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ISSN: 2365-9793

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ABSTRACT

Racial and Gendered Impacts of International Students on Domestic Peers*

This paper examines the impact of international students on the academic outcomes of domestic peers in introductory economics courses. We address the potential endogeneity of class selection by focusing on first-year students enrolling in a large public flagship university, for whom class assignment is likely to be quasi-random, conditional on a rich set of control variables for the class and individual. Results suggest an increased share of international student peers reduces the likelihood of majoring in economics for domestic White and Asian men while increasing the likelihood of majoring in economics for domestic men from underrepresented racial and ethnic groups. There is also evidence that higher shares of international student peers increase the likelihood that domestic White and Asian men major in business and decrease the likelihood that some men drop out of college. Additional analyses point to introductory course grades as possible mechanisms to explain these results, as a higher international peer share is associated with higher domestic student grades. Results for men enrolled in large introductory economics classes are similar to the main results for men overall and are also similar for women.

JEL Classification: I23, J15

Keywords: peer effects, higher education, immigration, college major, college dropout, race/ethnicity, gender, international, foreign

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* We thank Brian Cadena and seminar/conference participants at the University of Colorado Boulder and the Western Economic Association International conference for helpful feedback. Blake Redabaugh provided outstanding administrative data support. This project was reviewed and approved by the Institutional Review Board at the University of Colorado Boulder. Any errors are ours alone.

I. INTRODUCTION

As demand for higher education has increased steadily around the world, more international students have enrolled in American colleges and universities in recent years (Bound et al. 2021).[1] This pattern has become all the more pronounced after state governments reduced public funding for higher education in the wake of the Great Recession and universities became more heavily dependent on tuition but were constrained by how much they could charge domestic students (Bound et al. 2020). The increased prevalence of international students in American colleges and universities leaves open the question of how an increase in enrollment by international students affects domestic peers at U.S. institutions. Chen et al. (2023) find that on average international students arrive at U.S. institutions better prepared than their domestic peers, which could impact classroom dynamics and grade distributions, however, it remains to be seen whether this difference holds in all institutions and disciplines.[2] Aside from differences in academic preparation prior to college entry, international students may vary in broad areas like language and culture which may affect domestic students' persistence in college and choice of major. If institutional constraints present limits on the size of classes, majors, or grades, one might expect international student inflows to impact domestic students, but the direction of the effect is not obvious, as crowd-out style effects may be offset by peer effects and may further depend on the characteristics of domestic and international students. Since collegiate outcomes vary substantially across demographic subgroups in the U.S. (Antman 2024; Frye 2023; Grawe 2018), it is reasonable to explore whether the impacts of rising shares of international peers vary by the

[1] International students represented approximately 4-5% of the total student population in recent years (Institute for International Education 2022).

[2] Also note that Chen et al. (2023) uses confidential data on SAT test-takers, which may comprise a majority of all new international undergraduate students, but is likely to be less representative of students at less selective institutions, especially those which do not require the SAT.

race, ethnicity, and gender of domestic students. In this paper, we consider these impacts, focusing on the introductory economics course pathway and explore outcomes including college major and college dropout choices.

Since introductory courses are important gateways to college majors and also critical periods during which many students determine whether to drop out of college, the experience in introductory courses can have long-term impacts on wages and careers and thus present an important setting in which to evaluate this question. From a research design perspective, focusing on introductory classes also has distinct advantages since incoming freshmen are likely to be assigned to a particular section of a course independent of their peers. With this vantage point, Anelli, Shih, and Williams (2023) consider the impacts of foreign peers on students in introductory math classes and find some attrition of domestic students out of STEM majors and toward social sciences.[3] However, they find that these are not necessarily worse outcomes, since the latter majors are in some cases associated with high earnings. We follow Anelli, Shih, and Williams (2023) in the spirit of our research design, however, we look at the impacts of international students on domestic peers in introductory economics courses at a large public flagship university where economics is housed within the College of Arts and Sciences, but which also has a business school that offers undergraduate degrees.[4]

Our setting has several unique advantages that add to the work done by Anelli, Shih, and Williams (2023). First, we highlight our contribution focusing on introductory economics courses as opposed to introductory math courses. Introductory economics courses are a required course for many social science majors, and in many universities, business majors as well. The students

[3] STEM majors are majors that fall within Science, Technology, Engineering, or Mathematics.
[4] As others have shown, the presence of a business school can be a draw for students who would otherwise consider economics (Goldin and Avilova 2024).

electing to take introductory economics courses upon entry into a university may have different college preparation or career aspirations, which may make their responses to increased international peers unique and important to document. Additionally, since the population taking introductory economics may be different from the population in introductory math courses in their first college term, the treatment effects could be operating through different channels. For example, students opting into economics may be seeking different experiences or interactions in their learning environments. Differences in classroom settings across disciplines (for example, larger versus smaller classes and associated activities) may also make certain attributes of classmates more or less important when picking a potential major. Finally, our focus on a large, public flagship university which has an acceptance rate for undergraduate students that is close to the national average for public universities, potentially makes this study more generalizable to a greater proportion of public universities in the United States. In addition, the student population in our study is much less racially diverse than the university studied in Anelli, Shih, and Williams (2023), which may make these results more generalizable to colleges and universities across the United States that are primarily White.[5]

Our results suggest that increases in the international student peer share in introductory classes reduce the likelihood that domestic peers major in economics, with estimates that are similar in relative magnitude for men and women overall, but only statistically significant for men in the full sample. Men also increase their likelihood of majoring in programs offered through the business school, where there are generally fewer international students. We show that an important mechanism driving the decline of domestic men majoring in economics in our study is the impact

[5] While racial and ethnic diversity in the United States has been increasing steadily over recent decades, in roughly half of U.S. states, non-Hispanic White individuals make up more than two-thirds of the population as of the 2020 census (U.S. Census 2023).

on grades, which tend to increase for students at the bottom of the grading distribution when there is a higher international student peer share. In addition, we find evidence that men from underrepresented minority groups (URM men)[6] may be less likely to drop out of college as international peer share rises, which is also consistent with the grade mechanism. As an extension, we also examine the effects for students enrolled in large introductory economics classes, for whom class assignment is arguably more likely to be exogenous and whose grades are more likely to be determined at arms-length. The results for men in large classes are similar to those for men in the full sample. Results are also similar and statistically significant for women, showing that women in large classes are less likely to major in economics and increase their likelihood of majoring in business in response to an increase in international peer share. Racial subgroups of women are much smaller, however, and thus pose related challenges for interpretation.

While the economics literature has extensive studies of the impacts of skilled foreign workers on domestic workers' labor market outcomes (Ma 2020; Borjas 2009), most of the literature examining the academic setting has addressed the graduate student population (Borjas 2007; Shih 2017) and connects immigration policy for skilled workers with the educational and career choices of international students (Amuedo-Dorantes and Furtado 2019; Kato and Sparber 2013). Heretofore, the main study examining impacts on undergraduate students is Anelli, Shih, and Williams (2023), which, as discussed above, focuses on introductory courses in STEM, and thus misses impacts in high-return majors such as economics and business, one of the largest majors in the U.S. as a whole (Andrews, Imberman, and Lovenheim 2017). As a result, we contribute to research on undergraduate economics education (Allgood, Walstad, and Siegfried

[6] Underrepresented minorities (URM) are non-White non-Asian domestic students and include Hispanic, Black, American Indian, and Pacific Islander groups. The majority of URM students are Hispanic at the institution in this study.

2015), as well as the growing literature on mechanisms that shape racial and ethnic diversity in the economics profession specifically (Bayer and Rouse 2016; Bayer, Hoover, and Washington 2020). More broadly, we contribute to the literature on the determinants and returns to college major choice (Andrews et al. 2024; Lovenheim and Smith 2023; Zafar 2013), college major switching (Astorne-Figari and Speer 2019; Zafar 2011), and college dropout decisions (Stinebrickner and Stinebrickner 2012, 2014), as well as research documenting significant heterogeneity in collegiate outcomes by race and ethnicity (Andrews, Imberman, and Lovenheim 2020; Andrews, Li, and Lovenheim 2014, 2016; Arcidiacono and Koedel 2014). While we investigate important outcomes in their own right, we also note that the collegiate outcomes we observe are closely tied to long-term consequences for domestic students in the form of earnings premia which have been established elsewhere for the economics major (Bleemer and Mehta 2022) and the business major (Andrews, Imberman, and Lovenheim 2017).

The remainder of the paper proceeds as follows. Section II discusses the data and summary statistics, including background on the institutional setting. Section III presents the empirical strategy. Section IV discusses the results and Section V concludes.

II. DATA

A. Background

The main sample used in this study comes from institutional records of all first-year, first-term[7] domestic students who enrolled in introductory economics courses at a large public flagship

[7] Since we are only using first-term students, the outcome variable will be related to the student's first attempt at economics. Students who take economics more than once within the sample period, however, would be included in the calculations of the peer controls.

university between the years 2010-2015, and whose outcomes we observe through fall 2020.[8] This group of students generally enrolls in classes with the assistance of an academic advisor in the summer before arriving on campus, thus their class choices are likely to be independent of their peers. Admitted students who have declared economics as a major prior to the start of classes would be enrolled in the introductory economics course prior to arrival. Economics is housed in the College of Arts and Sciences, and all economics majors are required to take the introductory economics course.[9] Other majors requiring the introductory economics course over the time period in this study are political science, international affairs, and environmental studies, along with all majors in the business school. Students may have also taken introductory economics to fulfill a distributional requirement during the period of our study.

B. Summary Statistics

Table 1 shows the summary statistics for the 7,419 first-term domestic students who took introductory economics between 2010 and 2015 at the large public flagship university. The sample is almost 80% White and 66.5% male. The largest entry college is Arts and Sciences within which economics is housed (49.3% of the sample), followed closely by the business school (48.7%)[10]. Panel B shows that there are 106 introductory economics classes observed in the sample overall. While classes are generally large, with an average size of 146 students, about 9% of students are in classes that have fewer than 50 students. In all classes, the average international student peer

[8] Note that this allows for a 5.5-year graduation period for students who took introductory economics in 2015.
[9] Exceptions would include transfer students who took a course that would satisfy the requirement elsewhere as well as students who passed the Advanced Placement Economics: Micro exam with a score of 4 or higher.
[10] In our sample, 29.77% are undeclared majors within the College of Arts and Sciences, and 27.93% are undeclared majors within the business school. In total 58.23% of domestic students in our sample enter without a declared major.

share, based on the IPEDS classification of "non-resident alien," is about 4.67%[11], while the average percent of the class that took the TOEFL exam is about 3.81%.[12] Almost all students were enrolled in the principles of microeconomics introductory course (98.1% of the sample), as opposed to the combined micro and macro introductory course which was offered in one of the early terms in the sample.[13] Thus, our use of the term introductory economics throughout the paper largely consists of Principles of Microeconomics.

