20.01.2020

Culture and school performance:
Evidence from second-generation immigrants in Norway*

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Abstract
The paper studies how the cultural orientation of immigrant parents affects the school performance of their children. We use detailed register data on native and immigrant parents, featuring students born in Norway with one or two immigrant parents. The cultural values of immigrant parents are measured by cohort- and education-level specific survey responses in the World Value Survey and the European Value Survey, which are merged with individual-level data.

The paper estimates effects on several indicators of school performance, controlling for detailed measures of the human capital of parents, school fixed-effects and relevant country-of-origin characteristics. We also analyze students' schooling progression and control for initial performance. Finally, we exploit differences in cultural exposure as consequence of immigrant students having a native and an immigrant parent vs. two immigrant parents from the same country of origin, which allows us to include country-of-origin fixed effects.

The results show that an independence-oriented parenting style yields better educational performance than parenting that values children's obedience. A lenient child-rearing practice reduces student effort and weakens educational outcomes, which accounts for the modest schooling performance of Scandinavian students.

JEL Codes: 121, 124, J24, Z1
Keywords: Culture; School performance; Epidemiological approach

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1. Introduction

International student assessment tests like PISA and TIMMS[1] display large cross-country disparities in students' school performance. Many Western countries, including Norway, attain modest positions in these country rankings. This is worrying; cognitive skills are essential for the life prospects of individuals as well as for the development of the economy as a whole (Hanushek and Woessmann 2008; 2012). Despite numerous policy initiatives to improve results, many Western countries have seen stagnant test scores since these programs were introduced more than two decades ago.[2] The current paper suggests that the educational outcomes are at least partly embedded in parents' cultural orientations[3], thereby accounting for the persistence of schooling results.

Parents can influence their children's choices in two ways: either by shaping children's preferences, or by imposing direct constraints on their choices. Echoing the classification of "parenting styles" in developmental psychology (Baumrind 1971), an authoritative parenting style implies that parents attempt to mold their children's preferences, with the aim of inducing choices that parents view as conducive to success in life. A permissive parenting style allows children to make free choices according to their natural inclinations, while authoritarian child rearing emphasizes obedience (Doepke and Zilibotti 2008; 2017). Both permissive and authoritative parenting seek to enhance children's independence, the first being more lenient and the latter more intensive and time-consuming. We propose that school performance benefits from authoritative parenting; that lax and loose "permissive" parenting leads to weaker results; and that the authoritarian style yields the worst outcomes.[4]

[1] The Programme for International Student Assessment (PISA) is an international study conducted by the Organization for Economic Co-operation and Development (OECD). It covers students' scholastic performance in mathematics, science, and reading. The Trends in International Mathematics and Science Study (TIMSS) is a similar test focusing on assessments of mathematics and science.

[2] For an overview of learning results in PISA and TIMSS in the Nordic countries, see Nordic Council of Ministers (2018). For the US case, see the outline in the *New York Times*, December 3, 2019: "'It Just Isn't Working': PISA Test Scores Cast Doubt on U.S. Education Efforts", see link: https://www.nytimes.com/2019/12/03/us/us-students-international-test-scores.html

[3] Culture is a broad concept and no "standard" definition is available. For example, Guiso et al. (2006:23) suggest the following definition: "Those customary beliefs and values that ethnic, religious and social groups transmit fairly unchanged from generation to generation". Fernandez (2011 uses the following formulation: "… the integrated pattern of human knowledge, belief, and behavior that depends upon the capacity for learning and transmitting knowledge to succeeding generations."

[4] Doepke and Zilibotti (2017) suggest these cultural differences are due to income disparities: "Permissiveness flourishes in the egalitarian context with modest gains from education, while the authoritative style thrives in the incentivized context."

The fact that cultural traits, school standards, and parental levels of human capital evolve together makes empirical testing challenging. Studies that combine survey data on parental attitudes with test-score data on children offer interesting correlations, but no causal effects (see, for example, Dornbusch et al. 1987). Research designs based on cross-national data are unlikely to yield reliable estimates of cultural effects due to omitted variable bias and reverse causality. In line with Fernandez and Fogli (2009), we employ a modified version of the epidemiological approach (cf. Fernandez 2011). The key idea is to estimate the effects on school performance of students who receive the same education, live in similar neighborhoods and have immigrant parents with different cultural origins.

The Norwegian case is particularly suitable for this approach since parents and their offspring meet a highly egalitarian society[5] and unitary schooling system. Schooling is fully financed by the government, and enrollments in private schools are marginal. We have access to individual-level register data from Statistics Norway covering the entire student population for the 2007–2015 period. These data yield a direct and precise identification of native and immigrant parents and their country of origin. Immigrants to Norway are a self-selected group from the country of origin.[6] We adjust for self-selection using individual-level data in the World Value Survey (WVS) and the European Value Survey. We identify the country-specific cultural values of sub-populations defined by cohort and education levels and we merge these cultural indicators with corresponding individual-level data on immigrant parents.

The data allows us to analyze student tests scores, exam results and learning progression in primary and upper-secondary school as well as choice of specializations at the secondary level. We present regression models separately for students with one and two immigrant parents, and include control for immigration reasons, parental education levels, labor-market participation, household income levels, school fixed-effects and country-of-origin characteristics.

The baseline epidemiological model assumes that people coming from different countries differ in cultural orientation only, conditional on the controls included in the regression models. This approach might produce biased estimates of causal effects as consequence of unmeasured country-of-origin

[5] The Nordic countries generally display low parent–children income correlations (Raaum et al., 2007). One of the mechanisms accounting for positive child-by-parent earnings gradients is the diffusion of cultural values across generations, potentially reducing income mobility across generations.

[6] For example, Docquier et al (2019) show that those who wish to migrate to these countries display lower levels of religiosity, and the younger have a more positive view of gender equality.

features affecting both parental values and school performance. One way of accounting for this is the value-added model, where we estimate cultural effects, controlling for students' initial test scores. Another strategy exploits that children with identical ancestry have been exposed to different doses of country-of-origin culture. Cultural effects are diluted for students who have receiving a larger infusion of Norwegian culture. We estimate models for students with two immigrant parents coming from the same country vs. students with one immigrant and one native parent, which allows us to include country-of-origin fixed effects.

Our central result is that cultural backgrounds valuing children's independence tend to yield better student performance. The three identification strategies show consistently that the authoritative – and *not* the authoritarian – child-rearing style yields better learning outcomes. Our analyses also indicate that these can be nullified by permissive parenting. This appears to be a key difference between the East Asian countries and the Scandinavian countries, including Norway.

The current paper relates to several literatures. One is studies of the impact of culture on economic outcomes. Important papers have addressed effects on interpersonal trust (see, for example, Knack and Keefer 1996; Falk et al. 2018), thriftiness and the probability of becoming an entrepreneur (Guiso et al. 2006), occupational choices (Zhan 2015), fertility, and women's work participation (Fernandez and Fogli 2009; Alesina and Giuliano 2015). Using the "epidemiological approach", these studies are also related to papers on immigration and the intergenerational transmission of values (Fransenso et al. 2019).

The results presented here shed light on empirical studies analyzing the effects of culture on economic growth. For example[7], Tabellini (2010) combines historical data on economic developments in 69 West European regions with a set of WVS indicators. Cultural traits – including the level of children's submission to parental authority – appear to affect economic development negatively, possibly through the functioning of political institutions. The current paper indicates that cultural effect might be transmitted through educational outcomes. Similarly, Gorodnichenko and Roland (2017) argue that individualistic cultures generate affluence since they reward individual accomplishments. Individualism is a cultural trait that emphasizes personal freedom and achievement. In contrast, collectivism encourages conformity to a group and loyalty to, and respect for, one's superiors. As in

[7] Several studies analyze the impact of cultural values on rates of economic growth (Granato et al. 1996; Barro and McCleary 2003; Becker and Woessmann 2009; Tabellini 2010; Algan and Cahuc 2010; Gorodnichenko and Roland 2017).

Tabellini (2010), cognitive skills might be a key mechanism that links the effects of cultural values to economic development.

Finally, a handful of papers have addressed the impact of cultural background on students' educational performance.[8] Importantly, Figlio et al. (2019) employ data on Florida's immigrant populations and analyze how country-of-origin variations in long-term orientation affect students' school performance. Immigrant students with parents from countries with a strong long-term orientation tend to do better at school, both in terms of early test scores and as measured by subsequent improvements in educational performance. We replicate Figlio et al. (2019) on Norwegian register data, include a novel strategy for causal identification, and add to the existing literature by analyzing different cultural dimensions.

2. The institutional setting

This section provides a brief description of the Norwegian school system, the national testing regime and key aspects of immigration and immigration policies.

The Norwegian school system

The public sector is organized as a two-tier system comprising a central government, 19 county governments and 429 municipalities (2011). Education is a shared responsibility of central government, counties and municipalities. Primary and secondary education comprise a unified school system. Schools operate a standardized curriculum, defined by central government. Compulsory

[88] Three papers use more limited datasets from the PISA program. Levels et al. (2008) analyze data on the mathematics performance of 7,400 immigrant students based on the 2003 PISA study. The analysis includes data on immigrants to 13 host countries (mostly in Western Europe) from 35 different countries of origin. This design allows the authors to analyze both country-of-origin and destination effects. Immigrants doing well in the country of origin tend to have high test scores in the new country as well. The analysis is limited by the small sample of immigrant students, particularly from second-generation immigrant students. Jerrim (2015) focuses on second-generation children of East Asian immigrants to Australia, who appear to do extremely well as measured by international test scores. These "immigrants" are born and raised in Australia, and educated by the Australian school system. The data includes about 14,000 students, only 276 of which are second-generation immigrants of East Asian origin. Interestingly, these students obtain mathematics scores that are substantially higher than their native peers (about 100 PISA test points). The study covers a small sample of immigrants, and it addresses the influence of cultural background only indirectly. Nollenberger et al. (2016) exploit similar data from the four waves of the P1SA program, yielding about 12,000 second-generation immigrant students. They address the impact of gender equality on the gender gap in mathematics test scores. They estimate a regression model where student gender is interacted with an indicator of the gender gap in the country of extraction. This specification allows the authors to include country-of-origin fixed effects. Attitudes to the role of women in society appear to have a major impact on gender differences in math test scores.

schooling starts at the age of six and lasts for ten years.

Nearly all schools are publicly funded, owned and managed by the municipal authorities. About 97% of students attend the publicly owned primary schools. Primary and lower secondary education are operated by the municipalities, but are subject to extensive national regulation, including a standardized core curriculum defining common learning content for all students, and the same number of teaching hours in each subject. All students are entitled to attend the nearest primary school, and they generally attend the primary and upper secondary schools closest to home. Students from different cultural backgrounds attend the same schools and belong to the same classes. Students have their final compulsory school exam in the tenth grade. A third of the students are randomly selected to take a final math exam, a third take a final Norwegian language exam, and the remaining third take a final English exam.

