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Alexandra de Gendre, Krzysztof Karbownik, Nicolas Salamanca, and Yves Zenou

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Cultural Integration in the Classroom: The Role of Parents and Teachers*

Alexandra de Gendre†
University of Melbourne

Krzysztof Karbownik‡
Emory University

Nicolas Salamanca§
University of Melbourne

Yves Zenou¶
Monash University

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Abstract

Integration of ethnic minority students in classroom could change behavior of students, parents and teachers of ethnic majority. Using random assignment of children to classrooms in Taiwanese middle schools, we show that exposure to Indigenous but not Hakka minorities lowers test scores of Hoklo majority students. These negative effects are due to endogenous responses of parents and teachers rather than those of students or other characteristics correlated with minority status. We conclude that parental and teacher behavioral adjustments rather than direct exposure to minority children are plausible explanations behind the observed negative effects of classroom exposure to Indigenous students.

JEL: I23, I26, D13
Keywords: Taiwan, ethnic minorities, Indigenous population, peer effects, parental investments, school production function

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†de Gendre: Department of Economics, The University of Melbourne; LCC; IZA. a.degendre@unimelb.edu.au

‡Karbownik: Department of Economics, Emory University. krzysztof.karbownik@emory.edu

§Salamanca: Melbourne Institute, The University of Melbourne; LCC; IZA. n.salamanca@unimelb.edu.au

¶Zenou: Department of Economics, Monash University, CEPR and IZA. yves.zenou@monash.edu

1 Introduction

A minority is defined as any group of people who, because of their physical or cultural characteristics, are singled out from others in the society in which they live for differential and unequal treatment, and who therefore regard themselves as objects of collective discrimination (Wirth, 1945). This definition connotes historical disadvantages, direct discrimination, and general lack of power of certain groups of people in a given society in which they live. Notably being a minority does not have to be limited to race or ethnicity but could likewise include cultural disadvantage. There is extensive research in various settings and across countries on how minorities shape the society as well as how the society can compensate them for their historical disadvantage and discrimination (Kymlicka, 1995, 2017, Vasta, 2007). In many cases the proposed solutions revolve around increasing human capital of minority children so that they can successfully overcome the disadvantage that their parents faced (Coleman, 1968, Heckman, 2000, Alba, Sloan and Sperling, 2011).

A pre-requisite of increasing human capital of minority children is offering them access to high quality schools which are often attended by societal majority populations. This creates a tension between minority and majority parents as well as teachers, often leading to pushback and even increased segregation. Yet, we have limited causal evidence on the effects of exposing majority children to minorities in the classroom; this is ultimately is an empirical question. There could be positive effects due to externalities from increased diversity or more resources dedicated to teaching; there could also be no effects if minority status is not an important input in the human capital production function. Finally, one could also find negative effects, which could arise either due to other unfavorable characteristics correlated with minority status or negative behavioral changes of students, their parents, or their teachers. For example, minority students tend to come from lower income families, and income itself can have causal effects on human capital of other students in the classroom aside from minority status.

In this paper, we study the effects of exposure to ethnic minorities in the classroom on the academic performance of majority students as well as changes in behaviors of their parents and teachers. We do this in the context of Taiwan and two separate and distinct minority groups: Indigenous Peoples and Hakka. We find that in classrooms with a one standard deviation higher share of Indigenous peers, ethnic majority students test scores are on average 2.4% of a SD lower. We do not find similar effect for Hakka minority and we can rule out negative effects as small as 0.9% of a SD.

We then investigate four potential mechanisms beyond these uncovered negative externalities generated by Indigenous students. We first attempt to rule out that the negative effects are driven by other characteristics correlated with indigeneity, where we consider differential ability and language skills of Indigenous students, socioeconomic status of their households, and finally investments of Indigenous parents into their children. We find that only about 1/3 of the negative

peer effects can be explained by factors correlated with indigeneity and the primary driver appears to be differential academic ability of Indigenous students. Second, we consider changes in behaviors of majority students and parents as well as teachers assigned to these classrooms. We do not find statistically significant changes in behaviors in ethnic majority students, and, if anything, the positive coefficient suggests that it improves offsetting the estimated negative effect. On the other hand, we document that both ethnic majority parents and teachers in classrooms with Indigenous peers change their behaviors in a way that is correlated with negative test scores of ethnic majority children. This channel accounts for almost 2/3 of the negative peer effect.

Taiwan has multiple institutional and interesting features that allow us to credibly answer our research questions. First, Taiwan has two important minority groups officially recognized by the government – Hakka and Indigenous Peoples. This allows us to abstract from subjectively classifying children into minority and majority groups. Second, the local education system requires – based on the arguments of equity and non-discrimination – random assignment of students to classrooms within junior high schools; this is rare in compulsory school settings. It allows us to estimate linear-in-means models that are not confounded by issues of selection and reflection, which have plagued previous research (Angrist, 2014). Finally, the Taiwan Education Panel Survey which we use in this paper allows us to track a large cohort of students through junior high school and additionally provides rich information not only on classroom composition but also on children's parents and their teachers. This unique dataset allows us to document a new set of mechanisms, beyond student characteristics, which generate the observed peer effects.

Our primary contribution is to the literature on peer effects and their mechanisms. To the best of our knowledge this is the first paper documenting minority peer effects in compulsory education where children are randomly allocated to their peers and teachers[1]. Prior studies, primarily using US data due to their ethnic-racial history, were mostly forced to utilize cohort-by-school variation due to lack of randomization (Hoxby, 2000, Diette and Oyelere Uwaifo, 2014, Figlio and Özek, 2019, Angrist and Lang, 2004). Second, we study two different minority groups in the same paper and document that they can generate very different effects. This is important firstly to understand the generalizability of peer effects estimates - and in particular to reconcile the long stream of inconsistent findings of this literature, and secondly to inform policy-makers and education decision-makers on how to direct limited resources in a targeted way. Most prior work focused on a single group such as immigrants (e.g. Figlio and Özek, 2019, Figlio et al., 2021, Diette and Oyelere Uwaifo, 2014, 2017), refugees (e.g. Alan et al., 2021, Imberman, Kugler and Sacerdote, 2012, Green and Iversen, 2022, Morales, 2022), or a single minority such as Black

1. There are prior studies exploiting random assignment to schools in Korean middle schools, and random assignment to classrooms within schools in Chinese middle schools. None of those studies, however, have estimated minority peer effects; rather they have focused on estimating the impact of studying with higher-achieving peers, female peers, children of college-educated parents or teacher-student match effects (see e.g. Kang et al., 2007, Fang and Wan, 2020, Chung, 2020, Lim and Meer, 2017, 2020, Feng and Li, 2016)

students in US schools (e.g. Hoxby, 2000). Third, this is one of the first papers investigating the black box of mechanisms behind the observed peer effects and the first one to our best knowledge to do this in the context of minority peers. In that, we propose that agents other than students themselves – namely parents and teachers – can contribute to the observed data patterns. This means that researchers should view peer effects findings more broadly through a multi-factor production function which goes beyond the direct interactions between students. Finally, we also provide some of the first evidence on educating Indigenous children, a group of people that has largely been omitted from research due to data limitations, who faced deep and perpetuating disadvantage. Indigenous Peoples represent about 5% of world's population but as much as 15% of extremely globally poor (Hall and Patrinos, 2014). Furthermore, they are not evenly distributed within countries and thus there are regions where effects such as those that we document in this paper might be pervasive, leading to even higher integration difficulties between minority and majority stakeholders (e.g., in the US in Alaska 15% of inhabitants are Indigenous, while in Taiwan in Hualien County 30% of the population is Indigenous).

Although our focus is on compulsory education and younger children this paper is also naturally linked to the broader literature on peer effects in education. Considering university-level coursework there are several papers which use random assignment to peers to identify the effects of interest (e.g., Carrell, Fullerton and West (2009), Carrell, Sacerdote and West (2013) in the US, Feld and Zoelitz (2017) in the Netherlands, Garlick (2018) in South Africa, and Brunello, De Paola and Scoppa (2010) in Italy). However, even in this literature, to the best of our knowledge, only Chevalier, Isphording and Lisauskaite (2020) specifically focus on minority status of peers – in their case non-native speakers at a British university – and on the issue of language barriers in the classroom which we also consider in our analysis. Unlike us, they do not find any negative spillovers from non-native to native speakers in terms of their grades.

More broadly, there is a long-standing discussion on the effects of school racial and ethnic diversity on the student achievement, which has produced mixed empirical evidence. In the United States, Hoxby (2000) provided earlier evidence on the impact of racial diversity in high school on student performance and found that exposure to low ability peers is particularly harmful for Blacks; Card and Rothstein (2007) find a strong associations between racial segregation in neighborhoods and schools and the Black-White gap in SAT scores. Angrist and Lang (2004) analyze spillovers generated by school integration policies, and find short-lived, small to null effects on test scores. Hanushek, Kain and Rivkin (2009) estimate the effect on student achievement of studying in racially diverse schools keeping school quality constant, and find large negative effects for Blacks, especially higher ability Black students, and small negative effects for White and other non-White minorities. A related but separate strand of literature focusing on ethno-linguistic diversity in school has also yielded mixed findings (e.g. Cho, 2012, Diette and Oyelere Uwaifo, 2014, 2017, Geay, McNally and Telhaj, 2013, Tonello, 2016, Ohinata and Van Ours, 2013, 2016, Friesen and Krauth, 2011, Gould, Lavy and Daniele Paserman, 2009, Jensen and Rasmussen, 2011, Ahn and Jepsen, 2015, Hunt, 2017). Both strands of literature share

one common limitation: their inability to delve into the mechanisms underlying their findings. It is worth noting three recent experimental studies which have focused on the effect of exposure to refugees on pupils' attitudes, prejudice and friendship formation (Boucher et al., 2020, Alan et al., 2021) and on teachers' prejudice (Alan et al., 2020).

Finally, we also contribute to contact theory literature in social psychology which serves as our theoretical guideline and inspiration (Pettigrew, 1998, Pettigrew et al., 2011, Rivas-Drake et al., 2019). According to this theory exposing people to other ethnic groups should reduce prejudice. Our results suggest that consequences of exposing majority students to minority students are more nuanced and may involve agents other than students themselves which are for the most part omitted in contact theory. In particular, we find no responses to exposure to Hakka students but negative behavioral responses to Indigenous students suggesting that the *contact* may differ across minority groups. Furthermore, the negative behavioral adjustments are concentrated among parents and teachers rather than students and are consistent with a reinforcement rather than amelioration of prejudice. On the other hand, for students we don't find any statistically significant responses and, if anything, conditional on the behavior of their parents and teachers it is positive indeed suggesting reductions in prejudice.

