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Abstract: Although geographical and temporal variations in gender achievement gaps have received considerable attention, the role of culture in explaining this variation is not well understood. We exploit a large Swedish administrative data set to study gender gaps in education among second-generation immigrant youth with different cultural backgrounds. Guided by hypotheses we derive from the economics literature on gender differences and gender convergence, we explore the predictive power of a set of cultural dimensions including achievement orientation, acceptance of inequality, risk avoidance, and long-term orientation. Our empirical strategy relies on within-family, cross-gender sibling comparisons, identifying culture's differential impact on girls relative to boys while netting out unobserved family heterogeneity. We find that the central cultural dimension that matters for gender gaps in student achievement is the extent to which a society emphasizes ambition, competition, and achievement, which is strongly predictive of a relative achievement disadvantage of girls compared with boys. Exploring factors that may explain the results, we find that parents from achievement-oriented cultures choose higher quality schools for their children, and that boys benefit more from exposure to higher quality schools than girls do. Using PISA data to probe external validity, we find qualitatively and quantitatively remarkably similar results in a very different sample of second-generation immigrant youth.

Keywords: Culture, Achievement Orientation, Gender Gaps in Education

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1 Introduction

Over the past decades, reportage of girls "outgunning" boys in end-of-school examinations has repeatedly made headline news in many parts of the world. Yet there is more to it than that. Gender gaps in student achievement continue to exhibit large geographical and temporal variations. They differ across countries, across districts within countries, and across communities within districts (Pope and Sydnor 2010; Reardon et al. 2019). As for changes over the past decades, while many countries have witnessed a closure or even reversal of male-favoring gender gaps in education, some countries have seen them widening (Evans et al. 2019). Given society's interest in tackling inequality of opportunity, it is important to understand the causes of these variations. A broad literature examines how gender gaps in student achievement are shaped by early childhood influences, characteristics of schools, and educational systems (Dee 2005; Machin and McNally 2008; Bertrand and Pan 2013; Deming et al. 2014). Yet, much less is known about the extent to which boys and girls are differentially affected by entrenched cultural values transmitted from generation to generation.

Using a large Swedish administrative data set, we present new evidence on the cultural origins of gender gaps in student achievement. Our analysis complements existing work in two important dimensions. First, differently from existing studies that equate culture to a single aggregate economic variable or index from the country-of-ancestry, we operationalize culture in a multidimensional way. Understanding which dimensions of culture shape gender achievement gaps is important, as it can help structure programs that counter cultural influence (if undesired) or amplify it (if desired). Second, building on the epidemiological approach to culture (Carroll et al. 1994; Fernández and Fogli 2006; Giuliano 2007; Fernández and Fogli 2009), which exploits cultural diversity among second-generation immigrants who share the same economic and institutional environment, we provide a powerful and tightly controlled test of the effect of culture on gender gaps in student achievement. Our test relies on within-family, cross-gender sibling comparisons, identifying the differential effect of culture on girls relative to boys after controlling, *inter alia*, for unobserved family heterogeneity and gender-specifc neighborhood effects. The within-sibling comparison is crucial for our analysis, since it allows us to explore some of the potential mechanisms that might explain the gendered impact of culture. Inspired by earlier work on gender gaps in student performance, we explore the effect of school quality and socio-economic environment on the gender gap in student achievement as potential explanations.

In order to describe culture, social scientists have used the analogy of an onion with basic beliefs, values, and attitudes forming the core of culture, and actual behavior and manifestations thereoff representing the outer layers (Taras et al. 2009). In applying the epidemiological approach, economists have often focused on outer-layer measures of culture. For example, in a paper examining the role of gender norms in explaining the gender gap in math, Nollenberger et al. (2016) used the World Economic Forum's Gender Gap Index to measure gender equality in an immigrant's country of ancestry, and examined whether this measure is able to explain variations in the gender math gap across second-generation immigrant youth living in 9 host countries. In this paper, we zoom in on beliefs, norms and attitudes that plausibly underlie manifestations of gender (in)equality in society, and analyze their effect on gender gaps in student achievement. To that end, we draw upon the work of Dutch sociologist Hofstede (2001), who was among the first to develop a coherent theoretical model of culture and corresponding cross-country indices describing cultural values along several dimensions. Importantly, if one connects Hofstede's multidimensional notion of culture with the economics literature on gender differences and gender convergence (see, e.g., Goldin 2006; Bertrand 2018; Niederle and Vesterlund 2010), then one arrives at several potentially important cultural channels through which gender gaps in education may be affected.

Consider as a first cultural dimension the extent to which a society emphasizes ambition, competition, and achievement (labeled *masculinity vs. femininity* by Hofstede). This cultural trait might affect gender gaps in student achievement for various reasons. For example, it is conceivable that parents from achievement-oriented cultures choose higher quality schools for their offspring, exposure to which has been linked to an educational advantage of boys relative to girls (Autor et al. 2016). Moreover, a series of studies in behavioral economics have shown that males and females differ in their response to competition, with the effects in mixed-sex settings ranging from women failing to perform well in competitions (Gneezy et al. 2003) to women shying away from environments in which they have to compete (Niederle and Vesterlund 2007). Thus, one might hypothesize that if parents transmit to their children achievement-oriented attitudes, this raises competitive pressures associated with test-taking, which may cause boys to outperform girls in class.

The second cultural dimension we single out is the extent to which a society accepts an unequal distribution of power (labeled *power distance* by Hofstede). Although women have made significant progress in the labor market around the world, they remain under-represented in high-earnings, high-power occupations (Bertrand 2018; Bertrand et al. 2019). This phenomenon is commonly referred to as the glass ceiling. If parents and their children are accustomed to expect and accept unequal distribution of power, it may reinforce perceptions of the glass ceiling. This, in turn, may lead to differential parental investments in human capital of sons and daughters and act as an impediment to girls' education. Thus, one may hypothesize that among children from cultures with a high degree of inequality acceptance, we are less likely to observe girls having caught or overtaken boys in their academic attainment.

The third potentially relevant cultural dimension is a society's tolerance for uncertainty and ambiguity (labeled *uncertainty avoidance* by Hofstede). When women in the US started to increase their investments in formal schooling, they altered their identity in a way that placed a career on equal footing, or even ahead, of marriage (Goldin 2006). Although this change was important for women's progress, it did not come without risks and uncertainty. For example, when women started to move away from "safe", traditionally female-dominated jobs in the public sector (e.g., teachers, nurses) to male-dominated fields, it involved the risk of breaking gender norms, of social rejection, and of professional failure. Hence, if children are socialized to avoid choices that involve risks and uncertainty, this may be an obstacle to females increasing career-oriented human capital investments. As a consequence, the likelihood of girls catching up with or overtaking boys educationally may be smaller.

The final cultural dimension we draw attention to is the extent to which members of society are willing to delay short-term material or social rewards in order to prepare for the future (labeled *long-term vs. short-term orientation* by Hofstede). Figlio et al. (2019) have shown that immigrant students in the US from countries with long-term oriented attitudes perform better than students from cultures with less emphasis on delayed gratification. Beyond this intriguing finding, there are also reasons to expect a link between long-term orientation and gender gaps in education. Specifically, Goldin (2006) has argued that a change from static decision-making with limited horizons to dynamic decision-making with long-term horizons was a key factor behind the "quiet revolution" that transformed women's education and employment in the US. Based on this, we hypothesize that we are more likely to observe girls having caught up with or overtaken boys educationally if parents transmit long-term oriented attitudes to their offspring.

We empirically analyze these hypotheses by relating gender gaps in student achievement among children of contemporary immigrants to the cultural characteristics of their parents' birth countries. Any such epidemiological approach faces a key identification challenge: to avoid conflating the effect of culture with the effect of unobserved family characteristics. Take, as an example, selection into neighborhoods: Since immigrants are not randomly assigned to neighborhoods within host countries, immigrant parents from a, say, achievement-oriented culture might select into better neighborhoods. If, in turn, girls and boys are differentially affected by neighborhood characteristics, as some studies suggest they are (see, e.g., Deming et al. 2014; Hastings et al. 2006), estimates of the effect of achievement orientation on gender gaps will suffer from selection bias. To overcome this identification challenge, we combine several registries from Statistics Sweden to construct a large administrative dataset which contains educational outcomes and background characteristics of almost 80,000 opposite-sex siblings, all born in Sweden but with parents who immigrated to the country from other nations. The main outcome variable in our investigation is students' grade-point average (GPA) at age 16. Using Hofstede's cross-country data, we assign to each student the cultural dimensions characterizing their countries of ancestry. The resulting dataset allows us to run specifications that exploit within-family, cross-gender sibling comparisons, allowing us to not only separate out the impact of unmeasured family variables that are constant across siblings, but also to control, *inter alia*, for gender-specific neighborhood effects, which alleviates the concern that neighborhood sorting is confounding the impact of culture. To check for external validity, we re-examine our results for Sweden using data from five waves of the Program for International Student Assessment (PISA), which provides us with a sample of roughly 35,000 second-generation immigrant students residing in 29 host countries.

Our empirical analysis yields several interesting results. First, in our analysis of Swedish administrative data, we find that the central cultural dimension that matters for gender gaps in student achievement is the extent to which a society emphasizes ambition, competition, and achievement. In our population of interest—i.e., the universe of second-generation immigrant students graduating from 9^{th} grade in the period 1988-2017—girls reach, on average, GPAs that are 31 percent of a standard deviation higher than those of boys. Our main result shows that among children from countries with achievement-oriented attitudes, girls' comparative GPA advantage significantly decreases. For example, if immigrants from Denmark, a society that puts little emphasis on ambition, competition, and achievement (*Masculinity Score*=0.16), had the same degree of achievement orientation as those from Germany (*Masculinity Score*=0.66), our findings suggest that the mean GPA of girls relative to boys would decrease by roughly 38%. Another cultural dimension that matters for gender gaps in student achievement, but with an effect size only roughly half as large, is long-term orientation. In particular, and as hypothesized at the outset, a culture of long-term orientation is associated with an educational advantage of girls relative to boys. Hofstede's other two cultural dimensions have no, or at best small, effects on gender gaps in student achievement. These results remain qualitatively the same when examining student grades in mathematics and Swedish, and are not picking up source countries characteristics that may affect girls and boys differentially.

Second, we explore mechanisms that may explain why cultural background has implications for the achievement gap between girls and boys. We consider four possibilities: (i) parents with different cultural beliefs might gender-discriminate when choosing schools for their children, i.e., enroll sons in higher quality schools than daughters; (ii) irrespective of their children's gender, parents from achievement-oriented culture might enroll their offspring in higher quality schools, and boys might benefit more from exposure to higher quality schools than girls do (see, e.g., Autor et al. 2016); (iii) in parallel and not mutually exclusive to (ii), parents from achievement-oriented cultures might be positively selected in terms of SES or host country experience compared to immigrants from other cultures,[1] and this could disproportionately promote the educational outcomes of boys (see, e.g., Autor et al. 2019); (iv) parents from achievement-oriented cultures might adopt more traditional role models than those from other cultures, and this in turn could explain an educational advantage of boys relative to girls. In examining these four possibilities, we follow earlier research that studies the impact of school quality and socio-economic environment on the gender gap in student achievement using family-fixed effects (Autor et al. 2016, 2019). We find no evidence in favor of differential treatment of girls versus boys. Instead, we obtain results that are supportive of mechanisms (ii) and (iii), whereby parents from achievement-oriented cultures send their children to higher quality schools and have stronger socioeconomic position, which in turn is more beneficial for boys. However, school quality and parental SES are far from fully explaining the impact of culture on the gender gap in education. The mechanisms through which cultural values are passed on and affect offspring are therefore remain, in part, unobserved. When

[1] If achievement orientation alone leads to migration, we might expect positive selection of migrants. Within host countries, achievement orientation might imply that immigrants exert more effort and therefore exhibit better host country outcomes.

it comes to achievement orientation, the strongest predictor of gender gaps in student achievement, an important explanation might lie, as discussed in the outset, in the different reactions of girls and boys to competitive pressure.

Third, we find qualitatively and quantitatively remarkably similar results when we replicate our results for Sweden using PISA data. In our PISA sample of second-generation immigrants, girls have, on average, higher reading scores than boys, but they are outperformed by boys in math and science. Among children from achievement-oriented cultures, girls' comparative advantage in reading vanishes, while the math and science gap in favor of boys significantly increases. In other words, a culture of achievement orientation is associated with boys performing as well as girls in reading and much better than them in math and science. As with Swedish administrative data, Hofstede's other cultural dimensions are less prominent in explaining gender gaps in student achievement, a result that holds irrespective of whether we analyze each variable in isolation or run "horse-race" regressions between them. The fact that we obtain remarkably similar results in two very different samples of second-generation immigrants suggests that a cultural heritage that emphasizes ambition, competition and achievement plays a central role for the existence of educational disadvantages of girls relative to boys.

Our study contributes a unified set of insights on how cultural values along different dimensions shape gender gaps in student achievement. Our results broadly add to findings on culture's impact on various economic outcomes such as female work and fertility (Fernández and Fogli 2006; Fernandez 2007; Fernández and Fogli 2009), education (Figlio et al. 2019), family living arrangements (Giuliano 2007, unemployment (Eugster et al. 2017), or preferences for redistribution (Luttmer and Singhal 2011). Fernández (2011) provides an insightful review of this strand of literature. More narrowly, our study has two important antecedents in the works of Guiso et al. (2008) and Nollenberger et al. (2016). Both studies, the former using analysis across countries and the later employing the epidemiological approach, provide evidence that more gender equality in society is associated with a higher math performance of girls relative to boys.

More recently, three studies have coupled the epidemiological approach with siblings-fixed effects models, like we do. Finseraas and Kotsadam (2017) explore the link between source country female labor force participation and gender differences in labor supply among second-generation immigrants in Norway. Ericsson (2020) proxy cultural norms using female-to-male labor force participation in the source country and study how they impact the gender gap in math. Alde;n and Neuman (2019) use the female relative share in traditionally male fields to proxy for culture on gendered beliefs about educational choices in the source country, and study its role in the gender gap in major choice.

Our analysis adds to these works by shifting focus to cultural values, beliefs, and attitudes that plausibly underlie a society's gender (in)equality and by adding a thorough analysis of mechanisms that might explain the link between culture and gender gaps in student achievement. Finally, our study adds a cultural and gendered aspect to a large body of research on the economic outcomes of second-generation immigrants in host countries (e.g. Chiswick 1977; Card et al. 2000; Bleakley and Chin 2008; Aydemir et al. 2009; Algan et al. 2010; Dustmann et al. 2012).

The remainder of the paper proceeds as follows. Sections 2 through 4 describe data, stylized facts, and the empirical strategy. Sections 5 through 8 present the empirical evidence from Swedish administrative data, an in-depth analysis of the robustness of the results, and investigation of potential mechanisms, and the findings using PISA. The final section concludes. All supplementary material is in the Appendix.