After the end of compulsory education, students can choose to leave school or to enroll in upper-secondary education operated by the county government. The counties determine the capacity of the individual schools and study tracks according to local needs and student demand. Some counties use catchment areas for the individual study tracks; other counties have free school choice within certain regions, while some do not have any restrictions on school choice.

About 95 percent of students enroll in upper-secondary education the year they finish compulsory education, and a little more than half of the students take academic tracks. Students must rank three different study tracks when applying for enrollment. All students have a legal right to be enrolled in one of these three tracks, but which track and school they enroll into depends on achievement in compulsory education measured by their teacher grades and the results on the exit examination. The students can choose between 15 different study tracks. Three of the tracks qualify for higher education (academic tracks) and 12 tracks result in a certificate for work in a wide range of occupations (vocational tracks). The academic tracks comprise three years, while the vocational tracks normally consist of two years in school plus two years as an apprentice.

The school-testing scheme

National school testing was established in 2004 as one element of a national quality assessment system. Because of strong resistance from teacher unions and some political parties, no students were tested in 2005 and 2006, but tests were reintroduced in 2007. The national tests are standardized, and they test all pupils in mathematics, reading in English, and reading in Norwegian at the beginning of

grades 5 and 8, and in mathematics and reading in Norwegian at the start of the ninth grade.

The English and math (numeracy) tests are performed on a digital platform, while the reading in Norwegian language is performed on paper. The individual test results are confidential; only the students, their parents, teachers and school management have access to the students' test results. The national tests are not used to grade students but to customize teaching to their individual needs and improve standards of education. The Directorate for Education and Training publishes average test scores at the municipal and school level (for schools with a sufficient number of students).

Immigration policies

The rate of immigration to Norway has been high over the last generation.[9] The number of immigrants residing in Norway in 1970 was about 60,000, most of whom came from other Western European and Scandinavian countries. The current immigrant population is about 880,000 (2017), or nearly 17 percent of the total population.[10] Job seekers, mostly from the European Union /European Economic Area (EU/EEA), constitute one group of immigrants. Refugees and their relatives are another. They have been granted permanent residence either as asylum seekers or as family members through the family reunion program.

The legal framework regulating the treatment of asylum seekers and family reunions is decided at the national level. The UDI (Norwegian Directorate of Immigration) processes applications for protection, family reunion and residence. When a refugee is granted permanent residence, the Directorate of Integration and Diversity (IMDi) is in charge of finding the refugees a place to live. It asks the municipalities if they are willing to accept refugees. The government has devised a matching grant scheme as an incentive for municipalities to accept the resettlement of refugees. After a few years in the first municipality, significant numbers move elsewhere, often from rural communities to larger population centers, particularly in the greater Oslo area.

3. The cultural orientation of immigrant parents

[9] According to Statistics Norway, the immigrant population is defined as "persons with two foreign-born parents, both of whom have immigrated to Norway and those born in Norway of two foreign-born parents." Data on immigrant populations at the municipal and national levels are taken from the national population register.

[10] This refers to the Statistics Norway definition of the immigrant population.

We analyze effects of two dimensions of parenting cultures (Baumrind 1971; Doepke and Zilibotti 2017). The first captures cultures that emphasize children's independence versus those that value obedience; the second distinguishes between parenting types that attach importance to children's imagination and tolerance versus hard work.

We use data from the World Value Survey and the European Value Survey to measure these dimensions. The World Value Survey data derive from the integrated, longitudinal file covering six waves. We use data from the three last waves in the World Value Survey (from 2000 onwards), comprising 91 countries and more than 250,000 respondents.[11] The European Value Survey gives us data from 16 additional countries and about 22,000 respondents. We use data from a survey instrument that taps child-rearing values:

> *Here is a list of qualities that children can be encouraged to learn at home.*
> *Which, if any, do you consider to be especially important? Please choose up to five!*

The respondents could choose from eleven characteristics: independence, hard work, feeling of responsibility, imagination, tolerance and respect for other people, thrift (saving money and things), determination (perseverance), religious faith, unselfishness, obedience, and self-expression.

A key cultural cleavage is between parents who want children to develop independence and those who want children to be obedient.[12] The latter may be more prevalent in traditional societies with a stable economy, and parents expect children to follow their example. Knowing what is required to prevail in these societies, parents impose particular types of behavior on their children. In contrast, modern market economies are dynamic and require flexibility and adaptability, which convince parents that children should make their own life choices. Parents induce children to take charge of their own lives and to develop competences required in the future labor market.

The authoritative parenting style implies an active and time-consuming interaction between parent and

[11] The World Values Survey (WVS) is a large set of national surveys that have been developed to understand how cultural change affects political and economic outcomes. A baseline questionnaire has been translated into the relevant languages, and administered to the national samples. Source: World Values Survey 1981–2016 Longitudinal Aggregate. World Values Survey Association (www.worldvaluessurvey.org). (For information on the European Value Survey: https://europeanvaluesstudy.eu/). We document the number of second-generation immigrants from the various countries in Appendix Table B1.

[12] The measurement of value dimensions used here is similar to those applied by Doepke and Zilibotti (2017: 1336).

child, and aims at developing at least two of the characteristics included in the survey: responsibility and determination. We display correlations using country-level as well as individual-level data in the Appendix (Table B3a).[13] The correlations between Independence, Responsibility and Determination are positive at both levels, and the three variables correlate negatively with Obedience. The value dimension "authoritative parenting" is therefore defined as follows:

Authoritativeness = (Independence + Responsibility + Determination) * 0.33 – Obedience

Raising children to become independent could mean more autonomy, allowing children to develop creativity and open-mindedness. Both individual-level and country-level data display a positive correlation between Imagination and Tolerance, and both these indicators are negatively related to the indicator for Hard Work (see Appendix Table B3a). This suggests the following measure of "permissive parenting":[14]

Permissiveness = (Imagination + Tolerance) * 0.5 – Hard Work

In Figure 1, we display country-level values for the parenting values. A number of countries with a relatively low GDP per capita have low scores on both permissiveness and authoritativeness, while countries in Eastern Europe and East Asia display high scores on authoritativeness values and low scores on permissiveness. Like Doepke and Zilibotti (2017, Figure 1), we observe that the Scandinavian countries – Norway, Denmark, Sweden and Finland – have the higher scores on the permissiveness values.

[13] The Hofstede-indicator is defined by survey questions included in the World Value Survey and European Value Survey. Long-term orientation is defined by "Thrift as a desirable trait for children", "National pride", and "Importance of service to others" (Hofstede 2010:253; c.f. https://geerthofstede.com/research-and-vsm/dimension-data-matrix/)

[14] Note that the two indicators vary between -1 and +1.

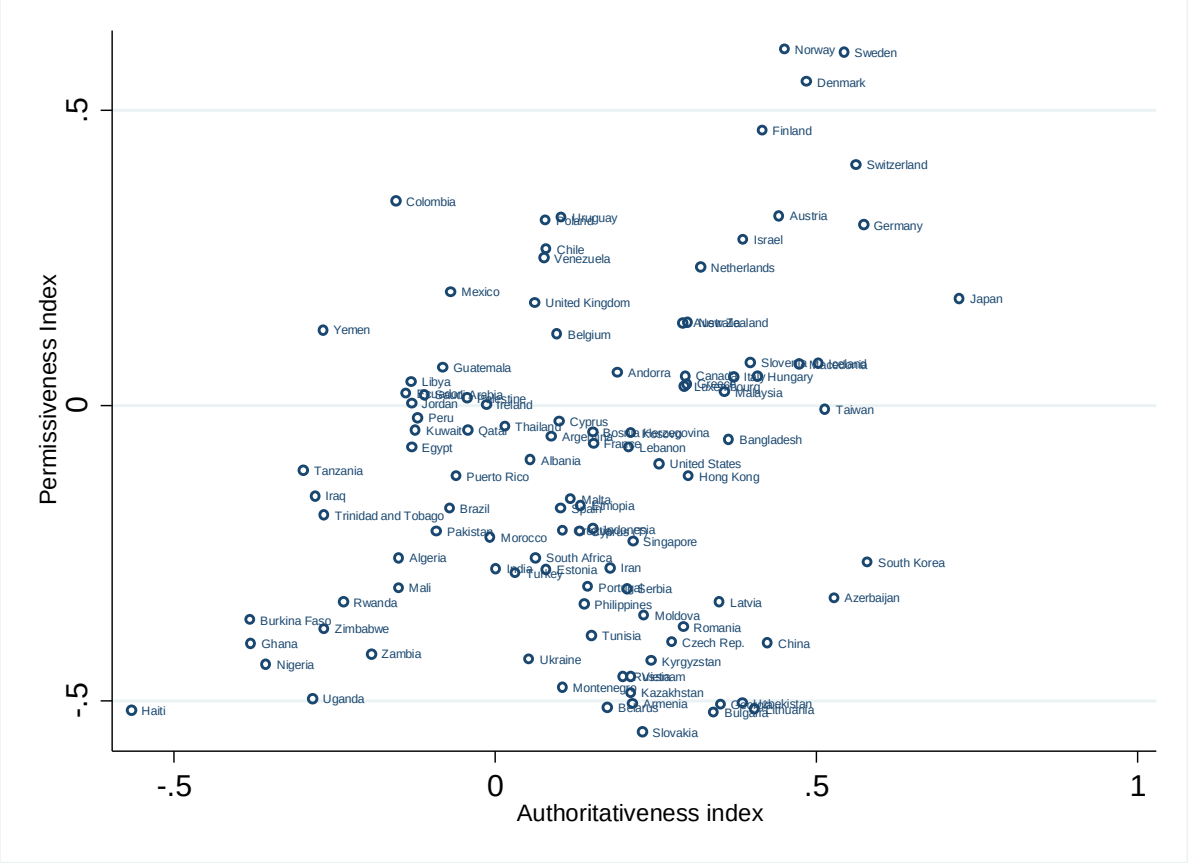

Figure 1. Cross-county variations in parental cultures

The diagram shows country-level averages for the Authoritativeness and the Permissiveness indexes. The data derive from the integrated, longitudinal file covering six waves. We use data from the last three waves in the World Value Survey (from 2000 onwards). The European Value Survey gives us data from 16 additional countries.

The Appendix (Figure A1) displays the developments in the cultural indexes for subsets countries where sufficient time series are available. Most countries show developments away from authoritative parenting focusing on obedience towards a style emphasizing independence, responsibility and determination. These trends can be seen in the context of global shifts towards support for liberal values (Inglehart 2008; Welzel 2013). The permissiveness dimension indicates highly contrasting developments. Some countries – including the USA, Spain, Australia and South Africa – experience a decline in support for permissive parenting. Two other countries – Norway and Sweden – display an opposite trend, where a larger share of the population support a permissive parenting style.

