The Math Gender Gap: The Role of Culture

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Abstract

This paper investigates the effect of gender-related culture on the math gender gap by analysing math test scores of second-generation immigrants, who are all exposed to a common set of host country laws and institutions. We find that immigrant girls whose parents come from more gender-equal countries perform better (relative to similar boys) than immigrant girls whose parents come from less gender-equal countries, suggesting an important role of cultural beliefs on the role of women in society on the math gender gap. The transmission of cultural beliefs accounts for at least two thirds of the overall contribution of gender-related factors.

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The Math Gender Gap: The Role of Culture

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Using analysis across countries or states, previous studies show that girls in more gender-equal countries or states perform relatively better than boys in math test scores (Fryer and Levitt 2010; Guiso et al. 2008, and Pope and Sydnor 2010). While it is possible that greater gender equality leads to a reduction in the math gender gap, an alternative interpretation of these findings could be that in countries where girls perform relatively better at math, women might also be more prepared, access better jobs, earn higher wages, and be more easily promoted and politically empowered--leading to greater gender equality.

The current paper's contribution to this literature is twofold. First, we assess the direction of causality using the epidemiological approach (Fernández and Fogli 2009, and Fernández 2007). Second, we quantify the effect of values and beliefs about women's role in society transmitted from generation to generation (what we call "culture on gender equality") versus that of a country's institutions and formal practices on the math gender gap. In doing so, we inform a public policy issue of first-order importance.

The epidemiological approach focuses on second-generation immigrants, which have lived in a host country since birth and are exposed to the same host-country institutions, such as, the same educational system, labor market, and laws and

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regulations. Crucially, second-generation immigrants living in the same host country are also likely to be influenced by the cultural beliefs of their parents' ancestry country. Given that math test scores of second-generation immigrants are unlikely to affect the gender-equality measures (culture or institutions) of their parents' country of ancestry, the problem of reverse causality is less of an issue in our paper. In addition, with the epidemiological approach, any country-of-ancestry variation in the math gender gap of second-generation immigrants in a particular host country can only be attributed to cultural differences transmitted from the immigrants' parents (or peers), as opposed to institutional differences. We find that the transmission of beliefs on the role of women in society is an important determinant of the math gender gap, as it accounts for at least two thirds of the overall contribution of gender-related societal factors

I. Data

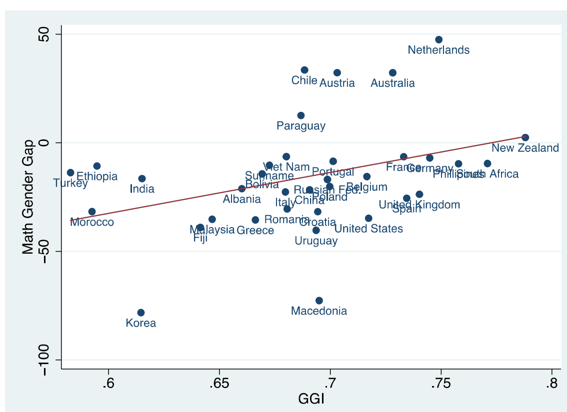
We use data from the 2003, 2006, 2009 and 2012 Program for International Student Assessment (PISA), conducted by the Organization for Economic Cooperation and Development (OECD). PISA is an internationally standardized (and, hence, culture-neutral) mathematics assessment administered to 15-year olds in schools. Our sample contains 11,527 second-generation migrants from 35 different countries of ancestry and living in 9 host countries (see Table A.1. in the on-line appendix).

On average, the gender gap in math scores (defined as the difference in math score between girls and boys) among second-generation immigrants is 15.70, equivalent to 4.5 months of schooling (see Table A.2). Crucially, it varies widely by country of ancestry. Whereas at the bottom 10% of the distribution second-generation immigrant girls underperform boys by as much as 63 score points (equivalent to a difference of almost 1.5 years of schooling), at the top 10% of the distribution, second-generation immigrant girls outperform boys by around 36 points (a difference equivalent to 10 months of schooling).

Following Guiso et al. (2008), we use the 2009 Gender Gap Index (GGI, thereafter) in the country of ancestry from the World Economic Forum to measure gender equality in an immigrant's country of ancestry (see Hausmann, Tyson, & Zahidi, 2009). The GGI measures economic and political opportunities, education, and well-being for women, and ranges from 0 to 1, with larger values pointing to a better position of women in society.