2 Data

2.1 Cultural Dimensions Data

The seminal contribution in the field of culture measurement is the work of Hofstede (1980, 2001), who has developed a concise set of quantitative indices describing cultural values, beliefs, and attitudes along several dimensions. Hofstede's original measures of national culture were based on survey data from IBM employees across the world, and were later expanded using data from the Chinese Values survey and from the World Values Survey 1995-2004. Although alternative measures of culture gained recognition over the years (e.g., Schwartz 2000; House et al. 2004), they have all been shown to be fairly consistent in their approach and closely resemble the methodology used by Hofstede (Taras et al. 2009). Thus, we apply the current version of Hofstede's cultural dimensions data (Hofstede et al. 2010).[2] Motivated by the hypotheses we sketched out in the introduction, we focus in particular on the following four dimensions of national culture.

Masculinity versus Femininity (MAS). A high MAS country score reflects that individuals in society put strong emphasis on ambition, competition and achievement. By contrast, a society that scores low on MAS is defined as being consensus-oriented and exhibiting a prefence for cooperation, modesty, and caring for the weak. Hofstede's measure of MAS was created using a factor analysis model that loads on answers to eight work goal questions administered to samples of respondents across the world. The questions were designed to tap into individuals' views of the importance of, *inter alia*, high earnings, opportunities for advancement, having challenging work to do, working in an cooperative environment, or having a good working relationship with superiors. The MAS variable ranges between 5 and 110, which we rescaled to lie between 0.05 and 1.1. Over the years, there has been some controversy surrounding the labeling of this cultural dimension, within experts in the field and Hofstede et al. (2010) themselves suggesting it should be relabeled as performance or achievement orientation.

Power Distance (PDI). Individuals in societies showing a high PDI score expect and accept that power is distributed unequally. By contrast, in countries scoring low on PDI, individuals strive to equalize the distribution of power and demand justification for inequalities of power. Based on factor

[2]The data is available at https://geerthofstede.com/research-and-vsm/dimension-data-matrix.

analysis, the three survey items used to compose the measure of PDI tapped into individuals' of power and inequality at the workplace (i.e., frequency of disagreements with superiors, perceptions of leadership-styles, preferences for leadership styles). The PDI variable ranges between 11 and 104, which we re-scaled to lie between 0.11 and 1.04.

Uncertainty Avoidance (UAI). Individuals in societies that score high on UAI are more likely to feel threatened by ambiguous or unknown situations and to show intolerance of unorthodox behavior and ideas. By contrast, in countries with a low UAI score, individuals maintain a more relaxed attitude towards situations that are novel, unknown, surprising, different from usual. The UAI measure is constructed by combining three survey items that tap into individuals' feelings of stress at work, their perceptions of the importance of rule orientation, and their openness towards new work experiences. The UAI variable ranges between 8 and 112, which we re-scaled to lie between 0.08 and 1.12.

Long-Term Orientation versus Short-Term Orientation (LTO). A high LTO country score reflects that individuals in society foster virtues oriented towards future rewards, perseverance, and thrift. By contrast, societies with a low LTO score are characterized by norms towards immediate need gratification. The LTO was constructed based on a factor analysis model that loads on three survey questions presented to respondents across the world, tapping into whether thrift is considered a desirable personality trait, national pride, and importance of service to others. The LTO variable ranges between 0 and 100, which we re-scaled to lie between 0 and 1.

The four dimensions of national culture are largely independent, as is evident in Figure 1. It shows that the pairwise cross-country correlations between each of the four cultural dimensions are virtually zero ($r \leq 0.05$) in four out of six cases and small ($r \leq 0.2$) in the remaining two. Appendix Figures A1-A4 map the distributions of the four cultural variables around the globe. For all four variables, we observe considerable variation not only across but also within supranational geographic regions. For example, while some Latin countries in Europe (e.g., France) score high on PDI, others (e.g., Spain) are characterized by a much lower PDI score. In a similar vein in Eastern European and ex-Soviet countries, some show, for example, high MAS values (e.g., Slovakia, Hungary, Poland), while others (e.g., Russia, Latvia, Slovenia) belong to the lowest part of the MAS distribution.

Hofstede's database contains cross-country measures for two additional cultural dimensions: (i) the extent to which members of society are supposed to take care of themselves as opposed to being strongly integrated and loyal to a cohesive group (labeled *individualism vs. collectivism*); and (ii) the degree to which a society allows relatively free gratification of basic and natural human drives related to enjoying life and having fun (labeled *indulgence vs. restraint*). Based on the economics literature on gender differences and gender convergence, we did not arrive at clear-cut predictions within respect to these cultural dimensions, and hence exclude them from our main analysis. However, we carry out sensitivity checks to probe whether our results are robust to the inclusions of these two dimensions of national culture.

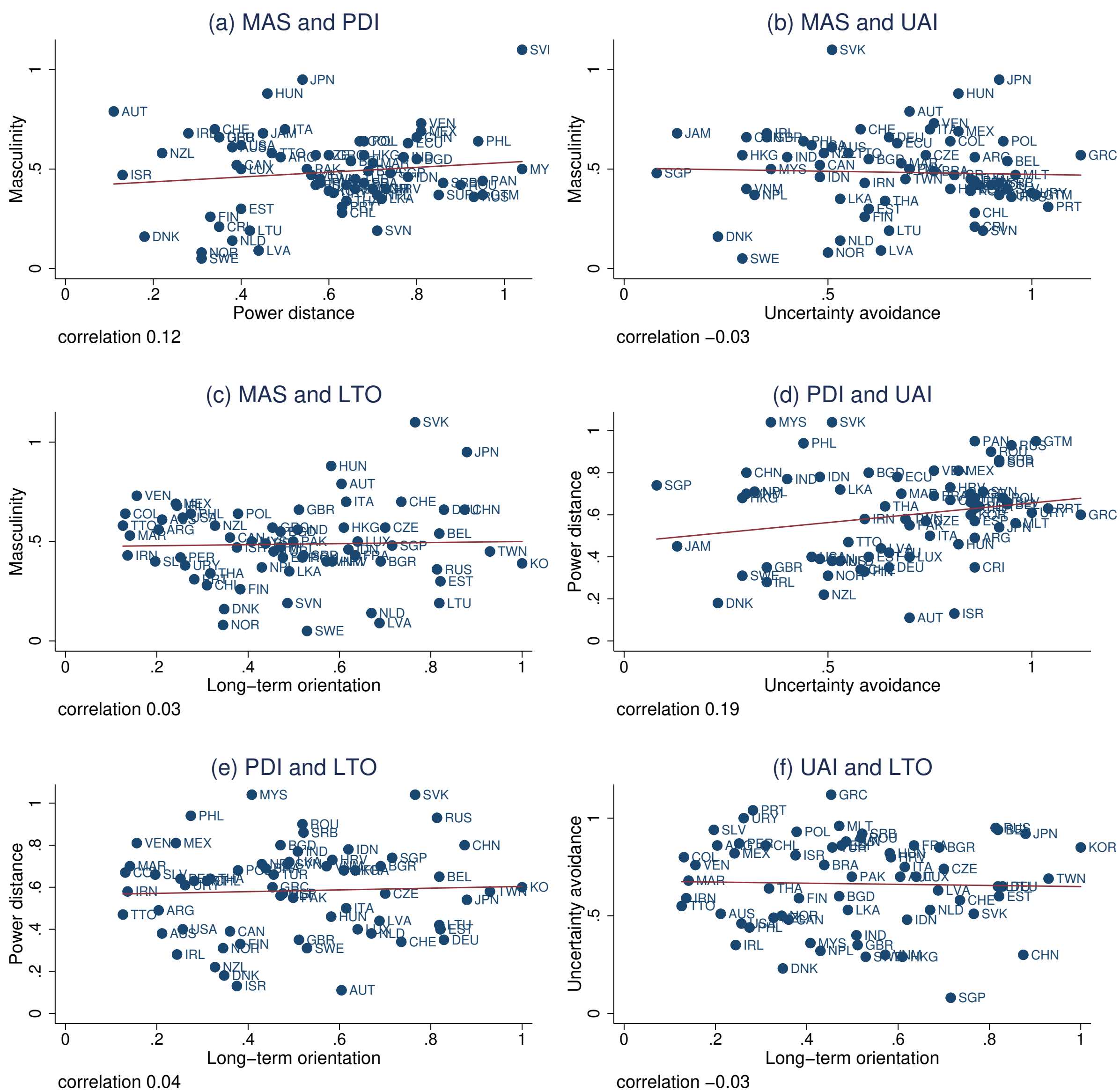

Figure 1: Correlations between Hofstede's Cultural Dimensions

Notes: This figure plots the pairwise cross-country correlations between four dimensions of national culture (Hofstede et al., 2010) : Masculinity versus Femininity (MAS), Power Distance (PDI), Uncertainty Avoidance (UAI), Long-Term Orientation versus Short-Term Orientation (LTO).

2.2 Registry-Based Student Data from Sweden

The student data are based on several registers compiled by Statistics Sweden. Our population of interest consists of the universe of second-generation immigrants observed in the 9th grade graduation registers between 1988 and 2017, at the end of compulsory education at age 16. Second-generation immigrants are defined as individuals born in Sweden to two foreign-born parents. In the 1988 graduating cohort, 4.6 percent were second-generation immigrants, and with increasing immigration to Sweden, this fraction has risen and constitutes 10 percent of the graduating cohort in 2017. We merge this population to their parents and siblings through the multi-generation register and obtain additional family background information through education and tax registers. Our main variables are detailed below.

Outcome Variables. We study student achievement using grades at the end of compulsory school. Our main outcome is the GPA, an average over grades in all subjects at of compulsory education (age 16). The GPA is standardized by graduation year to mean zero and standard deviation one, within the population of second-generation immigrants. Since the GPA is a teacher assessment, we complement our analysis by separately studying grades in mathematics and Swedish, subjects in which students take standardized tests. In Table 1, we provide summary statistics for our estimation sample. Rows 1-3 show our outcome measures used for estimation. Rows 4-6 show our outcome variables when standardized within a sample of all students. From the latter it can be seen that, relative to the whole population, second-generation immigrant children show lower educational achievements, in the order of roughly 15 percent of a standard deviation.

Family Background Variables. Our model includes family-fixed effects, which make background variables such as parents' education and earnings redundant. When exploring mechanisms we will, however, consider the role of socio-economic background and exploit variation in parents' education and earnings. We use information on parents' highest achieved education level observed in the education register when the child is aged 15, and a measure of average parental earnings when the child is aged 13–15. Additionally, we adopt an earnings-based measure of labor force participation previously used in the immigration literature for Sweden, which assigns participation to individuals with annual earnings of at least 50 percent of the median of a 45-year old worker (Erikson et al. 2007; Forslund et al. 2011). Summary statistics for some of the family background variables are shown in Table 1. Immigrants parents have roughly 10.5 years of education (mothers: 10.54; fathers: 10.68), which is more than a year less than the schooling of their native counterparts (non-reported). Average annual earnings of immigrant mothers amounts to roughly 157,000 SEK, while those of immigrants fathers amount to roughly 210,00 SEK. When compared to the average earnings of their native counterparts (non-reported), the earnings of immigrants are between 28 percent (mothers) and 35 percent (fathers) lower.

Source Country Cultural Variables. The data include information on parents' birth country or birth region. Specifically, for the source countries from which immigration to Sweden is rare, birth countries have been combined into birth regions to protect anonymity in the data. Table 2 lists the distribution of birth countries/regions of parents present in our sample. We merge

Table 1: Summary Statistics

	N	Mean	Std Dev	min	max
Outcome variables					
standardized GPA (2nd gen imm.)	78040	-0.01	1.00	-3.405508	2.60006
stand. Math grade (2nd gen imm.)	78040	-0.01	1.00	-2.027084	2.470137
stand. Swedish grade (2nd gen imm.)	77740	-0.02	0.99	-2.415584	2.227661
Student outcomes (overall)					
standardized GPA (whole pop.)	78040	-0.14	1.03	-3.426538	2.563698
stand. Math grade (whole pop.)	78040	-0.18	0.97	-2.273564	2.117368
stand. Swedish grade (whole pop.)	77740	-0.15	0.95	-2.485414	2.054244
Hofstede's cultural dimensions					
Masculinity vs. Feminity (MAS)	78040	0.43	0.12	.08	.864171
Power Distance (PDI)	78040	0.59	0.16	.18	.8982282
Uncertainty Avoidance (UAI)	78040	0.72	0.15	.23	1.021508
Long-Term Orientation (LTO)	78040	0.39	0.15	.1289433	.9369735
Covariates					
Female	78040	0.50	0.50	0	1
Graduation year	78040	2,004.29	7.75	1988	2017
Age[3]	78040	16.00	0.28	14	19
Birth month	78040	6.47	3.41	1	12
Birthorder	78040	2.24	1.27	1	7
Individualism	78040	0.44	0.14	.19	.90425
Indulgence	78040	0.42	0.14	.1509012	.9088017
log ppp GDP p.c. (2000)	78040	9.24	0.62	7.247311	10.51245
Socioeconomic status					
Years of schooling mother	75887	10.53	2.63	7	19
Years of schooling father	72958	10.68	2.62	7	19
Income mother (in SEK)[4]	77336	156,784.49	134,608.78	0	2287446
Income father (in SEK)	75328	209,817.36	203,960.95	0	1.55e+07

Notes: The table shows summary statistics for our estimation sample of opposite-gender second generation immigrants graduating between 1988 and 2017. Age is captured as the difference between the year of graduation and the year of birth. Parental income captures the average income of the mother/father at the age 13-16 of the child.

Hofstede's contemporaneous cultural indicators to parents' source countries, regardless of parents' birth and immigration year, making the assumption that the cultural traits represented by these indicators are fixed over time. For source regions, we use weighted averages of the culture variables across countries belonging to each region, where weights are based on age-, graduation year, and gender-specific immigrant shares from different source countries provided by Statistics Sweden. Hofstede data are missing for some countries (see Figures A1–A4) and students with both parents originating from these countries are dropped from our analysis. This concerns primarily individuals from the horn of Africa and Iraq, which are large immigrant groups in Sweden.[5] 81.5 percent of

[5]In the full population of second-generation immigrant students, 5 percent have parents from the horn of Africa, and 5–6 percent from Iraq, respectively. As seen in Table 2, these country groups are underrepresented in our data

Table 2: Distribution of Birth Countries/Regions of Parents

	Fathers		Mothers	
Birth Region	Freq.	Percent	Freq.	Percent
Finland	13,513	17.32	15,816	20.27
Denmark	919	1.18	924	1.18
Norway and Iceland	720	0.92	828	1.06
Bosnia	335	0.43	353	0.45
Former Yugoslavia	10,517	13.48	10,137	12.99
Poland	1,892	2.42	2,689	3.45
Great Britain and Ireland	655	0.84	470	0.6
Germany	558	0.72	561	0.72
Southern Europe	2,431	3.12	1,970	2.52
The Baltic states	114	0.15	100	0.13
Former USSR, Rumania, Bulgaria, Albania	822	1.05	1,108	1.42
Slovakia, Check republic, Hungary	1,098	1.41	1,038	1.33
France, Benelux, Swizerland, Austria	396	0.51	344	0.44
Canada and USA	204	0.26	164	0.21
Mexico and Central America	361	0.46	347	0.44
Chile	2,531	3.24	2,504	3.21
Rest of South America	1,079	1.38	1,038	1.33
African horn (Ethiopia, Eritrea, Somalia)	145	0.19	78	0.1
North Africa and Middle east	15,240	19.53	15,472	19.83
Other Africa	358	0.46	132	0.17
Iran	3,280	4.2	2,675	3.43
Iraq	1,439	1.84	250	0.32
Turkey	13,067	16.74	12,468	15.98
China	754	0.97	906	1.16
South east Asia	2,553	3.27	2,776	3.56
Other Asia	3,017	3.87	2,858	3.66
Oceania	23	0.03	25	0.03
Unknown	19	0.02	9	0.01

Notes: The table captures the distribution of birth countries/regions of parents present in our sample of second-generation immigrant students with opposite-sex siblings. Source countries from which immigration to Sweden is rare have been combined into birth regions to protect anonymity in the data.

the second-generation immigrants in our sample have parents from the same source country and as such there is no ambiguity in terms of their cultural heritage. For the remaining 18.5 percent, we define cultural origin as the average across parents. The estimation sample consists of 78,040 opposite-sex biological siblings.

set and students are only included if their other parent is from a different country where culture is non-missing.