Figure 1 shows the distribution of the international student peer share (not standardized) over class size. Class sizes range from very few students to almost 500 people, but most classes hover around 200 students. The international student peer share variable ranges from 0 (in very small classes) to just over 20%. However, most classes have an international student peer share between 2-13%. Appendix Figure 1 shows how the international student peer share in our sample changes over time.

Since the analysis below will attempt to explore the mechanisms through which international peers affect domestic students, it is helpful to provide some background on the observable differences between these two groups. Thus, we provide summary statistics showing how international peers enrolled in introductory economics compare with domestic students.[14] Appendix Table A2 shows that international peers are more likely to be male, first generation, and economics majors. In addition, international students in introductory economics classes on

[11] Appendix Table A1 lists the foreign countries represented in the international student sample. Approximately 44.14% of international students in the sample are from China. The next highest concentrations of students come from Saudi Arabia (7.64%), South Korea (5.02%), Kuwait (4.29%), Mexico (3.14%), Venezuela (2.62%) and Norway (1.99%). All other countries make up less than 2% of the total sample of international students.
[12] International students coming from English speaking countries are not required to take the TOEFL (e.g., UK, Australia, etc.).
[13] In 2011, there was one large introductory micro/macro class, but all others in the sample are principles of microeconomics.
[14] Note that the students in the Appendix Table A2 sample include all domestic students and all international peers across all years of study, not only those who are in their first year.

average receive lower grades in introductory economics, have a lower term GPA in the term they take introductory economics, lower GPA at the end of their college career, and are less likely to be enrolled in the College of Arts and Sciences. These differences in academic performance foreshadow our results suggesting grades in introductory economics are an important mechanism influencing the way international peers affect domestic students' college major choice and dropout outcomes.

While we do not observe complete information on prior academic background for all international students, for the subsample of international students for which we have this information, we observe lower averages for high school GPA and their combined English and Reading ACT score, but a slightly higher ACT Math score. It is important to note that these last three statistics are drawn from a smaller, possibly self-selected, pool of observations since international students were not required to submit test scores after 2012, and they do not have to submit high school GPA. Thus, we caution against over-interpretation of these differences in prior academic ability. Nevertheless, we note that the regression analysis below will control for peer characteristics and class-level controls, and further sensitivity analysis below will show that results are robust to the inclusion of controls and how they are calculated.

III. EMPIRICAL STRATEGY

To determine the impact of international students on the academic outcomes of domestic peers, we follow the model of Anelli, Shih, and Williams (2023), but where the focus of our work is on the impact which occurs in introductory economics classes. Our sample is limited to students in their first term at the university because the admissions and registration process at the university suggest that these students largely enroll in classes before arriving at the university, and thus this

process is likely to be independent of any peer influences. Nevertheless, our preferred specification controls for a host of class characteristics, instructor fixed effects, and year fixed effects,[15] as well as a rich set of individual ability and demographic variables to better account for any factor that might be correlated both with our measure of international students in the classroom as well as the outcomes of individual students. The estimating equation is:

$$(1)\quad Y_{ic(pt)} = \alpha + \theta_1 IPS_{c(pt)} + \beta X_{ic(pt)} + \theta_2 ClassCharacteristics_{c(pt)} + \varphi_p + \upsilon_t + \varepsilon_{ic(pt)}$$

where $Y_{ic(pt)}$ is an outcome (e.g., college major indicator[16]) for individual *i* who took introductory economics class *c* taught by instructor *p* in semester-year *t*. Our independent variable of interest is $IPS_{c(pt)} = \frac{N_f}{N_c - 1}$, where N_f is the number of international students in the class and N_c is the number of students in the class. There are two ways that we are able to observe whether a student is international. The first is by whether the student is designated as a "non-resident alien" in the data. This potentially captures the most complete set of international students in our data set. In addition, the data indicate which students submitted TOEFL scores. This can be used to measure the number of students whose previous studies were not in English, a potentially important subgroup of international students. Thus, we also construct an analogous measure of $IPS_{c(pt)}$ using the number of students who submitted TOEFL scores in place of N_f and later use this as an alternative measure of international student peer share ($IPS\_TOEFL_{c(pt)}$). To minimize the risk of omitted variable bias, we also construct a non-TOEFL international peer share measure using the

[15] Though this is technically a two-way fixed effects (TWFE) strategy, the alternative estimators suggested in the literature to address threats to TWFE (see for example Callaway and Sant'Anna 2021) are not applicable in this case because we have an intensive treatment variable measuring exposure to international peers, as opposed to a binary treatment indicator. Regardless, any risk posed by dynamic treatment effects is likely to be small in this context, assuming the instructional environment is unlikely to evolve significantly over the period of our study.

[16] College major is measured upon graduation or our last observation of the individual if they are still enrolled in the college.

number of "non-resident alien" minus the number of TOEFL international students ($IPS\_nonTOEFL_{c(pt)}$). In an alternate specification we include $IPS\_TOEFL_{c(pt)}$ and $IPS\_nonTOEFL_{c(pt)}$ in place of $IPS_{c(pt)}$ in equation (1).

Unless otherwise noted, we utilize the standardized form of $IPS_{c(pt)}$ (i.e., subtract the mean and divide the result by the standard deviation) for ease of interpretation and comparison with Anelli, Shih, and Williams (2023). $\boldsymbol{X_{ic(pt)}}$is a vector of individual characteristics including baseline individual ability (ACT Math score, ACT English plus Reading score, and high school GPA) [17] and a set of indicators for the individual's race, first generation status, and entry college. $ClassCharacteristics_{c(pt)}$ includes a host of class-specific variables. Specifically, class characteristics controls include class size (number of students)[18], peer shares of the class by gender and racial demographic groups (peer share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), class peer average test scores and class peer average high school GPA, and class peer shares in each entry college.[19] Finally, we include both instructor fixed effects, φ_p, and semester by year fixed effects, ν_t.

[17] Domestic students may submit either SAT or ACT results to the school during this timeframe, though they can submit both. More students submit ACT results. In cases where students only report SAT results, ACT results are imputed using a concordance table.

[18] We control for class size non-linearly using indicators for four size categories: 200 or more students, between 100 and 200 students, between 50 and 100 students, and less than 50 students.

[19] The peer share measures are calculated analogously to the international peer share measures noted above, i.e., Number of peers with a given trait/ Number of classmates, however some important caveats should be noted. First, over the observation period in our study, the university did not require that international students submit HS GPAs. Second, in the middle of our observation period, the university stopped requiring ACT/SAT scores of international students. Thus, while we do have data on these measures for some international students, it is not a complete set. In our primary specifications, we use all available data to construct peer ability controls. The results are robust to alternate construction of the peer ability controls where international peer scores are not included (see Appendix Table 6 discussed below). We do not have race information for international students, so peer share race measures are only calculated with domestic students' race in the numerator.

Variation in international student peer share by instructor can be seen in Figure 2, and shows no systematic patterns, suggesting that it is indeed quasi-exogenous.[20] It is this variation in the international student peer share at the instructor-level that enables us to identify the impact of international student peer share, controlling for time-invariant instructor characteristics. While it is possible that instructors could change teaching styles over time, this would only be problematic for our identification strategy if instructor changes were correlated in a systematic way with the changes in the level of international student peer share in their classes. We find that unlikely given the fact that instructors are often teaching the same course multiple times over the years and using the same preparation materials. Another concern may be that students are placed into classes in a systematic fashion that could threaten our identification strategy. Given that the class placements are done at arms-length by academic advisors, this would be unlikely, but if it were to happen, it would be on the basis of observables. To address this, we investigate whether observable characteristics of the class are correlated with the international student peer share by regressing observable characteristics on the standardized "non-resident alien" share. Results are presented in Appendix Table A3 which shows that in general, international student peer share is not highly correlated with the observed characteristics of the class, which is again suggestive that international student peer share is likely to be quasi-random.[21]

IV. RESULTS

[20] This figure shows the non-standardized international student peer share measure, where international students are identified using the "non-resident alien" designation.

[21] One possible exception is with respect to the correlation between international student peer share and the share of Native Americans in the class, however, note that the share of Native American students in the overall sample is extremely small (1.36%). Another coefficient of interest is marginally significant at the 10% level in the regression with Black as the dependent variable. Thus, we do not expect these correlations to have a significant impact on our findings, and in any case, we will control for the class shares of domestic students in all racial groups in our regressions.

A. College Major Outcome

Table 2 shows the main results of estimating equation (1) for first-term domestic students with the indicator for majoring in economics as the outcome in the context of a linear probability model. Column (1) shows the main results for all domestic men using the "non-resident alien" status of students for the measurement of international student peer share. Columns (2) – (4) present the results for domestic White, Asian, and URM men,[22] respectively. Columns (5) – (8) present the analogous results for women. Results in column (1) suggest that a one standard deviation increase (3.3 percentage points) in the international student peer share as measured by "non-resident alien" status is associated with a 2.18 percentage point decrease in the likelihood of majoring in economics for domestic men, equivalent to about 21.8% relative to the average rate of majoring in economics for domestic men in the sample (10%). This is somewhat similar to the estimates from Anelli, Shih, and Williams (2023) which indicate that a one standard deviation (4.4 percentage points) increase in the share of foreign peers in introductory math classes reduces the probability of graduating with a STEM degree by 4.7 percentage points (equivalent to 10% of the average STEM graduation rate in their sample from another institution).

Examining the results by racial subgroup, columns (2) – (3) of Table 2 show that an increase of one standard deviation in international student peer share is associated with a statistically significant decrease in the likelihood of majoring in economics for domestic White men of 3.06 percentage points (roughly 32% drop relative to the mean). For domestic Asian men, the estimated decline is 10.5 percentage points and also statistically significant and large relative to the share of domestic Asian males majoring in economics (13.5%), though it should be noted that the sample

[22] URM consists of non-White, non-Asian domestic students. In our sample of URM men, 71.68% are Hispanic, 14.72% are Black, 10.52% are American Indian, and 3.07% are Pacific Islander. In our sample of URM women, 72.57% are Hispanic, 11.71% are Black, 10.29% are American Indian, and 5.43% are Pacific Islander.

size is much smaller for domestic Asian men. Conversely, in column (4), a one standard deviation increase in international students is associated with a 6.43 percentage point increase in the likelihood of URM men majoring in economics, which is statistically significant at the 1% level though the sample size is again smaller than for domestic White men. The magnitude of the estimate is also substantial - equivalent to approximately 53.6% relative to the average rate of majoring in economics for URM domestic men in the sample (12%).