Figure 1 plots the average math gender gap of second-generation immigrants by country of ancestry (column 1 in Table A.2) versus the GGI (column 2 Table A.2). Overall, the raw data show that the more gender equality in the country of ancestry, the higher the math scores of second-generation immigrant girls relative to boys. The correlation is 0.22 per cent and is statistically significant at conventional level.

Figure 1. Gender Gap in Math Scores of Second-Generation Immigrants and Gender Equality in Countries of Ancestry



Notes: Figure 1 displays the correlation between the raw average math gender gap among second-generation immigrants and the GGI in the country of ancestry. The math gender gap was obtained from estimating a linear regression using the plausible values provided by the PISA data sets as LHS variable and a female indicator as RHS variable. We estimated one regression for each PV for each country and present the average of the 5 coefficients estimated. We use individuals whose both parents were born in a foreign country from the 2003, 2006, 2009 and 2012 PISA datasets.

III. Empirical Specification

To estimate the effect of cultural attitudes toward gender equality on the math gender gap, we run the following model:

$$E_{ijkt} = \alpha_1 \text{ female}_i + \alpha_2 \, (female_i \, GGI_j) + \beta'_1 X_{ijkt} + \beta'_2 \, (X_{ijkt} \, female_i) + \lambda_j + \lambda_k + \lambda_t + \delta \, (female_i \, \lambda_k) + \varepsilon_{ijkt} \tag{1}$$

where E_{ijkt} is the math test score of individual i who lives in region k in a given host country at time t and is of ancestry j. $female_i$ is an indicator equal to one if the individual is a girl and zero otherwise. GGI_j measures gender equality from the immigrant i's country of ancestry j. X_{ijkt} is a set of individual characteristics which varies depending on the specification considered. The construction of all individual variables and basic summary statistics are shown in Table A.3 in the on-line appendix. We also include a full set of dummies that control for the country of ancestry j (λ_j), host country (λ_k), and the PISA cohort t (λ_t). Country-of-ancestry fixed effects (λ_j) control for the GGI in the country of ancestry, and for any other country-of-ancestry factors *not* related to culture's attitude toward gender equality that affect the math scores of boys and girls in the same way. Host-country dummies (λ_k) are interacted with the female dummy to account for variation in the host-country educational gender gaps that may arise from across host-country differentials in cultural or institutional channels. Following OECD recommendations, we apply the Fay's Balanced Repeated Replicated (BRR) methodology to estimate standard errors that will take into account PISA's stratified, two-stage sample design.

The coefficient of interest is the coefficient on the interaction between the GGI and the female indicator, α_2, which captures the role of culture on gender equality in explaining the gender differences in the math test scores of second-generation immigrant girls relative to boys. A positive and significant α_2 would suggest that more gender-equal cultural norms toward the role of women in society are associated with a higher relative math performance of second-generation-immigrant girls over boys.

IV. Results

Our baseline specification (column 1 in table 1) includes as individual controls the age of the child at the time of the exam and a dummy indicating whether the individual is in a different grade from the modal grade in the host country. The coefficient of interest, α_2, is positive and statistically significant, indicating that the math gender gap decreases for immigrants whose parents come from more gender equal countries. Given that immigrants are not necessarily representative of their country of ancestry's population and are, probably, less likely to be influenced by their country of ancestry's culture, the fact that we find that culture of ancestry matters is remarkable. Results remain robust to a battery of sensitivity checks, including alternative measures of gender equality in the country of ancestry, alternative specifications, adjustments of standard errors, and changes in sample criteria as shown in Tables A.4 and A.5 in the online appendix.

Column 2 in Table 1 shows our preferred specification, which includes the real log GDP per capita in the country of ancestry interacted with the female indicator in order to capture differences in the country of ancestry's culture beyond those due to differences in the economic development, which may affect an immigrant's test scores for reasons unrelated to gender equality norms in their country of ancestry (Luttmer and Singhal, 2011). We find that a one standard deviation increase in the gender equality index is associated with a reduction of 7.47 score points in the math gender gap (about one and a half months of schooling). A reduction of 7.47 points represents a 29% of the standard deviation in the math gender gap across countries of ancestry.[2]

[2] Using estimates from column 2 in Table 1, these values are calculated as follows: $\alpha_2\ (149.55) * GGI_{std}(0.05) = 7.47$, and $\frac{7.47}{Gender\ Gap\ in\ Math_{std}(26.04)} = 0.29$.