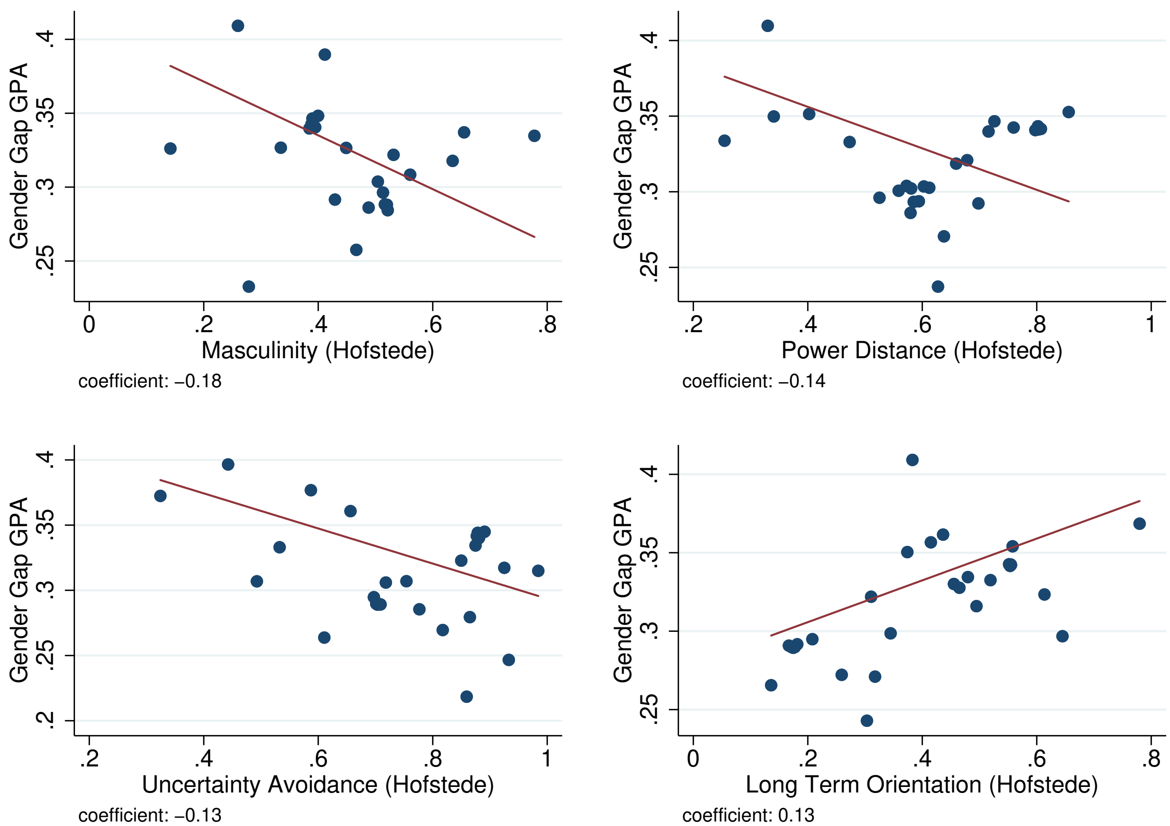

Figure 2: Hofstede's Cultural Dimensions and Gender GPA Gap

Notes: These figures present binned scatter plots of the relationship between the gender gap in student achievement and cultural dimension $C \in \{MAS, PDI, UAI, LTO\}$. To construct the figures, we divide the horizontal axis into 40 equal-sized bins and plot the mean level of the gender achievement gap against the mean level of cultural dimension C within each bin. Some bins a larger than others since some groups of second-generation immigrants account for more than 2.5% of our sample.

3 Stylized Facts

We begin our empirical analysis by providing descriptive evidence on the hypotheses we have formulated at the outset. Figure 2 presents binned scatter plots of the mean gender GPA gap versus the mean level of cultural dimension $C \in \{MAS, PDI, UAI, LTO\}$. To construct this figure, we first collapse the gender GPA gap at the level of second-generation immigrant groups. Then, we divide the horizontal axis into 40 equal-sized bins and plot the mean gender GPA gap versus the mean value of C in each bin. The binned scatter plots in Panels A through D provide representations of the correlations between the gender GPA gap and Hofstede's cultural dimensions. As an alternative to it, Appendix Figure A5 shows the same correlations in scatter plots where the gender GPA gap is averaged by second-generation immigrant groups and cultural dimension C.

Overall, the figure provides some first descriptive evidence in support of our hypotheses. To recap, we started out by arguing that a culture of achievement orientation may cause boys to outperform girls in class, for the reason that it can create parental pressure for children to be competitive and excel in school, to which girls tend to respond more adversely than boys do (Niederle and Vesterlund 2010). Panel A shows, indeed, that the higher the country-of-ancestry MAS score of second-generation immigrants, the lower the GPA of girls relative to boys. The correlation is 0.18, suggesting that, as we, for example, compare immigrant youth from Denmark (with a low MAS score of 0.16) with those from Germany (with a high MAS score of 0.66), the mean GPA of girls relative to boys would decrease by roughly 29%.

Our second argument was that a culture of inequality acceptance may reinforce perceptions of the glass ceiling. This, in turn, may cause parents to differentially invest in the human capital of sons and daughters, which can act as an impediment to girls catching up or overtaking boys educationally. Consistent with this argument, Panel B shows a negative relationship between PDI and the mean GPA of girls relative to boys. The correlation is -0.14, and thus roughly three-quarters of the size of that for MAS.

Our third argument was that young women may be less likely to increase career-oriented human capital investments, and thus less likely to catch up or overtake boys educationally, if they are socialized to avoid choices that involve risks (e.g. of breaking gender norms) or uncertainty (e.g., career progression). Panel C shows, indeed, that the higher Hofstede's UAI score among second-generation immigrants, the lower the GPA of girls relative to boys. The correlation is -0.13, and thus of roughly the same magnitude as that for PDI.

Finally, a powerful factor in the transformation of women's education and work was a change from static decision-making with limited horizons to dynamic decision-making with long-term horizon (Goldin 2006). Based on this, we have formulated the hypothesis that we are more likely to observe girls catching up with or overtaking boys if parents transmit long-term oriented attitudes to their offspring. In line with this hypothesis, Panel D shows a positive relationship between LTO and the mean GPA of second-generation immigrant girls relative to boys. The correlation is 0.13, and thus in terms of magnitude similar to those for PDI and UAI.

4 Using Siblings to Identify the Impact of Culture on Gender Achievement Gaps

We build on and expand the epidemiological approach used to estimate correlations between source country characteristics and immigrant outcomes in the host country (Carroll et al. 1994; Giuliano 2007; Fernández and Fogli 2009). The epidemiological approach isolates the impact of source country cultural norms by studying immigrants who face the same social and economic institutions in the host country. This empirical strategy is however limited by the fact that social beliefs, gender equality and cultural norms are correlated with other underlying factors that affect immigrant opportunities in the host country. For example, the level of economic development and education in the source country, which conceivably affects immigrants' outcomes in the host country, are likely to be correlated with social norms, thus complicating a causal interpretation. By studying immigrant gender gaps instead of levels of immigrant outcomes, we can (under some assumptions) identify the gendered impact of culture without conflating the estimate with the potentially underlying correlation between culture and other determinants of outcomes.

To identify the impact of culture, we compare sisters and brothers from the same family using a family-fixed effects specification. We net out all unobserved source-country and family-level characteristics that affect sisters and brothers in the same way, while we are still able to identify the impact of culture on the gender gap in student achievement.

Consider Equation 1 below:

$$y_{ift} = \beta_0 + \beta_1 Female_{ift} + \beta_2 (Female_i \times Culture_f) + \beta_3 \mathbf{X}_i' + \beta_4 (Female_i \times \mathbf{X}_i') + \delta_t + \theta_f + \varepsilon_{ift} \quad (1)$$

where i denotes individual i from family f, graduating in year t. $Female_{ift}$ is a dummy that takes the value one if the individual is a girl; $Culture_f$ is the cultural index and δ_t represents graduation cohort dummies. The vector $\mathbf{X}_i$ controls for a set of individual attributes, which in our basic specification only includes a student's age. The family-fixed effect θ_f nets out all (observed and unobserved) family-specific characteristics that are correlated with culture, but still allows us to estimate the interaction between source country characteristics and the female dummy. β_2 is the coefficient of interest that informs us how the achievement gap varies with cultural background. By including the family-fixed effect, we essentially compare how achievement gaps between brothers and sisters who grow up in the same family and most often attend the same school, are related to the cultural norms and beliefs in their parents' birth countries.

In terms of identification, the remaining concern is that unobserved traits correlated with culture affect girls and boys differently, and therefore prevent us from interpreting β_2 as the impact of culture on the gender gap. Such 'confounders' could however also be considered as 'mediators' or mechanisms, depending on the causal pathways underlying the correlations.[6] We think of confounders/mediators both as originating in the economic and social conditions in the source country, and as the result of e.g. sorting of immigrants within the host country. For example, culture may be related to immigrants' education level, economic opportunities and selection into different neighborhoods within host countries, and to the school quality of their children. Previous literature has shown that girls and boys respond differently to family and neighborhood disadvantage and school quality (Autor et al. 2016, 2019; Deming et al. 2014; Hastings et al. 2006) and the culture-gender interaction could pick up such effects.

[6]If cultural norms causally affect the socioeconomic position of immigrants or parents' school choice (e.g. through aspirations and work ethics), such variables should be seen as mediators through which cultural norms are transmitted. Instead, if causality goes the other way, or correlations arise due to other reasons, we should think of these variables as confounders.

Therefore, β_2 should be interpreted as the impact of culture, and factors correlated with culture, on the gender achievement gap. In comparison with the traditional epidemiological approach (see, e.g., Fernández and Fogli 2006; Fernández and Fogli 2009), we believe that this is a significant advancement, since the estimate will be biased only to the extent that unobserved factors have gendered implications. We test the sensitivity of our results to such bias by expanding our model and including interactions between the female dummy and additional source country characteristics such as GDP per capita. Importantly, our rich data allow us to include interactions between host country neighborhood and gender, which control for all time-constant neighborhood characteristics that have differential impacts on girls and boys.[7] This sensitivity test therefore directly controls for the gendered impact of sorting to neighborhoods with different degrees of disadvantage. Our contribution compared to the previous literature therefore lies both in the focus on the inner layers of culture, and in the empirical specification which allows us to compare girls and boys and at the same time control for the gendered impact of unobserved confounders at the neighborhood level.[8] While the sibling comparison is not essential for identifying the impact of culture (since the variation in culture is at the source country level, not family level), it is crucial for the remainder of our analysis where we explore mechanisms. In Section 7 we build on the earlier literature on gender gaps in student achievement that uses family-fixed effects to probe the importance of schools and family environment for girls' and boys' scholastic achievement.[9]

5 Main Results

We present our baseline results in Table 3. The "raw" within-family gender achievement gap, i.e. the coefficient of the female dummy in a specification including family-fixed effects, graduation-year-fixed effects and age as controls, amounts to a girl advantage of the magnitude 0.31 of a standard deviation.

In columns 1–4, we start out with regressions of second-generation immigrants' GPA on each cultural domain $C \in \{MAS, PDI, UAI, LTO\}$ separately, interacted with the female dummy (Equation 1). All columns show that the cultural beliefs, norms and attitudes in parents' source countries have implications for the gender achievement gap among second generation immigrants in Sweden today, even when comparing opposite-sex siblings. The signs of the interactions are all in line with our hypotheses, generated by research on gender gaps in the economics literature. First, column 1 shows that a society's emphasis on ambition, competition and achievement (MAS) is associated with a smaller girl advantage. Moving up one standard deviation in the distribution of achieve-

[7]We use neighborhoods defined by Statistics Sweden's SAMS (small areas for market statistics) units. A SAMS area is a geographical neighborhood, developed to correspond to "real" physical neighborhoods. On average, a SAMS unit has 1000 inhabitants, and there are around 9,200 units in total.

[8]Nollenberger et al. (2016) study the gender math gap and how it is related to the gender gap index developed by the World Economic Forum, an example of a variable that captures the outer layers, or manifestations, of cultural beliefs. In addition, Nollenberger et al. (2016) have a more limited set of controls (e.g. for location within host countries) to account for the fact that other factors correlated with culture and gender gaps could drive the results.

[9]See Autor et al. (2016, 2019).

Table 3: Gender GPA Gap and Cultural Dimensions, Baseline Results

	(1)	(2)	(3)	(4)	(5)
GPA_st_sgim					
MAS * Female	-0.2411***				-0.1840***
	(0.0455)				(0.0503)
PDI * Female		-0.1195***			-0.0523
		(0.0346)			(0.0463)
UAI * Female			-0.1097***		-0.0560
			(0.0355)		(0.0427)
LTO * Female				0.0871**	0.1123***
				(0.0360)	(0.0376)
Observations	78040	78040	78040	78040	78040
R-squared	.674	.674	.674	.674	.674
Dependent var. (mean)	-.007	-.007	-.007	-.007	-.007
Dependent var. (sd)	.996	.996	.996	.996	.996
Cultural var. (mean)	.427	.587	.723	.387	
Cultural var. (sd)	.119	.158	.149	.148	
Cultural var. * Fem. (beta)	-.029	-.019	-.016	.013	
Number of clusters	30018	30018	30018	30018	30018
Gender Gap	.313	.313	.313	.313	.313
Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

ment orientation is associated with a closing of the gender gap by 9 percent.[10] Comparing two of the most common source countries of refugee immigrants to Sweden, Chile (MAS index 0.28) and Turkey (MAS index 0.45), we predict that the girl-favoring gender gap among children of Turkish immigrants should be 4 percent of a standard deviation smaller than that of children to Chilean immigrants. As an alternative comparison using non-refugee source countries, we can compare the performance among children originating in the neighboring Nordic countries, with weak norms regarding performance and ambition (e.g. Denmark with a MAS index 0.16), to Germany with a much stronger achievement culture (MAS index 0.66): the estimate predicts that the gender gap among children of German immigrants should be 12 percent of a standard deviation smaller than among second generation Danes, or put differently, would reduce the "raw" achievement gap by 38 percent. As such, cultural norms that emphasize ambition and competition seem to be associated

[10] (0.119*0.2411)/0.313.

with sisters performing worse relative to their brothers, which is in line with the hypothesis generated by insights from the behavioral economics literature on women's and men's performance in competitive situations.