In contrast to the results for men, column (5) of Table 2 shows that international student peer share does not have a statistically significant impact on the decision of domestic female students to major in economics at conventional levels. Nevertheless, the coefficient estimate is also negative (-.009) and reflects a relative magnitude of approximately 23.4% when compared with the average share of women majoring in economics (3.9%). Columns (6), (7), and (8) present the results for domestic White, Asian, and URM women, respectively, and support a similar conclusion, with similar signs to those of their male counterparts but estimated coefficients that are smaller in absolute magnitude in comparison with the results for men and are not statistically significant.[23] This gendered difference may be related to the significant underrepresentation of women in the economics major (overall average at 3.9% compared with men's 10% overall average) and in the full sample of introductory economics classes, where women make up approximately 33.5%.[24] This implies a much smaller sample of women in the analysis here, with potential consequences for estimate precision. Due to the smaller sample size and statistically

[23] The exception to the statistical significance is for Asian women in the sample, for which the coefficient of interest is negative and statistically significant at the 10% level. However, the sample size for domestic Asian women in introductory classes is quite small, so we hesitate to draw broad conclusions based on this point estimate.

[24] Decomposing the international peer share variable into share of peers who are international men and the share of peers who are international women yields similar results for men overall, but impacts the precision of the estimates of interest. While the results for some subgroups suggest there may be more complex impacts of international peers on individuals based on intersectional identities, the sample sizes are small, and our data limit our ability to explore those mechanisms further, thus we leave these avenues as areas for future research.

insignificant results for women in the full sample, the remainder of the paper focuses primarily on the impacts of international students on domestic men by racial subgroups, however we will return to examining effects by gender in the section on robustness checks and extensions below.

If greater international student peer share in introductory economics courses decreases the likelihood of domestic men majoring in economics, what do these students major in? Panel A of Table 3 shows the results of estimating equation (1) with majoring in a business program as the outcome variable. Panel B shows the analogous regression results but with STEM major[25] as the outcome variable, and Panel C shows the results for other majors in the College of Arts and Sciences (where economics is housed) as the dependent variable. The outcome variable in Panel D is dropping out of college. Column (1) shows the results for all domestic men whereas columns (2) – (4) show the results for the different racial subgroups of domestic men.

Panel A, column (1) shows that a one standard deviation increase in the international student peer share increases the likelihood that first term domestic men major in business by 5.94 percentage points. Since 41.3% of men in introductory economics major in business, this represents a 14.4% increase relative to the mean. Looking more closely at the different racial subgroups, we see that having more international students in class increases the likelihood of domestic White and domestic Asian men majoring in a business program (a one standard deviation increase in international student peer share increases the likelihood by 7.03 and 8.02 percentage points for these groups, respectively). Though the point estimate is also positive for URM men, it

[25] In our sample, STEM majors include: Astrophysical & Planetary Sciences; Biochemistry; Chemistry; Computer Science; Architectural Engineering; Aerospace Engineering Sciences; Chemical & Biological Engineering; Chemical Engineering; Civil Engineering; Electrical & Computer Engineering; Electrical Engineering; Engineering Physics; Environmental Engineering; Mechanical Engineering. A person is designated a STEM major if they have at least one of these majors. No business school degrees or social science degrees are classified as STEM in this analysis..

is much smaller in magnitude and statistically insignificant indicating that having more international student peers may not impact URM men in the same way.

In Panel B of Table 3, results indicate there may be a small decrease in the likelihood of domestic men majoring in STEM majors. While the analogous estimates are small and negative for all male subgroups, we lack the power to precisely estimate the impacts by racial group. Panel C shows that an increase of one standard deviation of international students in introductory economics classes makes it less likely that domestic White men will select other majors within the College of Arts and Sciences (by 2.26 percentage points), but it increases the likelihood that domestic Asian students will major in other College of Arts and Sciences fields (by 6.4 percentage points). Last, in Panel D, we look at the impact international peers have on domestic students' decisions to drop out of college.[26] Panel D shows that changes in international student peer shares do not seem to impact domestic men's decisions to drop out of college in the full sample. [27]

B. Mechanisms

1. Grades

There are several potential mechanisms through which international student peer share could affect domestic peers' choice to major in economics. Since grades are an important predictor of college major choice (Antman, Skoy, and Flores 2024; Main and Ost 2014) and vary by discipline (Butcher et al. 2014; Walstad and Boshardt 2019), our first avenue of exploration is whether having more international students affects the course grades of domestic peers. While the

[26] We observe the 2015 entering cohort for 5.5 years. There are 33 students who were still enrolled as of Spring 2021 with anticipated graduation dates.

[27] Students are defined to have dropped out of college if they are not observed to graduate, they no longer have an expected major listed, and the last term in which they are observed is earlier than the last semester in the data set.

economics department issues firm guidelines to instructors regarding the overall grade distribution of the course (median/mean around B-/C+), an individual student's position in that distribution may be affected by the performance of their peers, and thus provides a plausible mechanism by which peers may affect college major choice through course grades.[28] Table 4 shows the results from regressing introductory economics grade on international student peer share. At this institution, the average grade of first-term domestic male students in introductory economics courses is 2.581, between a B- and C+, and column (1) shows that a one standard deviation increase in international student peer share increases domestic male grades by 0.0592 points.[29] When looking at the different subgroups of domestic men, we can see that in particular White and URM men receive higher grades when their introductory economics courses have more international students, while effects are not statistically significant for Asian men. Most notably, a one standard deviation increase in international peer share increases domestic White men's grades by 0.0659 points and domestic URM men's grades by 0.147 points (on a four point grading scale). While it may seem counter-intuitive that domestic White students receiving higher grades in introductory economics makes them less likely to major in economics, at this large flagship public university many students express a desire to ultimately major in business even if they were not initially admitted to that academic program.

Thus, receiving higher grades in introductory economics, a class that is required to be a business major, may increase a student's likelihood of acceptance into the business program. This would be consistent with the impact of international student peer share on moving into the business

[28] See Antman, Skoy, and Flores (2024) for further discussion of relative grades as a mechanism influencing college major choice patterns and dropout rates for men and women enrolling in introductory economics courses.
[29] As shown in Appendix Table A4, median and mean grades of courses do not appear to change as international student share changes.

major shown in Table 4. However, while White men seem to be moving to business programs, URM men seem more likely to stay in economics. This difference could be related to differences in preferences for URM versus White men, however, it could also be related to higher overall grades for White men relative to URM men which may make White men more likely to be granted an intra-university transfer. This would be consistent with the evidence from Table 4 showing that the average introductory economics GPA for White men is 2.622 while it is 2.336 for URM men. Consequently, it may be that the grade boost associated with a higher international student peer share is sufficient for White men to move to the business school, while it is not sufficient for URM men to transfer to the business school.

In order to clarify the marginal impacts of grades, we run an additional regression where the outcome variable is an indicator for whether a student receives a B- or higher grade. The regression is run with the same structure as Equation (1) and includes all controls. Results in Table 5 show that, indeed, domestic White men are more likely to receive a B- or better when international student peer share increases. A one standard deviation increase in international student peer share increases the likelihood that a White domestic man receives a B- or higher grade by 4.25 percentage points (7.1% of the mean for White domestic men). In contrast, while domestic URM men are seeing increases in their grades, the marginal impact they see does not bring as many students up to a B- or better grade, which may ultimately impact their likelihood of moving to the business school.

While the grades of domestic students appear to be positively impacted when international student peer share increases, the median and mean grade within a class do not appear to be impacted by international student peer share, as evidenced in Appendix Table A4. These findings are consistent with expectations given the grading guidelines of the department which are not

impacted by the share of international students in the program. Instead, as shown in Figure 3, it appears that international students may be displacing domestic students at the bottom of the grade distribution, thereby raising domestic student grades. While Figure 3 also shows that international students are overrepresented in the right tail of the grade distribution, namely, the highest category of the economics grade distribution (A grade), this appears to be less extensive. Moreover, the difference between an A and a slightly lower grade is not likely to impact college major choice or college persistence (examined below) in the same way as performance on the lower end of the grade distribution. Thus, although we see domestic students pushed toward the middle of the grade distribution, the pattern is consistent with a grade mechanism underlying our results on college major choice.

2. Language

Using SAT verbal scores as a measure of language fluency, Anelli, Shih, and Williams (2023) find that low language ability of international students is a key mechanism in pushing domestic peers out of STEM majors. While we do not have complete data on SAT scores for international students, we investigate language as a potential mechanism in our study setting by decomposing results by the share of peers who took the TOEFL exam as well as the TOEFL scores of students who took the exam. At the same time, we caution against overinterpretation of these results, due to data limitations on other measures of academic preparation such as ACT/SAT scores and high school GPAs which were not required to be submitted for international students throughout our sample. This complicates our interpretation because TOEFL exam outcomes may actually be correlated with other forms of international peers' academic preparation which are unobserved and may exert independent effects on the outcomes in our study.

With these caveats in mind, Panel A of Table 6 shows the results for Equation (1) where we decompose the original international peer share measure into two separate measures: the proportion of "non-resident alien" students who took the TOEFL relative to the class size and the proportion of "non-resident alien" students who did not take the TOEFL relative to the class size. To maintain the same interpretation of results, both measures are standardized using the same approach discussed above. To be clear, those who take the TOEFL are a subset of the "non-resident alien" student body, thus, conceptually, one might think of this measure as describing the share of students who come from countries where English is not the primary language and/or students who have not received their education in English prior to arrival at this institution. As shown in column (1) of Table 6 Panel (A), a one standard deviation increase in international peers who took the TOEFL (3.35 percentage points) decreases domestic males' likelihood of majoring in economics by 10.2 percentage points while an increase of one standard deviation in the international peer share that did not take the TOEFL (3.12 percentage points) actually increases the likelihood of domestic males majoring in economics by 8.36 percentage points. Since TOEFL exam taking is correlated with country of instruction and academic preparation, the difference in sign across coefficients may reflect other factors beyond language ability, including cultural differences between domestic students and international peers as well as academic preparation. Though results are not statistically significant for domestic White or Asian men, the pattern of the overall results hold. Moreover, for domestic URM men, the statistically significant coefficient estimate from Table 6 column (4) Panel A (point estimate of 0.241) suggests that the results for URM men from Table 2 may be driven primarily by the share of international peers who did not take the TOEFL.

