.0351)	(0.0407)	(0.0529)	(0.0528)	(0.0391)	(0.0488)	(0.0385)	(0.0356)
American Indian or Native American	-0.151**	-0.204***	-0.173***	-0.235***	-0.0788	-0.0811	-0.0621	-0.0951*
	(0.0470)	(0.0488)	(0.0472)	(0.0509)	(0.0469)	(0.0534)	(0.0463)	(0.0469)
Other race	-0.147*	-0.218***	-0.125*	-0.126*	-0.0196	-0.121*	-0.115	-0.109
	(0.0592)	(0.0572)	(0.0516)	(0.0581)	(0.0555)	(0.0536)	(0.0651)	(0.0669)
Above median age	-0.067***	-0.0596**	-0.149***	-0.182***	-0.059***	-0.074***	0.0332	0.0381*
	(0.0173)	(0.0224)	(0.0217)	(0.0234)	(0.0126)	(0.0149)	(0.0198)	(0.0162)
Born in the United States	0.0388	0.0113	-0.0124	-0.00369	-0.00594	0.0657*	0.163***	0.111***
	(0.0273)	(0.0312)	(0.0451)	(0.0381)	(0.0256)	(0.0264)	(0.0312)	(0.0321)
Household size								
One	-0.180	-0.211	-0.296	-0.300	-0.155	-0.157	-0.121	-0.0600
	(0.142)	(0.138)	(0.205)	(0.206)	(0.127)	(0.0986)	(0.127)	(0.114)
Two	-0.0501	-0.0150	-0.0705	-0.0510	0.0100	-0.0564	0.00663	-0.0351
	(0.0392)	(0.0343)	(0.0422)	(0.0454)	(0.0298)	(0.0320)	(0.0448)	(0.0389)
Four to six	0.0408*	0.0336*	0.0792***	0.0951***	0.0206	0.0431**	0.102***	0.0640**
	(0.0203)	(0.0166)	(0.0200)	(0.0241)	(0.0156)	(0.0157)	(0.0189)	(0.0214)
Shelter or group home	-0.335*	-0.589***	-0.186	-0.177	-0.461*	-0.495*	-0.406	0.0323
	(0.150)	(0.169)	(0.163)	(0.150)	(0.221)	(0.200)	(0.261)	(0.178)
Constant	3.911***	4.751***	4.305***	4.507***	4.283***	4.565***	4.488***	3.627***
	(0.133)	(0.107)	(0.130)	(0.160)	(0.0964)	(0.101)	(0.145)	(0.105)
Observations	31,445	31,445	31,445	31,445	31,445	31,445	31,445	31,445

The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

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

Table A8: Disaggregated regression results for male students

	Male students							
	Socially accepted	Loved and wanted	Close to people	Part of school	Have good qualities	Have a lot to be proud of	Likes self	Doing everything right
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share female	0.341	0.458	0.631*	0.441*	0.121	0.304	0.634**	0.469*
	(0.208)	(0.299)	(0.274)	(0.219)	(0.169)	(0.167)	(0.240)	(0.227)
Hispanic or Latino	0.0150	-0.0365	0.00896	-0.118***	-0.0765*	-0.0354	0.0717**	0.0870**
	(0.0295)	(0.0372)	(0.0301)	(0.0329)	(0.0316)	(0.0284)	(0.0251)	(0.0294)
Black or African American	0.138***	0.0479	0.000402	0.0245	0.167***	0.140***	0.213***	0.0810*
	(0.0310)	(0.0283)	(0.0320)	(0.0379)	(0.0239)	(0.0282)	(0.0322)	(0.0352)
Asian or Pacific Islander	-0.124**	-0.177***	-0.0412	-0.0871*	-0.144***	-0.190***	-0.0419	-0.00585
	(0.0430)	(0.0350)	(0.0394)	(0.0376)	(0.0378)	(0.0365)	(0.0374)	(0.0428)
American Indian or Native American	-0.187***	-0.228***	-0.180**	-0.296***	-0.114**	-0.158***	-0.0622	-0.0875
	(0.0450)	(0.0486)	(0.0587)	(0.0840)	(0.0355)	(0.0441)	(0.0449)	(0.0541)
Other race	0.00611	-0.0810	-0.154*	-0.133	0.0133	0.0159	0.0137	0.0336
	(0.0459)	(0.0506)	(0.0605)	(0.0717)	(0.0434)	(0.0417)	(0.0589)	(0.0498)
Above median age	-0.0160	-0.0382*	-0.0357*	-0.0534*	-0.0202	-0.063***	0.0397*	0.0346*
	(0.0163)	(0.0154)	(0.0160)	(0.0224)	(0.0159)	(0.0167)	(0.0161)	(0.0154)
Born in the United States	-0.0649*	-0.138***	-0.0339	-0.0399	-0.0752**	-0.0372	0.0264	0.0232
	(0.0307)	(0.0339)	(0.0312)	(0.0373)	(0.0283)	(0.0334)	(0.0316)	(0.0323)
Household size								
One	0.0301	-0.210	-0.00477	-0.228	-0.225*	-0.248*	-0.151	0.0200
	(0.108)	(0.120)	(0.125)	(0.145)	(0.0929)	(0.0985)	(0.111)	(0.120)
Two	-0.0300	-0.0443	-0.0876*	-0.0379	-0.0327	-0.0561	-0.0359	-0.0520
	(0.0353)	(0.0352)	(0.0366)	(0.0427)	(0.0299)	(0.0332)	(0.0446)	(0.0400)
Four to six	0.0454*	0.0537**	0.0645**	0.0737**	0.0201	0.0545**	0.0492*	0.0588**
	(0.0188)	(0.0169)	(0.0211)	(0.0234)	(0.0179)	(0.0205)	(0.0207)	(0.0195)
Shelter or group home	-0.615***	-0.831***	-0.392	-0.474*	-0.900***	-0.858***	-0.772***	-0.369*
	(0.180)	(0.200)	(0.203)	(0.182)	(0.200)	(0.192)	(0.180)	(0.175)
Constant	3.928***	4.051***	3.768***	4.115***	4.284***	4.513***	3.712***	2.913***
	(0.117)	(0.168)	(0.162)	(0.114)	(0.0966)	(0.103)	(0.133)	(0.126)
Observations	28,684	28,684	28,684	28,684	28,684	28,684	28,684	28,684