Second, consider column 2 which shows how the acceptance of inequality (PDI) is related to the gender achievement gap. We expect acceptance of unequal power distribution to increase boys' performance relative to girls, since parents who carry such beliefs might invest more in boys relative to girls as they perceive women's access to high positions in society as either undesirable or unattainable. Higher acceptance of power inequality is as expected associated with a reduction of the gender gap: a one standard deviation increase in the index is associated with a lowering of the gender gap by 6 percent.

Third, column 3 presents how norms that emphasize uncertainty avoidance (UAI) influence the gender gap. We hypothesize that tolerance for uncertainty and ambiguity makes it easier for women to step out of their traditional gender role, in order to put more emphasis on career and to try out male-dominated professions. Our findings are in line with this idea: higher uncertainty avoidance is associated with girls performing worse relative to boys. A one standard deviation shift in the uncertainty avoidance index corresponds to a 5.2 percent change of the gender achievement gap.

Column 4 focuses on the extent to which members of societies are willing to delay short-run rewards for long-term goals and returns (LTO). Long-term orientation can in this context increase girls' effort and parents' investments in their daughters, since it involves a perception of women having a life-long commitment to the labor force rather than a static short-term view that focuses on family formation. We find that long-term orientation is associated with sisters performing better relative to their brothers, which confirms our hypothesis.

Finally, column 5 shows the results from our preferred specification. It includes all four cultural dimensions simultaneously in order to test the robustness of the results to potential correlations between the domains and to shed light on their relative importance. As Figure 1 generally shows low correlations between the indices, we expect the results to be relatively insensitive to this test. We find that two out of four indicators remain highly significant: achievement orientation and long-term orientation have clear implications for the relative achievement of girls and boys. The coefficients on acceptance of power distance and uncertainty avoidance are roughly halved (and become insignificant), which is not surprising since these indices are the ones most highly correlated with each other. As for the relative importance of the four cultural dimensions, the strongest predictor of gender gaps in student achievement is a society's emphasis on ambition, competition and achievement (MAS). Long-term orientation (LTO) too has a statistically significant effect, but its magnitude is only about two-thirds that of achievement orientation.

To sum up, we have found compelling and intriguing evidence that differences in beliefs and attitudes across cultures have gendered consequences for the academic outcomes of second-generation immigrants, holding constant the host country and its institutions. The previous epidemiological literature has primarily focused on source country indicators that reflect actual behavior, such as female labor force participation and fertility, and that are one-dimensional manifestations of potentially many different cultural beliefs and attitudes. Our contribution is the first to demonstrate that multi-dimensional measures of norms and attitudes have implications for gender gaps in the host country, in ways that can be predicted by findings in the earlier economics literature.

6 Robustness

In Table 4, we provide a number of robustness tests to check the sensitivity of our baseline results to potential confounding factors. First, column 1 simply repeats our preferred specification from Table 3. Column 2 includes birth month and birth order controls interacted with gender. Column 3 includes controls for Hofstede's additional cultural domains, indulgence and individualism, interacted with gender. Column 4 controls for log GDP per capita in the source county, again interacted with gender to pick up source countries characteristics that may affect girls and boys differentially.

Finally, columns 5 and 6 include all these controls simultaneously, while additionally phasing in municipality and neighborhood fixed effects, and their interactions with gender, respectively. The baseline estimates are virtually unchanged in these alternative specifications. We believe that this is a very powerful test of the potential impact of confounders, since we can control for all unobserved neighborhood-specific factors that have differential impacts on girls and boys. In other words, immigrant selection to neighborhoods and the different environments their children are exposed to, are not driving our results.

In addition, Table 5 and Table 6 present results separately for mathematics and Swedish, subjects in which students take standardized tests. We see that our main conclusions are confirmed, and that in these cases the impact of all four different cultural dimensions is even more visible in the 'horse-race' specification in the last column. Appendix Tables A1 and A2 present the corresponding sensitivity tests which show that including additional controls reduces the importance of power distance and uncertainty avoidance, but that the impacts of achievement orientation and long-term orientation are robust both in terms of magnitude and precision.

7 Mechanisms and Potential Confounders

In this section, we open up the discussion and consider that confounders, such as parental education and socioeconomic status, or choice of neighborhood and school, could also be considered as mechanisms or mediators if culture per se is causally linked to such outcomes. For example, if parents from achievement-oriented cultures are more successful in the labor market because of higher effort, or send their children to higher quality schools because of their high valuation of performance, parents' SES and children's school environment should not necessarily be seen as confounders. The purpose of this section is therefore to highlight potential pathways through which culture could be

Table 4: Gender GPA Gap and Cultural Dimensions, Sensitivity Checks

	(1)	(2)	(3)	(4)	(5)	(6)
GPA_st_sgim						
MAS * Female	-0.1840***	-0.1802***	-0.2262***	-0.1869***	-0.1865***	-0.2090**
	(0.0503)	(0.0502)	(0.0627)	(0.0521)	(0.0693)	(0.0816)
PDI * Female	-0.0523	-0.0538	-0.1385	-0.0700	-0.1495	0.0026
	(0.0463)	(0.0463)	(0.1338)	(0.1075)	(0.1480)	(0.1742)
UAI * Female	-0.0560	-0.0617	-0.0304	-0.0479	-0.0153	-0.0320
	(0.0427)	(0.0425)	(0.0476)	(0.0615)	(0.0634)	(0.0746)
LTO * Female	0.1123***	0.1094***	0.1334***	0.1159***	0.1060**	0.0943*
	(0.0376)	(0.0376)	(0.0398)	(0.0416)	(0.0430)	(0.0504)
Observations	78040	78040	78040	78040	77702	73448
R-squared	.674	.676	.674	.674	.681	.715
Dependent var. (mean)	-.007	-.007	-.007	-.007	-.007	-.007
Dependent var. (sd)	.996	.996	.996	.996	.996	.996
Number of clusters	30018	30018	30018	30018	29898	28201
Gender Gap	.313	.313	.313	.313	.314	.313
Family FE	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓
Birth variables		✓			✓	✓
Birth var. * Fem		✓			✓	✓
Individualism * Fem.			✓		✓	✓
Indulgence * Fem.			✓		✓	✓
LogGDPpc2000 * Fem.				✓	✓	✓
Municipality FE					✓	
Mun. FE * Fem.					✓	
Neighborhood FE						✓
Neighb. FE * Fem.						✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

mediated, while acknowledging that we are not able to identify them in a causal sense. As will become apparent, the pathways we explore are not necessarily mutually exclusive, nor can we rule out the possibility that alternative mechanisms are at work. Our results are summarized in Tables 7 and 8. In discussing the results, we focus mainly on factors that may explain why a culture of achievement orientation leads to an educational advantage of boys relative to girls, as this is the cultural dimension that matters most strongly for gender gaps in student achievement. Where appropriate, we also discuss how the mechanisms play out for the other cultural dimensions.

Table 5: Gender Math Gap and Cultural Dimensions

	(1)	(2)	(3)	(4)	(5)
math_st_sgim					
MAS * Female	-0.2340***				-0.1775***
	(0.0490)				(0.0560)
PDI * Female		-0.1063***			-0.0072
		(0.0366)			(0.0521)
UAI * Female			-0.1452***		-0.1275**
			(0.0392)		(0.0504)
LTO * Female				0.1101***	0.1374***
				(0.0387)	(0.0414)
Observations	78040	78040	78040	78040	78040
R-squared	.636	.636	.636	.636	.636
Dependent var. (mean)	-.008	-.008	-.008	-.008	-.008
Dependent var. (sd)	.997	.997	.997	.997	.997
Cultural var. (mean)	.427	.587	.723	.387	
Cultural var. (sd)	.119	.158	.149	.148	
Cultural var. * Fem. (beta)	-.028	-.017	-.022	.016	
Number of clusters	30018	30018	30018	30018	30018
Gender Gap	.015	.015	.015	.015	.015
Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Intentional Differential Treatment of Sons vs. Daughters through Parents. A natural starting point for thinking about plausible mechanisms driving our main results is to ask whether parents with different cultural backgrounds treat girls and boys differently. Gendered treatment can involve passing on different aspirations, ambitions, values and gender roles in the education and upbringing of children. Parents can also invest differentially in boys' and girls' skill formation either through differential time investments or through choosing schools of different qualities. While mechanisms reflecting values and time investments are hard to observe in most data sets, with our data we can partly address whether sons and daughters are treated differently by observing whether parents gender-discriminate when choosing schools for their offspring.

In column 1 of Table 7, we explore this possibility by investigating whether parents from different cultures systematically place sons in higher quality schools than daughters. To that end, we construct a measure of school quality, which represents the average peer achievement by school and

Table 6: Gender Gap in Swedish and Cultural Dimensions

	(1)	(2)	(3)	(4)	(5)
swe_st_sgim					
MAS * Female	-0.4156***				-0.1833***
	(0.0501)				(0.0569)
PDI * Female		-0.3359***			-0.2984***
		(0.0378)			(0.0528)
UAI * Female			-0.2655***		-0.0970*
			(0.0399)		(0.0501)
LTO * Female				0.1998***	0.3091***
				(0.0397)	(0.0421)
Observations	77601	77601	77601	77601	77601
R-squared	.615	.615	.614	.614	.615
Dependent var. (mean)	-.015	-.015	-.015	-.015	-.015
Dependent var. (sd)	.993	.993	.993	.993	.993
Cultural var. (mean)	.427	.588	.723	.387	
Cultural var. (sd)	.118	.158	.149	.148	
Cultural var. * Fem. (beta)	-.049	-.053	-.04	.03	
Number of clusters	29865	29865	29865	29865	29865
Gender Gap	.471	.471	.471	.471	.471
Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

graduation year, after netting out variation across schools that is explained by students' family background.[11] The specification is analogous to our main analysis: we identify whether there is a within-family difference in the school quality at schools attended by sisters and brothers by regressing school quality on culture interacted with gender in a family-fixed effects model. We restrict the sample to non-moving families to avoid picking up differences in school quality that are due to moving to a new neighborhood, rather than due to choice of school. We find that none of the cultural indicators predicts a within-family difference in school quality between brothers and sis-

[11] We construct the measure of school quality by regressing percentile ranked GPA (by graduation year) on children's gender, age, and birth country, and mothers' and fathers' education, earnings, birth country and immigration age, in the full population of graduating students. We use the residuals from this regression and create leave-out means at the school-graduation cohort level, leaving out the index individual from the average. This is our measure of school quality, which informs how well the school performs relative to other schools after taking into account student background. Unfortunately, we do not have data on prior test scores to construct a value-added quality measure.

Table 7: Gender Gap in Quality and Type of School Attendance, Baseline Results

	(1) Res. school quality	(2) Private school
MAS * Female	-0.4015	0.0164
	(0.3787)	(0.0159)
PDI * Female	-0.2352	-0.0016
	(0.3389)	(0.0132)
UAI * Female	0.0769	-0.0210
	(0.3418)	(0.0136)
LTO * Female	-0.3440	-0.0203
	(0.3043)	(0.0130)
Observations	57692	57348
R-squared	.614	.757
Dependent var. (mean)	.205	.096
Dependent var. (sd)	6.194	.295
Number of clusters	22817	22697
Gender Gap	.103	.005
Family FE	✓	✓
Grad. year FE	✓	✓
Age	✓	✓
Age * Female	✓	✓
Nonmover sample	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. *Nonmover sample* additionally restricts the sample to families who lived in the same neighborhood at graduation of all their children. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

ters. As school quality can be difficult for parents to observe and act on, we additionally examine differential treatment in the probability to send children to private schools.[12] If private schools are perceived as more selective and of higher quality, differential treatment could manifest itself through this type of school choice. In column 2 of Table 7, we again find no evidence that parents' cultural background is related to differences in the educational investments of sons and daughters. Table 6 thus gives us no reason to believe that parents from different cultural origins intentionally treat their sons and daughters differently when investing in their skills.[13]

[12]Private or "independent" schools were uncommon among the early cohorts in our sample, but after a reform in the 1990s, the share of students attending private schools has risen. Private schools are tuition-free but operated by independent foundations, small companies or large for-profit school corporations.

[13]Tables A3 and A4 in the Appendix show that these findings generally are robust to including a wider set of

Non-Intentional Mechanisms. Next, in Table 8, we investigate a set of mechanisms that no longer build on the idea that parents from achievement-oriented cultures intentionally treat sons and daughters differently.[14] First, we conjecture that, irrespective of their children's gender, parents from achievement-oriented cultures might place their children in higher quality schools, and that boys might benefit more from this than girls do (see, e.g., Autor et al. 2016). Thus, we first regress the quality of schools attended by immigrant children on the cultural variables to explore whether there is a correlation (Panel A, column 1). In a similar fashion, we also regress our binary dependent variable for a child attending private school on the cultural variables (Panel A, column 2). Panel A shows that children from achievement-oriented cultures (MAS) attend higher quality schools, and they are also more likely to go to private schools. We also find that the other cultural indicators are related to school characteristics. As an example, long-term orientation (LTO) is positively associated with school quality, and acceptance of power (PDI) and uncertainty avoidance (UAI) show negative correlations. Based on these correlations and the previous literature on gender gaps in education, we hypothesize that school quality may be a possible explanation to the link between achievement orientation and gender gaps in education. The positive correlation between LTO and school quality does however not yield a prediction consistent with our baseline findings in Table 3, since a higher LTO is to the benefit of girls' school performance.

In the next step, we regress student GPA on school quality interacted with gender in a family-fixed effects model (Panel B, column 1). Similarly, we regress student GPA on the private school dummy interacted with gender in a family-fixed effects specification (Panel B, column 2). These specifications adopt the identification strategy previously used by Autor et al. (2016) and essentially identify whether school quality has differential impacts on girls and boys by comparing sisters and brothers. Our results confirm those in Autor et al. (2016): column 1 shows that girls benefit less relative to boys from higher school quality. Similarly, in column 2 we observe that the gender gap is smaller in private compared to public schools. These results therefore support the explanation that differences in school quality and school characteristics across children with different cultural origins unintentionally could affect gender gaps in education, as girls and boys are differentially affected by school quality.

An alternative, and partly overlapping explanation, is that parents from achievement-oriented

controls. However, when including controls for individualism and indulgence, we find some significant interactions between gender and culture in the choice of private schooling. However, the interaction between MAS and female is positive, which would predict a larger girl-favoring gender gap and as such cannot explain our baseline result.

[14] A few additions to the table notes are in order here. *Nonmover sample* additionally restricts the sample to families who lived in the same neighborhood at graduation of all their children. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. Predicted GPA is obtained by regressing GPA on parents' education and earnings, age, a female indicator and graduation year dummies. Parental time in Sweden captures the host country experience prior to the birth of the oldest sibling. Traditional LFP takes 1 if only the father is working, 0 if both/none work, and -1 if only the mother is working. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth.