Panel B of Table 6 considers potential mechanisms through the lens of international student TOEFL scores. Specifically, measures are created to capture the proportion of students in a class that scored in the top 25 percent of the TOEFL exam among all TOEFL exam scores observed across all years in our data set, as well as the proportion that scored in the middle two quartiles of the same distribution, and the analogous proportion of students that scored in the bottom 25 percent on their TOEFL, where these measures have again been standardized for consistency with prior estimates.[30] In addition, to avoid omitted variable bias, we include the international peer share who did not take the TOEFL that was included in Panel A. Results in column (1) indicate that our main results appear to be driven by the international peers that have TOEFL scores in the middle two quartiles as opposed to international peers that are top or bottom performers on the TOEFL. This makes sense since most international peers TOEFL scores are in the interquartile range, however, it does not provide strong evidence that results are necessarily driven by strong or weak language abilities as measured by the TOEFL.

In sum, we note that the pattern of our TOEFL results may be due to a confounding of several unobserved international peer variables which may be correlated with TOEFL exam taking and scores, including academic preparation, language ability, and cultural differences between TOEFL test-takers and their domestic peers. Unfortunately, these are difficult to distinguish given our limited data on prior characteristics of international students. Thus, the extent to which TOEFL can adequately test the language mechanism is quite limited in our context, and unlike Anelli, Shih and Williams (2023), we cannot conclude that we observe any clear trends by language ability.

[30] The first variable of interest is the count of international students who scored in the 75th percentile or higher (score of 95 or above) in the course divided by the number of peers in the class, then standardized. The latter two variables are analogous but use the count of international students in the middle two quartiles (scores between 76 and 95) and the count of international students who scored in the 25th percentile or lower (score of 76 or below), respectively, divided by the number of students in the class, where each measure is standardized.

This could also be due to the differences across study settings between the introductory math versus introductory economics environments. Relative to the math setting, TOEFL may also be capturing many more unobserved background characteristics of international peers that are relevant for the outcome variables in the economics context, and thus we leave further analysis of the language mechanism for future research with better data.

C. Robustness and Extensions

C. 1. Results for Students Outside the Business School

Since students within the business school make up a large proportion of the students in introductory economic classes at this university (44.6% of the sample), there may be some concern that there could be sorting of international students into classes with more business majors. In Appendix A5 we limit the sample to only first-term students who are not in the business school. The results hold, and for each subgroup are stronger and more precisely measured. For domestic men, an increase of one standard deviation leads to around a 3.28 percentage point decrease in the likelihood of majoring in economics. Domestic White men are 4.9 percentage points less likely to major in economics, domestic Asian men are 24.3 percentage points less likely to major in economics, and URM men are 18.7 percentage points more likely to major in economics. In columns (5) through (8) we again see that the results for women are not statistically significant[31].

Appendix Table A6 presents results analogous to Table 3 for the non-business student sample, showing the impact of international peer share on alternative major and dropout outcomes. Consistent with Table 3, domestic White men are more likely to major in a business program in

[31] In many of the tables in this section which restrict samples by race and gender in certain subgroups, the sample size falls considerably affecting the interpretation of the magnitudes, as in Table A5 where the estimate for Asian women is very large in magnitude, likely due to the very small sample size for this group.

response to an increase in international student peer share. While the increase in the likelihood of domestic Asian men majoring in business is no longer statistically significant due to a smaller sample size and lack of power, the point estimate remains consistent with Table 3. We can also see that, like before, White men are less likely to major in another field within the College of Arts and Sciences while URM men are more likely to major in another Arts and Sciences field when international student peer share rises. Perhaps most interesting, in Panel D, we see that more international peers decreases the likelihood of URM men dropping out of college. This finding is consistent with the marginal grade increase that URM men experience with more international peers. It is also worth noting that the point estimate for Asian men is moderately significant in Panel D, suggestive of the possibility that domestic Asian men may be more likely to leave college as a result of more international peers.

We run additional robustness checks where the sample is limited to domestic students admitted into the College of Arts and Sciences whose major is undeclared at their entry (29.77% of the original sample). Results are provided in Appendix Table A7 and Appendix Table A8. Statistically significant results remain consistent, but precision of estimates falls, likely due to smaller samples sizes.

Additionally, there could be concerns that we are over-controlling in our preferred specification which includes many class characteristics that could be correlated with international student peer share. There could also be concerns that the composition of the controls could be biasing our results since international students may be represented in some controls when data are

available.[32] In Appendix Table A9, we address these concerns by progressively adding controls and modifying the way that controls are calculated. Though there are small movements in point estimates, results are largely unchanged. Appendix Table A9, column 1, shows the results with no controls. In column 2, individual controls are added (ACT scores, high school GPA, race indicators, first generation indicator, indicators for entry college). In column 3 we add professor and time fixed effects as well as controls for class size. In columns 4-9 we progressively add peer controls which include international students in the construction when those data are available. Column 9 has the full set of controls from our main specification. Note that the results are more precise when the average ACT math score of peers is included. In Column 10, we use alternate measures of share female, average HS GPA, and average ACT scores where only domestic students were included in the calculations of peer controls. The point estimate of interest changes slightly, and the estimate is somewhat less precise, but overall, the main result is very similar. Importantly, this table provides evidence that the results are robust to various controls and the composition of those controls.

C. 2. Results for Students in Large Classes

Finally, at this university, most students are placed into large introductory sections of economics, however, as can be seen by the summary statistics, some students take introductory microeconomics through special programs at the college where class sizes are much smaller (fewer than 50 students).[33] Since the class environment can differ significantly in large classes and to

[32] For example, institutional records only include "race" information on domestic students. Therefore, peer shares of each race/ethnicity are only for domestic peers. In contrast, peer ACT and high school GPA include international student data when data are available, i.e., for a minority of international students, since those records were not required in some of the years of this study.

[33] Since the sample of students in small classes is much smaller (approximately 9% share of the overall sample for both men and women) and may raise hidden selection issues, we do not explore heterogeneous effects in small classes, and leave that for future work.

address concerns about possible selection into small classes, we re-run the primary results in Tables 2-5 after omitting these small classes of less than 50 students, and discuss the analogous results here.

As can be seen in Table 7, the main results for domestic men hold - showing a 3.53 percentage point decreased likelihood of majoring in economics for men in response to one standard deviation increase in international peer share, which is again large compared to the mean of the sample (.101). As before, the sign for women is also negative, but is statistically significantly in large classes, indicating that a one standard deviation increase in "non-resident alien" share leads to a decrease in the likelihood that women major in economics by 2.5 percentage points, which is substantial compared to the share of women majoring in economics (0.0369). Though the point estimates are negative for all subgroups of women, they are only statistically significant for URM women.

Moreover, in large classes, we also find more evidence that men and women choose similar alternative majors when international peer share increases (Table 8). Women appear to be more likely to major in business (coefficient 0.0815; mean 0.506), which is similar to the magnitude for men (coefficient 0.0973; mean 0.411). One striking difference from the overall sample results is that men in the large class sample are less likely to drop out of college when their introductory economics course has more international peers. For the men in large classes, this is equivalent to a decline of 3.72 percentage points (relative to an average dropout rate of 0.260) in response to one standard deviation increase in the international peer share. Dropout responses for White and Asian male subgroups are also negative and statistically significant, and the coefficient is positive for URM men though not statistically significant. In contrast, domestic Asian women (Table 8,

column 7) may be more likely to drop out of college and also appear less likely to major in STEM and other Social Sciences when international peer share rises.

Table 9 shows the impact of international peers on domestic student grades in large classes and shows that similar patterns exist for both men and women. In particular, an increase in one standard deviation in international peer share increases the introductory economics grade by about 0.125 points for men and increases the grade by 0.146 points for women. This is a roughly similar relative magnitude for men and women, when compared with their average grades (roughly 2.55 for men and 2.56 for women). The magnitude of the impact on White male students' grades is also statistically significant and similar in magnitude, but for URM men, the impact is larger (coefficient of 0.254 and statistically significant at 1% level, relative to mean of 2.315).

Table 10 shows similar results, indicating that men in large classes are more likely to earn a B- or better in their introductory course when international peer share increases (coefficient estimate 0.0657 relative to mean of 0.567), which is again similar to the magnitude for women (0.057 relative to mean of 0.559). The impact is also statistically significant and somewhat similar in magnitude for White men (0.0533 relative to mean of 0.584), and again the effect is much larger for URM men (coefficient estimate of 0.125 relative to mean of 0.456). As with the main results, Tables 9 and 10 seem to indicate that grades may be an important mechanism and suggest that the impacts on men and women overall appear similar.

In parallel with the main results, we also provide results for large classes where international peer share is measured in alternative ways relating to their TOEFL scores (Appendix Table A10). Again, we do not see clear evidence that language ability, as measured by the TOEFL, appears to be a mechanism underlying the impacts of international peer share on college major and the results

are generally not statistically significant for women overall when international peer share is defined by TOEFL scores. Appendix Tables A11 and A12 limit the sample of students in large classes to those who were not initially enrolled in the business school and show results that are generally consistent with the large class results discussed above. In Table A11, the results for URM men show statistically significant increases in the likelihood of majoring in economics of 21.9 percentage points with an increase of one standard deviation in international peer share. Table A12 shows that Asian Men and White women are statistically significantly more likely to major in STEM, URM men are more likely to major in another social science, and URM women are more likely to drop out when there are more international peers.[34]

V. CONCLUSION

As student populations have become increasingly global, the number of international students in college classrooms has risen significantly in the U.S., raising questions about the impacts of these demographic shifts on domestic students. Evidence from this paper, focusing on quasi-random assignment of first-year, first-term students to introductory economics courses at a large public flagship university, suggests there may be important shifts in college major choice of domestic students as a result. In particular, increases in the international student peer share in introductory economics classes decreases the likelihood of majoring in economics for domestic White and Asian male students, and increases the probability of White and Asian male students majoring in business. While we do not generally see statistically significant results for women in the full sample, women in large classes generally show similar responses to men overall, though the results by racial subgroups of women vary more widely, arguably due to smaller sample

[34] As mentioned above, the sample of Asian women is very small, so we do not emphasize those results here.

sizes. We also see statistically significant results on the dropout margin for men in large class settings, indicating that men in large classes are generally less likely to drop out of college when their introductory economics course has more international peers. Overall, our results suggest that student grades are an important mechanism behind our results, suggesting that a higher international peer share is generally associated with higher grades for domestic students, who are able to select preferred majors that may require higher grades for admission (e.g., business). Consequently, these students may also be less likely to drop out of school as a result.