2 Institutional Setting

2.1 Education in Taiwan

Compulsory education in Taiwan starts with primary school at age 6 and ends with junior high school around age 15, however, approximately 95 percent of students continue their education with either General or Vocational Senior High School or Junior College. Figure A.1 provides a schematic of the Taiwanese education system. The educational curriculum is developed centrally by the Taiwanese Ministry of Education and has no subject specialization during the compulsory stage of education. It is centered around sciences and mathematics and often credited as the reason why Taiwanese pupils are consistently placed at the top on international educational rankings (e.g. 4th out of 72 countries in PISA 2015; Law (2004)). Since the 1990s, public junior high schools have been managed at the municipal level where in principle students can choose their preferred school. If the school is oversubscribed, however, the admission is based on a lottery system. We neither observe this source of random variation in our data nor use it for identification. Rather, we utilize the fact that conditional on admission to specific junior high school, students are randomly assigned to classrooms. This rule, critical for our identification strategy, is mandated by the central government and further extends to homeroom teachers.[2]

2. For legislative details see the Implementation Guideline for Class Assignment of Junior High School Students, later superseded by Article 12 of the Primary and Junior High School Act in 2004. Additional information can be

No exceptions to this rule are made based on demographic characteristics. The assignment is permanent and, net of extraordinary circumstances like moving to a different municipality, students typically remain with their classroom and homeroom teacher (Dao Shi) throughout all three years of junior high school. For example, in our data, we observe that 97% of students are in the same school and with the same Dao Shi at the beginning and the end of junior high school.

At the end of compulsory education, students take the National Basic Competence Test and its results determine competitive admissions to senior high schools and senior vocational schools. Consequently, students, parents and teachers spend considerable time, money and effort preparing for the exam. For example, schools regularly organize practice exams and other forms of preparation while parents are known to hire private tutors in mathematics, English and sciences. The latter is often facilitated through "cram schools" which are private extra-curricular institutions preparing specifically for high stakes centralized examinations.

2.2 Ethnic Minorities in Taiwan

Population of Taiwan is approximately 23 million and it is mostly inhabited by descendants of Han Chinese. According to 2010 Census, 95% of population was Han Taiwanese, 4% was Taiwanese Indigenous Peoples, and 1% of individuals were of other ethnicities (mostly immigrants from other Asian countries). At the same time, Han Taiwanese is not a homogenous group. While the vast majority are Hoklo descendants from Fujian (approximately 70%), there is a significant minority of Hakka descendants mostly from eastern Guangdong (approximately 15%).[3] We consider the former group as the ethnic majority, for whom we are interested in measuring outcomes, and the latter group as well as Indigenous Peoples as the two minority groups of interest. We provide a brief cultural and ethnographic sketch for each of the groups below but our choice was primarily motivated by the fact that both ethnic minority groups we consider have their own special representation in the government through Hakka Affairs Council and Council of Indigenous Peoples, respectively. In that, the Taiwanese government itself recognizes and defines these individuals as ethnic minorities.

Hoklo are the ethnic majority people living in Taiwan. They are primarily descendants of people from southern Fujian who migrated to the island before the start of Japanese occupation in 1895 with the early migrations starting at the begining of 17th century. They have strongest Taiwanese identity among the three Han Taiwanese groups. For example, in 1999, 75% of Hoklo identified

found at http://edu.law.moe.gov.tw/EngLawContent.aspx. We do not have enough power in our data, mainly due to small number of Indigenous teachers, to utilize the fact that homeroom teachers are also randomly assigned to their students.

3. The remaining 10% of Han Taiwanese is Waishengren which defines people who migrated from the mainland China to Taiwan between 1945 and 1949 during the relocation of Republic of China government. Since this group is very heterogeneous, we exclude them from the main analysis and instead focus on the Hoklo (majority) and Hakka (minority) Han Taiwanese.

as Taiwanese only while this share was 58% and 32% for Hakka and Waishengren, respectively (Tsai, 2007). Hoklo are mostly bilingual speaking both Taiwanese Mandarin (most commonly spoken language in Taiwan) and Taiwanese Hokkien. The latter is specific to Hoklo people and has distinct literary and colloquial layers of vocabulary. In our data 92% of Hoklo students are fluent in Mandarin and 41% of those students are additionally fluent in Hokkien.

Hakka are the first minority group we consider in this paper. They are primarily descendants of people who migrated from Guandong province at the end of the Ming dynasty and the beginning of the Qing dynasty in the middle of 17th century. They specialized in agriculture and mostly settled in Eastern and Southern provinces. Both in mainland China and historically in Taiwan Hakka faced discrimination from other Chinese ethnic groups that sometimes turned violent leading to mass-killings in Hakka villages. They also speak a distinct language, Hakka, which is not mutually intelligible with either Mandarin or Hokkien. In our data we see 93% and 15% of Hakka minority children being fluent in Mandarin and Hakka, respectively. On the other hand, very few non-Hakka Taiwanese declare speaking the language.

Indigenous Peoples of Taiwan are the second minority group we consider. They are the native inhabitants of the island of Taiwan who are descendants of those who lived on the island as far as 6000 years ago. There are many distinct tribes of Indigenous Peoples which generally have different histories and customs while Taiwanese government officially recognizes 16 distinct ethnic groups within this broader ethnic umbrella. The share of Indigenous students among school-age children is about 4% but they are not distributed evenly across the country. Figure A.2 presents the fraction of 10 to 14 year olds who are Indigenous by county of residence. It's is clear that the vast majority of those children live in eastern parts of Taiwan where their concentration is as high as 45% but there is also a non-trivial share in counties surrounding Taipei - the capital.[4] Akin to the two Han Taiwanese groups vast majority of Indigenous Peoples are fluent in Mandarin (91%), however, almost 30% are bilingual and speak also various indigenous languages. On the other hand, based on our data, virtually no Indigenous Children speak Hokkien or Hakka. Conversely almost no Hokkien or Hakka children speak Indigenous languages.

3 Data

We use data from the Taiwanese Education Panel Survey (TEPS), a project jointly funded by the Ministry of Education, the National Science Council, and the Academia Sinica. The TEPS is a nationally representative longitudinal survey of the education system in junior high school, senior high school, vocational senior high school, and junior college. It is a multiple respondent

4. These are similar regions to where Hakka cluster while historically Hakka and Indigenous Peoples often allied against occupants of the island. Neither group is meaningfully represented in south-western Taiwan which is primarily inhabited by Hoklo.

survey, collecting linked information on students, parents, teachers, and school administrators.[5]

In this paper, we focus on the junior high school sample of the TEPS because it allows us to use measures of student ability and educational inputs paired with random assignment to classrooms in Grade 7. The TEPS junior high school sample includes information on more than 20,000 students, their parents, their teachers and their school administrators over two waves. The first wave was collected in early September 2001 at the very beginning of students' first year of junior high school, and right after their random assignment to classrooms within a school.[6] The second wave was collected in 2003, at the beginning of the students' last year of junior high school. There are three key features of TEPS that aid the design of our study.

First, its sampling framework allows us to observe a random sample of classmates in each junior high school classroom included in the survey. TEPS follows a stratified nested sampling procedure where first 338 randomly selected junior high schools were sampled (45 percent of all high schools in the country at the time), with sampling strata for urban and rural areas, public and private schools, and senior high and vocational schools. In each of these schools an average of three classrooms of first-year students were then randomly sampled. In each of these classrooms around 15 students were then randomly sampled. Since the mandated maximum class size at the time was 35 students per class, this generally amounts to observing a random half of the classroom.[7]

Second, students in the TEPS take a standardized test in waves 1 and 2 called the Comprehensive Analytical Ability test. This is a low-stakes test constructed for the purpose of the survey, it is anonymous from student perspective, and it has no bearing on their subsequent academic careers. It measures students' cognitive ability and analytical reasoning, and was specifically designed to capture gradual learning over time. The test contains 75 multiple-choice questions, covering general reasoning, mathematics, Chinese and English. They were taken from an extensive bank of questions which includes adapted questions from other international standardized tests, as well as questions provided by education and field experts in Taiwan. The Comprehensive Analytical Ability test scores, constructed as the sum of all correct answers, provide a measure of academic ability for students and their peers. Importantly, the tests are externally graded

5. Although the sample is longitudinal, follow-up of the full panel is only possible between the beginning and end of junior high school which is what we use in this paper. We are unable to use subsequent waves of the survey due to selective attrition and much smaller sample sizes.

6. Although we cannot observe the difference between admission roster and our post-randomization sample, due to strict regulation it is highly unlikely that students withdraw from school upon learning their assignment or between admission and randomization. To the extent that there is some selective dropout we should observe this in our blanacing test.

7. This sampling framework is similar to that of the National Longitudinal Study of Adolescent to Adult Health (Add Health), a panel study of middle and high school pupils in the United States. Add Health is unique in collecting friendship ties and in observing multiple cohorts of students in each school, which makes it particularly appealing for peer effect and networks research (Agostinelli, 2018, Elsner and Isphording, 2017, Card and Giuliano, 2013, Bifulco, Fletcher and Ross, 2011, Calvo-Armengol, Patacchini and Zenou, 2009).

and the results of those tests are not disclosed to either students, parents, teachers or school administrators. Their main goal is for researchers to be able to accurately measure and study children's educational progress. We utilize the anonymity and low-stakes characteristics of the test as one of an important features in our analysis as it limits the possibility that teachers or parents might influence the results.

Third, beyond cognitive outcomes, the TEPS provides a wealth of questions measuring student behavior, attitudes and beliefs in and outside the school environment, parent-child interactions and parental investments, as well as detailed information on teachers and school administrators. Many of these measures have multiple raters, combining questions asked to students, parents, teachers and school administrators. We aggregate all these questions to construct three indexes which measure student, teacher and parent inputs into the educational production function. Interestingly, teachers are also asked about their subjective assessment of each student's cognitive ability which we use as a contrast to the objective and anonymous measure generated by test scores. The large set of inputs reported by multiple stakeholders allows us to comprehensively understand the production function at classroom level, including its spillovers to household environment.

Based on our data, we propose that changes in student's classroom composition, and in particular exposure to ethnic minority students, could alter student educational choices and behaviors, parental investments and attitudes, and teacher perceptions and subjective assessments. For example, in our data Indigenous students have on average 50% of a SD lower test scores compared with Hoklo majority students and thus it could be that the latter might study less when exposed to relatively weaker peers. On the other hand, their parents might try to compensate for this perceived negative peer composition with increased private tutoring while teachers in these classrooms might be less effective if they need to tailor their instructional practices to students with vast heterogeneity in ability. Since all inputs are measured using multiple questions, we first identify entire blocks of items in the questionnaires of all respondents—e.g. blocks of items related to study effort reported by students, parents and teachers. We eliminate very low correlates to maximize the informational content of each index and reduce noise. To do this, we compute Spearman correlations between all items under consideration, assess their Cronbach's alphas, and perform an exploratory factor analysis. Once we narrow down the list of items for a scale, we perform an additional confirmatory factor analysis to validate these items and ensure their item factor loadings have similar magnitudes. Finally, for each of these potential mediating factors and in each wave, we perform PCA analysis and select first component of PCA to generate the three final indexes. Tables A.1 to A.3 present results from this PCA analysis for student, parent, and teacher indexes, respectively, along with their eigenvectors and eigenvalues. Each input in each table was first constructed based on Cronbach's alphas.