Table 1: Math Scores and Gender Equality

	(1)	(2)	(3)	(4)	(5)	(6)
Female	-191.32	-177.15	-104.61	-198.47	-173.27	-185.23
	[307.83]	[294.34]	[212.13]	[321.00]	[290.52]	[307.09]
GGI x Female	110.53**	149.55**	139.35**	155.51***	170.83***	156.31**
	[51.08]	[62.62]	[63.46]	[60.08]	[60.98]	[61.13]
Age of student	7.77	7.90	9.46	7.53	8.61	8.15
	[6.73]	[6.71]	[6.76]	[6.81]	[6.80]	[6.90]
Age x Female	6.22	6.07	2.29	7.21	6.82	6.20
	[9.55]	[9.54]	[9.73]	[9.56]	[9.47]	[9.60]
Diff. grade	-13.69***	-13.82***	-16.69***	-13.63***	-12.56***	-12.35**
	[4.69]	[4.69]	[4.91]	[4.86]	[4.79]	[4.83]
Diff. grade x Female	-5.94	-5.64	-6.32	-3.73	-3.14	-3.04
	[6.29]	[6.30]	[6.77]	[6.36]	[6.25]	[6.10]
GDP x Female		-3.94	-4.40	-3.60	-4.57	-4.28
		[3.30]	[3.67]	[3.28]	[3.38]	[3.34]
Dad educ.				6.85***	5.62***	5.42***
				[1.52]	[1.52]	[1.51]
Dad educ. x Female				-1.12	-1.53	-1.56
				[2.06]	[2.09]	[2.08]
Mom educ.				4.14***	2.93**	2.69*
				[1.44]	[1.46]	[1.44]
Mom educ. x Female				-0.54	-0.62	-0.49
				[1.73]	[1.81]	[1.79]
Dad work					20.15***	19.92***
					[7.09]	[6.97]
Dad work x Female					-9.32	-9.17
					[9.23]	[9.20]
Mom work					17.01***	15.93***
					[4.89]	[4.94]
Mom work x Female					-12.92*	-11.05
					[7.58]	[7.52]
Home posessions					11.10***	11.20***
					[2.57]	[2.49]
Home posessions x Female					6.14*	5.92*
					[3.46]	[3.37]
Proportion of girls at school						-18.07
						[13.77]
Prop. girls x Female						47.34***
						[18.35]
Private school						6.91
						[7.79]
Private school x Female						2.90
						[7.93]
School is in a City-Metropolis						18.12***
						[5.75]
School in City-Metrop x Female						-14.44*
						[7.46]
GGI			100.54*			
			[54.50]			
GDP			3.66			
			[3.26]			
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country of ancestry FE	Yes	Yes	No	Yes	Yes	Yes
Host country FE	Yes	Yes	Yes	Yes	Yes	Yes
Host countryFE x female	Yes	Yes	Yes	Yes	Yes	Yes
N	11,527	11,527	11,527	11,527	11,527	11,527
R^2	0.35	0.35	0.28	0.38	0.40	0.40

Notes: Results from estimating equation 1 on individuals' math scores. In all cases we use the five plausible values of math test scores provided by PISA datasets and report the average coefficient (Stata command *pv*). Standard Errors are adjusted following the Fay's BRR methodology using the 80 alternative weights provided by the PISA datasets. * p<0.1, ** p<0.05, *** p<0.01

Column 3 in Table 1 shows that results remain qualitatively the same under an alternative specification to equation (1) that excludes the country-of-ancestry fixed effects and instead adds first-order effects of the GGI (and also the GDP) in the country of ancestry. Overall, results from columns 2 and 3 suggest that not taking into account differences in the economic development of the immigrant's country of ancestry could lead to a downward bias in the estimated effect of gender equality and the gap in math scores.

To address concerns that several sources of heterogeneity across individuals other than cultural beliefs on gender roles may affect their educational attainment, in column 4 we add to the preferred specification parent's highest education level and its interaction with the female indicator. If less educated parents (who may happen to come from less gender-equal countries) invest relatively less in their girls' than in their boys' education than more educated parents (who may happen to come more from more gender-equal countries), failure to control for parental education (and their interaction with the female indicator) may lead us to incorrectly conclude that cultural beliefs are affecting the math gender gap. Having higher educated parents increases math test scores, albeit not differentially for boys than for girls. More importantly, the effect of culture on the math gender gap continues to be positive and statistically significant, with the coefficient increasing in magnitude and precision.