Our results on college major are broadly consistent with those from Anelli, Shih, and Williams (2023) which indicate that a higher share of foreign peers in introductory math classes reduces the probability of graduating with a STEM degree, with the important caveat that Anelli, Shih, and Williams (2023) found a displacement of domestic students toward social sciences, and in this case, we see a displacement of some domestic students toward business degrees. The difference may be due to institutional differences in access to alternative majors like business.

In contrast, more international peers in introductory economics courses increases the likelihood of domestic URM males majoring in economics and, some evidence suggests, decreases the likelihood of URM men dropping out of college. This appears to be driven by increases in introductory economics course grades for domestic White and URM students when introductory courses have higher shares of international peers. Marginal grade changes enable some students to move into the business major while potentially giving other students more confidence to pursue a degree in economics. Unfortunately, we are unable to identify a mechanism for the impact that we see on domestic Asian men. It is possible that these impacts may be the result of more complex relationships including culture and language which we are not able to further deconstruct given our data limitations and small sample size for this group.

Further research using larger samples and complete data on prior academic background and language skills of international peers should further isolate the roles of these mechanisms. Additional data collection from student surveys could also help to identify whether classroom environment and feelings of belonging may exert independent effects on college major and college dropout in this environment, and may differ by race and gender (Bayer et al. 2020, Krafft et al. 2023). More broadly, our findings add to the literature documenting significant heterogeneity in policy impacts by race and ethnicity (Andrews, Imberman, and Lovenheim 2020) as well as to research highlighting the importance of disaggregating effects by racial and ethnic subgroups (Andrews, Li, and Lovenheim 2014, 2016; Arcidiacono and Koedel 2014). Although we are not able to observe earnings in our sample, the wider literature on the relatively high returns to the economics major (Bleemer and Mehta 2022) and the business major (Andrews, Imberman, and Lovenheim 2017) suggest that the long-run implications of our results may be profound.

While we have controlled for extensive characteristics of the classroom experience, we acknowledge that there are inherent limitations in our ability to observe classroom behaviors and how international peers might affect that dynamic in this large-scale quantitative study. Further research in this area might employ student and faculty surveys as well as direct observations of college courses to better understand how classroom peers shape academic and career outcomes for all students.

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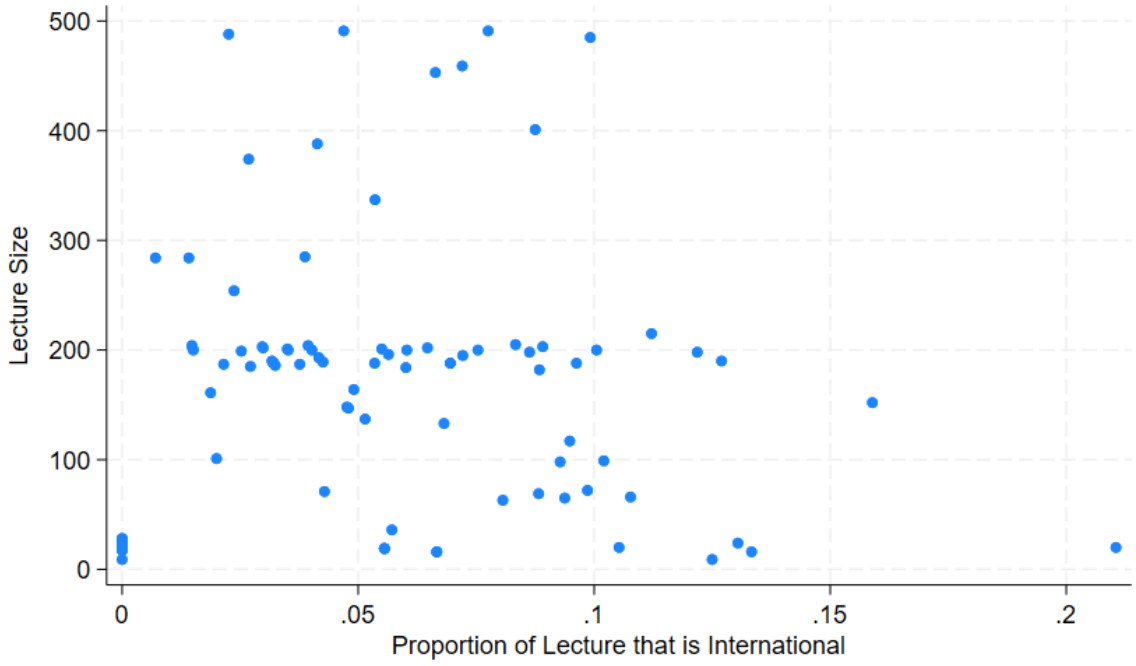
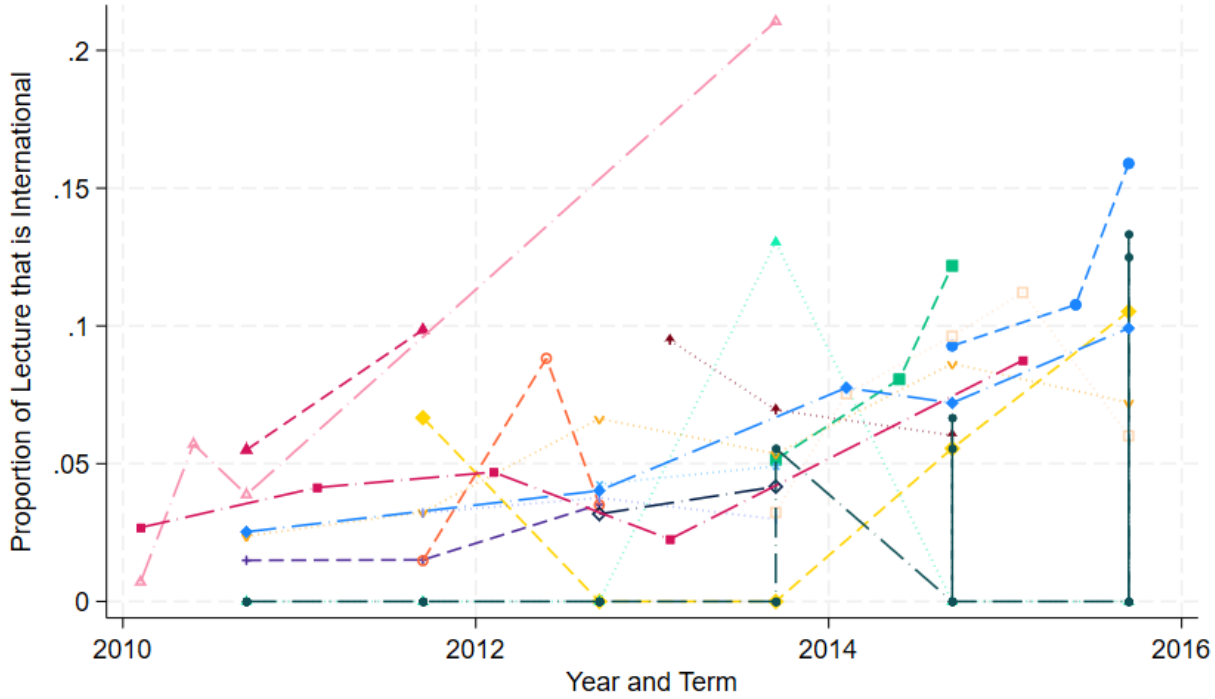
Figures

Figure 1 Distribution of International Student Peer Share over Lecture Class Size



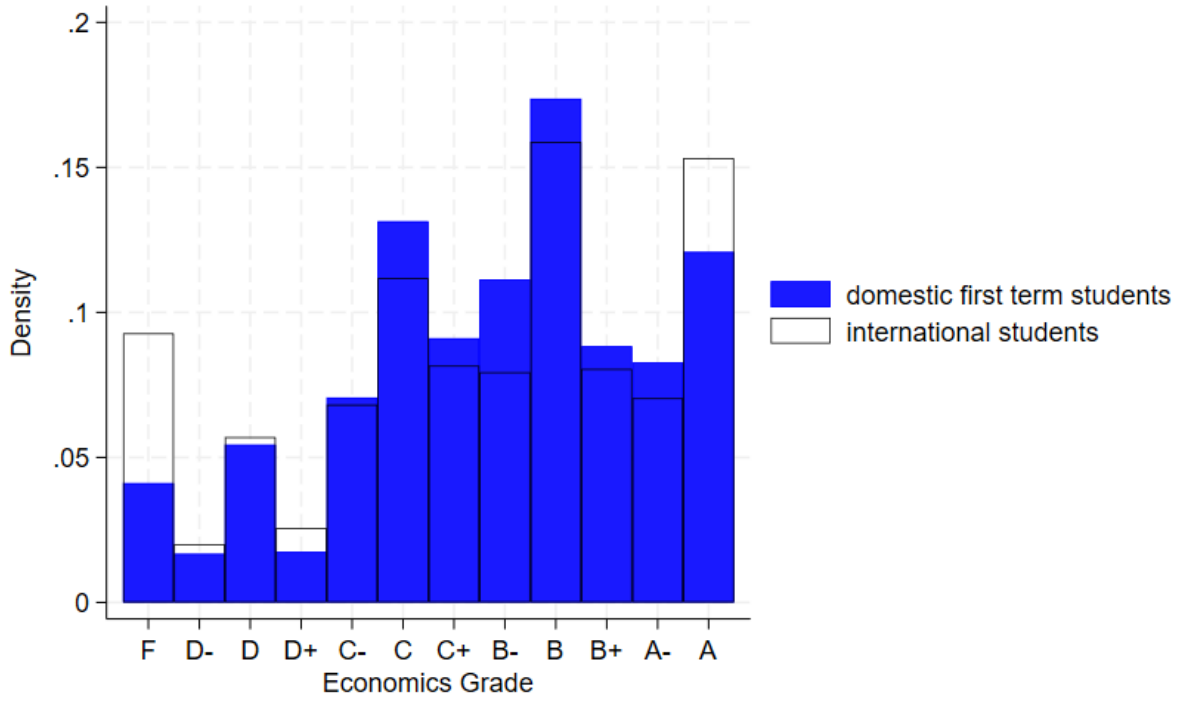
Note: This graph shows the variation in the proportion of international peer share by class size. Each class is represented by a dot.

Figure 2 Variation of International Student Peer Share by Instructor over Time



Note: This graph shows the variation in the proportion of international peer share by unique instructors. Each instructor who taught more than one section of introductory economics within our observation period is shown (those instructors who only taught one section are omitted for readability). Each instructor has a unique combination of ash and marker. This figure shows the variation within instructor over time of the proportion of the class that is international.