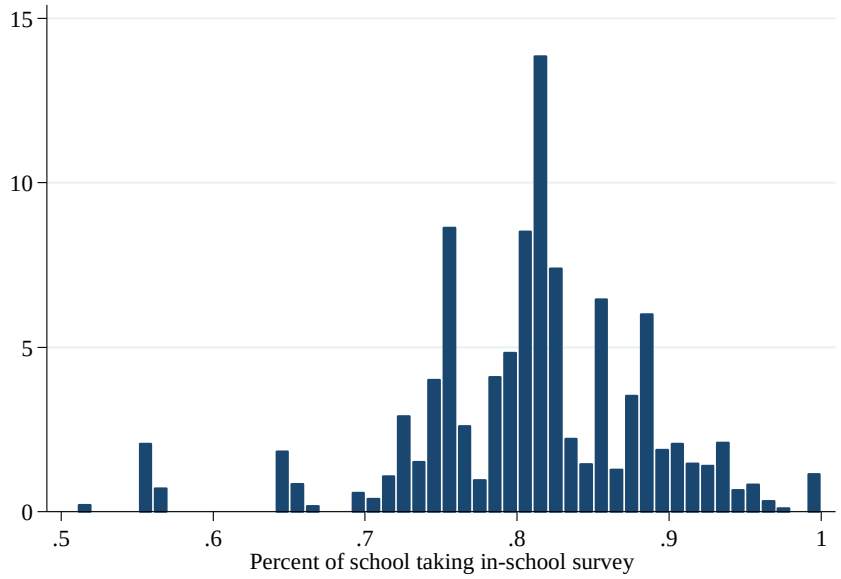
The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.

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

K. Sensitivity to measurement error

The primary explanatory variable, the share of female peers, is based on individual-level responses to the in-school questionnaire and is not a precise measure of the true share of female students in a school and grade, as not every student in every school was in attendance or agreed to take the survey. However, school administrators did report how many students were on their roster for the in-sample grades, allowing me to calculate the percentage of students who responded to the survey. As shown in the histogram below, most students in my sample attended schools which had an 80% response rate or higher, and every student in my sample attended a school with at least a 50% response rate.

Figure A3: Distribution of school response rates



Despite the high responses rates, there is still measurement error in the share of female peers, and this imprecision biases my standard errors downward. The effect on the point estimates is unknown ex ante, as the measurement error does not satisfy the classical assumptions. To account for this bias, I follow a multiple imputation procedure and adjust the standard errors according to the formula proposed by Rubin and Schenker (1986).

I assume that the observed share of female students in a school and grade is an unbiased estimate for the true share of female students, which would be true if survey non-response is uncorrelated with sex. Next, I estimate the number of missing students in a grade by multiplying the number of missing responses in a school by the share of the school within each grade. I then create 500 simulated data sets filling in the missing students with draws from a Binomial distribution using the probability of being female and number of missing students in each school and grade. I re-estimate my baseline model for each data set, replacing the observed share of female peers with a simulated share of female peers. The average point-estimate is a consistent estimate for the

theoretical point-estimate without measurement error in the share of female peers, and the average standard error, plus a term to correct for the variation across simulations, is a consistent estimate for the standard error without measurement error.

As shown in the table below, the point estimates for the share of female peers are slightly smaller and the standard errors are slightly larger than in the baseline model. The main results of the paper are unchanged.

Table A9: Regression estimates accounting for measurement error

	All		Female		Male	
	Belonging	Self-worth	Belonging	Self-worth	Belonging	Self-worth
	(1)	(2)	(3)	(4)	(5)	(6)
Share female	0.247	0.197	-0.00112	-0.182	0.613*	0.537*
	(0.315)	(0.192)	(0.398)	(0.268)	(0.367)	(0.276)
Control variables	X	X	X	X	X	X
Observations	60,129	60,129	31,445	31,445	28,684	28,684

The table contains estimates from a regression of the number of "Agree" or "Strongly Agree" responses to the sense of belonging and self-worth question categories on the share of female peers within a student's school and grade, individual covariates, and state and grade dummy variables. Standard errors are adjusted for the stratification and clustering of the survey design and for the uncertainty introduced by measurement error in the share of female peers. Observations are weighted by the inverse probability of their selection using weights provided by Add Health.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$