4. School performance and parental characteristics

We analyze individual-level data on mathematics performance. Though second-generation immigrant students are born in Norway, some may find it harder to read and write in Norwegian. Language barriers will depend on the ancestral language family. Mathematics language is arguably equally "strange" for all students, offering a (more) level playing field.[15] We therefore analyze test scores in mathematics for fifth and eighth grade pupils for the years 2007 to 2015. The mathematics test results are particularly useful inasmuch as the percentage of students exempted from the test is lowest in mathematics and English (about 1.9 percent in 2011) and higher in the reading of Norwegian (about 2.7 percent in 2011). Results on these tests have no consequence for the student's course grade. Whether tests are high- or low stakes are likely to influence the students' efforts, possibly depending on their cultural background. Gneezy et al. (2017) suggest that students living in different countries/cultures have different levels of intrinsic motivation to do well on tests. In a field experiment, they found that US students did much better when test performances were linked to economic rewards, while students in Shanghai had a much weaker response to incentives. It is therefore interesting to see that cultural estimates for test scores are comparable to exam results. We therefore analyze exam results in math at the 10th grade level, whether students entered the academic track at the secondary school, and finally, whether they opted for the most advanced math curriculum at this level.

The upper panel in Table 1 contains descriptive statistics for the student-level variables. These statistics cover about 100,000 observations where students have one immigrant parent (and one native parent) originating from 101 countries, and about 59,000 observations where students have two immigrant parents originating from 97 countries. The students with one immigrant parent attend 2,961 schools, while those with two immigrant parents attend 2,086 schools. The data provides information on tests conducted when students were in fifth and eighth grade (in primary and lower secondary schools), exam results from the 10th grade, and whether they were enrolled in an academic track at the higher secondary level and the extent to which they chose theoretical math at this level.[16] The same students are observed at these levels.

[15] Böhlmark (2008) suggests that the age of immigrant students' arrival (to Sweden) influences schooling performance. He finds that age-at-immigration affects performance negatively, but has lesser bearing on mathematics results than on other topics. This indicates that language-specific skills are less relevant in mathematics.

[16] The dataset has few missing observations. Income from work of parents about whom we lack education level information is particularly low, indicating low levels of education from their country of origin.

As Table 1 illustrates, families with one immigrant parent are better educated, earn more and have a higher probability of being employed than families with two immigrant parents. For example, we observe large differences between families with one and two immigrant parents with respect to the share with a university degree.

Table 1. Summary statistics

Individual-level variables

	One immigrant parent			Two immigrant parents		
	Mean	Sd.	N	Mean	Sd.	N
Math performance in 8th grade	0.07	1.01	45,337	-0.25	0.99	26,177
Math performance in 5th grade	0.04	1.01	50,328	-0.31	1.02	30,380
Math performance exam 10th grade	0.06	1.02	14,002	-0.13	1.00	7,952
Academic track (=1)	0.71	0.45	14,925	0.74	0.44	8,301
Theoretical math (=1)	0.35	0.48	14,925	0.38	0.49	8,301
Student gender (Boy = 0,Girl = 1)	0.49	0.50	99,169	0.49	0.50	59,106
Father's income	47,21	54.49	52,192	32.76	32.64	59,106
Mother's income	32,70	27.11	50,326	20.29	21.89	59,106
Mother's work experience	28.11	10.79	50,100	21.81	14.71	56,043
Father's work experience	31,19	11.21	50,071	27.92	15.31	55,034
Mother employed (=1)	0.89	0.31	50,326	0.70	0.46	59,106
Father employed (=1)	0.92	0.28	52,192	0.79	0.41	59,106
Parents married (=1)	0.56	0.50	99,169	0.71	0.45	59,106
Parents divorced. Child lives with mother (=1)	0.21	0.40	99,169	0.17	0.37	59,106
Parents divorced. Child lives with father (=1)	0.05	0.22	99,169	0.02	0.14	59,106
Cohabitants with common child (=1)	0.13	0.34	99,169	0.05	0.22	59,106
Refugee status (=1)	0.03	0.17	99,169	0.36	0.48	59,106
Number of siblings	1.88	1.29	99,169	2.44	1.60	59,106

Note: The descriptive statistics refer to all second-generation immigrant students taking the annual national test in grades 5 and 8 for the years 2007–2015 For these students we also provide information on their choice of track in high school and their choice of math course in high school. The table distinguishes between second-generation immigrants with one or two immigrant parents respectively. The students are all born in Norway, with at least one parent born in a foreign country. All test scores are standardized test scores (mean 0 and standard deviation 1). Academic track and theoretical math are dummy variables indicating whether students choose academic track and theoretical math respectively. Mothers' and fathers' experience is potential work experience measured as parental age less six years less number of years of schooling. Income is measured at the pre-tax yearly wage level (divided by 10; NOK, current prices). Employment is a dummy variable with value 1 if the parents have positive working income. Refugee status is a dummy variable with value 1 if at least one of the student's parents came to Norway as a refugee. There are dummy variables indicating whether the parents are married, divorced (student lives with mother or father) or cohabitants.

Table 1. Summary statistics continued

Education level

	One immigrant parent			Two immigrant parents		
Father's education level:	Mean	Sd.	N	Mean	Sd.	N
Primary school (6–7 years)	0.01	0.10	52,192	0.04	0.20	59,106
Lower secondary school (9–10 years)	0.16	0.36	52,192	0.29	0.45	59,106
Incomplete secondary education (11–12 years)	0.06	0.24	52,192	0.06	0.25	59,106
Complete secondary education (13–14 years)	0.22	0.41	52,192	0.23	0.42	59,106
Complete secondary education (14–15 years)	0.02	0.14	52,192	0.02	0.14	59,106
University lower degree	0.24	0.43	52,192	0.17	0.37	59,106
University higher degree	0.13	0.34	52,192	0.06	0.25	59,106
PhD degree	0.03	0.16	52,192	0.02	0.13	59,106
Missing observations	0.13	0.33	52,192	0.10	0.31	59,106
Mother's education level:	Mean	Sd.	N	Mean	Sd.	N
Primary school (6–7 years)	0.02	0.14	50,326	0.05	0.22	59,106
Lower secondary school (9–10 years)	0.15	0.36	50,326	0.34	0.47	59,106
Incomplete secondary education (11–12 years)	0.05	0.21	50,326	0.05	0.22	59,106
Complete secondary education (13–14 years)	0.21	0.40	50,326	0.22	0.41	59,106
Complete secondary education (14–15 years)	0.02	0.13	50,326	0.01	0.10	59,106
University lower degree	0.35	0.48	50,326	0.16	0.37	59,106
University higher degree	0.13	0.34	50,326	0.04	0.20	59,106
PhD degree	0.02	0.15	50,326	0.01	0.09	59,106
Missing observations	0.06	0.24	50,326	0.11	0.32	59,106

Note: Education by the NUS2000 standard (Norway), being compatible with the OECD-ISCED scale. The table provides information on the share of students having parents with different levels of education based on the ISCED scale. Missing observation is the share of students with parents missing information on education. In the analyses, these are given value 1.

5. Research strategy

The "epidemiological" approach allows us – in principle – to isolate the influence of parental culture from other influences. Immigrant parents from all parts of the world face similar economic, institutional, and educational conditions when they settle in Norway. The Norwegian setting is particularly useful due to being a highly homogenous society with modest income disparities, and possessing an unusually standardized schooling system. First-generation immigrant students have lived some part of their early lives in the country of origin, and this is likely to have influenced these students directly, i.e. independently of parental influence. These students could also have been subjected to non-cultural influences, potentially influencing school outcomes through their health status and cognitive abilities. These factors might act as omitted variables in our analyses. We assume that the cultural effects are due to parental immigrant influences, and therefore analyze the school performance of students born in Norway (second-generation immigrant students).

We estimate effects of parental culture using a dataset where country-of-origin characteristics are merged with individual-level observations on immigrant parents. Cultural orientations are measured by aggregate statistics derived from the World Value Survey and the European Value Survey. However, immigrants from similar countries have heterogeneous value orientations, and display dissimilar attitudes to child rearing. Immigrants are also a selected sample of the country-of-origin populations, which form the basis of the survey samples. If we calculate the value dimension as country-level averages on the survey data, this might produce biased value indicators. Firstly, we observe parents in Norway with children aged 11, 14 and 16. Nearly all immigrant parents are younger than 50, and we base our cultural indicators on survey data for respondents aged 50 or less. Secondly, we exploit country-level surveys conducted starting in 2000. Cultural values have changed considerably over recent decades (see Appendix, Figure A1), and we therefore classify respondents by birth year 1970. Education has considerable bearing on cultural values (see Appendix, Table B4 and B5), and we categorize respondents into three levels of education (Primary school: ISCED codes 1–2; Secondary education: ISCED codes 3–5; University degree: ISCED codes 6–8). We calculate average scores for the Authoritativeness, Permissiveness and Long-term Orientation value dimensions defined by the country-specific surveys and the six-fold categorization defined by birth year 1970 and education levels. We use information on country of origin, year of birth and education level for immigrant parents to Norway, and merge the individual-level data with the corresponding statistics derived from the survey data.

The baseline model

Y_{ikc} is the (second-generation immigrant) students' test score in mathematics, i denotes student, k represents the school identification, and c is the country-of-origin. School performance has been measured by the test scores in mathematics in the 5th and 8th grade, as exam results in math at the 10th grade, whether students attend the academic track (=1) or the vocational track (=0) in upper secondary school, and given that they chose the academic track, whether they chose advanced math (=1) or ordinary math.

$$Y_{ikc} = \beta_1 Authoritativeness_c + \beta_2 Permissiveness_c + \beta_3 LTO_c + X_{ikc}\vartheta + \psi_t + \theta_k + \epsilon_{ikc}$$

Following Figlio et al. (2019), we add the Hofstede (2010) indicator of Long-term Orientation (LTO: measured as in Hofstede 2010, c.f. Figlio 2019) to the analysis. This enables us to replicate the results for Florida in the Norwegian context. Our key hypotheses are that $\beta_1 > 0$, and that $\beta_2 < 0$.

We estimate the regression models separately for students with one versus two immigrant parents (both having the same country of ancestry). Notation indicating whether the student has one or two immigrant parents has been suppressed in the regression formalization. The hypotheses are that the cultural indicators have larger effects for students with two immigrant parents.[17]

The model comprises school fixed effects (θ_k), which alleviate concerns related to human capital embedded in the neighborhood. This could be due to the ethnic network of the neighborhood or levels of human capital in the native population (Borjas 1995). A further concern is peer group effects, i.e. that characteristics of immigrant students affect the performance of the natives. For example, a large share of high-performing immigrants could improve the performance of the Norwegian students, and vice versa. Such interaction effects would cause a downward bias on estimates (Hunt 2016).

Ambitious parents may opt out of municipalities or school catchment areas with low-quality schools and settle in areas where published tests scores are higher (Black 1999; Fiva and Kirkebøen 2011). Teacher quality and levels of human capital might correlate with students' cultural background and school performance. Yet, parents' residential choices – and therefore their choice of school quality – can be an outcome influenced by their cultural orientation, which implies that it should not be

[17] The analyses include test scores for both fifth and eighth grade and the model has a corresponding dummy control.

understood as a confounding factor. Though for school fixed effects it might attenuate regression estimates, we stick to this conservative approach.