Figure 3 Economics Grade Distributions of First Term Domestic Students and International Student Peers



Note: This graph shows the distribution of first-term domestic student grades in introductory economics courses and all international student peers. Domestic student grade distribution is shaded, international student grade distribution is outlined in black.

Tables

Table 1 Summary Statistics

	Mean	SD
Panel A: Individual Variables for Domestic Students		
Men	0.665	0.472
White	0.798	0.402
Black	0.018	0.132
Asian	0.066	0.249
Hispanic	0.094	0.292
Native American	0.014	0.116
First Generation	0.139	0.346
ACT Math	25.647	3.575
ACT English + Reading	50.596	8.613
Introductory Microeconomics	0.993	0.086
Grade in Intro	2.584	1.010
Business College	0.487	0.500
Arts and Sciences College	0.493	0.500
Percent Lecture International (non-resident alien)	0.054	0.033
Dropout	0.228	0.420
Major in Econ	0.080	0.271
Entry Year	2012.612	1.705
N	7419	
Panel B: Class Variables		
International Student Peer Share (non-resident alien)	0.0467	(0.0417)
Percent with a TOEFL Score	0.0381	(0.0423)
Lecture Size (Number of Students)	145.9	(125.9)
Black Peer Percentage	0.0184	(0.0272)
Hispanic Peer Percentage	0.0890	(0.0465)
Native American Peer Percentage	0.0112	(0.0129)
Pacific Islander Peer Percentage	0.00495	(0.0136)
White Peer Percentage	0.756	(0.0922)
Asian Peer Percentage	0.0652	(0.0374)
Female Peer Percentage	0.362	(0.0808)
Introductory Microeconomics Classes	0.981	(0.137)
HS GPA of Peers	3.482	(0.0878)
ACT English + Reading of Peers	50.19	(1.489)
ACT Math of Peers	25.43	(0.592)
Business School Peers	0.313	(0.191)
N	106	

Notes: ACT/SAT scores were not required for international students for a majority of the observed timeframe. Because the university was not requiring ACT/SAT scores from international students, this may have impacted the type of international students who applied and were ultimately admitted.
Majoring in economics is measured upon graduation or our last observation of the individual (if they are still enrolled).
Percent Lecture International is measured by the “non-resident alien” distinction in the data. More than 78% of international students come from a country in Asia (with more than 44% coming from China alone). Countries that are represented are listed in Appendix Table A1.

Table 2 Impact of International Student Peer Share on the Likelihood of Majoring in Economics

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Non-resident alien share	-0.0218**	-0.0306**	-0.105**	0.0643***	-0.00911	-0.00605	-0.0950*	0.0157
	(0.0109)	(0.0118)	(0.0437)	(0.0238)	(0.00976)	(0.00963)	(0.0494)	(0.0298)
Observations	4,934	3,989	303	618	2,485	1,931	188	350
R-squared	0.090	0.089	0.249	0.179	0.084	0.072	0.299	0.320
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.100	0.0948	0.135	0.120	0.0390	0.0357	0.0585	0.0457

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 3 Impact of International Student Peer Share on College Major and Dropout Outcomes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men
Panel A: Business				
Non-resident alien share	0.0594***	0.0703***	0.0802*	0.0307
	(0.0159)	(0.0174)	(0.0454)	(0.0340)
Observations	4,934	3,989	303	618
R-squared	0.357	0.361	0.477	0.364
All Controls	YES	YES	YES	YES
mean Y	0.413	0.421	0.386	0.375
Panel B: STEM				
Non-resident alien share	-0.00639**	-0.00252	-0.0431	-0.00545
	(0.00310)	(0.00380)	(0.0337)	(0.0107)
Observations	4,934	3,989	303	618
R-squared	0.191	0.187	0.397	0.286
All Controls	YES	YES	YES	YES
mean Y	0.0300	0.0298	0.0528	0.0194
Panel C: Other College of Arts and Science				
Non-resident alien share	-0.00935	-0.0226***	0.0640***	0.00960
	(0.00764)	(0.00776)	(0.0200)	(0.0226)
Observations	4,934	3,989	303	618
R-squared	0.066	0.070	0.312	0.123
All Controls	YES	YES	YES	YES
mean Y	0.0768	0.0805	0.0495	0.0680
Panel D: Dropout				
Non-resident alien share	5.84e-05	-0.000357	0.00445	-0.0285
	(0.0142)	(0.0189)	(0.0434)	(0.0301)
Observations	4,934	3,989	303	618
R-squared	0.063	0.061	0.211	0.147
All Controls	YES	YES	YES	YES
mean Y	0.255	0.244	0.257	0.314

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 4 Impact of International Student Peer Share on Final Course Grade in Introductory Economics

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men
Non-resident alien share	0.0592**	0.0659*	-0.110	0.147**
	(0.0292)	(0.0344)	(0.0867)	(0.0716)
Observations	4,934	3,989	303	618
R-squared	0.250	0.250	0.416	0.298
All Controls	YES	YES	YES	YES
mean Y	2.581	2.622	2.545	2.336

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 5 Impact of International Student Peer Share on the Likelihood of Receiving a B- or Better in Introductory Economics

	(1)	(2)	(3)	(4)
VARIABLES	All Men	White Men	Asian Men	URM Men
Non-resident alien share	0.0344*	0.0425**	-0.0469	0.0333
	(0.0184)	(0.0200)	(0.0412)	(0.0385)
Observations	4,934	3,989	303	618
R-squared	0.199	0.194	0.374	0.277
All Controls	YES	YES	YES	YES
mean Y	0.580	0.597	0.581	0.466

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 6 Impact of Peer Share who took the TOEFL on the Likelihood of Majoring in Economics

VARIABLES	(1) All Classes All Men	(2) All Classes White Men	(3) All Classes Asian Men	(4) All Classes URM Men
Panel A				
International TOEFL Share	-0.102**	-0.0536	-0.149	-0.168
	(0.0402)	(0.0505)	(0.245)	(0.108)
International Non-TOEFL Share	0.0836*	0.0242	0.0651	0.241**
	(0.0452)	(0.0554)	(0.265)	(0.118)
Observations	4,934	3,989	303	618
R-squared	0.091	0.089	0.250	0.183
All Controls	YES	YES	YES	YES
mean Y	0.100	0.0948	0.135	0.120
Panel B				
International TOEFL Share above 75	-0.0383	0.00753	-0.199	-0.127
percentile for scores	(0.0394)	(0.0393)	(0.179)	(0.130)
International TOEFL Share between 25-75				
percentile scores	-0.0949**	-0.0528	-0.377	-0.167
	(0.0431)	(0.0466)	(0.266)	(0.112)
International TOEFL Share below 25				
percentile scores	-0.0113	0.0192	-0.109	-0.0562
	(0.0180)	(0.0238)	(0.109)	(0.0517)
International Non-TOEFL Share	0.0874	-0.00203	0.408	0.315*
	(0.0646)	(0.0712)	(0.388)	(0.173)
Observations	4,934	3,989	303	618
R-squared	0.091	0.090	0.253	0.183
All Controls	YES	YES	YES	YES
mean Y	0.100	0.0948	0.135	0.120

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. International TOEFL share is the proportion of "non-resident alien" students who took the TOEFL relative to the class size and international non-TOEFL share is the proportion of "non-resident alien" students who did not take the TOEFL relative to the class size. Both measures are standardized. International shares in Panel B are defined analogously. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 7: Impact of International Student Peer Share on the Likelihood of Majoring in Economics in Large Classes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Non-resident alien share	-0.0353***	-0.0386***	-0.193***	0.0341	-0.0250**	-0.0194	-0.0433	-0.0677**
	(0.00934)	(0.0122)	(0.0422)	(0.0292)	(0.0119)	(0.0123)	(0.0468)	(0.0335)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.095	0.092	0.278	0.196	0.08	0.075	0.288	0.252
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.101	0.0945	0.141	0.12	0.0369	0.0353	0.0568	0.0335

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Sample is limited to first year domestic students in classes with more than 50 students. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 8: Impact of International Student Peer Share on College Major and Dropout Outcomes in Large Classes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Panel A: Business								
Non-resident alien share	0.0973***	0.101***	0.223***	0.0472	0.0815***	0.0735***	0.368***	0.0608
	(0.0101)	(0.00978)	(0.0394)	(0.0301)	(0.0126)	(0.0136)	(0.0821)	(0.0403)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.365	0.368	0.476	0.368	0.391	0.405	0.374	0.511
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.411	0.419	0.373	0.381	0.506	0.504	0.551	0.497
Panel B: STEM								
Non-resident alien share	-0.000509	-0.00354	0.0239	0.0221	-0.00130	0.00170	-0.140***	0.0107
	(0.00357)	(0.00375)	(0.0334)	(0.0159)	(0.00539)	(0.00553)	(0.0194)	(0.0128)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.200	0.195	0.413	0.302	0.131	0.110	0.761	0.351
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.0300	0.0295	0.0543	0.0208	0.00801	0.00695	0.0114	0.0122
Panel C: Other Social Science								
Non-resident alien share	-0.0165**	-0.0307***	0.0650**	0.0277	-0.0153	0.000541	-0.177***	0.0287
	(0.00646)	(0.00708)	(0.0316)	(0.0209)	(0.00994)	(0.00999)	(0.0267)	(0.0550)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.069	0.073	0.285	0.126	0.114	0.122	0.380	0.267
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.0763	0.0802	0.0507	0.0659	0.0895	0.0938	0.0568	0.0793
Panel D: Dropout								

Non-resident alien share	-0.0372***	-0.0393**	-0.139**	-0.0429	0.0234	0.0175	0.194**	0.0507
	(0.0121)	(0.0182)	(0.0675)	(0.0302)	(0.0210)	(0.0185)	(0.0877)	(0.0506)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.065	0.063	0.224	0.153	0.079	0.083	0.292	0.297
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.260	0.249	0.272	0.315	0.182	0.169	0.199	0.244

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Table 9: Impact of International Student Peer Share on Final Course Grade in Introductory Economics in Large Classes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Non-resident alien share	0.125***	0.128***	-0.0162	0.254***	0.146***	0.0862	0.334	-0.135
	(0.0327)	(0.0437)	(0.107)	(0.0684)	(0.0521)	(0.0626)	(0.254)	(0.146)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.248	0.249	0.416	0.296	0.35	0.353	0.353	0.442
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	2.554	2.596	2.507	2.315	2.56	2.597	2.663	2.319

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Sample is limited to first year domestic students in classes with more than 50 students. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