One concern with the above estimates is that all individuals may have the same biased gender attitudes independently of country of ancestry but that, according to how credit constrained they are, they invest more or less in their girls. As parental income is unavailable in our dataset, column 5 in Table 1 controls instead for two indicator variables taking value one if the mother (or father) works, as well as for an index of family (material and educational) resources constructed by PISA, and their interaction with the female indicator. Parental employment and greater family resources improve math test scores of both girls and boys. However, whereas more family resources seem to benefit girls more than boys, the opposite is true for having a working mother (albeit these coefficients are only statistically significant at the 10% level). Compared to results in column 2, the coefficient on the interaction of our culture proxy with the female indicator increases in magnitude, suggesting that when omitting these family characteristics our measure of culture also picks up the differential negative effect that these variables have on girls' relative to boys' math scores.

Another concern is that girls from more gender-equal countries may also attend schools where they perform better relative to boys. To the extent that girls from more gender-equal countries are less likely to be discriminated by teachers, either because they attend schools with more female teachers or schools with a higher proportion of teachers from their same ethnicity (Dee, 2005), they may do relatively better (with respect to boys) than girls from less gender-equal countries. Gneezy, Niederle and Rustichini (2003) show that a higher proportion of girls in schools may boost women's confidence and, subsequently, improve their math performance relative to boys. Thus, an alternative reason why girls from more gender-equal countries may do relatively better (with respect to boys) than girls from less gender-equal countries could be that they attend schools where there is a higher proportion of girls. Column 6 accounts for these factors by adding to the specification in column 5 the percentage of girls enrolled at school, as well as other school characteristics, and the interaction between these variables and the female indicator. Overall, however, controlling for the immigrants' school characteristic remains positive and statistically significant, and similar in magnitude to the culture coefficient in column 4.

VI. Conclusion: Culture, Institutions, and Policy Implications

Our results so far indicate that cultural beliefs on the role of women in society matter in explaining the math gender gap. In this section, we quantify how much cultural beliefs on the role of women in society matter *vis-à-vis* other gender-equal societal factors. To do so, we compare the magnitudes of the estimates from the epidemiological approach in equation (1) to those from a model estimated on *both* natives and immigrants, where the country-of-ancestry GGI (and the host-country fixed effects) are substituted by the country-of-residence GGI. Identification in this model comes from the variation of the level of gender equality across countries of residence, and thus captures both, the effect of culture, as well as other institutional factors affecting the math gender gap in the country of residence. By comparing these two estimates, we are thus providing a lower bound of the effect of culture on the math gender gap.

Estimates from this alternative identification strategy show that a one standard deviation increase in the level of the gender equality index in the country of residence is associated with a 42% reduction in the standard deviation of the gender gap across countries of residence. Comparing both estimates suggests that the transmission of cultural beliefs on the role of women in society accounts for at least two thirds (29/42=69%) of the overall contribution of gender related factors to the math gender gap.

Our findings suggest that policies attempting to modify institutional constraints, including reducing the wage gender gap, imposing gender quotas, and giving parents of young children the right to work part-time, may not be enough. Alternatively, policies attempting to change cultural beliefs on the role of women in society (such as changing beliefs on: women having a comparative advantage in activities such as homemaking and family caretaking; or whether women should have a voice regarding their own rights; and women's autonomy to participate in any decision problem regarding themselves), may also prove decisive in reducing the math gender gap.

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On-Line Appendix

Table A. 1. Sample Size by Country of Ancestry and Destiny

		ARG	AUS	AUT	BEL	CHE	ISR	LUX	NLD	NZL	**Total**
1	Albania					132					**132**
2	Australia									36	**36**
3	Austria					46					**46**
4	Belgium							159			**159**
5	Bolivia	131									**131**
6	Chile	24									**24**
7	China		410						27	130	**567**
8	Croatia			77							**77**
9	Ethiopia						151				**151**
10	Fiji									35	**35**
11	France				102	203	67	242			**614**
12	Germany		21	38	41	176		116			**392**
13	Greece		46								**46**
14	India		158								**158**
15	Italy		88			739		256			**1,083**
16	Korea		31							15	**46**
17	Malaysia		34								**34**
18	Morocco								192		**192**
19	Netherlands				50						**50**
20	New Zealand		376								**376**
21	Paraguay	63									**63**
22	Philippines		240								**240**
23	Poland			47							**47**
24	Portugal					777		2,069			**2,846**
25	Romania			58							**58**
26	Russian Fed.						491				**491**
27	Viet Nam		291								**291**
28	South Africa		60								**60**
29	Spain					246					**246**
30	Suriname								107		**107**
31	Turkey			509	440	591			222		**1,762**
32	Macedonia			20							**20**
33	United		651							168	**819**
34	United States		29				82				**111**
35	Uruguay	17									**17**
	Total	**235**	**2,435**	**749**	**633**	**2,910**	**791**	**2,842**	**548**	**384**	**11,527**

Notes: Final sample of second-generation immigrants from 2003, 2006, 2009 and 2012 PISA datasets. ARG=Argentina, AUS=Australia, AUT=Austria, BEL=Belgium, CHE=Switzerland, ISR=Israel, LUX=Luxembourg, NLD=Netherlands, NZL= New Zealand.