A key challenge is that parents coming from different cultures differ with respect to relevant human capital indicators. We employ extensive controls to account for such influences, the most important being mothers' and fathers' education levels (cf. Table 1). The register data allows us to control for parents' education level by the eight-point scale defined by the ISCE (International Standard Classification of Education). Missing values on (parental) education classification has been included as a separate category. "Missing" is mostly a consequence for immigrants who have not finished formal schooling.

We also include controls for parents' success in the Norwegian labor market to account for other pre-determined parental skills, which might also influence children's school performance. Our data allows us to identify reasons for settling in Norway, and we differentiate between refugees and work immigrants. Parents in the latter group may be better qualified. The regression models include standard controls that are entered in all models, i.e. student gender, number of siblings, and parity.

Controlling for country-of-origin characteristics

Though we believe these individual-level characteristics go a long way toward accounting for parental human resources, we present an additional analysis with country-of-origin controls. In the Appendix, we present regressions where GDP per capita (measured in PPP), share of children with low birth weight (which is relevant for subsequent cognitive developments; see Black et al. 2007) and an indirect measure of the schooling quality of the country of origin. The latter is due to Schoellman (2008: 390), who analyzes data on foreign-educated immigrants to the US and Canada and estimates an augmented Mincer regression that allows the effects of years of schooling to vary by country of origin. These estimates of returns to schooling suggest that countries produce very different levels of human capital per year of schooling. These estimates can be interpreted as measures of school quality in parents' country of origin. We define quality-adjusted years of schooling by the product of reported average years of schooling for the student's parents (estimated based on the ISCE classification) and the country-level Schoellman estimates.

The value-added model

The baseline identification strategy is strong with respect to reverse causality; students' educational performance cannot influence the prevailing cultural values in their parents' country of origin. Omitted

variable bias is more questionable: the standard epidemiological model assumes that relevant non-cultural parental characteristics (particularly indicators of parental human capital) can be included as explicit controls. For example, the linguistic distance between immigrants' mother tongue and Norwegian might affect parents' ability to fit into the new society and raise their children. Another example is skin color, which could also affect results if cultural values correlate with complexion, and immigrants are received differently depending on their skin color. Skin color may affect teacher expectations of student performance.

Since our dataset allows us to observe students at several points in time, we can estimate models with student test scores controlling for performance at a previous stage. This approach improves our identification strategy because initial tests scores might correlate positively with (unmeasured) omitted parental characteristics.[18] Importantly, parents might have a larger bearing on students' cognitive skills at an early stage of the educational program, and possibly lesser influence on developments thereafter. At the same time, we would also expect students' "cultural programming" to exert a persistent influence. Those who come from a learning-oriented culture should have better progression from low to higher levels of schooling.[19]

We include the same set of controls as in the baseline specification. We enter initial test scores (Y_{ikc}^{t-1}) as a control variable, and define the response variable as the test-score difference over the two points of time ($Y_{ikc}^{t} - Y_{ikc}^{t-1}$). We analyze progression from the 5th grade to 8th grade, and from the 8th grade to 10th grade.

$$Y_{ikc}^{t} - Y_{ikc}^{t-1} = \beta_1 Authoritativeness_c + \beta_2 Permissiveness_c + \beta_3 LTO_c + \beta_4 Y_{ikc}^{t-1} + X_{ikc}\vartheta + \psi_t + \theta_k + \epsilon_{ikc}$$

Within country variations in cultural exposure

We also exploit the fact that students with parents originating from the same country receive varying exposure to its culture. We exploit that there has been a marked increase in marriage between

[18] Similar to Figlio et al. (2019: 278), we observe that initial math test scores are negatively correlated with test score improvements.

[19] For example, Figlio et al. (2019) suggest that immigrants coming from different countries may display different patterns of assimilation, potentially correlating with school performance. Including a test score outcome at an early stage as a control variable would lessen this concern. We believe that our results for students with only one immigrant parent are less susceptible to such assimilation effects. Students with a native parent are likely to have access to native social networks and speak Norwegian fluently.

Norwegians and people originating from other countries. This is due to natives who find a spouse from another country, and to a lesser extent due to immigrants who marry from other countries than the country of ancestry. Therefore, many students have parents where one is an immigrant and the other is native.

Mixed native–immigrant couples are likely to display different cultural orientations than couples from the same country of origin. Positive assortative mating based on cultural orientation would imply that the immigrant parent adheres to "Norwegian values", and conversely, the native parent might be more inclined to acknowledge the immigrant spouse's cultural orientation. The positive selection effects are distinctively *cultural* influences, which might induce a larger cultural "distance" relative to couples from the same culture. Pointing in the same direction is that intercultural marriage is a signpost of assimilation. Immigrants who find a spouse in the majority population are likely to become better integrated into the community, which is likely to reduce the cultural impulse from the immigrant's country. Our hypothesis is therefore that the cultural impulse is lower for students with one immigrant and one native parent – relative to students with two immigrant parents.

This identification strategy allows us to estimate models with country-of-origin fixed effects, and we can cancel out omitted country-level characteristics that are correlated with school performance and cultural background. We assume that spouse selection is uncorrelated with parental human capital, conditional on controls. From Table 1, we know that one-immigrant parents have higher employment rates than parents where both are immigrants (from the same country of origin). One-immigrant parents are better educated and have higher levels of wage income; particularly the mothers.

Following Besley et al. (2017), we test whether parents comprising one vs. two immigrants have dissimilar levels of human capital.[20] We employ a Mincer model in Appendix Table B8, and estimate effects on wage income, employment and number of siblings. Conditional on the controls in this model, our Appendix Table B8 shows that native–immigrant couples have a labor market performance – as measured by men's and women's wage income and work participation – on a par with couples where both have the same country of origin.

Let Q_{ikc} be a student-level indicator variable equal 1 if both parents are immigrants from the same

[20] Besley et al. (2017) analyze micro-data from Sweden, and demonstrate that the residuals from a Mincer regression ("their earnings score") correlates positively with cognitive ability (measured by assessments from military drafts).

country, and 0 if one parent is an immigrant and the other is a native Norwegian. This allows us to estimate the following model, defining year fixed effects (τ_t), school fixed effects (σ_k) and country-of-origin fixed effects (π_c):

$$Y_{ikc} = \omega_1 Authoritativeness_c Q_{ikc} + \omega_2 Permissiveness Q_{ikc} + \omega_3 LTO_c Q_{ikc} + \omega_3 Q_{ikc} + X_{ikc}\mu + \tau_t + \sigma_k + \pi_c + \varepsilon_{ikc}$$

In line with the above model specifications, the hypotheses are that $\omega_1 > 0$ and that $\omega_2 < 0$.

6. School performance by country of origin

We start out displaying country-of-origin differences in schooling performance. We employ a regression model using student test scores as a response variable and estimate effects of parental country of origin using native students as a reference category. We include control for municipality- and year fixed effects as well as a set of relevant covariates. The test scores are standardized with a mean of 0 and a standard deviation of 1, calculated separately for each year. The model has been estimated separately for students with one and two immigrant parents. Figure 2 displays the country-of-origin fixed effects.[21]

[21] The arrival of immigrant students to a school or a class could affect the school performance of non-immigrants. In our context, a 'positive' cultural shock as consequence of immigration from a particular country might improve the schooling results of natives, while a 'negative' shock could lower performance. A limited number of studies indicate that these spillovers are small (for review, see Card 2013).

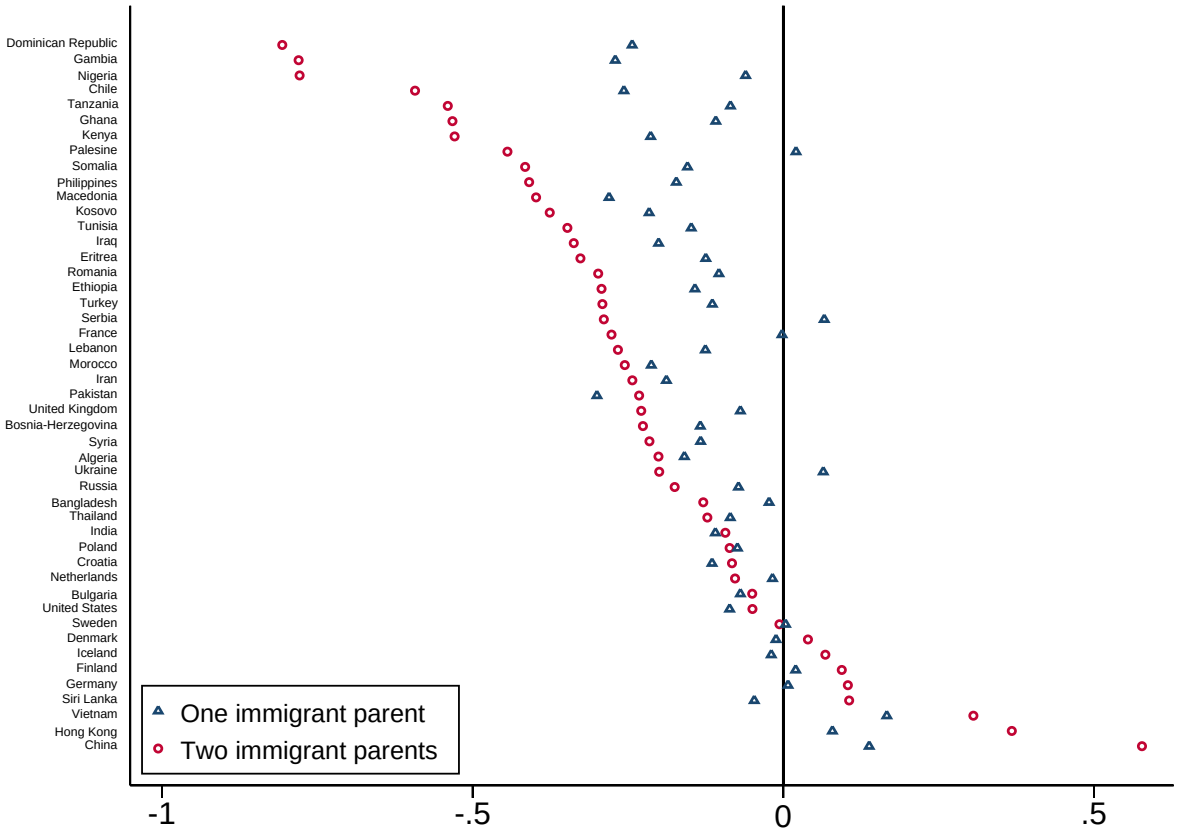

Figure 2. Country-level school performance

Note: The plot displays country-of-origin school performance, measured by math test scores in the 5th and 8th grades. The estimates derive from two separate regressions, one for second-generation immigrant students with two immigrant parents and the other for second-generation immigrant students with one immigrant and one native parent. Both models employ native (Norwegian) students as a reference group, indicated by the vertical line. The models include controls for mothers' and fathers' education levels, wage income, reason for immigration (refugee/work-related), student gender, number of siblings and parity. The graph includes country-of-origins with at least 50 observations in the two categories (students with one- and two immigrant parents; cf. Table A1).