We construct student behaviors index through five scales of study time, school effort and initiative in class as perceived by teachers, truancy, academic self-efficacy, and mental health, and three additional dummies for whether students ever cheated on exams, aspire to go to university, and

expects to be able to go to university. Effort and initiative are often considered as potential mechanisms for academic peer effects (see e.g., Feld and Zoelitz (2017) or Xu, Zhang and Zhou (2022)). Our data allows us to differentiate between study time outside the classroom and student engagement in the classroom, as measured by initiative. We analyze effort as perceived by teachers since it can be influenced by peers for different reasons (e.g., through relative performance benchmarking by teachers) and could also be capturing other types of investments (e.g., if teachers focus on specific students based on their relative perceived effort). Mental health and academic self-efficacy could be affected positively if minority peers help foster inclusive atmosphere in classroom or negatively if they generate conflict, disruption, or if students witness discrimination of their colleagues. Similar reasons could drive positive or negative responses in exam cheating and truancy. Finally, non-cognitive skills such as aspirations and expectations about one own ability have been shown to be partially formed by social interactions and to be productive for academic achievement (Carlana, La Ferrara and Pinotti, 2022).

We construct parental behaviors and investments index through four scales of monetary investments, time investments, parental strictness and parental support, and three additional dummies for whether parents have conflicts with their child, use harsh punishment/parenting, and aspire for their child to go to university. School environmnet has been shown to affect parental investments and academic achievement (see e.g., Pop-Eleches and Urquiola (2013) or Fredriksson, Öckert and Oosterbeek (2016)), and much of this work postulates peers as a key driver of these effects (see e.g. Pop-Eleches and Urquiola (2013) or Jackson (2013)). Furthermore, monetary and time parental investments are the canonical Beckerian household investments in human capital and can therefore respond as complements or substitutes to school inputs, such as exposure to minorities in classroom. Parental strictness, support, and harshness belong to a broader set of parenting styles which can also be modelled as parental investments (Cobb-Clark, Salamanca and Zhu, 2019) and thus also react to school inputs for similar reasons. Conceptually, strictness is close to parental monitoring, which can be an important margin in this context, whereas support is closer to warmth and more generally measures parental engagement. Harshness is also not uncommon in this context, and can be a margin of reaction for parents if they see it as a way to ensure their children's school performance. We see parent-child conflict as a potential outcome of all these interactions which can in itself affect student outcomes. Finally, parents' aspirations for their child to go to university can in themselves drive student outcomes (Janzen et al., 2017) and could proxy for other unmeasured inputs (e.g., parental encouragement).

Lastly, we construct teacher behaviors index based on teacher engagement scale, frequency of parent-teacher meetings, teacher mental distress scale, use of modern teaching practices scale, their assessment of the classroom's academic level compared to other classrooms in the same grade, and finally a dummy variable for whether teachers report that the classroom is hard to manage. We might expect students exposed to more diverse classrooms to have a more positive experience in school (Feld and Zoelitz, 2017, Booij, Leuven and Oosterbeek, 2017), or to feel marginalized (Pop-Eleches and Urquiola, 2013). Furthermore, lower-achieving peers such as

Indigenous students might increase classroom disruption, making classroom management harder and decreasing teacher engagement (Duflo, Dupas and Kremer, 2011). Ultimately, teachers might feel more motivated and less tired of teaching when working with a more homogenous classrooms with fewer minority students.

Table A.4 presents basic descriptive statistics for the full TEPS sample (column 1), our estimation sample (column 2), and then for the three ethnic groups we consider in the paper: Indigenous students (column 3), Hakka students (column 4), and Hoklo students (column 5). The first set of variables presents student characteristics, the second set parental characteristics, and the third set school characteristics. Comparing the first two columns suggests that our estimation sample is very similar to the full data set or if anything is is slightly positively selected.[8] Thus, our estimates should be externally valid to the full population of Taiwanese schools. This table further makes it clear that Indigenous students are much more disadvantaged than either Hakka or Hoklo students. Their baseline test scores are over 90% of a SD lower than those of Hoklo majority and they also come from larger families (2.4 siblings vs 1.7 for Hoklo) with less educated parents (80% of parents with at most high school vs. 64% for Hoklo) who have lower incomes (30% in lowest income bracket vs. 9% for Hoklo). Interestingly schools attended by Indigenous students are about half as likely to have principal with postgraduate degree compared with majority students but years of experience of the principals is comparable. This could reflect the fact that Indigenous Peoples in Taiwan cluster in more rual areas rather than in the largest cities. Furthermore, these striking differences highlight the value added of our random assignment. On the other hand, Hakka and Hoklo students are very similar to each other when it comes to demographics. The main difference present across all three groups is in their ability to speak language other than Mandarin which we take as a proxy for differential culture. Namely, almost no Hoklo majority students are fluent in either Hakka or Indigenous languages. Likewise Hakka students do not know Indigenous languages and conversely Indigenous students do not know Hakka. Importantly, across the three groups about 90% of students are fluent in Mandarin.[9]

4 Empirical Strategy

4.1 Estimating Equation

In order to estimate effects of exposure to minority students in classroom we follow peer effects literature and use linear in means models. Specifically for test scores we estimate:

8. The difference between these two columns comes primarily from the fact that we drop Waishengren and few schools which we know are exempt from following random assignment policy e.g., schools specializing in arts.

9. Lower test scores observed for Indigenous students could explain why they are somewhat less likely to be fluent in Mandarin compared to ethnic majority students. We consider langauge skills as fluency as one of our mediators later in the analysis.

$$Score_{iscw_2} = \alpha_1 + \alpha_2 \overline{\%Indigenous^{-i}_{iscw_1}} + \alpha_3 \overline{Hakka^{-i}_{icsw_1}} + \delta \mathbf{X}_{iw_1} + \gamma_{sw_1} + \varepsilon_{iscw_1} \quad (1)$$

where i indexes students, s indexes schools, c indexes classrooms, w_1 indexes start of grade 7 (baseline) while w_2 indexes start of grade 9 (when we measure outcomes). Coefficients of interest in Equation 1 are α_2 and α_3 representing causal effects of exposure of Hoklo majority students to share of Indigenous and Hakka students randomly assigned in the baseline grade. We also include control variables measure at the baseline to reduce noise in our relatively small sample sizes ($\mathbf{X}_{iw_1}$) and baseline school fixed effects (γ_{sw_1}) since our randomization is across classrooms (c) within schools (s). The control variables include baseline test scores and thus our main results have a value-added interpretation i.e., how much more students in classrooms with more vs. less minorities learn by grade 9 conditional on what they already knew in grade 7. Since we run these regressions on a full sample of students, rather than just on Hoklo majority, we control for student's own minority status and its interaction with the share of the two minorities we consider. We cluster the standard errors at wave 1 classroom since this is the level of randomization.[10]

When considering indexes of student behaviors, parental behaviors and investments, or teacher behaviors as dependent variables in select specifications we modify Equation 1 slightly. First, we do not control for student baseline test scores. Second, we include measures of these outcome variables at the baseline in grade 7. In that, causal effects from these regressions can likewise be interpreted in a value-added sense where, for example, we measure how the amount of parental investments changed between grades 7 and grades 9 conditional on their investments in grade 7. We discuss these various permutations in our robustness check section.[11]

4.2 Identifying Assumption: Random Assignment to Classrooms

Our identification strategy exploits institutional feature of Taiwanese junior high schools where students are randomly assignment to classrooms. Random assignment to treatment is the main identification assumption under which our estimates can be interpreted as causal effects of exposure of Hoklo majority students to Indigenous and Hakka minorities. Therefore, we first show that our treatments of interest – classroom leave-out-means of Indigenous and Hakka students – are as good as randomly assigned.

We start by running balancing tests on standardized test scores in wave 1, eight baseline characteristics and eight pre-assignment educational characteristics. Baseline characteristics include student gender, whether they were born prior to 1989, whether they live in a two-parent household,

10. Our conclusions remain unchanged if we instead cluster at school-level allowing correlated errors across classrooms.

11. We are still working on the robustness section. Sorry.

whether their household income is above median (NT$50,000 monthly, equivalent to roughly US$1,500 in 2001 dollars), whether they live in a household with at least one stable source of income, whether their parents have at most a high school degree, whether their father is employed, and finally whether at least one parent has a self-reported good health status. Pre-treatment educational characteristics are measured using retrospective questions asked at baseline, covering the student's outcomes up to a junior high school, such as behavior and health during primary school, attitudes to school and homework since primary school, and family investments in tutoring and homework before junior high school.

Thus, in total we test balance in 17 characteristics for two variables of interest yielding 34 tests. Given the number of comparisons we are doing we would expect to see at least three coefficients to show up as statistically significant at 10% level due to pure chance. Table 1 presents these results and we find only two coefficients statistically significant at 10% level. It appears that in classrooms that are randomly allocated higher share of Indigenous students Hoklo fathers are somewhat more likely to be employed while in classrooms that are randomly allocated higher share of Hakka students Hoklo parents have higher likelihood of having income above median. This, if anything, would imply positive selection into classrooms with higher share of minorities rendering our negative effects conservative. However, note that even these significant coefficients are quantitatively small when compared to the baseline means of their respective dependent variables. Furthermore, all the remaining non-significant coefficients are likewise small and relatively precisely estimated. We take this as evidence of compliance with the mandate of random assignment of students to classrooms within schools and in support of our identifying assumption.

5 Results

5.1 Test Scores

Having established that our identifying assumption is likely to hold, we first estimate the effects of exposure to minority students on academic achievement of Hoklo majority. The results are presented in Table 2 where akin to Table 1 we scale all the coefficients by a one SD increase in classroom share of either Indigenous or Hakka peers. We have three main findings stemming from this table. First, conditional on own test scores measured at the baseline additional controls or sample changes do not affect our point estimates of interest. This is expected given the balance we have documented in Table 1. At the same time, there is a small difference in effect sizes between column (1) where we do not control for own test scores and subsequent columns where we do. This is likely due to very strong correlation between test scores in waves 1 and 2 and relatively low correlation between share of minorities and wave 1 test scores (as documented in Table 1). Since omitted variables bias formula multiples these two correlations even slightest

imbalance in baseline test scores will be magnified by strong correlation between wave 1 and wave 2 scores. Overall, we view the point estimates of -0.018 and -0.021 as qualitatively identical and more importantly inclusion of baseline test scores sizably shrinks the standard errors on our estimates of interest. Second, irrespective of the specification, we find negative peer effects from exposure to Indigenous students and no negative effects of exposure to Hakka minorities. In three out of fours specifications, we can also reject the equality between the two peer effects coefficients. Third, looking at the interaction terms in the last column of the table, we do not see that increased shares of minorities in classroom help minority students themselves. These estimates although positive are not statistically significant at conventional level. We do note, however, that the point estimates suggest that the negative peer effect for Indigenous students could be reduced by approximately 30%.