Table 8: Mechanisms, Baseline Results

	(1) Res. school quality	(2) Private school	(3) Predicted GPA	(4) Par. time in Sweden	(5) Traditional LFP
MAS	2.3661***	0.1271***	0.0960***	-2.8025***	0.0226
	(0.3084)	(0.0166)	(0.0246)	(0.2959)	(0.0340)
PDI	-2.0610***	-0.1213***	-0.3394***	-12.2919***	0.0347
	(0.2947)	(0.0151)	(0.0215)	(0.2751)	(0.0334)
UAI	-0.6001**	0.0020	-0.0851***	3.3107***	-0.0556*
	(0.2880)	(0.0146)	(0.0202)	(0.1969)	(0.0314)
LTO	1.5369***	0.0235	0.3248***	8.7004***	-0.0350
	(0.2585)	(0.0143)	(0.0192)	(0.2098)	(0.0268)
Observations	57697	57472	78040	66454	78040
R-squared	.012	.06	.313	.165	.001
Dependent var. (mean)	.205	.096	-.231	5.618	.058
Dependent var. (sd)	6.195	.295	.468	4.671	.616
Number of clusters	22822	22821	30018	25530	30018
Gender Gap	.081	.004	.352	-.052	.004
	(1) Standardized GPA	(2) Standardized GPA	(3) Standardized GPA	(4) Standardized GPA	(5) Standardized GPA
Res. sch. qual. * Female	-0.0019*				
	(0.0011)				
Res. school quality	0.0202***				
	(0.0010)				
Priv. school * Female		-0.0798***			
		(0.0216)			
Private school		0.2129***			
		(0.0244)			
Pred. GPA * Female			-0.0236*		
			(0.0134)		
Par. time Swe. * Female				0.0007	
				(0.0012)	
Trad. LFP * Female					-0.0113
					(0.0090)
Observations	57692	57348	78040	66454	78040
R-squared	.687	.682	.674	.672	.674
Dependent var. (mean)	.038	.038	-.007	.023	-.007
Dependent var. (sd)	.982	.983	.996	.986	.996
Mechanism (mean)	.205	.096	-.231	5.618	.058
Mechanism (sd)	6.194	.295	.468	4.671	.616
Mechanism * Fem. (beta)	-.012	-.024	-.011	.003	-.007
Number of clusters	22817	22697	30018	25530	30018
Gender Gap	.312	.314	.313	.309	.313
Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓
Nonmover sample	✓	✓			

Notes: Panel A reports estimates of regressing each mechanism on the cultural dimensions (w/ control variables but w/o family FE). Panel B reports estimates of regressing normalized GPA on the mechanisms (w/ control variables and family FE). The sample is restricted to second-generation immigrant students with opposite-sex siblings.Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

cultures are positively selected in terms of SES compared to immigrants from other cultures, and that this disproportionately promotes the educational outcomes of boys (see, e.g., Autor et al. 2019; Figlio et al. 2019). The correlation between culture and SES can be considered a mechanism if culture *per se* is causing differences in socio-economic status across immigrants from different source countries. This could be the case either if differences in SES originate from selective migration, or if cultural origin affects the integration and socioeconomic position of migrants in the host country. For example, achievement orientation might induce the well-educated to emigrate, e.g., to secure well-paying jobs or the best possible educational opportunities for their offspring. Similarly, even without selective migration, achievement orientation might induce immigrants to work harder to integrate in the host country and consequently reach higher socio-economic positions.

Column 3 (Panel A) shows that parental SES (measured with an index incorporating both parental education and earnings[15]) is correlated with the cultural variables in a similar way as school quality: parents from achievement-oriented cultures appear to have higher SES in terms of education and earnings. In Panel B, similar to the results in Autor et al. (2016), we show that the female GPA advantage is reduced with higher SES. Socio-economic background and school quality/private school are positively correlated and likely to pick up similar mechanisms—that in comparison to girls, boys' relative behavioral and academic outcomes are particularly sensitive to disadvantage, both in terms of school and family environment. The magnitudes of the estimates in Table 8 are however very small, implying that they are far from fully explaining the culture-gender interactions in Table 3.[16]

Finally, in columns 4 and 5, we explore two additional mechanisms-—host country experience in terms of parental time in the country, and traditional gender roles in terms of parents' labor force participation. We measure parental time in the country and labor force participation in the year the oldest sibling turns 15. Recent evidence suggests that boys benefit more than girls from integration interventions targeting immigrants (Dahl et al. 2020), leading us to hypothesize that it may also be that boys disproportionately benefit from parents' host country experience. Panel A shows correlations between parents' time in the country and the cultural indices. We observe that high MAS immigrant groups have shorter time in the country, and high LTO immigrants have longer time in the country. However, as shown in Panel B, the gender GPA gap is unaffected by how long parents have lived in Sweden, and we can rule out gendered integration processes as a likely explanation.

In column 5, we explore parental role models as a potential mechanism. The outcome variable captures traditional gender roles in terms of parental labor force participation, and takes the value

[15]The parental SES index is based on a regression of GPA on parents' education and earnings, while controlling for age, gender, and graduation year dummies. We use the prediction—i.e., the "expected GPA"—as an index of students' SES.

[16]The correlations in Panel A and the gender interactions in Panel B would imply that school quality and predicted GPA can explain less than 1 percent of the MAS*gender gap in Table 3. The private schooling mechanism can explain somewhat more—up to 6 percent. As will become apparent in the analysis that follows (see Appendix Table A7, discussed below), jointly the mechanisms explored here explain roughly 25 percent of the MAS*gender gap in Table 3.

1 if only the father is working, 0 if both parents are working or none of them are working, and -1 if only the mother is working. The motivation for this analysis is that besides directly influencing values and investments in children, cultural origins – if they have gendered consequences – are likely to also manifest themselves in the division of labor among parents, which in turn can affect girls' and boys' perceptions about their future and their effort in school. Column 5 (Panel A) however shows limited evidence that the cultural indicators are correlated with traditional labor division among immigrant parents in Sweden. In Panel B we find no evidence that girls' relative advantage to boys is smaller in more traditional families.

To sum up, the results in Table 7 show that although achievement-oriented cultural origin substantially reduces the girl GPA advantage among second-generation immigrants in Sweden, there is little evidence that points in favor of intentional differential treatment of sisters and brothers in Sweden.

Alternative explanations investigated in Table 8 show that the indices reflecting cultural origins are correlated with children's disadvantage, both in terms of school quality and family SES.[17] Disadvantage in turn disproportionally affects boys, with gender gaps, even within the same family, that are larger in low SES environments. As such, the relative advantage of boys with achievement-oriented origins could be explained by lower disadvantage. However, our estimates suggest that this mechanism can by no means fully explain the culture/gender-gap interaction. Returning to our theoretical predictions based on findings in the previous literature, we should maybe not be surprised that our results are not fully explained by the mechanisms discussed here. When it comes to achievement orientation, we should perhaps instead seek explanations in that girls and boys react differently to competitive pressure, and not only in the gendered implications of growing up in disadvantage.

Above, we have emphasized that if culture is the driving force behind disadvantage, we should see this as a mechanism rather than as a confounder. It is, however, also possible that culture and SES are correlated without a causal link, and in that case the impact of achievement orientation on gender gaps should be attributed to disadvantage *per se*, not to culture. In order to understand whether cultural origin, in particular the MAS index, survives as an independent explanation, we return to our baseline specification and include controls for the gender interactions with school quality, private school and parental SES. The results in Appendix Table A7 show that the gender interaction with achievement orientation (MAS) decreases in magnitude by roughly 25 percent but remains statistically significant if we simultaneously control for the mechanisms explored in this section. Thus, the impact of achievement orientation on gender gaps in education exists beyond the potentially confounding role of disadvantage.[18] The results also show that the gender interaction

[17] Appendix Tables A5 and A6 show that the results in Table 8 are largely robust to alternative specifications. One exception is the positive correlation between predicted GPA and MAS in Panel A of Table 8, which disappears (respectively, turns negative) once we include municipality fixed effects (respectively, neighborhood fixed effects).

[18] In Appendix Tables A8 and A9, we show that this conclusion also holds when phasing in additional control variables and municipality and neighborhood fixed effects, respectively.

with long-term orientation (LTO) is virtually unaffected by controlling for the mechanisms explored here.

8 Findings Based on Data from PISA

To explore whether the associations between culture and gender achievements gaps observed among second-generation youth in Sweden also exist in different populations and circumstances, we use data from the OECD's Programme for International Student Assessment (PISA). The idea behind PISA is to test the knowledge and skills of students through a metric that is internationally agreed upon, and to link test scores with data from students, parents, teachers, schools and systems to understand performance differences.

Drawing on the PISA studies from 2003, 2006, 2009, 2012, and 2015, we obtain standardized test scores in mathematics, science, and reading. Following the previous literature (Fernández and Fogli 2009; Rodríguez-Planas and Nollenberger 2018), we drop second-generation immigrants whose countries of ancestry have fewer than 15 observations in a given host country.[19] Our sample contains 35,512 second-generation immigrant students residing in 29 host countries. We combine 41 mother source countries and 40 father source countries to 74 source country groups.[20]

Importantly, this dataset contains the country of origin of the mother and the father of each second-generation immigrant student. Based on this, we assign two values of cultural trait $C \in \{MAS, PDI, UAI, LTO\}$ to each student. The first, which we think of as our "broad" measure of culture, accounts for the possibility that a child's parents originate from different cultures, and is the average value of cultural trait C of mother and father, defined at the level of their respective birth countries. For the second, which we think of as our "narrow" measure of culture, we define a student's cultural background based on the values of C in the mothers country of origin.

The main dependent variable used in the analysis is a student's PISA grade-point average, computed as the average normalized test scores of mathemathics, science, and reading. We carry out sensitivity checks that use three standardized subject scores as dependent variables.

Although the PISA dataset does not allow for empirical specifications that rely on within-family, cross-gender sibling comparisons, we fit a reasonably tightly specified model to the data:

$$\begin{aligned} y_{ihgtf} = & \beta_0 + \beta_1 Female_i + \beta_2 (Female_i \times Culture_f) + \beta_3 \mathbf{X}_i' + \beta_4 (Female_i \times \mathbf{X}_i') \\ & + \gamma_f + \gamma_h + \gamma_g + \gamma_t + \beta_5 (Female_i \times \gamma_h) + \varepsilon_{ihgtf} \end{aligned} \quad (2)$$

where index i denotes a second-generation immigrant student, h her country of residence, g the grade

[19] As with the Swedish data, we assign only other parent's culture and source country in the case of missing cultural dimensions.

[20] We distinguish between mother's and father's ancestry when combining them. For example, students with a mother from Italy and a father from Spain are assigned a different ancestry than students with a mother from Spain and a father from Italy.

Table 9: Gender GPA Gap and Cultural Dimensions, PISA Data

Dependent Variable:	*Standardized PISA Grade-Point Average*				
	(1)	(2)	(3)	(4)	(5)
MAS * Female	-0.2048**				-0.2921**
	(0.0895)				(0.1267)
PDI * Female		-0.1091			-0.1717*
		(0.0913)			(0.0893)
UAI * Female			0.0326		-0.0819
			(0.0758)		(0.1033)
LTO * Female				-0.0842	-0.0046
				(0.0671)	(0.0934)
Observations	35512	35512	35512	35347	35347
R-squared	.398	.398	.398	.399	.399
Dependent var. (mean)	0	0	0	.001	.001
Dependent var. (sd)	.964	.964	.964	.965	.965
Cultural var. (mean)	.563	.700	.554	.664	
Cultural var. (sd)	.137	.154	.292	.23	
Cultural var. * Fem. (beta)	-.029	-.017	.01	-.02	
Number of Clusters	74	74	74	73	73
Gender Gap	-.011	-.011	-.011	-.011	-.011
Year FE	✓	✓	✓	✓	✓
Grade FE	✓	✓	✓	✓	✓
Anc. Country FE	✓	✓	✓	✓	✓
Host Country FE	✓	✓	✓	✓	✓
Host Country FE * Fem.	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Fem.	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (2) on a sample of second-generation immigrant students tested in PISA studies 2003, 2006, 2009, 2012, and 2015. The dependent variable is a student's PISA grade-point average, computed as the average normalized test score of mathematics, science, and reading. Each subject score is normalized to be mean 0 and standard deviation 1 in our estimation sample. All regressions include the female dummy (non-reported). Standard errors are adjusted for clustering at parents' country-of-origin level (combining mother's and father's origin and distinguishing between the two). ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

she attends, t the year she partakes in PISA, and f her mother's and father's combined ancestry.[21] $Female_i$ is an indicator for whether a student is a girl, and $Culture_f$ measures a cultural dimension (or a set of cultural dimensions) based on Hofstede's data for the individual's country of ancestry. The coefficient of interest is β_2, which identifies culture's differential impact on girls relative to boys. The vector $\mathbf{X}_i$ controls for a set of individual attributes, namely a student's age in our basic specification and parental characteristics including age and education in extended specifications. We include ancestry fixed effects (γ_f) in all regressions to net out the effects of unmeasured country-of-

[21] We combine mothers' and fathers' countries of ancestry to 74 groups.

ancestry factors which are common to girls and boys. In extended specifications, we probe whether our results are robust to allowing potential confounding characteristics of the country of ancestry to affect girls and boys differentially. Finally, we control for unmeasured confounders common to girls and boys partaking in PISA in a given year (through a set of year dummies, γ_t), attending a given grade (through a set of grade dummies, γ_g), and living in a given host country (through a set of host country dummies, γ_h). The interaction between *Female* and host-country dummies (γ_h) accounts for differential gender achievement gaps that may arise from economic, cultural and institutional differences across host countries.

As shown in Table 9, the replication of our findings for Sweden with a very different sample of second-generation immigrants drawn from PISA yields results that are qualitatively and quantitatively remarkably similar. Specifically, the most important and robustly significant effect of culture on gender achievement gaps turns out to be again the extent to which a society emphasizes ambition, competition, and achievement, measured by Hofstede's MAS dimension. This result holds irrespective of whether we analyze each of the four cultural dimension in isolation (Columns 1 through 4) or include them jointly in a regression (Column 5). In terms of effect sizes, suppose once more that immigrants from Denmark (MAS=0.16) had the same degree of achievement orientation as those from Germany (MAS=0.66): our estimates in Column 5 suggest that this would cause a relative GPA disadvantage of girls compared with boys of almost one-sixth of a standard deviation, i.e., we would observe a change from a negligibly small male-favorable GPA gap of 1% of a standard deviation to a substantial male-favorable GPA gap of 14% of a standard deviation. These findings pass several sensitivity checks, specified to resemble those we have conducted for Sweden (see Appendix Table A10).

The results are also confirmed when, instead of using students' PISA grade-point average, we analyze their subject scores in math, science and reading separately. The findings, reported in Appendix Tables A11 through A13, can be summarized as follows. In our PISA sample of second-generation immigrants, girls have, on average, higher reading scores than boys, but they are outperformed by boys in math and science. Among children from achievement-oriented cultures, girls' comparative advantage in reading vanishes, while the math and science gap in favor of boys significantly increases.