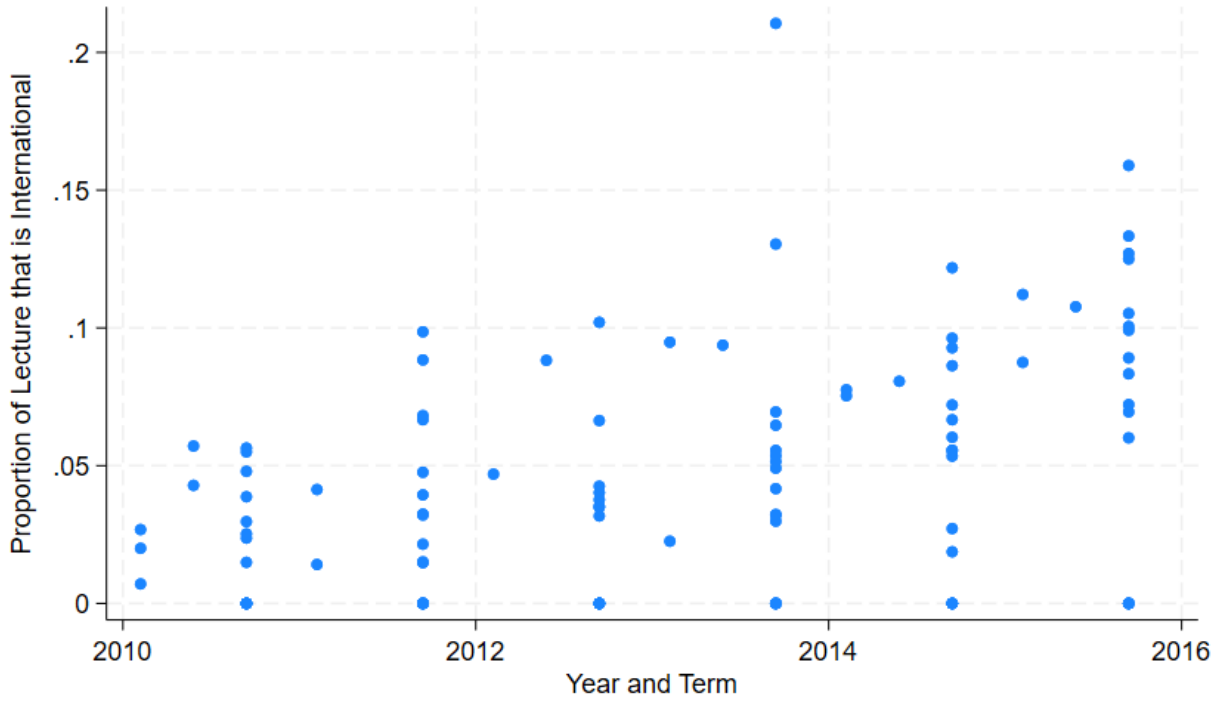
Table 10: The Impact of International Student Peer Share on the Likelihood of getting a B- or Better in Large Classes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Non-resident alien share	0.0657***	0.0533***	0.0570	0.125***	0.0570**	0.0364	0.0612	0.00674
	(0.0140)	(0.0158)	(0.0658)	(0.0375)	(0.0262)	(0.0254)	(0.102)	(0.0768)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.202	0.197	0.372	0.274	0.275	0.281	0.501	0.372
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.567	0.584	0.562	0.456	0.559	0.572	0.614	0.466

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Figures

Appendix Figure 1 Variation in International Student Peers (not Standardized) over Time



Note: This graph shows the variation in the proportion of international peer share over the study period. Each class is represented by a dot.

Appendix A Tables

Appendix Table A1 Foreign Countries Represented

International Student Home Country (71 countries represented)	Number of International Students	Percent of International Students
China	422	44.14
Saudi Arabia	73	7.64
Republic of Korea	48	5.02
Kuwait	41	4.29
Mexico	30	3.14
Venezuela	25	2.62
Norway	19	1.99
India	18	1.88
Canada	16	1.67
Japan	16	1.67
Malaysia	13	1.36
Sweden	13	1.36
Taiwan	13	1.36
Oman	12	1.26
Thailand	12	1.26
United Arab Emirates	11	1.15
United Kingdom	11	1.15
All Other (54) Countries individually making up less than 1% of the international student sample	163	16.92
Total	956	100

Note: Percentages do not add to 100 due to rounding.2

Appendix Table A2: Summary Statistics of Domestic and International Students

	(1) Domestic			(2) International			(3) Difference (Dom – Int)	
	Mean	Sd	count	mean	sd	count	b	T
Male	0.624	0.484	15497	0.702	0.458	927	-0.079***	(-5.059)
First Gen	0.151	0.358	15497	0.191	0.393	927	-0.040**	(-3.009)
ACT Math	25.375	3.901	15148	26.270	5.139	459	-0.895***	(-3.701)
ACT English + Reading	50.611	9.002	15149	32.782	10.912	458	17.829***	(34.612)
HS GPA	3.467	0.405	15129	3.280	0.451	204	0.187***	(5.886)
GPA in the Term of intro Econ	2.801	0.807	15069	2.571	0.996	906	0.230***	(6.818)
Cumulative GPA through intro econ	2.801	0.726	15309	2.523	0.939	924	0.278***	(8.843)
Last GPA on record (cumulative through the end of their college time)	2.865	0.643	15380	2.618	0.779	924	0.247***	(9.444)
Intro Micro	0.940	0.238	15497	0.973	0.162	927	-0.033***	(-5.843)
Intro Econ Grade	2.584	1.031	14776	2.463	1.194	894	0.121**	(2.972)
Business College	0.256	0.437	15497	0.269	0.443	927	-0.012	(-0.821)
Arts and Sciences College	0.670	0.470	15497	0.593	0.491	927	0.077***	(4.618)
International peer share (non-resident alien)	0.055	0.037	15496	0.076	0.061	927	-0.021***	(-10.351)
Dropout	0.223	0.417	15497	0.287	0.453	927	-0.064***	(-4.171)
Major in econ	0.084	0.277	15497	0.196	0.397	927	-0.113***	(-8.521)
Observations	15497			927			16424	

Note: Column 1 contains all domestic students in introductory economics classes. Column 2 contains all international students in introductory economics classes. Column 3 gives the difference between domestic and international summary statistics.3

Appendix Table A3 Selection on Observables

VARIABLES	(1) White	(2) Black	(3) Asian	(4) Hispanic	(5) Native American	(6) Pacific Islander	(7) HS GPA	(8) Math ACT	(9) English + Reading ACT	(10) Female	(11) First Generation
Non-resident alien share	0.0236	-0.00806*	0.00941	-0.0150	-0.00649***	-7.61e-05	-0.00138	0.108	0.413	0.0119	0.0112
	(0.0197)	(0.00412)	(0.00850)	(0.0124)	(0.00205)	(0.00578)	(0.0176)	(0.140)	(0.347)	(0.0130)	(0.0157)
Observations	7,419	7,419	7,419	7,419	7,419	7,419	7,419	7,419	7,419	7,419	7,419
R-squared	0.020	0.007	0.007	0.015	0.008	0.005	0.029	0.020	0.026	0.011	0.014
Year X Semester FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Professor FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Indiv. Controls	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Entry College	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Course Size	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peer Characteristics	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Peer College Char.	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
mean Y	0.798	0.0178	0.0662	0.0939	0.0136	0.00512	3.498	25.65	50.60	0.335	0.139
SD Y	0.402	0.132	0.249	0.292	0.116	0.0714	0.378	3.575	8.613	0.472	0.346

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. Controls include only year by semester fixed effects, and instructor fixed effects.

Appendix Table A4 Impact of International Student Peer Share on Introductory Economics Course Median and Mean Grade

VARIABLES	(1) Median Grade	(2) Mean Grade
Non-resident alien share	-0.0348	0.0131
	(0.0933)	(0.0583)
Observations	106	106
R-squared	0.805	0.839
Controls	YES	YES
mean Y	2.789	2.702

Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Controls include class size category, entry college proportions, class demographics, class ability, semester by year fixed effects, and instructor fixed effects.

Appendix Table A5 Impact of International Student Peer Share on the Likelihood of Majoring in Economics for Students who are not in the Business School

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Non-resident alien share	-0.0328*	-0.0490***	-0.243**	0.187***	-0.000959	0.00333	9.513	0.0255
	(0.0177)	(0.0182)	(0.109)	(0.0584)	(0.0197)	(0.0194)	(56.16)	(0.0959)
Observations	2,706	2,175	182	333	1,097	875	76	137
R-squared	0.033	0.035	0.358	0.175	0.071	0.059	0.658	0.418
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.173	0.165	0.209	0.207	0.0866	0.0777	0.132	0.117

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A6 Impact of International Student Peer Share on College Major and Dropout Outcomes for Domestic Students not in the Business School

	(1)	(2)	(3)	(4)
VARIABLES	All Men	White Men	Asian Men	URM Men
Panel A: Business				
Non-resident alien share	0.0445**	0.0558**	0.121	-0.00192
	(0.0221)	(0.0250)	(0.106)	(0.0415)
Observations	2,706	2,175	182	333
R-squared	0.059	0.061	0.314	0.149
All Controls	YES	YES	YES	YES
mean Y	0.157	0.162	0.148	0.132
Panel B: STEM				
Non-resident alien share	-0.00103	0.00456	-0.0180	-0.0230
	(0.00612)	(0.00721)	(0.0918)	(0.0165)
Observations	2,706	2,175	182	333
R-squared	0.212	0.209	0.474	0.326
All Controls	YES	YES	YES	YES
mean Y	0.0491	0.0487	0.0824	0.0330
Panel C: Other Social Science				
Non-resident alien share	-0.00506	-0.0257**	-0.0471	0.0835**
	(0.0127)	(0.0129)	(0.0698)	(0.0352)
Observations	2,706	2,175	182	333
R-squared	0.042	0.048	0.376	0.162
All Controls	YES	YES	YES	YES
mean Y	0.126	0.132	0.0824	0.111
Panel D: Dropout				
Non-resident alien share	0.0180	0.0282	0.190*	-0.152**
	(0.0150)	(0.0195)	(0.102)	(0.0587)
Observations	2,706	2,175	182	333
R-squared	0.065	0.059	0.282	0.212
All Controls	YES	YES	YES	YES
mean Y	0.304	0.294	0.302	0.354