The results of native students are comparable to those with parents from Sweden, Denmark, Iceland, Finland, the Netherlands and Germany. Students from China, Hong Kong and Vietnam do exceptionally well. Students with parents from the former South America, Africa, Central Asia and the Middle East tend to do less well in the math tests.

Sri Lanka is located close to the equator, where indigenous populations have dark skin. The test scores of students with parents from these countries differ significantly. Most parents from Vietnam came as refugees, while parents from Germany and the United Kingdom came to find work. Both groups have

comparable test scores. Teachers' preconceived attitudes related to students' skin color (Burgess and Greaves 2013) or parents' immigrant status seems unlikely explanations for the patterns seen in Figure 2.

The estimates in Figure 2 tend to be smaller (in absolute values) for one-immigrant-parent students than for students with two immigrant parents from the same country. The native parent appears to dissipate part of the cultural effect induced by the spouse, both when performance deviations are positive (Vietnam, China) and when they are negative (Gambia, Chile).

In Appendix Figure A2, we display a graph that illustrates the relationship between the estimates using data on students with one- and two-immigrant parents. The two estimates correlate positively; the bivariate correlation coefficients are r = 0.58 (unweighted) and r = 0.74 (using number of students as weights). This means that the estimates go in the same direction. The plot shows a significantly smaller variation in the one-immigrant-parent than in the two-immigrant-parents estimates. This suggests a larger cultural influence on students with two immigrant parents.

External validity

If immigrants to Norway have cultural values in line with the population in the country of origin, we would expect the country-level estimates to correlate positively with test scores obtained by students living in the homeland (cf. Levels et al. 2008). In Appendix Figure A3, we display a plot where the country-level estimates (i.e., a complete set of estimates) are measured on the horizontal axis, while the vertical axis measures the test scores in math obtained in the TIMSS 2011 and the PISA 2012 studies.[22] The bubble sizes are proportional to the number of immigrant students used to estimate the baseline regression model. The plot indicates a positive relationship between the international test scores and the estimates obtained in the Norwegian national tests. A regression with PISA and TIMSS scores as response variables indicates an R-square test statistic of 0.55 and 0.45 respectively for students with one immigrant parent, 0.49 and 0.26 respectively for students with two immigrant parents.[23] This indicates a high degree of external validity in the cross-national pattern observed in

[22] The data sources are: a) TIMSS 2011, International results in mathematics (the 4th grade) (Chapter 1), TIMSS & P1RLS International Study Center, Lynch School of Education, Boston College. b) PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know, OECD 2014. Figure A2 employs the mean scores for individual countries. The bivariate correlation between the PISA- and TIMSS-indicators of mathematics performance is 0.874.

[23] The two regressions are estimated with number of students as weights, i.e. as "analytic weights" in STATA terminology.

Figure 2.

The school performance of adopted children

If parent culture has a causal effect on children's school performance, we should see no similar effects when native parents adopt children from other countries. Students from Korea and China do exceptionally well in international tests as well as in the Norwegian context. We would not expect to see similar effect for children adopted from these countries. We analyze the school results of adoptees from these countries[24], and compare them with results for students with immigrant parents. Native students are used as the reference group. Dummy variables capture the "Korean" and "Chinese" effects: the adoptees (N = 1823, Korea; N = 2993, China), and students with one or two immigrant parents from Korea (N = 724) and China (N = 1550).[25] The regression specification is otherwise similar to the model in Figure 2. Appendix Table B7 shows the results.

Students born in Norway with one Chinese or Korean immigrant parent do significantly better than native students do. The two-parent effects are larger than the effects for students with one immigrant parent from China. The estimates for students with two immigrant parents from Korea are negative, while we should expect a positive coefficient. However, there are only 25 students in this group, so we must be careful with the interpretations. The estimate for the adoptees is negative, but much smaller (in absolute values) than effects for students with two immigrant parents.[26] This lends additional confidence to the interpretation that parents' cultural backgrounds account for the estimates presented in Figure 2.

7. The cultural effect on school performance

The baseline model

In Table 2, we present the estimates using our baseline model specification. The dependent variables are math test score at 5th grade and 8th grade, exam results in 10th grade, choice of the academic track

[24] The Korean adoptees were not selected by their parents, but allocated to registered parents on a first-come first-served basis. Fagereng et al. (2015) yield detailed information on the allocation mechanism, and provide evidence suggesting that allotments were as good as random.

[25] N indicates the relevant number of students in the dataset.

[26] A vast majority of adopted children spend the first months of their lives in orphanages. As consequence, they suffer from lack of stimulation, physical and psychosocial stress and even malnutrition. The children from China were older at the time of adoption than the children from Korea; on average 1.2 years of age versus 0.6 years. This might account for the larger negative effect in the case of the Chinese children.

in upper secondary school, and the choice of theoretical math course at upper secondary school. We have more observations for the test score results, where estimate precision is higher. The estimates are strikingly consistent: For students with two immigrant parents (column I), the Authoritativeness indicator has a positive effect on school performance; Permissiveness has a comparable, negative effect while Long-term Orientation has a positive effect. For students with two immigrant parents, the positive effects of an authoritative parenting style are cancelled out by permissiveness (test scores at the 5th and 8th grades), or possibly reversed (exam results in the 10th grade). Permissive upbringing has negative effects on the probability of choosing an academic track and the more theoretical math option at higher levels. This gives a first clue as to why students in East Asian countries attain better test scores than students in Scandinavia.

For students with one immigrant parent (column V), the estimates are smaller in absolute values and the effects go in the same direction. For example, a one-standard deviation increase in Authoritativeness produces a test score increase of 0.15 standard deviations when the student has two immigrant parents. The estimate is 0.05 for students having one immigrant parent only. This corroborates our expectation that the influence of immigrant culture is diluted with a native mother or father.

The LTO-effect is 0.08 for two immigrant parents. Figlio et al. (2019, Table 2) obtain an estimate of 0.12 for math scores in the 3rd grade, which is remarkably similar. The somewhat larger estimate in Figlio et al. (2019) could be because we control for Authoritativeness, which displays a strong correlation with the LTO-indicator (see Appendix Table B3). The analyses of math exam results in the 10th grade display a highly comparable and stronger pattern, particularly in the sample with two immigrant parents (column II). With one immigrant parent, we observe a larger, positive effect of LTO only (column VI). LTO display positive correlations with Authoritativeness and Permissiveness; correlations are 0.55 and 0.36 respectively (Appendix Table B3c). As to be expected, taking LTO out of the regression yields slightly larger parameter estimates (Appendix Table B6).

Cultural background has similar effects on students' choices for secondary schooling. When we interpret the academic track and theoretical mathematics as ambitious choices, we see the positive effects of Authoritativeness and Long-term Orientation, and negative effects of Permissiveness. We obtain smaller estimates (in absolute values) for students with one immigrant parent. The only exception is a zero-effect of Authoritativeness on choice of the academic track.

Table 2: Culture and school performance. Baseline estimates

	Two immigrant parents				One immigrant parent			
	I	II	III	IV	V	VI	VII	VIII
	Math score 5th and 8th grade	Exam results math 10th grade	Choice – Academic track	Choice theoretical math	Math score 5th and 8th grade	Exam results math 10th grade	Choice – academic track	Choice theoretical math
Permissiveness	-0.154**	-0.336***	-0.0387**	-0.117***	-0.00234	-0.0162	-0.0124**	-0.0103
	(0.0682)	(0.0712)	(0.0148)	(0.0305)	(0.0120)	(0.0192)	(0.00553)	(0.00732)
Authoritativeness	0.151***	0.176***	-0.000198	0.0594**	0.0580***	0.0607**	0.0108	0.0165
	(0.0444)	(0.0590)	(0.0101)	(0.0235)	(0.0153)	(0.0251)	(0.00704)	(0.0119)
Long-term Orientation	0.0526***	0.0901***	0.0132**	0.0337***	0.0146***	0.0296***	0.00673**	0.0132***
R-squared	0.220	0.320	0.150	0.183	0.2141	0.333	0.190	0.194
Number of students	41,882	3,762	5,011	5,011	86,337	8,042	10,855	10,855
Number of countries	97	75	76	76	101	93	94	94

Note: The table reports OLS estimates, with standard errors clustered at country-of-origin level. In columns I and V the unit of observation is students taking the annual national tests conducted in 5th grade or 8th grade between 2007 and 2015. In columns II and VI the unit of observation is students that have taken the national test in 8th grade and the math exam in 10th grade. In column III, IV, VII and VIII the unit of observation is students finishing upper secondary school and choosing a track for high school. Columns I–IV include only second-generation immigrants with two immigrant parents. Columns V–VIII include only students with one immigrant parent. The dependent variable in columns I and IV is math score in national tests in 5th grade or 8th grade (standardized with mean 0 and standard deviation 1). The dependent variable in columns II and V is math score in exam in 10th grade (standardized with mean 0 and standard deviation 1). In Norway, a third of students are randomly drawn to take the math exam in the 10th grade. The dependent variable in columns III and VII is a dummy variable taking the value 1 if the students chooses the academic track in high school. The dependent variable in columns IV and VIII is a dummy variable taking the value 1 if the student chooses theoretical/advanced math in high school. Individual controls are student gender, refugee status, mothers' education, fathers' education, mothers' income, fathers' income, mothers' employment status, fathers' employment status, mothers' experience, fathers' experience, number of siblings, parity, dummy variables for parental marriage and grade level. All models include year dummies and school fixed effects. The Permissiveness, Authoritativeness and Long-term Orientation value dimensions are based on the World Value Survey and European Value Survey. These dimensions are standardized with means of 0 and standard deviations of 1.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

In Figure 1, we observed that students from Norway and China had similar scores on authoritativeness, while the Norwegian parenting style put greater emphasis on permissiveness. At the same time, Figure 2 showed that that immigrant students from China performed much better than Norwegian students did. The test score estimates (Table 2, column I) help us connect the pattern in these diagrams. The China–Norway difference in (standardized) permissiveness scores is -3,32, which yields an effect on

student performance of (-3,32*-0,154) = 0.51. The difference between the two countries in authoritativeness is much smaller and the advantage is therefore small: (0,45*0,15) = 0.07. Finally, parents of Chinese origin are more long-term oriented, which also yields an advantage in math performance: (0,053*3,97) = 0,21. We note similar differences when we compare native students with students whose parents have a background from the other East Asian countries. These estimates suggest that parental permissiveness accounts for the weaker math performance of native students. The Norwegian parenting culture is also more shortsighted, which also explains why native students lag behind students of East Asian origin.

Robustness tests

In Appendix Table B9, we present an extension of the analyses presented in Table 2 and include three country-of-origin controls: GDP per capita, an indicator of school quality in the country of origin, and share of children born with low birth weight. The modified specification produces very similar cultural estimates. In Appendix Table B10, we present a separate analysis for refugees and other immigrants. The estimates broadly correspond to those in Table 2: The effects are mostly larger (in absolute values) for student with two immigrant parents. For students with two immigrant parents, the Permissiveness estimate is relatively large, particularly for students with refugee parents.