9 Conclusions

We have studied the cultural origins of gender gaps in student achievement, departing from the existing literature in two important ways. The first point of departure concerns how we operationalize culture. In the social sciences, culture is often described by the analogy of an onion, with basic beliefs, values, and attitudes forming the core of culture and actual behavior and manifestations thereoff representing the outer layers. From this perspective, the majority of related studies to date has focused not on the role of core cultural values and beliefs *per se*, but on one important manifestation of culture in society, namely whether more gender equality is associated with an educational advantage of girls relative to boys (Guiso et al. 2008; Nollenberger et al. 2016). Our analysis adds to this literature by shifting focus to cultural values, beliefs an attitudes that plausibly underlie manifestations of gender (in)equality in society. In particular, based on the multi-dimensional measures of culture developed by Dutch sociologist Geert Hofstede, and motivated by hypotheses derived from the economics literature on gender differences and gender convergence, we have explored whether and how cultural dimensions such as achievement orientation, acceptance of inequality, risk avoidance, and long-term orientation relate to gender gaps in student achievement. Our findings suggest that these cultural dimensions are important, as we are able to explain 10 percent of the cross-country variations in gender achievement gaps using Hofstede's cultural indices, while only 4 percent using GDP per capita.

Second, on research methods and depth of analysis, we have used administrative data linking children, parents and schools to study the cultural origins of gender gaps in student achievement. The first key advantage over student survey data used in related studies is that its detail and scale allows for a tightly-controlled, well-powered test of culture's impact on gender gaps in student achievement. Building on the epidemiological approach, our test relies on within-family, cross-gender sibling comparisons, controlling for unobserved family heterogeneity while identifying the differential effect of culture on girls relative to boys. The second advantage of our data is that it allows for an in-depth analysis of potential mechanisms linking culture to gender gaps in student achievement. Indeed, our analysis of mechanisms builds a bridge from the economics of culture to recent advances in the economics of education quantifying the contribution of school quality or family disadvantage to the gender gap in academic outcomes.

We conclude from our exercise that the central cultural dimension that matters for gender gaps in education is the extent to which a society emphasizes ambition, competition and achievement, which is strongly predictive of a relative achievement disadvantage of girls relative to boys. Cultural dimensions such as long-term orientation, inequality acceptance and uncertainty avoidance matter too, but they do not as strongly and robustly influence the gender gap in academic outcomes. An important mechanism driving our main result appears to be parental school choice: parents from achievement-oriented cultures place their children in higher quality schools compared to those from other cultures, which is more consequential for boys than it is for girls. It is, however, not the case that parents with different cultural origins intentionally treat sons and daughters differently when choosing schools for their offspring, i.e., we find no evidence that they enroll sons in good quality schools to a higher degree than daughters. These findings underscore the value of an augmented epidemiological approach combining detailed administrative data with multi-dimensional measures of cultural beliefs and attitudes.

It offers the opportunity to open-up the black box of cultural transmission and provide a nuanced account of possible pathways from specific cultural traits to gendered economic outcomes. Determining whether the gendered effects of culture highlighted here persist once youth enter the labor market and form families on their own is a promising and important area for future work.

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Appendix Figures and Tables (Intended for Online Publication)

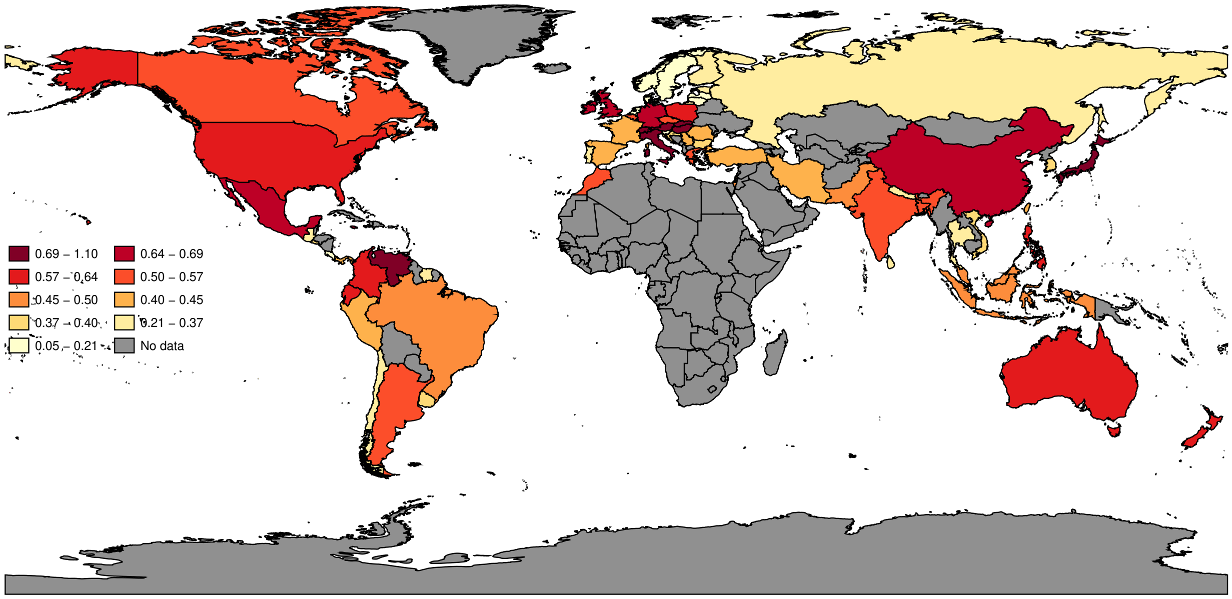

Figure A1: Distribution of MAS around the World

Notes: This figure is based on the code provided by Figlio et al. (2019).

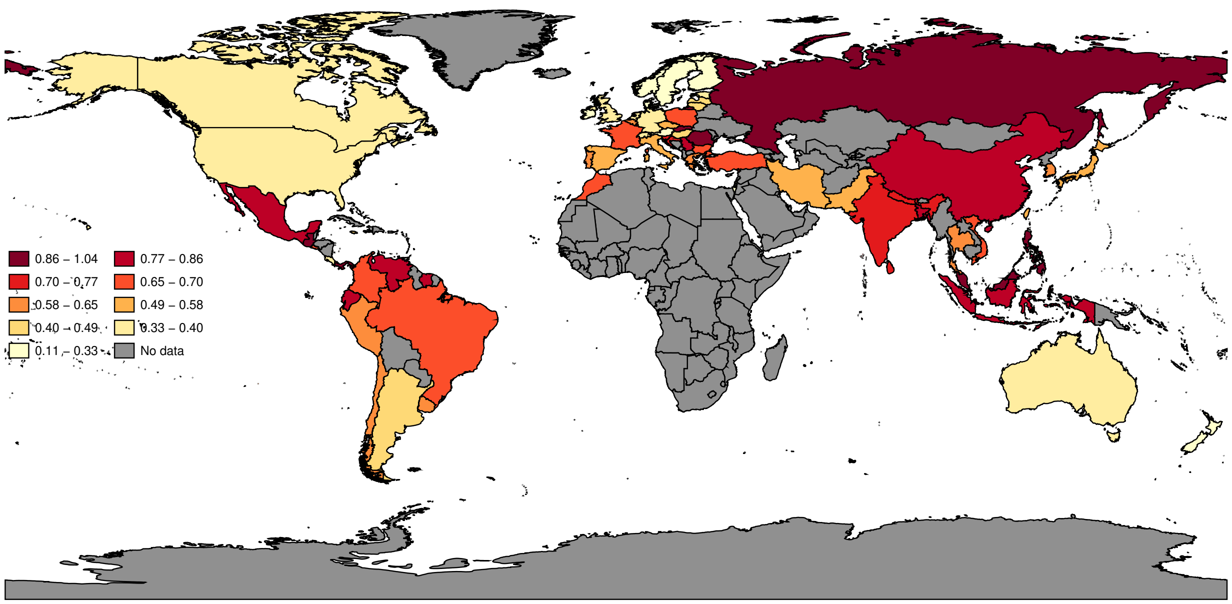

Figure A2: Distribution of PDI around the World

Notes: This figure is based on the code provided by Figlio et al. (2019).

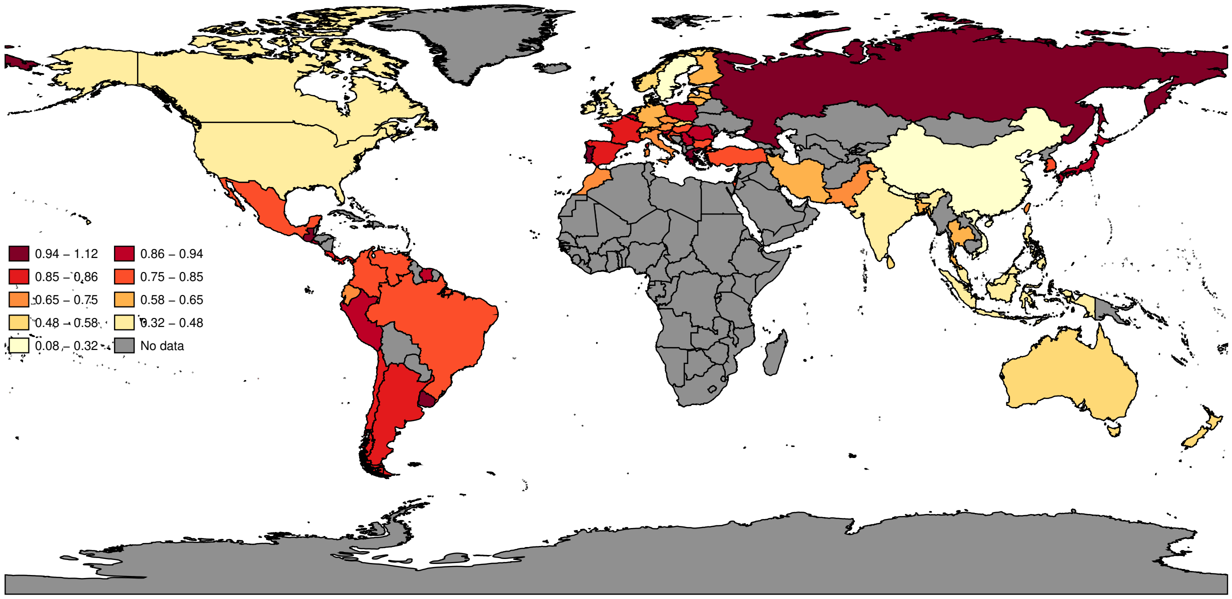

Figure A3: Distribution of UAI around the World

Notes: This figure is based on the code provided by Figlio et al. (2019).

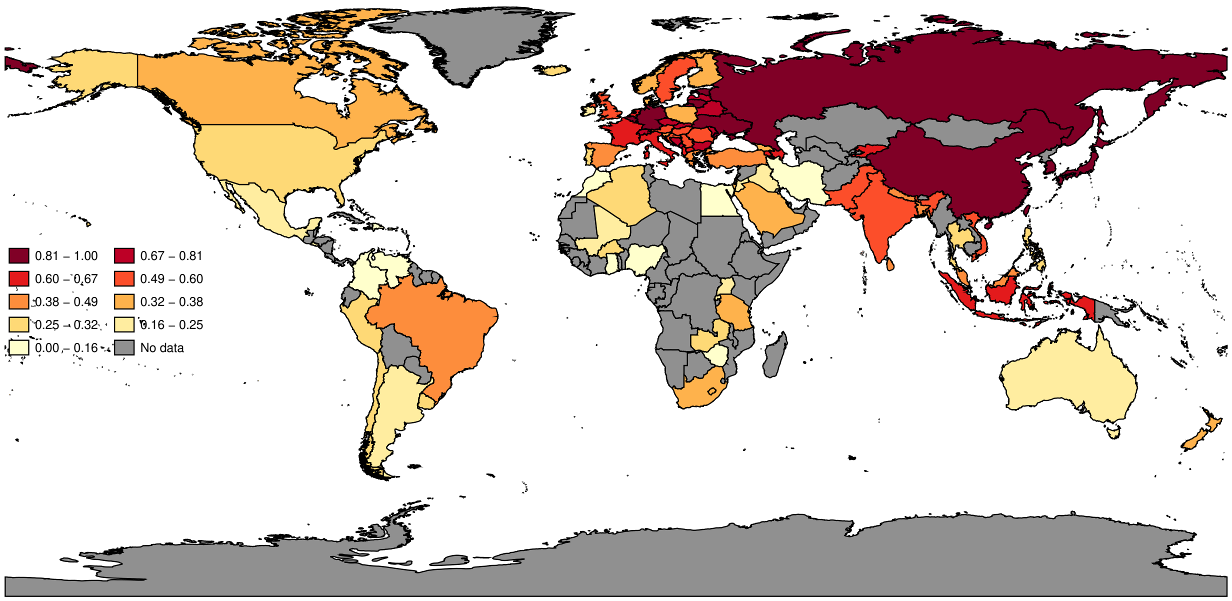

Figure A4: Distribution of LTO around the World

Notes: This figure is based on the code provided by Figlio et al. (2019).

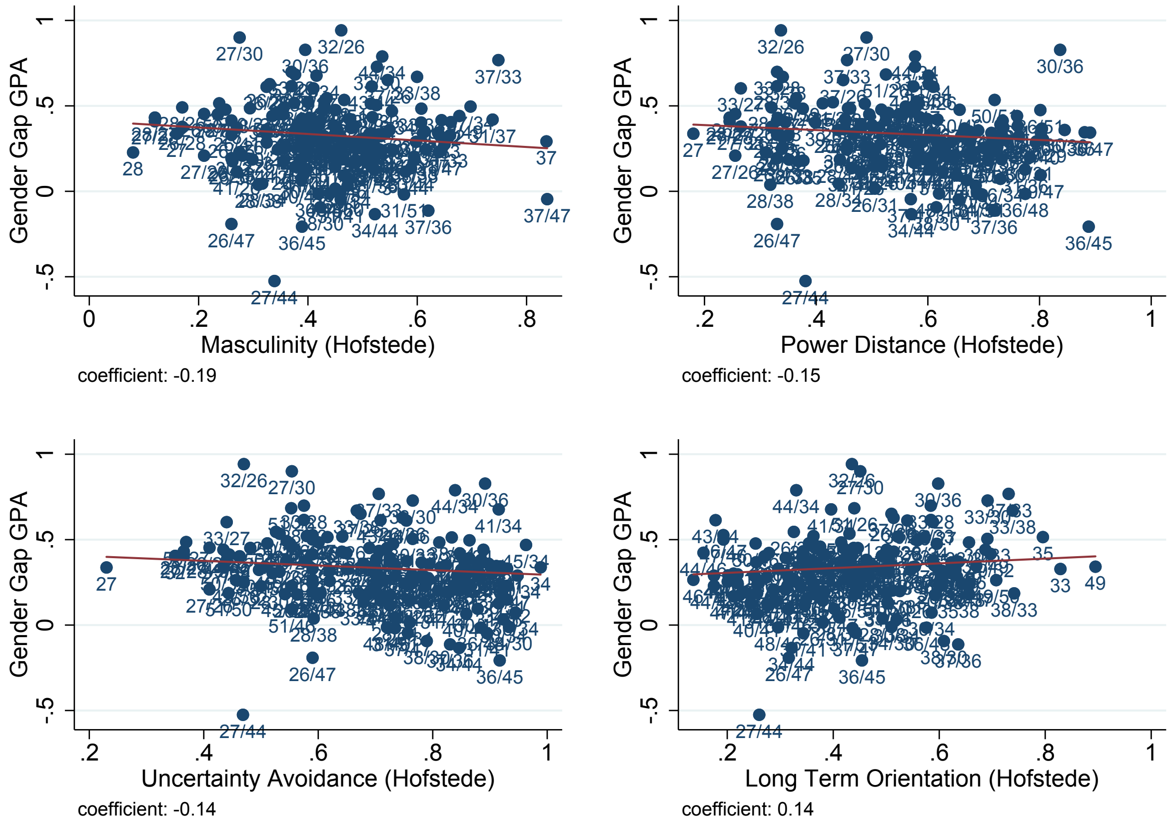

Figure A5: Hofstede's Cultural Dimensions and Gender GPA Gap

Notes: This figure presents plots of the gender gap in student achievement averaged by second-generation immigrant groups and cultural dimension $C \in \{MAS, PDI, UAI, LTO\}$. For data protection reasons, we only include immigrant groups with at least 50 observations here.