Table A.2. Gender Gap in Math Scores and Gender Equality by Country of Ancestry

	Country of ancestry	Math Gender Gap	GGI	*N*
1	Korea	-78.24	0.61	*46*
2	Macedonia	-72.64	0.69	*34*
3	Uruguay	-40.31	0.69	*111*
4	Fiji	-38.99	0.64	*35*
5	Greece	-35.53	0.67	*46*
6	Malaysia	-35.19	0.65	*192*
7	United States	-34.75	0.72	*819*
8	Croatia	-31.74	0.69	*77*
9	Morocco	-31.70	0.59	*50*
10	Romania	-30.52	0.68	*491*
11	Spain	-25.55	0.73	*246*
12	UK	-23.73	0.74	*20*
13	Italy	-22.65	0.68	*1,083*
14	China	-21.69	0.69	*567*
15	Albania	-21.16	0.66	*132*
16	Poland	-20.11	0.70	*2,846*
17	Russian Fed.	-16.88	0.70	*291*
18	India	-16.45	0.62	*158*
19	Belgium	-15.56	0.72	*159*
20	Bolivia	-14.36	0.67	*131*
21	Turkey	-13.77	0.58	*1,762*
22	Ethiopia	-10.69	0.59	*151*
23	Suriname	-10.39	0.67	*107*
24	Philippines	-9.66	0.76	*47*
25	South Africa	-9.56	0.77	*60*
26	Portugal	-8.53	0.70	*58*
27	Germany	-6.96	0.74	*392*
28	France	-6.43	0.73	*614*
29	Viet Nam	-6.34	0.68	*17*
30	New Zealand	2.42	0.79	*63*
31	Paraguay	12.61	0.69	*240*
32	Australia	32.26	0.73	*36*
33	Austria	32.29	0.70	*46*
34	Chile	33.52	0.69	*24*
35	Netherlands	47.53	0.75	*376*
	Mean	-15.70	0.69	*11,527*
	St. Dev.	26.04	0.05	

Notes: Table A.1 displays the means of the math gender gap and the GGI by country of ancestry estimated using our sample of second-generation immigrants from 2003, 2006, 2009 and 2012 PISA. Countries are ordered by the gender gap in math scores. It was obtained from estimating a linear regression using the plausible values provided by the PISA data sets as LHS variable and a female indicator as RHS (we estimated one regression for each PV and present the average of the 5 coefficients estimated). See Appendix Table A.3 for details about gender equality measures. The last two rows of Table A.1 display the mean and cross-country standard deviation.