Overall, these results suggest that Hoklo majority students have about 2.4 percent of a standard deviation lower test scores per one SD deviation increase in share of Indigenous students in their classroom where a SD in share of Indigenous students represents approximately two children. In our data 56% of classrooms have no Indigenous children, 29% have just one child while 15% have more than one child. Thus, adding one indigenous child to the typical classroom of 35 students would increase Indigenous peers share by at least 2.9% which translates into a negative effect of about 1.1% of a SD. Given that this average effect, albeit small, would apply to majority of students in Taiwanese schools its aggregate effects should not be understated. At the same time, using 95% confidence interval, we can rule out negative Hakka effects of as little as 0.9 percent of a standard deviation.

To put these estimates into context it is worth highlighting that prior results in the literature have been both limited and mixed; and no prior study had random assignment of minorities to either schools or classrooms. Angrist and Lang (2004) as well as Figlio and Özek (2019) do not find any negative effects on cognitive abilities of native/majority students exposed to racial minorities or immigrants, respectively. At the same time, Figlio et al. (2021) actually find that an increase in immigrants at school from 10th to 90th percentile increases native student's test scores in mathematics and reading by 2.8 and 1.7 percent of a standard deviation, respectively. The only other study that find negative effects, Diette and Oyelere Uwaifo (2014), shows that a 10 percentage point increase in limited English students lowers mathematics and reading scores of native students by about 0.7 percent of a standard deviation. Thus, out zero Hakka estimates square with some prior findings, however, our negative Indigenous Peoples estimates are negative and appear economically meaningful.

We also investigated heterogeneity in our estimates along two dimensions: student gender and parental resources. Our interest in gender stems from two recent research insights. First, Autor et al. (2019) among others suggest that boys may be particularly sensitive to inputs and in particular to school inputs (Autor et al., 2016). To the extent that this is true, and indeed there is differential gendered-productivity of inputs, then any changes in parental or teacher investments

in response to exposure to Indigenous peers might be more consequential for boys than for girls. Second, there is evidence in the literature that parents might invest different amounts of resources into their sons and daughters (Raley and Bianchi, 2006, Karbownik and Myck, 2017) while research in Asian societies specifically suggests that parents underinvest in daughters (Parish and Willis, 1993, Das Gupta and Li, 1999). In this case, we'd expect more negative effects for female compared to male students. When it comes to financial resources we hypothesize that in resource constrained households the effects might be muted since these parents do not have much resources to invest in their children in the first place. Similar argument it put fort by Karbownik and Özek (forthcoming) in their explanation for within family sibling spillovers generated by school starting age policy in Florida.

Table A.5 presents these results where we also provide p-values for whether the coefficients across the aforementioned groups are statistically identical or not. We find that negative effects generated by exposure to Indigenous peers are about 50% larger for male compared with female students, and this difference is almost statistically significant at conventional levels. Such finding is consistent with differential responses of boys to inputs but not with differential investment levels which tend to favor boys rather than girls in Taiwan (Parish and Willis, 1993). Thus, if anything our negative effect for boys is an underestimate for the effects expected in societies with more gender-neutral attitudes.[12] Furthermore, we find that effects are likewise larger in households with more resources. This makes sense if these households has more disposable income that might choose not to invest in the children who are randomly allocated to classrooms with Indigenous peers compared to classrooms without or with fewer such students. We consistently find no statistically significant or economically meaningful effects for exposure to Hakka students.

5.2 Robustness

Having presented our main results, here we document few basic robustness checks that we performer so far. In all the sensitivity analysis we focus on fully saturated model from column 4 of Table 2 but we only display coefficients on Indigenous and Hakka peers. Our preferred treatment measure is standard deviations of minority peers in classrooms but this might be misspecified. Thus, in Table A.6 we present two alternative ways of defining treatment: (1) share of specific minority students and (2) any student from a specific minority group capturing the extensive margin of the treatment. The results when using share of students are substantively unchanged. The point estimates increase which makes sense given that we changed the definition of the treatment variable but this change is proportional for both Indigenous and Hakka peers. Namely, both coefficients increase by a factor of approximately 16. Since the fraction of Indigenous students in the population is about 4% this means that randomly distributing them into classrooms in Taiwan would produce a negative effect of 1.6% of a SD. Restricting the

12. We are currently investigating if we see differential investments of parents by gender of their children.

distribution to only schools with at least one Indigenous child, which increases the Indigenous share in these schools to 6.9%, would yield a negative effect of 2.8% of a SD. Both effect sizes are certainly within the realm of prior estimates in the literature.

Given the relatively small share of Indigenous students in population, it is perhaps more policy relevant to ask if having exposure to any such peer – on the extensive margin – would also have negative effects similar to those that we estimated on the intensive margin. When we use a dummy variable for any minority in the classroom we find a negative point estimate of 4.7% of a SD for Indigenous peers. This effect is about twice the size of estimate in column 1 which suggest some non-linearity and diminishing penalty over subsequent Indigenous students.[13] Interestingly, on the extensive margin, we also find negative and statistically significant penalty from exposure to Hakka peers that is only somewhat smaller than penalty from Indigenous peers. Given that estimates in columns 1 and 2 for Hakka are positive, this suggests to us that the penalty from Hakka peers might be strongly decreasing in size of this peer group which in many schools is larger than Indigenous peer group due to the fact that Hakka students constitute about 16% of the population rather than just 4%.[14]

Another set of robustness check we perform pertains to their stability over alternative sample choices. Table A.7 presents these results. Column 1 replicates our baseline results from column 4 of Table 2 while column 2 drops majority Hakka and Indigenous schools where we might expect more muted peer effects. Then in column 3 we exclude Indigenous and Hakka students from the sample also dropping ethnic indicators and their interactions with share of ethnic minority students. Finally, in column 4 we drop all private schools which we worry might be less likely in following governmental rules or cater to a more select set of students. Irrespective of the sample we choose, we find very consistent results. Negative, statistically significant, and similar magnitude-wise estimates for Indigenous peers and never statistically significant and small coefficients for Hakka peers. Based on these exercises we conclude that our main results are robust to reasonable alternative specifications of treatment variables or estimation samples.

5.3 Alternative Explanations

As a transition between robustness checks and mechanisms we first verify to what extent our estimates are driven by characteristics correlated with indigeneity. Table A.4 makes it clear that Indigenous students have lower ability, are less fluent in Mandarin, and come from more disadvantaged households. Given the literature on ability peer effects (e.g., Lavy, Silva and

13. We have also estimated models with indicators for just one, just two, just three, and four of more Indigenous students in the classroom. The results suggest increasing penalties with more more students but at a decreasing rate; meaning that each point estimate is more negative but the difference between the next and prior estimate is diminishing. Standard errors are large in this specification and thus due to their noisiness we opted out of presenting it.

14. We are currently investigating this flip in sign further.

Weinhardt (2012)), important of language skills in schooling (e.g., Boucher et al. (2020)), and effects of disadvantage in generating peer effects (e.g., Carrell, Hoekstra and Kuka (2018)) we need to ensure that our peer effects are indeed due to the indigeneity of these students rather than due to any other correlated characteristics. Since we have not found any meaningful effects of exposure to Hakka minorities, we omit them in this and subsequent analyses.[15] Furthermore, the decompositions presented below, unlike our main estimates, do not have a causal interpretation and should be treated as a descriptive and exploratory findings.

To answer this question we use decomposition method proposed in Gelbach (2016) which we adjust to accommodate the inclusion of fixed effects which we need since our randomization is performed at classroom-level within schools. Importantly, unlike other decomposition methods, this one is not sensitive to ordering of the explanatory variables and takes into account correlation between them. Specifically, we only use within-school variation and compute the following equation for each input k:

$$\underbrace{ME}_{\substack{\text{total}\\ \text{mediated}\\ \text{effect}}} = \sum_k \underbrace{ME_k}_{\substack{\text{input } k\\ \text{contribution}}} = \sum_k \underbrace{\frac{\partial S_{ics2}}{\partial y^k_{ics2}}}_{\substack{\text{input } k\\ \text{average return}\\ \text{on scores}}} \times \underbrace{\frac{\partial y^k_{ics2}}{\partial \bar{S}^{-i}_{cs1}}}_{\substack{\text{peer effect}\\ \text{on input } k}}$$

where k includes Indigenous test scores in wave 1 , Indigenous fluency in Mandarin language, a composite score of socioeconomic status of Indigenous students household, and a composite score of behaviors and investments of Indigenous parents. The parental composite index is the same as we explore in the subsequent analysis but for Indigenous rather than majority parents.

Table 3 presents these results and shows that socioeconomic status and differential investments of Indigenous parents do not explain any of the negative effect on Hoklo majority test scores. On the other hand, lower test scores and Mandarin fluency of Indigenous students can explain part of the uncovered effects. Together these two correlates account for about 1/3 of the estimated negative effect meaning that majority of the effect is due to indigeneity itself or endogenous responses of students, parents, and teachers to Indigenous status of minority students. Overall, we conclude that although characteristics correlated with Indigeneity (or for that matter potentially other minorities status in different settings) should be accounted for, they are not the predominant factor driving the negative human capital effects documents in Table 2.

15. It feels unintuitive to try to explain a zero effects. Nonetheless, we run all the regressions with share of Hakka peers. Unsurprisingly we do not find any effects of either correlates of Hakka status or any effects on changes in parental or teacher behaviors studied in the next section. These zero effects are consistent with zero effects we find on test scores in Table 2. We omit reporting them for brevity.

5.4 Student, Parental, and Teacher Behavioral Changes

We now turn to another set of channels that could potentially explain the documented negative peer effect. In particular, we propose that differential behaviors of ethnic majority students, their parents, or teachers in classrooms with Indigenous students may be responsible for these effects. We conduct this analysis in two steps. First, we substitute our dependent variable with indexes of student, parents, and teachers behaviors described in Section 3. In this analysis, like with test scores, higher values of the index are better meaning that negative estimates correspond to less desirable behaviors. Importantly these indexes are positively and significantly correlated with test scores. Here we also add an estimate for subjective assessments of students cognitive outcomes by their teachers.[16] We hypothesize that perhaps parents might underinvest in their children because teachers report, based on their overall opinion about the classroom which in itself could be influences by Indigenous students, that their child is performing sufficiently well in schools. Such a finding would be consistent with reference-dependent preferences where agents exert more effort if expectations are high compared to setting when they are low (Abeler et al., 2011). Second, akin to results presented in Section 5.3, we use Gelbach (2016) decomposition to understand to what extent these changes in student, parent, and teachers behaviors could explain our negative peer effects.