Table A1: Gender Math Gap and Cultural Dimensions, Sensitivity Checks

	(1)	(2)	(3)	(4)	(5)	(6)
math_st_sgim						
MAS * Female	-0.1775***	-0.1761***	-0.1798**	-0.1912***	-0.1287	-0.1877**
	(0.0560)	(0.0560)	(0.0703)	(0.0588)	(0.0797)	(0.0923)
PDI * Female	-0.0072	-0.0128	-0.0802	-0.0918	-0.1426	-0.0028
	(0.0521)	(0.0521)	(0.1544)	(0.1202)	(0.1699)	(0.1951)
UAI * Female	-0.1275**	-0.1319***	-0.1129**	-0.0886	-0.0691	-0.0689
	(0.0504)	(0.0503)	(0.0562)	(0.0709)	(0.0742)	(0.0844)
LTO * Female	0.1374***	0.1414***	0.1486***	0.1542***	0.1290***	0.1103*
	(0.0414)	(0.0415)	(0.0450)	(0.0469)	(0.0491)	(0.0563)
Observations	78040	78040	78040	78040	77702	73448
R-squared	.636	.638	.636	.636	.643	.682
Dependent var. (mean)	-.008	-.008	-.008	-.008	-.008	-.01
Dependent var. (sd)	.997	.997	.997	.997	.997	.996
Number of clusters	30018	30018	30018	30018	29898	28201
Gender Gap	.015	.015	.015	.015	.015	.011
Family FE	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓
Birth variables		✓			✓	✓
Birth var. * Fem		✓			✓	✓
Individualism * Fem.			✓		✓	✓
Indulgence * Fem.			✓		✓	✓
LogGDPpc2000 * Fem.				✓	✓	✓
Municipality FE					✓	
Mun. FE * Fem.					✓	
Neighborhood FE						✓
Neighb. FE * Fem.						✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A2: Gender Gap in Swedish and Cultural Dimensions, Sensitivity Checks

	(1)	(2)	(3)	(4)	(5)	(6)
swe_st_sgim						
MAS * Female	-0.1833***	-0.1829***	-0.3406***	-0.1655***	-0.2455***	-0.2885***
	(0.0569)	(0.0568)	(0.0707)	(0.0596)	(0.0791)	(0.0928)
PDI * Female	-0.2984***	-0.2958***	-0.0894	-0.1879	-0.0850	-0.0818
	(0.0528)	(0.0527)	(0.1558)	(0.1206)	(0.1713)	(0.1980)
UAI * Female	-0.0970*	-0.1017**	-0.1048*	-0.1480**	-0.0992	-0.0420
	(0.0501)	(0.0500)	(0.0560)	(0.0713)	(0.0744)	(0.0867)
LTO * Female	0.3091***	0.2954***	0.3097***	0.2872***	0.2513***	0.2584***
	(0.0421)	(0.0422)	(0.0454)	(0.0470)	(0.0492)	(0.0567)
Observations	77601	77601	77601	77601	77263	73022
R-squared	.615	.618	.615	.615	.623	.664
Dependent var. (mean)	-.015	-.015	-.015	-.015	-.015	-.017
Dependent var. (sd)	.993	.993	.993	.993	.993	.991
Number of clusters	29865	29865	29865	29865	29745	28051
Gender Gap	.471	.471	.471	.471	.471	.468
Family FE	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓
Birth variables		✓			✓	✓
Birth var. * Fem		✓			✓	✓
Individualism * Fem.			✓		✓	✓
Indulgence * Fem.			✓		✓	✓
LogGDPpc2000 * Fem.				✓	✓	✓
Municipality FE					✓	
Mun. FE * Fem.					✓	
Neighborhood FE						✓
Neighb. FE * Fem.						✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A3: Gender Gap in Quality and Type of School Attendance, Sensitivity (municipality level)

	(1) Res. school quality	(2) Private school
MAS * Female	0.4043	0.0517**
	(0.5268)	(0.0215)
PDI * Female	-0.7672	0.0438
	(1.1201)	(0.0462)
UAI * Female	-0.1968	-0.0530**
	(0.5228)	(0.0211)
LTO * Female	-0.4922	-0.0380**
	(0.3518)	(0.0155)
Observations	57445	57104
R-squared	.624	.768
Dependent var. (mean)	.207	.096
Dependent var. (sd)	6.193	.294
Number of clusters	22726	22607
Gender Gap	.101	.005
Family FE	✓	✓
Grad. year FE	✓	✓
Age	✓	✓
Age * Female	✓	✓
Birth variables	✓	✓
Birth var. * Fem	✓	✓
Individualism * Fem.	✓	✓
Indulgence * Fem.	✓	✓
LogGDPpc2000 * Fem.	✓	✓
Municipality FE		
Mun. FE * Fem.	✓	✓
Nonmover sample	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. *Nonmover sample* additionally restricts the sample to families who lived in the same neighborhood at graduation of all their children. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A4: Gender Gap in Quality and Type of School Attendance, Sensitivity (neighborhood level)

	(1) Res. school quality	(2) Private school
MAS * Female	0.3119	0.0442**
	(0.5353)	(0.0223)
PDI * Female	-1.0356	0.0371
	(1.1411)	(0.0484)
UAI * Female	0.0338	-0.0455**
	(0.5343)	(0.0219)
LTO * Female	-0.3681	-0.0337**
	(0.3550)	(0.0159)
Observations	57692	57348
R-squared	.615	.757
Dependent var. (mean)	.205	.096
Dependent var. (sd)	6.194	.295
Number of clusters	22817	22697
Gender Gap	.101	.005
Family FE	✓	✓
Grad. year FE	✓	✓
Age	✓	✓
Age * Female	✓	✓
Birth variables	✓	✓
Birth var. * Fem	✓	✓
Individualism * Fem.	✓	✓
Indulgence * Fem.	✓	✓
LogGDPpc2000 * Fem.	✓	✓
Neighborhood FE		
Neighb. FE * Fem.	✓	✓
Nonmover sample	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. *Nonmover sample* additionally restricts the sample to families who lived in the same neighborhood at graduation of all their children. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A5: Mechanisms, Sensitivity Checks (municipality level)

	(1) Res. school quality	(2) Private school	(3) Predicted GPA	(4) Par. time in Sweden	(5) Traditional LFP
MAS	1.2613***	0.0331*	-0.0157	-3.1100***	0.0970***
	(0.3169)	(0.0177)	(0.0250)	(0.3194)	(0.0358)
PDI	-1.0990***	-0.1035***	-0.2380***	-12.0561***	0.0314
	(0.3210)	(0.0168)	(0.0223)	(0.2968)	(0.0362)
UAI	-1.0175***	-0.0009	-0.0339*	3.4192***	-0.0631*
	(0.2837)	(0.0153)	(0.0200)	(0.2050)	(0.0326)
LTO	1.7731***	0.0606***	0.2909***	8.3474***	-0.0363
	(0.2453)	(0.0144)	(0.0182)	(0.2116)	(0.0271)
Observations	57540	57316	77822	66260	77822
R-squared	.109	.12	.41	.234	.02
Dependent var. (mean)	.206	.096	-.231	5.615	.058
Dependent var. (sd)	6.193	.294	.468	4.668	.616
Number of clusters	22821	22819	30015	25527	30015
Gender Gap	.072	.003	.349	-.068	.005

	(1) Standardized GPA	(2) Standardized GPA	(3) Standardized GPA	(4) Standardized GPA	(5) Standardized GPA
Res. sch. qual. * Female	-0.0019*				
	(0.0011)				
Res. school quality	0.0196***				
	(0.0010)				
Priv. school * Female		-0.0781***			
		(0.0217)			
Private school		0.1904***			
		(0.0245)			
Pred. GPA * Female			-0.0300**		
			(0.0147)		
Par. time Swe. * Female				-0.0007	
				(0.0013)	
Trad. LFP * Female					-0.0128
					(0.0091)
Observations	57445	57104	77702	66150	77702
R-squared	.692	.687	.681	.679	.681
Dependent var. (mean)	.039	.039	-.007	.023	-.007
Dependent var. (sd)	.982	.983	.996	.986	.996
Mechanism (mean)	.207	.096	-.231	5.613	.058
Mechanism (sd)	6.193	.294	.468	4.666	.616
Mechanism * Fem. (beta)	-.012	-.023	-.014	-.003	-.008
Number of clusters	22726	22607	29898	25420	29898
Gender Gap	.313	.314	.314	.31	.314

Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓
Birth variables	✓	✓	✓	✓	✓
Birth var. * Fem	✓	✓	✓	✓	✓
Individualism * Fem.	✓	✓	✓	✓	✓
Indulgence * Fem.	✓	✓	✓	✓	✓
LogGDPpc2000 * Fem.	✓	✓	✓	✓	✓
Municipality FE			✓	✓	✓
Mun. FE * Fem.	✓	✓	✓	✓	✓
Nonmover sample	✓	✓			

Notes: See table notes of Table 8. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A6: Mechanisms, Sensitivity Checks (neighborhood level)

	(1) Res. school quality	(2) Private school	(3) Predicted GPA	(4) Par. time in Sweden	(5) Traditional LFP
MAS	2.4051***	0.1200***	-0.0461*	-2.7014***	0.1152***
	(0.3312)	(0.0175)	(0.0249)	(0.3317)	(0.0397)
PDI	-2.0150***	-0.1229***	-0.1295***	-11.5452***	0.0536
	(0.3255)	(0.0160)	(0.0234)	(0.3170)	(0.0413)
UAI	-0.2746	0.0305**	0.0117	3.2932***	-0.0517
	(0.3025)	(0.0154)	(0.0199)	(0.2192)	(0.0357)
LTO	1.4346***	0.0204	0.1547***	7.5248***	-0.0387
	(0.2609)	(0.0145)	(0.0183)	(0.2231)	(0.0303)
Observations	57697	57472	74672	63385	74672
R-squared	.015	.065	.54	.372	.126
Dependent var. (mean)	.205	.096	-.234	5.568	.055
Dependent var. (sd)	6.195	.295	.466	4.624	.617
Number of clusters	22822	22821	29186	24771	29186
Gender Gap	.072	.003	.353	-.034	.006

	(1) Standardized GPA	(2) Standardized GPA	(3) Standardized GPA	(4) Standardized GPA	(5) Standardized GPA
Res. sch. qual. * Female	-0.0017				
	(0.0011)				
Res. school quality	0.0199***				
	(0.0010)				
Priv. school * Female		-0.0749***			
		(0.0217)			
Private school		0.2064***			
		(0.0245)			
Pred. GPA * Female			-0.0133		
			(0.0178)		
Par. time Swe. * Female				-0.0001	
				(0.0015)	
Trad. LFP * Female					-0.0073
					(0.0102)
Observations	57692	57348	73448	62256	73448
R-squared	.689	.684	.715	.716	.715
Dependent var. (mean)	.038	.038	-.007	.022	-.007
Dependent var. (sd)	.982	.983	.996	.985	.996
Mechanism (mean)	.205	.096	-.237	5.553	.055
Mechanism (sd)	6.194	.295	.465	4.615	.617
Mechanism * Fem. (beta)	-.011	-.022	-.006	-.001	-.004
Number of clusters	22817	22697	28201	23880	28201
Gender Gap	.313	.314	.313	.309	.313
Family FE	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓
Birth variables	✓	✓	✓	✓	✓
Birth var. * Fem	✓	✓	✓	✓	✓
Individualism * Fem.	✓	✓	✓	✓	✓
Indulgence * Fem.	✓	✓	✓	✓	✓
LogGDPpc2000 * Fem.	✓	✓	✓	✓	✓
Neighborhood FE			✓	✓	✓
Neighb. FE * Fem.	✓	✓	✓	✓	✓
Nonmover sample	✓	✓			