Table A. 3. Individual-level variables: Definition and Descriptive Statistics

Name	Definition	Mean	St. Dev. across countries of ancestry
A. Individual Characteristics			
Female	Dummy variable equal to 1 if the individual is a girl	0.52	0081
Age	Years and months	15.77	0.06
Different grade	Dummy equal to 1 if the current individual's grade is different from the modal grade at the children age in the host country and 0 otherwise.	0.35	0.17
B. Family characteristics			
Mother highest level of education (MISCED)	Index constructed by the PISA program based upon the highest education level of each parent. It has the following categories: (0) None; (1) ISCED 1 (primary education); (2) ISCED 2 (lower secondary); (3) ISCED Level 3B or 3C (vocational/pre-vocational upper-secondary); (4) ISCED 3A (upper-secondary) and/or ISCED 4 (non-tertiary post-secondary); (5) ISCED 5B (vocational tertiary); and (6) ISCED 5A, 6 (theoretically-oriented tertiary and post-graduate).	3.66	1.04
Father highest level of education (FISCED)		3.85	0.85
Mother works	Dummy equal to one if the mother (father) works, and zero otherwise. Due to the direct question about parents' labor status is not included in all PISA waves, we use students' responses about what is the mother (father) main work. The dummy takes the value of zero when the answer is housewife, student or social beneficiary (unemployed, retired, sickness, etc.) and one otherwise.	0.82	0.14
Father works		0.93	0.05
Index of home possessions (homeposs)	The index of home possessions comprises all items on the indices of wealth, cultural possessions and home educational resources, as well as books in the home recoded into a four-level categorical variable (0-10 books, 11-25 or 26-100 books,101-200 or 201-500 books, more than 500 books). The index of wealth is based on the students' responses on whether they had a room of their own, a link to the Internet, a dishwasher, a DVD player, and three other country-specific items; and their responses on the number of cellular phones, televisions, computers, cars and the rooms with a bath or shower. The index of cultural possessions is based on the students' responses to whether they had the following at home: classic literature, books of poetry and works of art. The index of home educational resources is based on the items measuring the existence of educational resources at home including a desk and a quiet place to study, a computer, educational software, books to help with students' school work, technical reference books and a dictionary.	-0.04	0.53
C. ***School characteristics***			
Percentage of girls	PISA index of the proportion of girls enrolled in each school derived from school principals' responses regarding the number of girls divided by the total of girls and boys at a school.	0.49	0.04
Private school	Dummy equal to 1 if school is private and 0 otherwise.	0.24	0.18
School location	Dummy equal to 1 if the school is in a metropolis or city and 0 if the school is in a town or village.	0.29	0.27

Table A.4. Robustness Checks

	Math scores
A. Baseline	
GGI×Female	149.55**
	[62.62]
N	11,527
R^2	0.35
B. Controlling for ancestry-country HDI and its interaction with female	
GGI×Female	158.79**
	[66.52]
N	11,527
R^2	0.35
C. Host-country regional FE	
GGI×Female	133.98**
	[62.69]
N	11,527
R^2	0.36
D. Gender equality measures from 90s	
FLFP(1990) × Female	35.46
	[31.23]
N	11,527
R^2	0.35
Parliament seats held by women (1990-97) × Female	77.60*
	[42.79]
N	11,507
R^2	0.35
E. Adding Year FE × Female	
GGI×Female	150.13**
	[64.12]
N	11,527
R^2	0.35
F. Cluster SE at country of ancestry level	
GGI×Female	149.55***
	[45.98]
N	11,527
R^2	0.35

Notes: Results from estimating equation 1 using alternative specifications. In panel B we replace the GDP per capita in the country of ancestry by a better proxy of the human capital level in the country of ancestry (the Human Development Index). In panel C, host-country regional fixed effects are used instead of host-country fixed effects. Panel D uses alternative measures of gender equality in the country of ancestry, measured in the 1990s. Panel E presents a more flexible specification in which PISA fixed effects are interacted with the gender indicator. Panel F presents estimates with standard errors clustered at the country of ancestry level. In all cases we use the five plausible values of math test scores provided by PISA datasets and report the average coefficient (Stata command *pv*). Except for Panel F, standard errors are adjusted following the Fay's BRR methodology using the 80 alternative weights provided by the PISA datasets.
* p<0.1, ** p<0.05, *** p<0.01

Table A.5. Sensitivity to Sample Selection

	Math scores
Baseline	
GGI×Female	149.55**
	[62.62]
N	11,527
R^2	0.35
A. Dropping the most important country of ancestry (Portugal)	
GGI×Female	144.52**
	[65.15]
N	8,681
R^2	0.36
B. Dropping the most important host country (Switzerland)	
GGI×Female	148.77**
	[74.20]
N	8,617
R^2	0.38
C. Keeping only one host country	
Switzerland	163.12
	[136.34]
N	2910
R^2	0.13
Australia	199.01**
	[91.00]
N	2,450
R^2	0.16
D. Dropping those countries that send immigrants to only one host country	
GGI×Female	228.01**
	[101.93]
N	8,240
R^2	0.29

Notes: Results from estimating our preferred specification (Baseline) with different samples. In panel A we drop those second-generation immigrants whose ancestries come from Portugal (the country of origin with more observations in our sample). In panel B, we drop the host country with more observations in our sample (Switzerland). In panel C, we replicate our analysis using only one host country (Switzerland or Australia). In panel D, we drop those countries that send immigrants to only one host country. In all cases we use the five plausible values of math test scores provided by PISA datasets and report the average coefficient (Stata command *pv*). Standard Errors are adjusted following the Fay's BRR methodology using the 80 alternative weights provided by the PISA datasets.
* p<0.1, ** p<0.05, *** p<0.01