Table 4 presents the results for the first part of the analysis. Consistent with our prediction other agents, thus far mostly ignored in the extant literature, appear to matter in the production function as we find that in classrooms with higher share of Indigenous students ethnic majority parents exhibit negative behavioral changes.[17] Why would parents lower their investments in such classrooms? For example, it could be that ethnic majority parents perceive these classrooms as weaker and thus decide to spend their resources elsewhere (perhaps on their other children; see e.g., Karbownik and Özek (forthcoming) studying sibling spillovers in Florida context). On the other hand, a point that we come back to below, perhaps they get an incorrect signal from the teacher about the (relative and subjectively assessed) performance of their child and believe that they don't need to invest additional time and money into their children.

16. The developmental assessment score is constructed based on 10 questions answered by the homeroom teachers (Dao Shi). The questions ask them to assess the student on a 5-point scale going from *Poor* to *Excellent* on the following aspects: mental maturity, computer operation skills, oral presentation skills, writing skills, cooperation with other students to complete task, leadership, the ability to independently collect and organize materials, abstract and logical thinking ability, problem solving ability, motivation to study. Thus, this measure is more holistic that cognitive test scores which we use as our primary outcome. Nonetheless, the two measure are highly positively correlated and the score is certainly meant to reflect student's cognitive ability to a certain degree.

17. When we investigate specific components of the index we find that the negative effect is driven by lower spending on private tutoring, lower university aspirations, and less time spend with their children. We prefer to present the aggregated index results rather than its separate components since given their number those do not survive adjustment for multiple hypothesis testing (Clarke, Romano and Wolf, 2020). Thus, the analysis of specific components for each index should be treated as exploratory and descriptive.

Likewise, we find negative effects on teacher behaviors.[18] On the other hand, we do not find any statistically significant effects on either student behaviors or on teacher's subjective assessment of student's ability. The former suggests that the observed peer effects are unlikely to be caused by students themselves – a prevalent hypothesis behind the origin of peer effects literature – due to either their characteristics or actions. Rather, they occur because of changes in behaviors of parents and teachers. The latter finding suggests that perhaps teachers in classrooms with higher fractions of Indigenous students tent to evaluate Hoklo majority students overly favorably. Of course, this favoritism would not be captured by the test scores as teachers cannot influence them and don't actually know how their students performed. Although we are unable to discern if teacher's subjective assessment is a causative factor behind changes in parental behaviors or if these two occur in parallel, it certainly seems plausible that no negative feedback from a teacher could change reference point of student's parents and alter then investment behaviors.

We now turn to the question if these changes in behaviors matter for the estimated peer effect. Table 5 presents these results.[19] Since student, parental, and teacher behaviors are correlated and our method accounts for this interdependence the coefficients change somewhat compared to those from Table 4. In particular, coefficient on student-related mediators flips the sign and becomes positive albeit statistically insignificant. This means that conditional on parental and teacher behavioral changes, if anything, student behavior improves in classrooms with higher share of Indigenous students potentially offsetting the negative peer effect. On the other, we consistently find negative and statistically significant coefficients for parental- and teacher-related indexes which means that part of the negative effect can be explained by decline in behaviors of these two groups. How much of the effect we can explain? Table 5 suggests that almost 2/3 of the negative peer effects could be due to changes in behavior of students, parents, and teachers and this is about twice the amount that was explained by characteristics correlated with indigeneity discussed in Section 5.3. Taken together these results support the notion that peer effects in schools should be modelled in the context of multi-factor production function while researchers should consider endogenous changes in behaviors of other agents such as parents or teachers (and perhaps also administrators which we cannot observe in our data) as potential explanations for the effects they uncover. Our results certainly suggest that direct peer effects explain a rather small part of the effects documented in Section 5.1.

Our final analysis combines the decomposition results presented in Tables 3 and 5 and asks if we can fully explain away the negative peer effect documented in Table 2 by accounting for correlated student characteristics as well as responses of students, parents and teachers. Table A.8 presents

18. This index is primarily driven by teachers having lower average assessment of class ability and reporting that such classrooms are harder to manage. Interestingly, they also report that classrooms with higher share of Hakka students are harder to manage – the only meaningful estimate we found for Hakka share. This could suggest that heterogeneous classrooms are more broadly harder to manage.

19. Here we do not include teacher's subjective assessment of student's ability in the teacher-related mediators.

these results. First, it is worth highlighting that including preassignment controls (conditional on including wave 1 test scores) does not alter the point estimates – comparing columns 1 and 2 – which provides further support for validity of our identifying assumption discussed in Section 4.2. Including correlated peer characteristics (column 3) explains about 25% of the estimated negative effect but it remains statistically significant. This is somewhat smaller but certainly within the same range as the results produced by Gelbach (2016) decomposition in Section 5.3. At the same time, including student, parent, and teacher indexes (column 4) halves the negative peer effect and it is no longer statistically significant. Finally, conditioning of both of these plausible channels (column 5) explains away almost all of the negative coefficient and renders it close to zero.

6 Conclusions

This paper shows that minority peers can have negative effects on cognitive outcomes of majority children and that these negative externalities can be group-specific even within the context of a single country and education system. We find that classroom exposure to Indigenous peers lowers test scores of ethnic majority students by 2.4% of a SD per one SD increase in number of Indigenous students. We do not find any statistically significant or economically meaningful peer effects from the other minority group we consider - Hakka. Furthermore, we document that a non-trivial share of the negative effect can be explained by changing behaviors and investments of majority parents as well as teachers in these classrooms. On the other hand, characteristics correlated with indigeneity can account for a smaller fraction of the estimated coefficient. In that, the negative effect should not be attributed to the ethnicity of students per se but rather to how others react when interacting with ethnic minorities. Thus, successful classroom integration efforts need to better understand and address these endogenous responses of parents and teachers which have largely been ignored in the peer effects literature to date.

References

Abeler, Johannes, Armin Falk, Lorenz Goette, and David Huffman. 2011. "Reference points and effort provision." *American Economic Review*, 101(2): 470–492.

Agostinelli, Francesco. 2018. "Investing in children's skills: An equilibrium analysis of social interactions and parental investments."

Ahn, Thomas, and Christopher Jepsen. 2015. "The effect of sharing a mother tongue with peers: evidence from North Carolina middle schools." *IZA Journal of Migration*, 4(1): 1–21.

Alan, Sule, Ceren Baysan, Mert Gumren, and Elif Kubilay. 2021. "Building social cohesion in ethnically mixed schools: An intervention on perspective taking." *The Quarterly Journal of Economics*, 136(4): 2147–2194.

Alan, Sule, Enes Duysak, Elif Kubilay, and Ipek Mumcu. 2020. "Social Exclusion and Ethnic Segregation in Schools: The Role of Teacher's Ethnic Prejudice." *The Review of Economics and Statistics*, 1–45.

Alba, Richard, Jennifer Sloan, and Jessica Sperling. 2011. "The integration imperative: The children of low-status immigrants in the schools of wealthy societies." *Annual Review of Sociology*, 37: 3955–415.

Angrist, Joshua. 2014. "Does school integration generate peer effects? Evidence from Boston's Metco Program." *Labour Economics*, 30: 98–108.

Angrist, Joshua, and Kevin Lang. 2004. "Does school integration generate peer effects? Evidence from Boston's Metco Program." *American Economic Review*, 94(5): 1613–1634.

Autor, David, David Figlio, Krzysztof Karbownik, Jeffrey Roth, and Melanie Wasserman. 2016. "School quality and the gender gap in educational achievement." *American Economic Review*, 106(5): 289–295.

Autor, David, David Figlio, Krzysztof Karbownik, Jeffrey Roth, and Melanie Wasserman. 2019. "Family disadvantage and the gender gap in behavioral and educational outcomes." *American Economic Journal: Applied Economics*, 11(3): 338–381.

Bifulco, Robert, Jason Fletcher, and Stephen Ross. 2011. "The effect of classmate characteristics on post-secondary outcomes: Evidence from the Add Health." *American Economic Journal: Economic Policy*, 3(1): 25–53.

Booij, Adam, Edwin Leuven, and Hessel Oosterbeek. 2017. "Ability peer effects in university: Evidence from a randomized experiment." *Review of Economic Studies*, 84(2): 547–578.

Boucher, Vincent, Semih Tumen, Michael Vlassopoulos, Jackline Wahba, and Yves Zenou. 2020. "Ethnic Mixing in Early Childhood: Evidence from a Randomized Field Experiment and a Structural Model." *Available at SSRN 3753928*.

Brunello, Giorgio, Maria De Paola, and Vincenzo Scoppa. 2010. "Peer effects in higher education: Does the field of study matter?" *Economic Inquiry*, 48(3): 621–634.

Calvo-Armengol, Antoni, Eleonora Patacchini, and Yves Zenou. 2009. "Peer effects and social networks in education." *Review of Economic Studies*, 76(4): 1239–1267.

Card, David, and Jesse Rothstein. 2007. "Racial segregation and the black–white test score gap." *Journal of Public Economics*, 91(11-12): 2158–2184.

Card, David, and Laura Giuliano. 2013. "Peer effects and multiple equilibria in the risky behavior of friends." *Review of Economics and Statistics*, 95(4): 1130–1149.

Carlana, Michela, Eliana La Ferrara, and Paolo Pinotti. 2022. "Goals and gaps: Educational careers of immigrant children." *Econometrica*, 90(1): 1–29.

Carrell, Scott E, Bruce I Sacerdote, and James E West. 2013. "From natural variation to optimal policy? The importance of endogenous peer group formation." *Econometrica*, 81(3): 855–882.

Carrell, Scott E, Richard L Fullerton, and James E West. 2009. "Does your cohort matter? Measuring peer effects in college achievement." *Journal of Labor Economics*, 27(3): 439–464.

Carrell, Scott, Mark Hoekstra, and Elira Kuka. 2018. "The long-run effects of disruptive peers." *American Economic Review*, 108(11): 3377–3415.

Chevalier, Arnaud, Ingo E Isphording, and Elena Lisauskaite. 2020. "Peer diversity, college performance and educational choices." *Labour Economics*, 64: 101833.

Cho, Rosa Minhyo. 2012. "Are there peer effects associated with having English language learner (ELL) classmates? Evidence from the Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K)." *Economics of Education Review*, 31(5): 629–643.

Chung, Bobby W. 2020. "Peers' parents and educational attainment: The exposure effect." *Labour Economics*, 64: 101812. European Association of Labour Economists, 31st annual conference, Uppsala Sweden, 19-21 September 2019.