The value-added model

We present value-added estimates for second-generation immigrant students with two immigrant parents in Table 3.

Table 3: The value-added model

	Change in math score from 5th to 8th grade	Change in math score from 8th grade to exam in 10th grade	Academic track	Theoretical math
	I	II	III	IV
Permissiveness	-0.0504	-0.0645**	-0.0107**	-0.0266***
	(0.0310)	(0.0313)	(0.00490)	(0.00911)
Authoritativeness	0.105***	0.0643*	0.00111	0.0168
	(0.0342)	(0.0354)	(0.00552)	(0.0105)
Long-term Orientation	0.0133	0.0234**	0.00508*	0.0112***
	(0.0100)	(0.0114)	(0.00279)	(0.00393)
Two immigrant parents (=1)	0.0456	0.239***	0.0724***	0.117***
	(0.0432)	(0.0428)	(0.00986)	(0.0173)
Math score 5th grade	-0.588***			
	(0.0175)			
Math score 8th grade		-0.110***	0.107***	0.210***
		(0.0149)	(0.00569)	(0.00673)
Observations	39,362	11,820	15,846	15,846
R-squared	0.252	0.247	0.189	0.298
Number of countries	101	95	97	97

Note: The table reports OLS estimates, with standard errors clustered at country of origin level. In column I the unit of observation is students taking the annual national tests in 5th grade and 8th grade between 2010 and 2015. In column II the unit of observation is students taking the annual national test in 8th grade and exam in math at 10th grade between 2009 and 2012. In columns III and IV the unit of observation is students finishing upper secondary school and choosing a track for high school between 2009 and 2012. All columns include only second-generation immigrants. The dependent variable in column I is the change in math score from national test in 5th grade to national test in 8th grade (standardized with mean 0 and standard deviation 1). The response variable in column II is change in math score from national test in 8th grade to math exam in 10th grade (standardized with mean 0 and standard deviation 1). A third of the students are randomly drawn to take a math exam. The dependent variable in column III is a dummy variable taking the value 1 if the students choose the academic track in high school. The dependent variable in column IV is a dummy variable taking the value 1 if the student chooses theoretical/advanced math at high school. Individual controls are student gender, refugee status, mothers' education, fathers' education, mothers' income, fathers' income, mothers' employment status, fathers' employment status, mothers' experience, fathers' experience, number of siblings, parity, dummy variables for parental marriage and grade. All models include year dummies and school fixed effects. The Permissiveness, Authoritativeness and Long-term Orientation value dimensions are based on the World Value Survey and European Value Survey. The dimensions are standardized with mean 0 and standard deviation 1.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

The overall pattern in Table 3 is similar to what we saw in Table 2: An authoritative parenting style yields better schooling performance, while a permissive upbringing has negative effects. We measure differences in learning progression over relatively short time periods, which may explain why the cultural estimates in Table 3 are smaller (in absolute values) than in Table 2.

The estimates in Column I – based on the higher number of observations – highlight the importance of Authoritativeness, while the estimates for Permissiveness and LTO are weaker. In Column II, the results are comparable, though estimates are less precise. The test scores in the 5th and 8th grades have negative effects, suggesting that better results at the lower levels yield smaller value-added scores at the higher level. Columns III and IV suggest that Permissiveness and LTO have larger effects on the probability of selecting an academic track and mathematics at a more theoretical level. This tentatively suggests that Permissiveness and Long-term Orientation have a larger bearing in explaining education choices at higher levels in the schooling system. The response variables capturing academic track and theoretical math are not defined as differences (columns III and IV), and the lower-level test scores therefore have positive effects.

The country-of-origin fixed-effects model

The final model exploits a dataset with students having one or two immigrant parents, which allows us to exploit within country-of-origin variations. We analyze test scores in math in the 5^{th} and 8^{th} grades, and the interaction terms displayed in Table 4 indicate cultural effects induced by switching from one to two immigrant parents.

Columns I–II show estimates based on models where each of the interaction terms are entered separately. Permissiveness appears to have a small effect, not significantly different from zero. The estimate for Authoritativeness is positive, indicating that a more authoritative upbringing yields better school performance outcomes. Long-term Orientation also produces a positive and statistically significant estimate. These results are mostly sustained when the three cultural indicators are included in column IV.

Table 4: The impact of cultural exposure

Mathematics test scores in the 5th and 8th grades

	I	II	III	IV
Two parents (=1)	-0.0601**	-0.0545**	-0.0831***	-0.0714**
	(0.0286)	(0.0266)	(0.0283)	(0.0277)
Permissiveness*	0.0227			-0.0180
Two immigrant parents (=1)	(0.0273)			(0.0300)
Authoritativeness*		0.0570***		0.0485**
Two immigrant parents (=1)		(0.0213)		(0.0224)
LTO*			0.0307**	0.0216*
Two immigrant parents (=1)			(0.0141)	(0.0126)
Number of students	128,557	128,557	128,557	129,535
R-squared	0.230	0.230	0.230	0.230
Number of countries	101	101	101	101

Note: The table reports OLS estimates, with standard errors clustered at the country-of-origin level. The unit of observation is students taking the annual national tests in 5th grade or 8th grade between 2007 and 2015. All columns include only second-generation immigrants. The dependent variable is the math score from the national tests in 5th grade and 8th grade (standardized with mean 0 and standard deviation 1). Individual controls are student gender, refugee status, mothers' education, fathers' education, mothers' income, fathers' income, mothers' employment status, fathers' employment status, mothers' experience, fathers' experience, number of siblings, parity, dummy variables for parental marriage and grade. All models include year dummies, country-of-origin fixed effects and school fixed effects. "Two parents" is a dummy variable taking the value 1 if the student has two immigrant parents, 0 otherwise.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

8. Conclusions

Immigrant students to Norway display substantial differences in mathematics achievements when they are classified by country of ancestry. These differences persist after employing extensive controls for family background, including several indicators measuring parents' human capital. These country-of-origin differences go in the same direction for students with one and two immigrant parents, the latter usually being larger. We also see that the country-of-origin disparities correlate positively with national test scores as observed in PISA and TIMSS.

Our key hypothesis is that parents' cultural orientation – originating in their country of ancestry – accounts for these differences in school performance. We suggest that an authoritative upbringing that values students' independence, responsibility and determination induces better school results, while demanding obedience has a negative effect. Excessive emphasis on children's independence may

weaken educational results. A permissive child-rearing strategy that values imagination and tolerance, but not hard work, may have adverse effects. We also replicate a related study by Figlio et al. (2019), and estimate the effects of parents' long-term orientation.

Our first set of results relies on identification assuming selection of observable characteristics. It exploits country-of-origin parental differences to map the influence of cultural background on students' school results. We focus on students born in Norway, thereby isolating parental influences from the direct country-of-origin effects. The detailed register data facilitate extensive controls for human capital and related parental assets. Next, we include control for students' initial performance, which goes a long way in controlling for unobserved country-of-origin confounders. This value-added approach yields qualitatively similar results. Our last shot at the cultural effect hypothesis analyzes student-level variations in cultural exposure, which facilitates the estimation with country-of-origin fixed effects. The cultural effects are larger for students with two immigrant parents from the same country, and the estimates are broadly consistent with previous results.

Cultural background has an important bearing on students' school performance. One factor is allowing children freedom to develop as individuals, rather than insisting on obedience. This result suggests that developing cognitive skills requires a degree of intrinsic motivation, not attainable by a dictatorial parenting style (cf. Heckman et al. 2006; Flavio and Heckman 2007; Bettinger et al. 2018). When children have self-confidence and understand that schooling is important, they will do their best irrespective of being watched and without being rewarded or punished for their performance. This is also consistent with our replication result that educational results are better when parents persuade children to defer current consumption to do better in the future. Yet we also find that that too much parental lenience – and too little student effort – can harm school results. Each of these traits yield better educational outcomes, and thereby pave the way for better individual lives and societies that are more prosperous.

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Online Appendix to:

Culture and school performance
Evidence from second-generation immigrants to Norway

Rune Jørgen Sørensen, Jon Marius Iversen,
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Figures:

Tables:

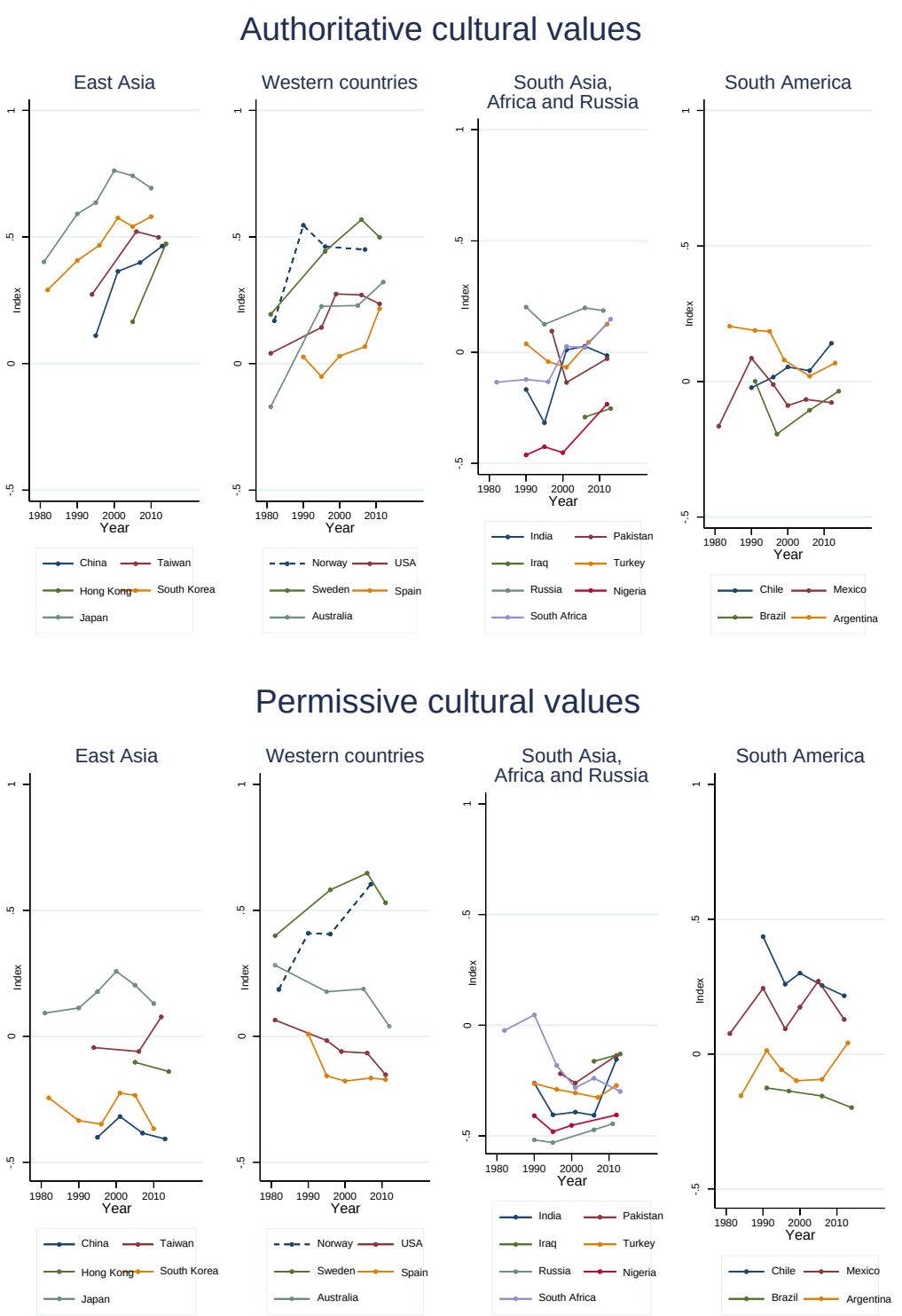

Figure A1. Developments in parenting values

The diagrams display data from the World Value Survey on the Authoritative and Permissiveness cultural indexes (for definitions, see text). The upper panel shows annual average scores per country for the Authoritativeness index, and the lower panel shows the scores for the Permissiveness index. Data on Norway derive from the Norwegian Value Surveys.