Notes: See table notes of Table 8. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A7: Mechanisms as control variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MAS * Female	-0.1840***	-0.1818***	-0.1759***	-0.1805***	-0.1413***	-0.1837***	-0.1360**
	(0.0503)	(0.0500)	(0.0506)	(0.0504)	(0.0545)	(0.0503)	(0.0545)
PDI * Female	-0.0523	-0.0452	-0.0490	-0.0625	-0.0944*	-0.0516	-0.0846*
	(0.0463)	(0.0460)	(0.0466)	(0.0466)	(0.0510)	(0.0463)	(0.0512)
UAI * Female	-0.0560	-0.0530	-0.0615	-0.0593	-0.0491	-0.0568	-0.0571
	(0.0427)	(0.0424)	(0.0428)	(0.0426)	(0.0448)	(0.0427)	(0.0446)
LTO * Female	0.1123***	0.1156***	0.1106***	0.1224***	0.1204***	0.1118***	0.1234***
	(0.0376)	(0.0373)	(0.0377)	(0.0377)	(0.0410)	(0.0376)	(0.0409)
Res. sch. qual. * Female		-0.0012					-0.0000
		(0.0010)					(0.0011)
Res. school quality		0.0203***					0.0191***
		(0.0008)					(0.0009)
Priv. school * Female			-0.0619***				-0.0650***
			(0.0191)				(0.0214)
Private school			0.1970***				0.1055***
			(0.0209)				(0.0224)
Pred. GPA * Female				-0.0332**			-0.0445***
				(0.0135)			(0.0148)
Par. time Swe. * Female					-0.0013		-0.0004
					(0.0013)		(0.0013)
Trad. LFP * Female						-0.0108	-0.0123
						(0.0090)	(0.0096)
Observations	78040	78020	77550	78040	66454	78040	66016
R-squared	.674	.68	.675	.674	.672	.674	.679
Dependent var. (mean)	-.007	-.007	-.007	-.007	.023	-.007	.024
Dependent var. (sd)	.996	.996	.996	.996	.986	.996	.985
Number of clusters	30018	30013	29861	30018	25530	30018	25389
Gender Gap	.313	.312	.313	.313	.309	.313	.313
Family FE	✓	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. Predicted GPA is obtained by regressing GPA on parents' education and earnings, age, a female indicator and graduation year dummies. Parental time in Sweden captures the host country experience prior to the birth of the oldest sibling. Traditional LFP takes 1 if only the father is working, 0 if both/none work, and -1 if only the mother is working. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A8: Mechanisms as control variables, Sensitivity Checks (municipality level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MAS * Female	-0.1865***	-0.2009***	-0.1919***	-0.1924***	-0.1319*	-0.1840***	-0.1668**
	(0.0693)	(0.0687)	(0.0695)	(0.0694)	(0.0751)	(0.0693)	(0.0747)
PDI * Female	-0.1495	-0.1384	-0.1496	-0.1188	-0.1997	-0.1518	-0.1567
	(0.1480)	(0.1467)	(0.1481)	(0.1486)	(0.1600)	(0.1480)	(0.1596)
UAI * Female	-0.0153	-0.0063	-0.0149	-0.0247	0.0035	-0.0160	-0.0017
	(0.0634)	(0.0626)	(0.0634)	(0.0635)	(0.0676)	(0.0633)	(0.0672)
LTO * Female	0.1060**	0.1156***	0.1085**	0.1098**	0.1147**	0.1056**	0.1257***
	(0.0430)	(0.0426)	(0.0431)	(0.0430)	(0.0464)	(0.0430)	(0.0461)
Res. sch. qual. * Female		-0.0016					-0.0004
		(0.0010)					(0.0012)
Res. school quality		0.0201***					0.0190***
		(0.0009)					(0.0010)
Priv. school * Female			-0.0538***				-0.0555**
			(0.0197)				(0.0220)
Private school			0.1818***				0.0951***
			(0.0211)				(0.0226)
Pred. GPA * Female				-0.0327**			-0.0460***
				(0.0148)			(0.0160)
Par. time Swe. * Female					-0.0013		-0.0006
					(0.0013)		(0.0013)
Trad. LFP * Female						-0.0125	-0.0126
						(0.0091)	(0.0097)
Observations	77702	77682	77216	77702	66150	77702	65717
R-squared	.681	.687	.682	.681	.68	.681	.686
Dependent var. (mean)	-.007	-.007	-.007	-.007	.023	-.007	.024
Dependent var. (sd)	.996	.996	.996	.996	.986	.996	.985
Number of clusters	29898	29893	29742	29898	25420	29898	25281
Gender Gap	.314	.313	.314	.314	.31	.314	.314
Family FE	✓	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓	✓
Birth variables	✓	✓	✓	✓	✓	✓	✓
Birth var. * Fem	✓	✓	✓	✓	✓	✓	✓
Individualism * Fem.	✓	✓	✓	✓	✓	✓	✓
Indulgence * Fem.	✓	✓	✓	✓	✓	✓	✓
LogGDPpc2000 * Fem.	✓	✓	✓	✓	✓	✓	✓
Municipality FE	✓	✓	✓	✓	✓	✓	✓
Mun. FE * Fem.	✓	✓	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. Predicted GPA is obtained by regressing GPA on parents' education and earnings, age, a female indicator and graduation year dummies. Parental time in Sweden captures the host country experience prior to the birth of the oldest sibling. Traditional LFP takes 1 if only the father is working, 0 if both/none work, and -1 if only the mother is working. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A9: Mechanisms as control variables, Sensitivity Checks (neighborhood level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MAS * Female	-0.2090**	-0.2266***	-0.2126***	-0.2126***	-0.1076	-0.2075**	-0.1436
	(0.0816)	(0.0807)	(0.0820)	(0.0817)	(0.0899)	(0.0817)	(0.0895)
PDI * Female	0.0026	0.0212	0.0167	0.0128	-0.0812	0.0012	-0.0276
	(0.1742)	(0.1725)	(0.1747)	(0.1747)	(0.1917)	(0.1742)	(0.1910)
UAI * Female	-0.0320	-0.0253	-0.0311	-0.0338	-0.0059	-0.0322	-0.0070
	(0.0746)	(0.0737)	(0.0747)	(0.0746)	(0.0815)	(0.0746)	(0.0809)
LTO * Female	0.0943*	0.0972*	0.0939*	0.0951*	0.1187**	0.0941*	0.1154**
	(0.0504)	(0.0499)	(0.0506)	(0.0504)	(0.0550)	(0.0504)	(0.0548)
Res. sch. qual. * Female		-0.0006					0.0005
		(0.0012)					(0.0014)
Res. school quality		0.0195***					0.0187***
		(0.0010)					(0.0011)
Priv. school * Female			-0.0599***				-0.0736***
			(0.0227)				(0.0259)
Private school			0.1831***				0.0971***
			(0.0232)				(0.0252)
Pred. GPA * Female				-0.0162			-0.0379*
				(0.0178)			(0.0195)
Par. time Swe. * Female					-0.0006		0.0000
					(0.0015)		(0.0015)
Trad. LFP * Female						-0.0066	-0.0057
						(0.0102)	(0.0109)
Observations	73448	73426	72973	73448	62256	73448	61820
R-squared	.715	.721	.716	.715	.716	.715	.722
Dependent var. (mean)	-.007	-.007	-.007	-.007	.022	-.007	.022
Dependent var. (sd)	.996	.996	.996	.996	.985	.996	.985
Number of clusters	28201	28195	28047	28201	23880	28201	23738
Gender Gap	.313	.311	.312	.313	.309	.313	.311
Family FE	✓	✓	✓	✓	✓	✓	✓
Grad. year FE	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓
Age * Female	✓	✓	✓	✓	✓	✓	✓
Birth variables	✓	✓	✓	✓	✓	✓	✓
Birth var. * Fem	✓	✓	✓	✓	✓	✓	✓
Individualism * Fem.	✓	✓	✓	✓	✓	✓	✓
Indulgence * Fem.	✓	✓	✓	✓	✓	✓	✓
LogGDPpc2000 * Fem.	✓	✓	✓	✓	✓	✓	✓
Neighborhood FE	✓	✓	✓	✓	✓	✓	✓
Neighb. FE * Fem.	✓	✓	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (1) on a sample of second-generation immigrant students with opposite-sex siblings. The dependent variable is normalized to be mean 0 and standard deviation 1 relative to the universe of all second-generation immigrant students. Residual school quality measures the average peer achievement by school and graduation year, after netting out variation across schools that is explained by children's gender, age, and birth country as well as mothers' and fathers' education, earnings, birth country and immigration age. Private school is a binary variable which indicates whether the student attends a private school in the year of graduation. Predicted GPA is obtained by regressing GPA on parents' education and earnings, age, a female indicator and graduation year dummies. Parental time in Sweden captures the host country experience prior to the birth of the oldest sibling. Traditional LFP takes 1 if only the father is working, 0 if both/none work, and -1 if only the mother is working. All regressions include the female dummy (non-reported). Age is captured as the difference between the year of graduation and the year of birth. Birth variables include dummies for the month of birth and birth order. Standard errors are adjusted for clustering at the family level. ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A10: Gender Math Gap and Cultural Dimensions, Sensitivity Checks for PISA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
st_ GPA							
MAS * Female	-0.2921**	-0.3084**	-0.2231*	-0.2773*	-0.2231*		-0.2644**
	(0.1267)	(0.1355)	(0.1160)	(0.1411)	(0.1197)		(0.1261)
PDI *Female	-0.1717*	-0.1946*	-0.1901*	-0.2037	-0.2323		-0.1896**
	(0.0893)	(0.0978)	(0.1093)	(0.1311)	(0.1402)		(0.0892)
UAI * Female	-0.0819	-0.0634	-0.0769	-0.0632	-0.0517		-0.0668
	(0.1033)	(0.1138)	(0.1038)	(0.1240)	(0.1350)		(0.1048)
LTO * Female	-0.0046	-0.0609	0.0040	-0.0046	-0.0532		-0.0350
	(0.0934)	(0.1042)	(0.0953)	(0.0938)	(0.1051)		(0.0921)
MAS (moth.) *Female						-0.2315*	
						(0.1329)	
PDI (moth.) * Female						-0.1705*	
						(0.1004)	
UAI (moth.) * Female						-0.1109	
						(0.1160)	
LTO (moth.) *Female						-0.0281	
						(0.1012)	
Observations	35347	35347	35347	35347	35347	33750	35754
R-squared	.399	.418	.399	.399	.418	.408	.398
Dependent var. (mean)	.001	.001	.001	.001	.001	-.005	.001
Dependent var. (sd)	.965	.965	.965	.965	.965	.965	.965
Number of Clusters	73	73	73	73	73	40/50	72
Gender Gap	-.011	-.008	-.011	-.011	-.008	-.01	-.012
Year FE	✓	✓	✓	✓	✓	✓	✓
Grade FE	✓	✓	✓	✓	✓	✓	✓
Anc. Country FE	✓	✓	✓	✓	✓	✓	✓
Host Country FE	✓	✓	✓	✓	✓	✓	✓
Host Country FE * Fem.	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓
Age * Fem.	✓	✓	✓	✓	✓	✓	✓
Parental Variables		✓			✓		
Parental Variables * Fem.		✓			✓		
Individualism * Fem.			✓		✓		
Indulgence * Fem.			✓		✓		
LogGDPpc2000 * Fem.				✓			
no diff. betw. m/f & f/m							✓

Notes: The table reports estimates of equation (2) on a sample of second-generation immigrant students tested in PISA studies 2003, 2006, 2009, 2012, and 2015. The dependent variable is a student's PISA grade-point average, computed as the average normalized test score of mathematics, science, and reading. Each subject score is normalized to be mean 0 and standard deviation 1 in our estimation sample. All regressions include the female dummy (non-reported). Parental variables include parents' education. Column 6 assigns cultural dimensions accoding to the mother's country of ancestry. Standard errors are adjusted for clustering at parents' country-of-origin level (combining mother's and father's origin and distinguishing between the two in columns 1-6). Column 7 relaxes the distinguishment between these combinations (treating m/f like f/m). ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A11: Gender Math Gap and Cultural Dimensions, PISA Data

Dependent Variable:	*Standardized PISA Test Score in Mathematics*				
	(1)	(2)	(3)	(4)	(5)
MAS * Female	-0.1849**				-0.2910**
	(0.0918)				(0.1162)
PDI * Female		-0.0986			-0.1608*
		(0.0934)			(0.0916)
UAI * Female			0.0126		-0.0835
			(0.0811)		(0.0967)
LTO * Female				-0.0533	0.0248
				(0.0693)	(0.0891)
Observations	35512	35512	35512	35347	35347
R-squared	.399	.399	.399	.4	.4
Dependent var. (mean)	0	0	0	.001	.001
Dependent var. (sd)	1	1	1	1.001	1.001
Cultural var. (mean)	.563	.700	.554	.664	
Cultural var. (sd)	.137	.154	.292	.23	
Cultural var. * Fem. (beta)	-.025	-.015	.004	-.012	
Number of Clusters	74	74	74	73	73
Gender Gap	-.195	-.195	-.195	-.195	-.195
Year FE	✓	✓	✓	✓	✓
Grade FE	✓	✓	✓	✓	✓
Anc. Country FE	✓	✓	✓	✓	✓
Host Country FE	✓	✓	✓	✓	✓
Host Country FE * Fem.	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Fem.	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (2) on a sample of second-generation immigrant students tested in PISA studies 2003, 2006, 2009, 2012, and 2015. Each subject score is normalized to be mean 0 and standard deviation 1 in our estimation sample. All regressions include the female dummy (non-reported). Standard errors are adjusted for clustering at parents' country-of-origin level (combining mother's and father's origin and distinguishing between the two). ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A12: Gender Science Gap and Cultural Dimensions, PISA Data

Dependent Variable:	*Standardized PISA Test Score in Science*				
	(1)	(2)	(3)	(4)	(5)
MAS * Female	-0.1997**				-0.3058**
	(0.0929)				(0.1294)
PDI * Female		-0.0966			-0.1454
		(0.0852)			(0.0888)
UAI * Female			-0.0129		-0.1515
			(0.0763)		(0.1091)
LTO * Female				-0.0801	-0.0228
				(0.0618)	(0.0889)
Observations	35512	35512	35512	35347	35347
R-squared	.386	.386	.386	.388	.388
Dependent var. (mean)	0	0	0	.001	.001
Dependent var. (sd)	1	1	1	1	1
Cultural var. (mean)	.563	.700	.554	.664	
Cultural var. (sd)	.137	.154	.292	.23	
Cultural var. * Fem. (beta)	-.027	-.015	-.004	-.018	
Number of Clusters	74	74	74	73	73
Gender Gap	-.103	-.103	-.103	-.103	-.103
Year FE	✓	✓	✓	✓	✓
Grade FE	✓	✓	✓	✓	✓
Anc. Country FE	✓	✓	✓	✓	✓
Host Country FE	✓	✓	✓	✓	✓
Host Country FE * Fem.	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Fem.	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (2) on a sample of second-generation immigrant students tested in PISA studies 2003, 2006, 2009, 2012, and 2015. Each subject score is normalized to be mean 0 and standard deviation 1 in our estimation sample. All regressions include the female dummy (non-reported). Standard errors are adjusted for clustering at parents' country-of-origin level (combining mother's and father's origin and distinguishing between the two). ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.

Table A13: Gender Reading Gap and Cultural Dimensions, PISA Data

Dependent Variable:	*Standardized PISA Test Score in Reading*				
	(1)	(2)	(3)	(4)	(5)
MAS * Female	-0.2297**				-0.2796*
	(0.0927)				(0.1421)
PDI * Female		-0.1320			-0.2089**
		(0.1062)			(0.0984)
UAI * Female			0.0981		-0.0107
			(0.0803)		(0.1185)
LTO * Female				-0.1193	-0.0157
				(0.0772)	(0.1090)
Observations	35512	35512	35512	35347	35347
R-squared	.37	.37	.37	.371	.371
Dependent var. (mean)	0	0	0	0	0
Dependent var. (sd)	1	1	1	1	1
Cultural var. (mean)	.563	.700	.554	.664	
Cultural var. (sd)	.137	.154	.292	.23	
Cultural var. * Fem. (beta)	-.031	-.02	.029	-.027	
Number of Clusters	74	74	74	73	73
Gender Gap	.266	.266	.266	.265	.265
Year FE	✓	✓	✓	✓	✓
Grade FE	✓	✓	✓	✓	✓
Anc. Country FE	✓	✓	✓	✓	✓
Host Country FE	✓	✓	✓	✓	✓
Host Country FE * Fem.	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓
Age * Fem.	✓	✓	✓	✓	✓

Notes: The table reports estimates of equation (2) on a sample of second-generation immigrant students tested in PISA studies 2003, 2006, 2009, 2012, and 2015. Each subject score is normalized to be mean 0 and standard deviation 1 in our estimation sample. All regressions include the female dummy (non-reported). Standard errors are adjusted for clustering at parents' country-of-origin level (combining mother's and father's origin and distinguishing between the two). ***,**,* indicate significance at the 1%, 5%, and 10% level, respectively.