Clarke, Damian, Joseph Romano, and Michael Wolf. 2020. "The Romano-Wolf multiple-hypothesis correction in Stata." *The Stata Journal*, 20(4): 812–843.

Cobb-Clark, Deborah, Nicolas Salamanca, and Anna Zhu. 2019. "Parenting style as an investment in human capital." *Journal of Population Economics*, 32(4): 1315–1352.

Coleman, James. 1968. "Equality of educational opportunity." *Integrated Education*, 6(5): 19–28.

Das Gupta, Monica, and Shuzhuo Li. 1999. "Gender bias in China, South Korea and India 1920-1990: Effects of war and famine." *Development and Change*, 30(3): 619–652.

Diette, Timothy, and Ruth Oyelere Uwaifo. 2014. "Gender and race heterogeneity: The impact of students with limited English on native students' performance." *American Economic Review*, 104(5): 412–417.

Diette, Timothy, and Ruth Oyelere Uwaifo. 2017. "Do limited English students jeopardize the education of other students? Lessons from the North Carolina public school system." *Education Economics*, 25(5): 446–461.

Duflo, Esther, Pascaline Dupas, and Michael Kremer. 2011. "Peer effects, teacher incentives, and the impact of tracking: Evidence from a randomized evaluation in Kenya." *American Economic Review*, 101(5): 1739–1774.

Elsner, Benjamin, and Ingo Isphording. 2017. "A big fish in a small pond: Ability rank and human capital investment." *Journal of Labor Economics*, 35(3): 787–828.

Fang, Guanfu, and Shan Wan. 2020. "Peer effects among graduate students: Evidence from China." *China Economic Review*, 60: 101406.

Feld, Jan, and Ulf Zoelitz. 2017. "Understanding peer effects: On the nature, estimation and channels of peer effects." *Journal of Labor Economics*, 35(2): 387–428.

Feng, Han, and Jiayao Li. 2016. "Head teachers, peer effects, and student achievement." *China Economic Review*, 41: 268–283.

Figlio, David, and Umut Özek. 2019. "Unwelcome guests? The effects of refugees on the educational outcomes of incumbent students." *Journal of Labor Economics*, 37(4): 1061–1096.

Figlio, David, Paola Giuliano, Ricardo Marchingiglio, , Umut Özek, and Paola Sapienza. 2021. "Diversity in schools: Immigrants and the educational performance of U.S. born students." National Bureau of Economic Research.

Fredriksson, Peter, Björn Öckert, and Hessel Oosterbeek. 2016. "Parental responses to public investments in children: Evidence from a maximum class size rule." *Journal of Human Resources*, 51(4): 832–868.

Friesen, Jane, and Brian Krauth. 2011. "Ethnic enclaves in the classroom." *Labour Economics*, 18(5): 656–663.

Garlick, Robert. 2018. "Academic Peer Effects with Different Group Assignment Policies:

Residential Tracking versus Random Assignment." *American Economic Journal: Applied Economics*, 10(3): 345–69.

Geay, Charlotte, Sandra McNally, and Shqiponja Telhaj. 2013. "Non-native speakers of English in the classroom: what are the effects on pupil performance?" *The Economic Journal*, 123(570): F281–F307.

Gelbach, Jonah. 2016. "When do covariates matter? And which ones, and how much?" *Journal of Labor Economics*, 34(2): 509–543.

Gould, Eric D, Victor Lavy, and M Daniele Paserman. 2009. "Does immigration affect the long-term educational outcomes of natives? Quasi-experimental evidence." *The Economic Journal*, 119(540): 1243–1269.

Green, Colin, and Jon Marius Vaag Iversen. 2022. "Refugees and the educational attainment of natives: Evidence from Norway." *Economics of Education Review*, 88: 102258.

Hall, Gillette, and Harry Patrinos. 2014. "Indigenous Peoples, poverty, and development." In *Indigenous Peoples, povery, and development*. , ed. Gillette Hall and Harry Patrinos. Cambridge.

Hanushek, Eric A, John F Kain, and Steven G Rivkin. 2009. "New evidence about Brown v. Board of Education: The complex effects of school racial composition on achievement." *Journal of labor economics*, 27(3): 349–383.

Heckman, James. 2000. "Policies to foster human capital." *Research in Economics*, 54(1): 3–56.

Hoxby, Caroline. 2000. "Peer effects in the classroom: Learning from gender and race variation." National Bureau of Economic Research Cambridge, Mass., USA.

Hunt, Jennifer. 2017. "The impact of immigration on the educational attainment of natives." *Journal of Human Resources*, 52(4): 1060–1118.

Imberman, Scott A, Adriana D Kugler, and Bruce I Sacerdote. 2012. "Katrina's children: Evidence on the structure of peer effects from hurricane evacuees." *American Economic Review*, 102(5): 2048–82.

Jackson, Kirabo. 2013. "Can higher-achieving peers explain the benefits to attending selective schools? Evidence from Trinidad and Tobago." *Journal of Public Economics*, 108: 63–77.

Janzen, Sarah, Nicholas Magnan, Sudhindra Sharma, and William Thompson. 2017. "Aspirations failure and formation in rural Nepal." *Journal of Economic Behavior & Organization*, 139: 1–25.

Jensen, Peter, and Astrid Würtz Rasmussen. 2011. "The effect of immigrant concentration in

schools on native and immigrant children's reading and math skills." *Economics of Education Review*, 30(6): 1503–1515.

Kang, Changhui, et al. 2007. "Classroom peer effects and academic achievement: Quasi-randomization evidence from South Korea." *Journal of Urban Economics*, 61(3): 458–495.

Karbownik, Krzysztof, and Michał Myck. 2017. "Who gets to look nice and who gets to play? Effects of child gender on household expenditures." *Review of Economics of the Household*, 15(3): 925–944.

Karbownik, Krzysztof, and Umut Özek. forthcoming. "Setting a good example? Examining sibling spillovers in educational achievement using a regression discontinuity design." *Journal of Human Resources*.

Kymlicka, Will. 1995. "The rights of minority cultures." In *The rights of minority cultures*. , ed. Will Kymlicka. Routledge.

Kymlicka, Will. 2017. "The internationalization of minority rights." In *Global Minority Rights*. , ed. Joshua Costellino, 35–66. Routledge.

Lavy, Victor, Olmo Silva, and Felix Weinhardt. 2012. "The good, the bad, and the average: Evidence on ability peer effects in schools." *Journal of Labor Economics*, 30(2): 367–414.

Law, Wing-Wah. 2004. "Translating globalization and democratization into local policy: Educational reform in Hong Kong and Taiwan." *International Review of Education*, 50(5/6): 497–524.

Lim, Jaegeum, and Jonathan Meer. 2017. "The impact of teacher–student gender matches random assignment evidence from South Korea." *Journal of Human Resources*, 52(4): 979–997.

Lim, Jaegeum, and Jonathan Meer. 2020. "Persistent Effects of Teacher–Student Gender Matches." *Journal of Human Resources*, 55(3): 809–835.

Morales, Camila. 2022. "Do refugee students affect the academic achievement of peers? Evidence from a large urban school district." *Economics of Education Review*, 89: 102283.

Ohinata, Asako, and Jan C Van Ours. 2013. "How immigrant children affect the academic achievement of native Dutch children." *The Economic Journal*, 123(570): F308–F331.

Ohinata, Asako, and Jan C Van Ours. 2016. "Quantile peer effects of immigrant children at primary schools." *Labour*, 30(2): 135–157.

Parish, William, and Robert Willis. 1993. "Daughters, education, and family budgets: Taiwan experiences." *Journal of Human Resources*, 28(4): 863–898.

Pettigrew, Thomas. 1998. "Intergroup contact theory." *Annual Review of Psychology*, 49: 65–85.

Pettigrew, Thomas, Linda Tropp, Ulrich Wagner, and Olivia Christ. 2011. "Recent advances in intergroup contact theory." *International Journal of Intercultural Relations*, 35(3): 271–280.

Pop-Eleches, Christian, and Miguel Urquiola. 2013. "Going to better school: Effects and behavioral responses." *American Economic Review*, 103(4): 1289–1324.

Raley, Sara, and Suzanne Bianchi. 2006. "Sons, daughters, and family process: Does gender of children matter?" *Annual Review of Sociology*, 32: 401–421.

Rivas-Drake, Deborah, Muniba Saleem, David Schaefer, Michael Medina, and Robert Jagers. 2019. "Intergroup contact attitudes across peer networks in school: Selection, influence, and implications for cross-group friendships." *Child Development*, 90(6): 1898–1916.

Tonello, Marco. 2016. "Peer effects of non-native students on natives' educational outcomes: mechanisms and evidence." *Empirical Economics*, 51(1): 383–414.

Tsai, Chang-Yen. 2007. "National identity, ethnic identity, and party identity in Taiwan." *Maryland Series in Contemporary Asian Studies*, 1: 1–34.

Vasta, Ellie. 2007. "From ethnic minorities to ethnic majority policy: Multiculturalism and the shift to assimilationism in the Netherlands." *Ethnic and Racial Studies*, 30(5): 713–740.

Wirth, Louis. 1945. "The problem of minority groups." In *The Science of Man in the World Crisis*. , ed. Ralph Linton, 347–372. New York: Columbia University Press.

Xu, Di, Qing Zhang, and Xuehan Zhou. 2022. "The impact of low-ability peers on cognitive and non-cognitive outcomes." *Journal of Human Resources*, 57(2): 555–596.