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A5 Impact of International Student Peer Share on the Likelihood of Majoring in Economics for Students Entering as Undeclared Majors in the College of Arts and Sciences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	All Men	White Men	Asian Men	URM Men	All Women	White Women	Asian Women	URM Women
Non-resident alien share	-0.0263	-0.0377**	-0.504**	0.235**	0.00825	0.0147	-2.16e-11	-1.287
	(0.0195)	(0.0181)	(0.243)	(0.110)	(0.0247)	(0.0235)	(3.35e-11)	(1.958)
Observations	1,621	1,328	102	186	588	476	40	68
R-squared	0.055	0.056	0.557	0.247	0.125	0.098	1.000	0.720
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.149	0.138	0.206	0.199	0.0697	0.0609	0.100	0.118

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A6 Impact of International Student Peer Share on College Major and Dropout Outcomes for Domestic Students Entering as Undeclared Majors in the College of Arts and Sciences

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men
Panel A: Business				
Non-resident alien share	0.0642**	0.0726**	0.358*	0.0316
	(0.0291)	(0.0304)	(0.205)	(0.105)
Observations	1,621	1,328	102	186
R-squared	0.089	0.091	0.541	0.249
All Controls	YES	YES	YES	YES
mean Y	0.202	0.210	0.137	0.177
Panel B: STEM				
Non-resident alien share	-0.0185**	-0.0192**	0.00893	-0.0280
	(0.00726)	(0.00820)	(0.0689)	(0.0314)
Observations	1,621	1,328	102	186
R-squared	0.058	0.060	0.648	0.255
All Controls	YES	YES	YES	YES
mean Y	0.0302	0.0316	0.0294	0.0215
Panel C: Other College of Arts and Science				
Non-resident alien share	0.00237	-0.0106	0.0588	0.0746*
	(0.0153)	(0.0158)	(0.0489)	(0.0373)
Observations	1,621	1,328	102	186
R-squared	0.049	0.050	0.649	0.297
All Controls	YES	YES	YES	YES
mean Y	0.105	0.114	0.0392	0.0860
Panel D: Dropout				
Non-resident alien share	0.00400	-0.000225	0.176	0.0366
	(0.0224)	(0.0276)	(0.263)	(0.197)
Observations	1,621	1,328	102	186
R-squared	0.063	0.059	0.485	0.332
All Controls	YES	YES	YES	YES
mean Y	0.306	0.297	0.363	0.328

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A9: Impact of International Student Peer Share on the Likelihood of Majoring in Economics- Robustness to controls

VARIABLES	(1) All Men	(2) All Men	(3) All Men	(4) All Men	(5) All Men	(6) All Men	(7) All Men	(8) All Men	(9) All Men	(10) All Men
Non-resident alien share	-0.00651	-0.0169***	-0.0192*	-0.0189*	-0.0185*	-0.0185*	-0.0191*	-0.0190*	-0.0218**	-0.0189*
	(0.00645)	(0.00572)	(0.0104)	(0.0106)	(0.0102)	(0.0103)	(0.0105)	(0.0106)	(0.0109)	(0.0111)
Female Peer Share						-0.0108	-0.0397	-0.0383	-0.0114	
						(0.102)	(0.133)	(0.134)	(0.130)	
Average HS GPA							0.0640	0.0570	0.0615	
							(0.184)	(0.198)	(0.214)	
Average English + Reading ACT Score								0.000714	-0.00567	
								(0.00492)	(0.00642)	
Average Math ACT Score									0.0401*	
									(0.0215)	
Observations	4,934	4,934	4,934	4,934	4,934	4,934	4,934	4,934	4,934	4,934
R-squared	0.000	0.081	0.088	0.088	0.090	0.090	0.090	0.090	0.090	0.090
Individual Controls	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES
Course Controls	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
Peer College Controls	NO	NO	NO	YES	YES	YES	YES	YES	YES	
Peer Race Controls	NO	NO	NO	NO	YES	YES	YES	YES	YES	
Peer Controls (Domestic Only)										YES
mean Y	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. Individual controls include ACT Math score, ACT English/Reading score, high school GPA, race indicators, first generation indicator, and indicators for entry college. Course controls include class size (number of students as a categorical variable), professor fixed effects, and time fixed effects. Peer college controls include the proportion of the class by entry college. Peer race controls include proportion by racial demographic groups (i.e., share of the lecture that is Black, Hispanic, Asian, Pacific Islander, and Native American). Note the groupings of controls that are added in columns 2-5. In column 6-9, controls are added where international students were included when the data was available. In Column 10, share female, average HS GPA, and average ACT scores only include domestic students in the calculations.

Appendix Table A10: Impact of Peer Share who took the TOEFL on the Likelihood of Majoring in Economics in Large Classes

VARIABLES	(1) Large Classes All Men	(2) Large Classes White Men	(3) Large Classes Asian Men	(4) Large Classes URM Men	(5) Large Classes All Women	(6) Large Classes White Women	(7) Large Classes Asian Women	(8) Large Classes URM Women
Panel A								
International TOEFL Share	-0.428*	-0.244	0.204	-0.436	0.0958	0.0355	1.655*	-0.921
	(0.214)	(0.200)	(1.495)	(1.217)	(0.161)	(0.177)	(0.880)	(0.733)
International Non-TOEFL Share	0.401*	0.212	-0.367	0.471	-0.115	-0.0486	-1.683*	0.884
	(0.214)	(0.200)	(1.497)	(1.222)	(0.162)	(0.178)	(0.877)	(0.742)
Panel B								
International TOEFL Share above 75 percentile for scores	-0.143*	-0.0320	-1.143***	0.101	0.0854	0.0736	2.134	-0.230
	(0.0826)	(0.0851)	(0.213)	(0.336)	(0.0624)	(0.0685)	(1.564)	(0.852)
International TOEFL Share between 25-75 percentile scores	-0.375**	-0.265*	-1.926***	0.188	0.0668	0.0431	6.186	-0.462
	(0.146)	(0.145)	(0.348)	(0.545)	(0.0966)	(0.109)	(5.022)	(1.252)
International TOEFL Share below 25	-0.168**	-0.0719	-1.229***	0.0181	0.0703	0.0653	2.363	-0.249
	(0.0644)	(0.0637)	(0.157)	(0.258)	(0.0504)	(0.0553)	(1.720)	(0.411)
International Non-TOEFL Share percentile scores	0.454**	0.245	2.742***	-0.196	-0.160	-0.125	-7.870	0.606
	(0.202)	(0.202)	(0.493)	(0.773)	(0.138)	(0.154)	(6.178)	(1.720)
Observations	4,506	3,629	276	577	2,247	1,727	176	328
R-squared	0.097	0.095	0.292	0.197	0.081	0.075	0.298	0.255
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.101	0.0945	0.141	0.120	0.0369	0.0353	0.0568	0.0335

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. International TOEFL share is the proportion of "non-resident alien" students who took the TOEFL relative to the class size and international non-TOEFL share is the proportion of "non-resident alien" students who did not take the

TOEFL relative to the class size. Both measures are standardized. International shares in Panel B are defined analogously. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A11: Impact of International Student Peer Share on the Likelihood of Majoring in Economics for Students who are not in the Business School in Large Classes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	All Men	White Men	Asian Men	URM Men	All Women	White Women	Asian Women	URM Women
Non-resident alien share	-0.0536***	-0.0718***	-0.748***	0.219***	-0.0459*	-0.0304	-6.525	-0.270***
	(0.0190)	(0.0229)	(0.119)	(0.0717)	(0.0260)	(0.0257)	(17.80)	(0.0964)
Observations	2,447	1,962	166	303	977	773	72	123
R-squared	0.039	0.038	0.405	0.202	0.069	0.068	0.623	0.445
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.175	0.166	0.217	0.211	0.0829	0.0776	0.125	0.0894

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.

Appendix Table A12: Impact of International Student Peer Share on College Major and Dropout Outcomes for Domestic Students not in the Business School in Large Classes

VARIABLES	(1) All Men	(2) White Men	(3) Asian Men	(4) URM Men	(5) All Women	(6) White Women	(7) Asian Women	(8) URM Women
Panel A: Business								
Non-resident alien share	0.110***	0.129***	0.412***	0.00496	0.115***	0.0965***	-14.30	0.101
	(0.0199)	(0.0209)	(0.113)	(0.0580)	(0.0230)	(0.0269)	(26.91)	(0.0770)
Observations	2,447	1,962	166	303	977	773	72	123
R-squared	0.062	0.066	0.307	0.159	0.106	0.094	0.650	0.320
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.149	0.154	0.133	0.129	0.170	0.173	0.278	0.0976
Panel B: STEM								
Non-resident alien share	0.00997	0.00770	0.306***	-0.0224	0.0175*	0.0237**	-2.267***	0.0173
	(0.00717)	(0.00779)	(0.0869)	(0.0314)	(0.0100)	(0.0108)	(1.29e-09)	(0.0347)
Observations	2,447	1,962	166	303	977	773	72	123
R-squared	0.224	0.222	0.502	0.337	0.193	0.187	1.000	0.403
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.0490	0.0479	0.0843	0.0363	0.0143	0.0116	0.0139	0.0325
Panel C: Other Social Science								
Non-resident alien share	-0.0230**	-0.0464***	-0.108	0.134***	-0.00521	0.0380*	29.37	-0.0832
	(0.0112)	(0.0117)	(0.121)	(0.0464)	(0.0252)	(0.0225)	(20.86)	(0.120)
Observations	2,447	1,962	166	303	977	773	72	123
R-squared	0.045	0.053	0.362	0.180	0.092	0.099	0.731	0.529

All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.126	0.133	0.0843	0.109	0.173	0.175	0.125	0.179
Panel D: Dropout								
Non-resident alien share	-0.0328**	-0.0346*	0.190	-0.137	0.0129	-0.0139	-3.117	0.325***
	(0.0152)	(0.0196)	(0.257)	(0.0920)	(0.0290)	(0.0292)	(15.67)	(0.121)
Observations	2,447	1,962	166	303	977	773	72	123
R-squared	0.064	0.059	0.299	0.242	0.109	0.109	0.641	0.530
All Controls	YES	YES	YES	YES	YES	YES	YES	YES
mean Y	0.312	0.301	0.325	0.356	0.238	0.220	0.236	0.366

*** p<0.01, ** p<0.05, * p<0.1 Standard errors clustered at the class level. Non-resident alien share is standardized. URM consists of all non-White, non-Asian domestic students. Controls include class size (number of students as a categorical variable), proportion of the class by gender and racial demographic groups (i.e., share of the lecture that is female, Black, Hispanic, Asian, Pacific Islander, and Native American), average test scores and high school GPA, and peer shares in each college. Individual ability controls include ACT Math score, ACT English/Reading score, and high school GPA. All other controls include race indicators, first generation indicator, indicators for entry college, year by semester fixed effects, and instructor fixed effects.