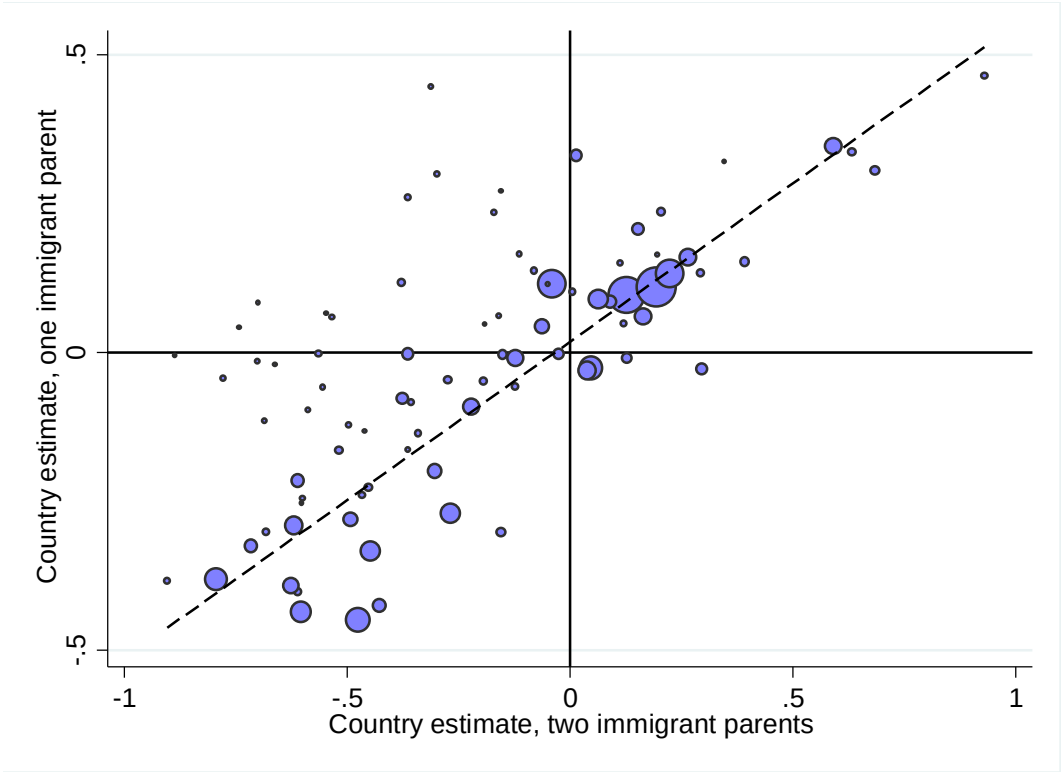

Figure A2. One and two immigrant parent country-level estimates

Note: The diagram is a plot displaying the correlation between country-level estimates based on data on immigrant students with one and two immigrant parents. The estimates derive from separate regression models for students in these two groups, i.e., the regression models displayed in Figure 2. The size of the bubbles are proportional to the number of immigrant students.

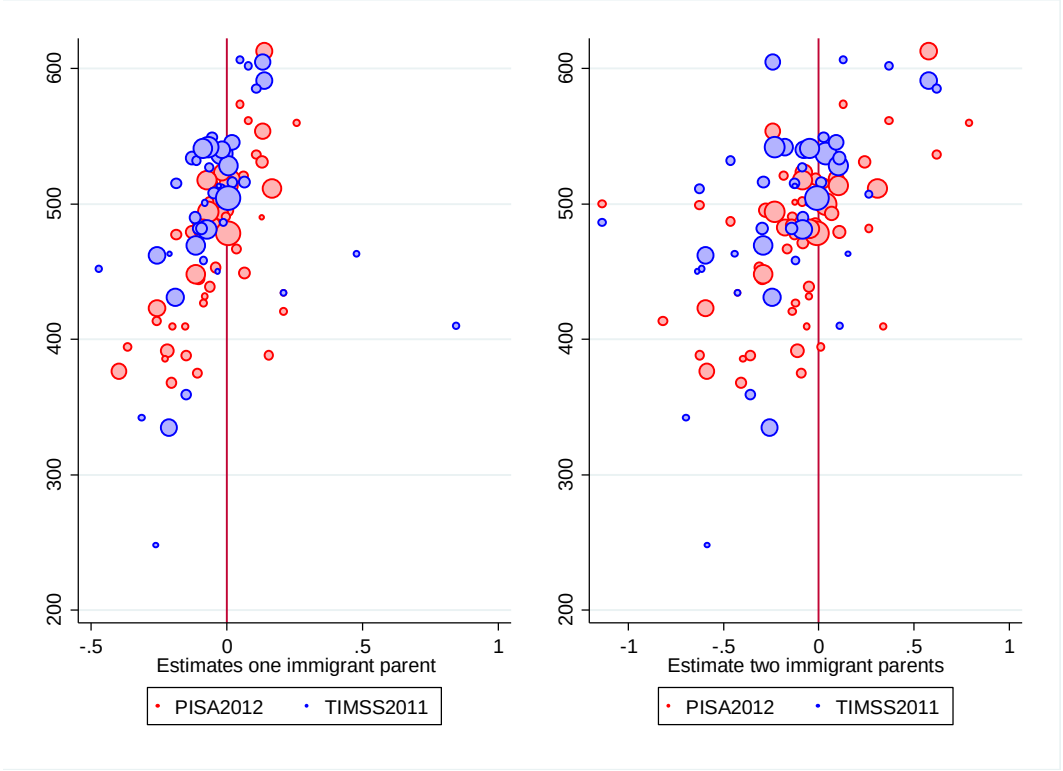

Figure A3. Correlates of immigrant school performance

The diagram shows the relationship between the school performance of immigrant students to Norway and the corresponding performance in the immigrants' country of origin. The horizontal axes display immigrant math performance as defined in Figure 1, defined by students having one immigrant and one native parent (left panel) and two immigrant parents (right panel). The vertical axes measure math performance in the immigrants' country of origin as measured by TIMSS 2011 and PISA 2012.

Table B1. Immigrant students to Norway. Selected countries

Country	One immigrant parent	Two immigrant parents
Algeria	189	162
Bangladesh	56	121
Bosnia-Herzegovina	441	1879
Bulgaria	284	55
Chile	1376	626
China	557	554
Croatia	206	225
Denmark	6477	315
Dominican Republic	125	51
Eritrea	111	499
Ethiopia	236	423
Finland	1443	159
France	1094	78
Gambia	265	207
Germany	3112	495
Ghana	213	282
Hong Kong	73	54
Iceland	793	173
India	460	1125
Iran	1030	1627
Iraq	406	3021
Kenya	253	87
Kosovo	403	2117
Lebanon	239	388
Macedonia	201	453
Morocco	793	1474
Netherlands	1427	212
Nigeria	205	119
Pakistan	1525	5286
Palestine	53	58
Philippines	2882	559
Poland	1372	421
Romania	403	81
Russia	1270	463
Serbia	177	174
Siri Lanka	390	3411
Somalia	245	2706
Sweden	10849	467
Syria	64	331
Tanzania	134	51
Thailand	2731	201
Tunisia	248	102
Turkey	1241	2711
Ukraine	196	57
United Kingdom	4962	199
United States	4187	39
Vietnam	556	3779

Note: The table displays number of immigrant students with two and on immigrant parents for selected countries. The list includes the countries included in Figure 2, that is countries with at least 50 students in both categories. Data include students enrolled for national tests in 5th grade and 8th grade in the period 2007 to 2015.

Table B2. Summary statistics for country-level indicators

	One-immigrant parents			Two-immigrant parents			N
	Mean	Sd.	N	Mean	Sd.	]	
Permissiveness	-0.09	0.28	101	-0.08	0.24		97
Authoritativeness	0.18	0.25	101	0.17	0.22		97
Long-term Orientation	0.44	1.82	101	0.45	1.84		97
Independence	0.54	0.17	101	0.54	0.17		97
Responsibility	0.72	0.12	101	0.72	0.13		97
Determination	0.41	0.13	101	0.40	0.14		97
Obedience	0.38	0.19	101	0.38	0.19		97
Imagination	0.24	0.12	101	0.24	0.13		97
Tolerance	0.70	0.12	101	0.69	0.13		97
Hard Work	0.56	0.23	101	0.56	0.23		97
Percentage of children with low birth weight	10.49	5.54	171	10.63	5.76		97
Schoellman indicator	0.28	0.15	127	0.26	0.17		97
GDP per capita (2000)	11,429	14,456	173	11,419	14,668		97

Note:
These are summary statistics on indicators measured on the country level for students with one or two immigrant parents respectively. Cultural values are from the three last waves of the World Value Survey (after 2000) and the European Value Survey (2008–2009). The Permissiveness, Authoritativeness and Long-term orientation indexes are calculated based on Independence, Responsibility, Determination, Obedience, Imagination, Tolerance and Hard Work. The calculations are described in the research strategy. GDP per capita is measured in at Purchasing Power Parity (PPP) in 2000 (Source: World Bank). Data on school standards in country of origin are based on Schoellman (2012: Table A1). Percentage of low birth weight students (below 2,500 grams at birth) is from the World Health Organization (WHO) and the UN (UNICEF). In families with one immigrant parent, the country-level data refer to the immigrant parent.