Tables

Table 1: *Balancing Check*

Treatment:		+1SD in classroom Indigenous peers		+1SD in classroom Hakka peers		
	Mean	Coef.	Std. err.	Coef.	Std. err.	Obs.
Outcomes: Pre-assignment characteristics						
Student test scores	Std	0.005	(0.014)	-0.001	(0.009)	16,262
Female student	0.49	-0.000	(0.006)	0.005	(0.004)	16,262
Student born before 1989	0.37	0.004	(0.006)	-0.002	(0.003)	16,218
Two-parent household	0.91	-0.001	(0.004)	-0.002	(0.002)	16,242
Household income > NT$50k/mo.	0.49	-0.005	(0.006)	0.007*	(0.004)	16,181
Stable income for 1+ household member	0.91	-0.002	(0.004)	-0.001	(0.002)	16,230
Parent(s) education is high school or less	0.65	-0.010	(0.006)	-0.002	(0.004)	16,262
Employed father	0.90	0.008*	(0.004)	0.000	(0.002)	15,725
Parent(s) in good health	0.61	-0.001	(0.007)	-0.001	(0.003)	16,256
Prioritized studies since primary school	0.27	0.007	(0.006)	0.001	(0.003)	16,187
Reviews lessons since primary school	0.18	0.002	(0.005)	-0.001	(0.003)	16,171
Likes new things since primary school	0.42	0.000	(0.007)	0.005	(0.004)	16,144
Was truant in primary school	0.33	0.005	(0.005)	-0.001	(0.003)	16,214
Student had mental health issues in primary school	0.48	-0.001	(0.005)	0.003	(0.003)	16,212
Had private tutoring before junior high	0.69	0.004	(0.008)	-0.001	(0.003)	16,094
Family help with homework before junior high	0.84	0.002	(0.005)	-0.002	(0.003)	15,482
Student quarreled with parents in primary school	0.67	-0.002	(0.005)	0.004	(0.003)	16,231
Guryan et al. (2009) sorting t-statistic		1.1		0.9		
Jochmans (2020) sorting t-statistic		1.0		1.0		

*Note: This table reports estimates of regressing pre-assignment characteristics in wave 1 on the classroom share of indigenous peers in wave 1. All estimators include school fixed effects and control for own indigenous and Hakka status. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table 2: *Effects of Exposure to Minority Peers on Test Scores of Students*

Outcome:	**Student test scores in wave 2 [std]**			
+1SD in classroom	-0.018	-0.021**	-0.021**	-0.024***
Indigenous peers	(0.013)	(0.009)	(0.009)	(0.009)
+1SD in classroom Hakka	0.003	0.004	0.003	0.003
peers	(0.009)	(0.006)	(0.005)	(0.006)
Own test scores in wave 1		0.734***	0.707***	0.706***
[std]		(0.006)	(0.006)	(0.006)
Indigenous peers ×				0.007
Indigenous				(0.005)
Hakka peers × Hakka				0.001
				(0.005)
Indigenous = Hakka (p-value)	0.180	0.011	0.010	0.007
Preassignment controls	No	No	Yes	Yes
R^2	0.22	0.64	0.65	0.65
Schools	307	307	307	307
Classes	1,154	1,154	1,154	1,154
Students	16,262	16,262	16,262	16,262

*Note: This table reports estimates of regressing standardized student test scores in wave 2 on the classroom share of indigenous peers. All regressions include school fixed effects. Preassignment controls include all variables tested for balancing in Table 1. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table 3: *Alternative Explanations: Indigenous Students Characteristics*

Outcome of non-indigenous students:	**Student test scores in wave 2 [std]**	**Share mediated**
+1SD in classroom indigenous peers	-0.025**	100%
	(0.010)	
Effect explained by other peer characteristics	-0.008**	32%
	(0.003)	
→ by peer test scores	-0.005**	20%
	(0.002)	
→ by peer language skills	-0.003	12%
	(0.002)	
→ by peer socioecnomic status	-0.000	0%
	(0.001)	
→ by peer parental investments	-0.000	0%
	(0.001)	
Students	16,262	

*Note: This table reports mediated effects of indigenous peers on non-indigenous students test scores based on Gelbach's (2016) decomposition. All regressions include school fixed effects and control for the share of Hakka peers, the interaction of indigenous peers and own indigenous indicator, and the interaction of Hakka peers and own Hakka indicator. Main effect of indigenous peers displayed. These estimates are produced using the b1x2 Stata package on a within-school transformation of the data. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table 4: *Mechanisms: The Role of Students, Parents, and Teachers*

Treatment effect on majority students:	+1SD in classroom Indigenous peers		
	Coef.	Std. err.	Obs.
Student-related mechanisms	-0.015	(0.015)	15,094
Parent-related mechanisms	-0.033***	(0.012)	15,955
Teacher-related mechanisms	-0.131***	(0.035)	14,960
Teacher subjective assessment of student development	0.005	(0.015)	15,193

*Note: This table reports estimates of regressing wave 2 aggregate indexes of student-related (row 1), parent-related (row 2), and teacher-related (row 3) mechanisms as well as teacher's subjective assessment of student's development on the classroom share of Indigenous and Hakka peers, and their respective interactions with own indigenous and Hakka indicators. Main effects of Indigenous peers are displayed. All regressions school fixed effects and control for indigenous status and test scores in wave 1. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table 5: *The Role of Students, Parents, and Teachers in Explaining the Peer Effect*

Outcome of majority students:	**Student test scores in wave 2 [std]**	**Share mediated**
+1SD in classroom Indigenous peers	-0.025**	100%
	(0.010)	
Mediated effect	-0.015***	60%
	(0.005)	
→ by student-related mediators	0.008	-32%
	(0.006)	
→ by parent-related mediators	-0.007*	28%
	(0.004)	
→ by teacher-related mediators	-0.012***	48%
	(0.004)	
Students	16,262	

*Note: This table reports mediated effects of indigenous peers on non-indigenous students test scores based on Gelbach's (2016) decomposition. All regressions include school fixed effects and control for the share of Hakka peers, the interaction of indigenous peers and own indigenous indicator, and the interaction of Hakka peers and own Hakka indicator. Main effect of Indigenous peers displayed. These estimates are produced using the b1x2 Stata package on a within-school transformation of the data. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Appendix A Additional Tables and Figures

Table A.1: *Construction of Student Behavior Index: PCA Analysis*

(1) Input	(2) Content	(3) First component	(4) Second component
Study hours	Number of hours at school, at tutoring, homework time, …	0.37	0.03
Initiative in class	Ask & answers questions - Math, Chinese, English	0.45	0.11
Truancy	Skipping class, fighting, substance abuse	-0.25	0.42
Cheated on exams	Ever cheats on exams	-0.13	0.53
Academic self-efficacy	Focus, conscientiousness, coopertion, curiosity, …	0.23	-0.26
Mental health	Troubled, depressed, nervous, suicidal thoughts, …	0.00	-0.63
University aspirations	Aspires to go to university	0.51	0.18
University expectations	Expects to be able to go to university	0.52	0.16
Eigenvalue		2.15	1.28

Note: This table reports the results of a principal components analysis of multiple inputs of student behaviors. These inputs were first constructed using numerous survey questions where we compute Spearman correlations between all items under consideration, assess their Cronbach's alphas, and perform a factor analysis generating the variables listed as inputs. The eigenvectors associated with the first and second components are reports, as well as their associated eigenvalues.

Table A.2: *Construction of Parental Behaviors and Investments Index: PCA Analysis*

(1) Input	(2) Content	(3) First component	(4) Second component
Private tutoring	Tutoring hours and expenditures	0.47	0.14
Time with parents	Frequency of various activities together	0.15	0.11
Conflict with parents	Frequency of quarrels with father or mother	0.03	-0.54
Parental strictness	Rule-setting, monitoring money spending, overseeing friends, …	0.49	0.38
Parental support	Discuss future, listens, advise, accepts, …	0.57	-0.27
Harsh parenting	Use of physical punishment	-0.10	0.67
Parent university aspirations	Parents aspire for child to go to university	0.43	-0.09
Eigenvalue		1.50	1.30

Note: This table reports the results of a principal components analysis of multiple inputs of parental behaviors and investments. These inputs were first constructed using numerous survey questions where we compute Spearman correlations between all items under consideration, assess their Cronbach's alphas, and perform a factor analysis generating the variables listed as inputs. The eigenvectors associated with the first and second components are reports, as well as their associated eigenvalues.

Table A.3: *Construction of Teacher Behavior Index: PCA Analysis*

(1) Input	(2) Content	(3) First component	(4) Second component
Teacher engagement	Remembers names, encourages students, cares, adapts, homeworks, reviews	0.09	0.40
Teacher-parent meetings	Number of meetings between parents and teacher	-0.07	-0.40
Teacher mental distress	Felt tired teaching, feels depressed or frustrated, wants to yell, break things, feels tense…	-0.27	0.44
Class hard to manage	N/A	-0.60	0.36
Modern teaching practices	Inputs, exploration, AV aids, outdoor teaching activities…	0.36	0.60
Class level assessed by teacher	How does this class compare to other classes in school?	0.65	0.09
Eigenvalue		1.42	1.09

Note: This table reports the results of a principal components analysis of multiple inputs of teacher behaviors. These inputs were first constructed using numerous survey questions where we compute Spearman correlations between all items under consideration, assess their Cronbach's alphas, and perform a factor analysis generating the variables listed as inputs. The eigenvectors associated with the first and second components are reports, as well as their associated eigenvalues.

Table A.4: *Descriptive Statistics*

	Mean of characteristics in sample:				
	TEPS	Estimation	Indigenous	Hakka	Non-minority
Students:					
Indigenous parent(s)	0.04	0.04	1	0	0
Hakka parent(s)	0.17	0.18	0	1	0
Test scores at baseline [std]	-0.05	0.00	-0.87	-0.02	0.04
Fluent in Mandarin	0.91	0.92	0.88	0.93	0.92
Fluent in indigenous language	0.02	0.02	0.29	0.01	0.01
Fluent in Hakka language	0.04	0.04	0.03	0.15	0.01
Female student	0.50	0.49	0.51	0.48	0.49
Birth year	1989	1989	1989	1989	1989
No. of siblings of student	1.77	1.75	2.36	1.77	1.72
Aspires to go to university	0.45	0.47	0.33	0.47	0.47
Expects to go to university	0.35	0.36	0.25	0.37	0.37
Has conflicts with parents	0.24	0.24	0.26	0.23	0.24
Parents are role models	0.31	0.32	0.36	0.31	0.32
Parents:					
Two-parent household	0.89	0.91	0.84	0.92	0.91
Good relationship between them	3.14	3.15	3.10	3.14	3.15
Parent(s) education is HS or less	0.65	0.65	0.80	0.65	0.64
Employed father	0.89	0.90	0.78	0.90	0.90
Parent(s) in good health	0.59	0.61	0.33	0.62	0.62
Financial difficulties in past 10 yrs	0.27	0.26	0.60	0.23	0.25
Household monthly income is					
NT$20,000 or less	0.11	0.09	0.30	0.09	0.09
NT$20,000-NT$50,000	0.41	0.41	0.47	0.39	0.41
NT$50,000-NT$100,000	0.35	0.35	0.20	0.38	0.36
More than NT$100,000	0.14	0.14	0.03	0.14	0.14
Schools:					
Principal has postgraduate degree	0.29	0.29	0.15	0.24	0.31
Principal years of experience	29.1	29.1	28.1	29.3	29.1
Government founded school	0.86	0.86	0.94	0.85	0.86
School year of foundation	1968	1968	1968	1968	1969
Observations (approx.)	20,055	16,262	588	2,894	12,814

Note: This table presents descriptive statistics for the full TEPS sample (column 1), our main estimation sample (column 2), and separately for Indigenous students (column 3), Hakka students (column 4), and Hoklo ethnic majority students (column 5).

Table A.5: *Heterogeneity*

Outcome:	**Effect on student test scores in wave 2 [std] by:**			
	student gender		**household income**	
	male	*female*	*<$50k*	*>$50k*
+1SD in classroom Indigenous peers	-0.030***	-0.020**	-0.021**	-0.029***
	(0.009)	(0.010)	(0.009)	(0.011)
+1SD in classroom Hakka peers	0.005	0.000	-0.001	0.006
	(0.006)	(0.006)	(0.006)	(0.006)
Indigenous = Hakka (p-value)	<0.001	0.069	0.054	0.003
Group equality Indigenous (p-value	0.149		0.339	
Group equality Hakka (p-value)	0.394		0.189	
Mean of Y	-0.05	0.06	-0.29	0.30
Observations	8,246	7,935	8,197	7,984

*Note: This table reports estimates of regressing standardized student test scores in wave 2 on the classroom share of indigenous and Hakka peers, their respective interactions with own indigenous and Hakka indicators, and on additional interactions for of all these regressors with student gender and household income indicators. Marginal effects of indigenous and Hakka share of peers displayed. All regressions school fixed effects and control for indigenous status and test scores in wave 1. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table A.6: *Robustness Checks: Definition of Treatment Variables*

Outcome:	**Student test scores in wave 2 [std]**		
	+1 SD	**Share (%)**	**Any**
Indigenous classroom peers	-0.024***	-0.400***	-0.047**
	(0.009)	(0.148)	(0.018)
Hakka classroom peers	0.003	0.050	-0.038*
	(0.006)	(0.075)	(0.021)
Indigenous = Hakka (p-value)	0.007	0.004	0.743
Schools	307	307	307
Classes	1,154	1,154	1,154
Students	16,262	16,262	16,262

*Note: This table reports estimates based on Equation 1 where we change the definitions of treatment variables. Column 1 replicates the results from column 4 of Table 2, column 2 uses share of peers as a treatment variable (between 0 and 1), while column 3 uses an indicator variable for any minority from a specific group in a classroom. All regressions school fixed effects and control for indigenous status and test scores in wave 1. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table A.7: *Robustness Checks: Alternative Samples*

Outcome:	**Student test scores in wave 2 [std]**			
	Baseline	**Majority Indigenous or Hakka schools**	**Exclude Indigenous or Hakka students**	**Private schools**
+1SD in classroom	-0.024***	-0.027***	-0.023**	-0.025***
Indigenous peers	(0.009)	(0.011)	(0.011)	(0.009)
+1SD in classroom Hakka	0.003	0.003	0.008	-0.000
peers	(0.006)	(0.006)	(0.006)	(0.006)
Indigenous = Hakka (p-value)	0.007	0.013	0.014	0.018
Schools	307	275	306	258
Classes	1,154	1,055	1,142	1,021
Students	16,262	14,760	12,814	14,396

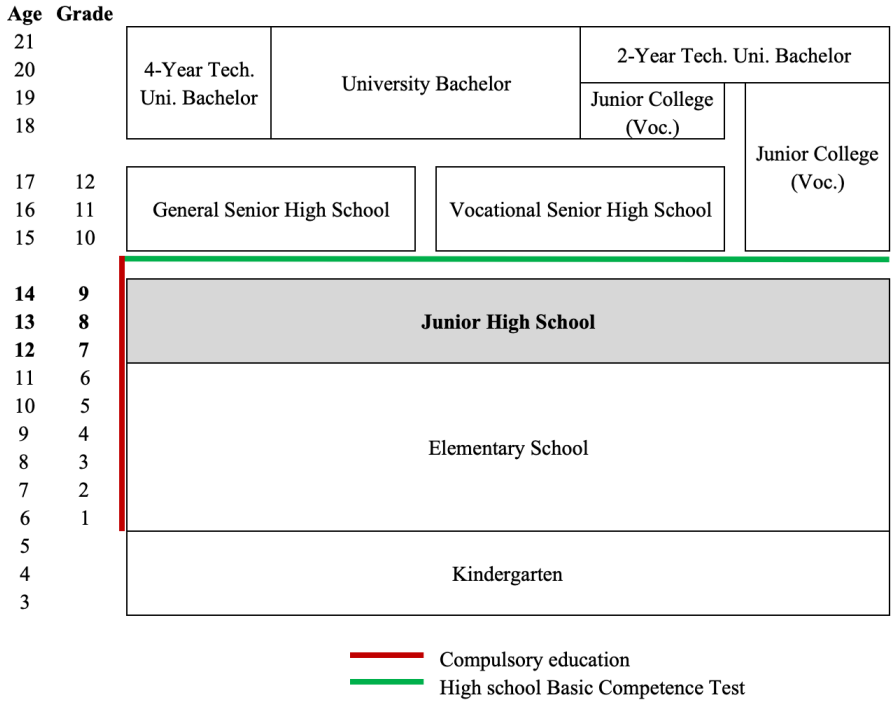
*Note: This table reports estimates based on Equation 1 where we change how we construct the sample. Column 1 replicates the results from column 4 of Table 2, column 2 excludes schools with majority Indigenous or Hakka students which we define as more than 50% of student population, column 3 excludes Indigenous or Hakka students from the analysis (here we also drop controls for student ethnicity and their interactions with share of the minority students), while column 4 drops all private schools where anecdotally there might be more score for gaming the assignment rules. All regressions school fixed effects and control for indigenous status and test scores in wave 1. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Table A.8: *Mediation Analysis*

Outcome of majority students	**Student test scores in wave 2 [std]**				
+1SD in classroom Indigenous peers	-0.024***	-0.024***	-0.018*	-0.012	-0.002
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
Preassignment controls	No	Yes	Yes	Yes	Yes
Other peer characteristics	No	No	Yes	No	Yes
Mechanisms	No	No	No	Yes	Yes
Fraction explained	N/A	0%	25%	50%	92%
R^2	0.64	0.65	0.65	0.68	0.69
Schools	307	307	307	307	307
Classes	1,154	1,154	1,154	1,154	1,154
Students	16,262	16,262	16,262	16,262	16,262

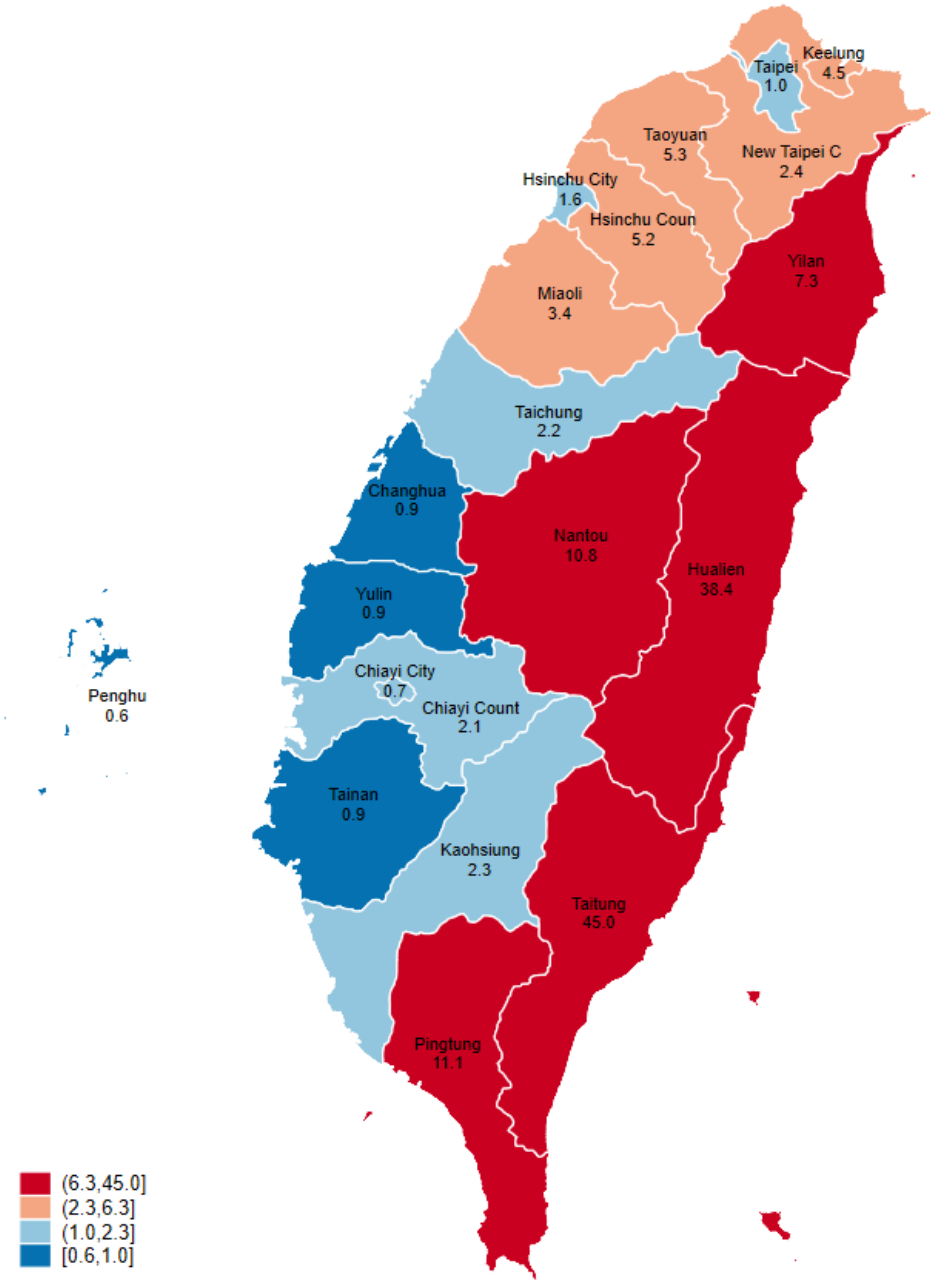
*Note: This table reports estimates of regressing standardized student test scores in wave 2 on the classroom share of Indigenous and Hakka peers, and their respective interactions with own Indigenous and Hakka indicators. Main effects of Indigenous peers are displayed. All regressions include school fixed effects. Preassignment controls include all variables tested for balancing in Table 1. Columns 1 and 2 replicate the results from column 4 of Table 2 without and with preassignment controls, column 3 then adds correlated peer characteristics that we explored in Section 5.3, column 4 drops the correlated peer characteristics but includes student, parent, and teacher behavioral indexes discussed in Section 5.4, and finally column 5 includes controls from both columns 3 and 4 jointly. Standard errors clustered at the classroom level in parentheses. ***, ** and * mark estimates statistically different from zero at the 99, 95 and 90 percent confidence level.*

Figure A.1: *Schematic of Taiwanese Education System*



Note: This graph depicts various levels in Taiwanese education system

Figure A.2: *Fraction of Indigenous Children Among 10 to 14 Year Olds by County*



Note: Based on 2010 Taiwanese Census.