Table B3a: Correlations of cultural indicators

	Indepen-dence	Respons-ibility	Deter-mination	Obedi-ence	Imagi-nation	Tolerance	Hard work
Independence	1	0.3844	0.6015	-0.5427	0.4539	0.2805	-0.3601
Responsibility	0.3404	1	0.4516	-0.2944	0.1969	0.3347	-0.3017
Determination	0.3564	0.3135	1	-0.5979	0.4928	0.4058	-0.4485
Obedience	-0.4375	-0.3925	-0.0586	1	-0.6100	-0.3140	0.3090
Imagination	0.3802	0.1009	0.4865	-0.0401	1	0.2067	-0.3610
Tolerance	0.2068	0.4529	0.2846	-0.0387	0.3870	1	-0.2111
Hard Work	-0.1737	-0.3043	0.0154	0.2400	-0.2712	-0.4290	1

Note: The correlations below the diagonal are based on data for the 101 countries participating in the World Value Survey and the European Value Survey. These are performed on the correlations above the diagonal individual-level within-country correlations. We estimate regression models with the five cultural indicators as response variables and include controls for country-of-origin and year fixed effects. We use the residuals from these regressions to estimate correlations. The estimates below the diagonal indicate between-country correlations.

Table B3b: Country-level correlations of cultural dimensions

	Permissiveness	Authoritativeness	Long-term orientation
Permissiveness	1		
Authoritativeness	0.3462	1	
Long-term orientation	-0.0072	0.5814	1

Note: The correlations are based on the 101 countries participating in the World Value Survey and the European Value Survey. The numbers indicate bivariate correlations estimated on the basis of country-level data.

Table B3c: Individual-level correlations of cultural dimensions

	Permissiveness	Authoritativeness	Long-term orientation
Permissiveness	1		
Authoritativeness	0.6558	1	
Long-term orientation	0.3600	0.5508	1

Note: The table shows individual-level, bivariate correlations for the three cultural dimensions defined in the paper. The correlations are based on data for the 137,331 immigrant parents in our sample.

Table B4. Cohorts and education levels

	Immigrant parents to Norway	
	One immigrant parent	Two immigrant parents
Primary education, born before 1970	6.76	20.39
Secondary education, born before 1970	34.02	28.21
University degree, born before 1970	21.93	8.24
Primary education, born after 1970	7.01	19.45
Secondary education, born after 1970	21.69	20.46
University degree, born after 1970	8.59	3.25
Total	101	97
(N)	99,169	59,106

Note: The table displays register data on immigrant parents to Norway. The numbers are the shares of individuals representing each category for the different data sources. Primary education is defined as ISCED codes 1 and 2, secondary education is defined as ISCED codes 3 to 5 and university degree is defined as ISCED codes 6 to 8.

Table B5: The impact of age and education level on cultural indicators

	Permissiveness	Authoritativeness	Long-term orientation
Born after 1970; primary education	-0.0621***	-0.0622***	0.0311***
	(0.00479)	(0.00502)	(0.00797)
Born after 1970; university degree	0.0376***	0.110***	0.0134**
	(0.00412)	(0.00417)	(0.00677)
Born before 1970; primary education	-0.116***	-0.0920***	-0.0393***
	(0.00481)	(0.00510)	(0.00790)
Born before 1970; secondary education	-0.0500***	0.0177***	-0.0292***
	(0.00387)	(0.00402)	(0.00652)
Born before 1970; university degree	0.0118**	0.154***	-0.00234
	(0.00523)	(0.00519)	(0.00873)
	-0.0621***	-0.0622***	0.0311***
Observations	175,535	175,450	168,289
R-squared	0.186	0.179	0.198
Number of countries	107	107	107

Note: The regression model includes also survey cohort effects and country fixed effects and is based on 107 countries participating in the three last waves of the World Value Survey and the European Value Survey in 2008/2009. The included variables are used to merge indicators from the World Value Survey and the European Value Survey to the Norwegian register data. The reference category is individuals born after 1970 with primary education. Primary education is defined as ISCED codes 1 and 2, secondary education is defined as ISCED codes 3 to 5 and university degree is defined as ISCED codes 6 to 8. Standard errors are clustered at the country level.
Significance levels:*** p<0.01, ** p<0.05, * p<0.1

Table B6: Culture and school performance
No control for long-term orientation (LTO)

	Two immigrant parents				One immigrant parent			
	I	II	III	IV	V	VI	VII	VIII
	Math score 5th and 8th grade	Exam results math 10th grade	Choice – Academic track	Choice theoretical math	Math score 5th and 8th grade	Exam results math 10th grade	Choice – academic track	Choice theoretical math
Permissiveness	-0.141**	-0.303***	-0.0340**	-0.108***	-0.00434	-0.0164	-0.0133**	-0.0116
	(0.0682)	(0.0779)	(0.0151)	(0.0319)	(0.0128)	(0.0218)	(0.00593)	(0.00868)
Authoritativeness	0.185***	0.231***	0.00785	0.0809***	0.0726***	0.0870***	0.0170**	0.0285**
	(0.0452)	(0.0658)	(0.00916)	(0.0214)	(0.0158)	(0.0248)	(0.00757)	(0.0109)
R-squared	0.215	0.308	0.149	0.174	0.214	0.332	0.189	0.193
Number of students	41,886	3,762	5,011	5,011	86,304	8,039	10,851	10,851
Number of countries	97	75	76	76	101	93	94	94

Note: The table corresponds to Table 2, except long-term orientation (LTO) has been taken out of the regression models. Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table B7: Placebo test

Adopted children from China and Korea

	Math score 5th and 8th grade
Adopted from Korea	-0.0393***
	(0.000913)
One immigrant parent from Korea	0.174***
	(0.000822)
Two immigrant parents from Korea	-0.151***
	(0.00278)
Adopted from China	-0.0713***
	(0.00115)
Two immigrant parents from China	0.625***
	(0.00155)
One immigrant parent from China	0.198***
	(0.00327)
Number of students	753,208
R-squared	0.165

Notes: This analysis includes all Norwegian students and students from China and Korea. Using register data for Norwegian students, we were able to identify students that had been adopted. We analyze the school results of adoptees and immigrant students using native students as the reference group. Dummy variables capture the Korean and Chinese effects: the adoptees (N = 1823, Korea; N = 2993, China), and students with one or two immigrant parents from Korea (N = 724) and China (N = 1550). The regression specification is otherwise similar to the model in Figure 2.

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table B8: The impact of intermarriage on labor market outcomes and siblings

	Wage income mother (log)		Labor participation (Employed = 1)		Number of siblings
	Mother	Father	Mother	Father	
Two immigrant parents	-0.0321	-0.0662*	0.00175	0.00134	-0.456
	(0.0284)	(0.0355)	(0.00123)	(0.00108)	(0.916)
Observations	68,017	67,139	68,142	67,315	39,158
R-squared	0.812	0.653	0.942	0.929	0.374

Note: The first two columns have log work income as a dependent variable. The dependent variable in columns 3 and 4 is a dummy variable for labor market participation. In column 5 the dependent variable is number of siblings in the family. The unit of observation is the parents of students taking national tests in 5th and 8th grade between 2007 and 2015. All models include age fixed effects, controls for education levels, refugee status, number of years since immigration, potential work experience, controls for family structure and number of siblings. In column 3, number of siblings is not a control variable. All models have country-of-origin and municipal fixed effects. Standard errors cluster on country of origin level.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table B9. Robustness test 1: Baseline estimates with country-level controls

	Two immigrant parents				One immigrant parent			
	I	II	III	IV	V	VI	VII	VIII
Permissiveness	-0.154**	-0.126**	-0.166***	-0.150**	-0.00243	-0.0173	-0.00986	-0.0111
	(0.0682)	(0.0599)	(0.0617)	(0.0652)	(0.0120)	(0.0119)	(0.0134)	(0.0128)
Authoritativeness	0.151***	0.148***	0.150***	0.179***	0.0580***	0.0498**	0.0579***	0.0551***
	(0.0444)	(0.0460)	(0.0451)	(0.0392)	(0.0153)	(0.0141)	(0.0159)	(0.0159)
Long-term orientation	0.0526***	0.0538***	0.0604***	0.0359	0.0146***	0.0139***	0.0146***	0.0107**
	(0.0179)	(0.0193)	(0.0189)	(0.0217)	(0.00557)	(0.00478)	(0.00562)	(0.00549)
GDP per capita 2000 (PPP)		-0.0351				0.0351**		
		(0.0327)				(0.0141)		
Quality-adjusted years of education			-0.0352				0.0815	
			(0.280)				(0.0650)	
Low birth-weight				0.000894				-0.00470*
				(0.00353)				(0.00273)
R-squared	0.220	0.220	0.220	0.222	0.214	0.214	0.218	0.215
Number of students	41,881	41,533	40,839	38,630	86,293	85,752	82,580	83,472
Number of countries	97	96	94	90	101	98	93	96

Note: The table reports OLS estimates, with standard errors clustered at country-of-origin level. The unit of observation is students taking the annual national tests in 5th grade and 8th grade between 2007 and 2015. The first four columns include students with two immigrant parents, while the last four columns include students with one immigrant parent. All columns include only second-generation immigrants. The dependent variable is the math score in national tests in 5th and 8th grade (standardized with mean 0 and standard deviation 1.) Individual controls are student gender, refugee status, mothers' education, fathers' education, mothers' income, fathers' income, mothers' employment status, fathers' employment status, mothers' experience, fathers' experience, number of siblings, parity, dummy variables for parental marriage and grade. All models include year dummies and school fixed effects. The Permissiveness, Authoritativeness and Long-term Orientation indexes are based on the World Value Survey and the European Value Survey. These indexes are standardized with mean 0 and standard deviation 1. GDP per capita is measured in at Purchasing Power Parity (PPP) in 2000 (Source: World Bank). Data on school standards in country of origin are based on Schoellman (2012: Table A1). Proportion of low birth weight students (below 2,500 grams at birth) is from the World Health Organization (WHO) and UN (UNICEF).
Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Table B10. Robustness test 2: Baseline estimates for refugees vs. work immigrants

	Refugees		Other immigrants	
	One immigrant parent	Two immigrant parents	One immigrant parent	Two immigrant parents
Permissiveness	-0.0451	-0.228***	-0.00299	-0.156**
	(0.0529)	(0.0812)	(0.0123)	(0.0625)
Authoritativeness	0.0094	0.0820***	0.0597***	0.181***
	(0.0370)	(0.0261)	(0.0158)	(0.0447)
Long-term orientation	0.0563***	0.0297**	0.0154***	0.0688***
	(0.0180)	(0.014)	(0.00504)	(0.0166)
Observations	1,718	13,459	84,086	28,075
R-squared	0.512	0.235	0.214	0.246

Note: The table reports OLS estimates, with standard errors clustered at country of origin level. The unit of observation is students taking the annual national tests in 5th grade and 8th grade between 2007 and 2015. The first two columns estimate the model only for refugees, while the two last columns estimate the model for other immigrants. All columns include only second-generation immigrants. The dependent variable is the math score in national tests in 5th grade and 8th grade (standardized with mean 0 and standard deviation 1.) Individual controls are student gender, mothers' education, fathers' education, mothers' income, fathers' income, mothers' employment status, fathers' employment status, mothers' experience, fathers' experience, number of siblings, parity, dummy variables for parental marriage and grade. All models include year dummies and school fixed effects. The Permissiveness, Authoritativeness and Long-term Orientation indexes are based on the World Value Survey and the European Value Survey. These indexes are standardized with mean 0 and standard deviation 1. Significance levels: *** p<0.01, ** p<0.05, * p<0.1