A community college instructor like me: Race and ethnicity interactions in the classroom[*]

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Abstract: Administrative data from a large and diverse community college are used to examine if underrepresented minority students benefit from taking courses with underrepresented minority instructors. To identify racial interactions we estimate models that include both student and classroom fixed effects and focus on students with limited choice in courses. We find that the performance gap in terms of class dropout rates and grade performance between white and underrepresented minority students falls by 20 to 50 percent when taught by an underrepresented minority instructor. We also find these interactions affect longer term outcomes such as subsequent course selection, retention, and degree completion.

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The achievement gap between historically underrepresented minority students and non-minority students is one of the most persistent and vexing problems of the educational system in the United States. African-American, Latino and Native-American students have substantially lower test scores, grades, high school completion rates, college attendance rates, and college graduation rates than non-minority students.[1] Fryer and Levitt (2006) and Fryer (2011) document that, for African-Americans, achievement gaps appear in elementary school and persist throughout primary and secondary education, while Reardon and Galindo (2009) find that, for Hispanics, achievement gaps are already substantial at the start of kindergarten.[2] Fry (2002) and Arcidiacono, Aucejo, and Spenner (2011) find that similar gaps exist at post-secondary institutions. A major concern is that, in spite of substantial publicity and some affirmative action, the racial achievement gap has not shrunk over the last two decades, contrasting sharply with trends in other educational disparities such as the gender gap.[3] Such persistent disparities in educational attainment may have major implications for income and wealth inequality across racial and ethnic groups.[4]

A common, though hotly debated, policy prescription for addressing these disparities is to expand the representation of minority instructors at all levels of the educational system. Indeed, there is a general lack of minority instructors, especially at

[1] See U.S. Department of Education (2010).
[2] Fryer and Levitt (2013) find no black/white gap in cognitive abilities at age 8 to 12 months. An extensive literature examines the underlying causes of the black/white achievement gap and its persistence even after controlling for a wide range of individual and family characteristics (e.g., see Jencks and Phillips 1998). A few examples of recent explanations with empirical support include segregation (Card and Rothstein 2007), attending schools with higher black enrollment shares and less teacher experience (Hanushek and Rivkin 2008), permanent income disparities (Rothstein and Wozny 2011), lower school quality (Fryer and Levitt 2004) and differences in social norms (Austen-Smith and Fryer, 2005), and for Hispanics whether English is spoken at home (Reardon and Galindo 2009).
[3] See e.g. Fryer and Levitt (2006).
[4] Such arguments are made in e.g. Altonji and Blank (1999), Card (1999), and Jencks and Phillips (1998).

the post-secondary level: only 9.6 percent of all full-time instructional faculty at U.S. colleges are black, Latino or Native American, while these groups comprise one-third of the college-age population and an even higher percentage of children.[5] The lack of minority instructors may impose severe limits on the availability of role models, increase the likelihood of "stereotype threats" and discrimination against minority students, and restrict exposure to instructors with similar cultures and languages.

In this paper we offer the first systematic empirical study of minority interactions between students and instructors at the post-secondary education level. We test whether underrepresented minority students experience significant achievement gains from being taught by an underrepresented minority professor. "Underrepresented minority", which we use interchangeably with "minority" below, includes African-Americans, Hispanics, and Native Americans/Pacific Islanders, but not Asian-Americans.[6] We estimate student-instructor minority interactions using a novel and unique administrative dataset with detailed demographic information on instructors as well as students from a large and ethnically diverse community college in the San Francisco Bay Area. Our data contain comprehensive information on students' course-level academic outcomes, and long-term outcomes such as majors, retention, degree completion, and transfers to 4-year colleges.

In addition to providing general evidence on the importance of social interactions by race and ethnicity, our study is also the first to focus on the community college system. The lack of previous research using data from community colleges is somewhat surprising given that they enroll nearly half of all students attending public universities. Since community colleges, in addition to providing workforce training, serve as an

[5] See U.S. Department of Education (2010).
[6] This is the common definition used for "underrepresented minority" in California public higher education.

important gateway to 4-year colleges, they can be seen as a crucial part of the post-secondary educational system in the United States. In fact, in some states, including California, nearly half of all students attending a 4-year college previously attended a community college.[7] With recent calls for major expansions in enrollments and provision of 4-year transfer courses, one can expect that community colleges will gain further importance. Transfers from community colleges to the California State University (CSU) system, for example, are projected to increase by 25 percent over the next decade (California Postsecondary Education Commission 2010).

It is well known that random assignment of students to classes does not occur at community colleges or 4-year universities outside of the military post-secondary educational system.[8] We therefore employ several empirical strategies to rule out the possibility that the estimates are driven by omitted variable biases, to explore the external validity of our results, and to investigate the channels through which our estimated reduced-form effects operate. Our basic empirical approach is built on a regression model in which the parameter of interest is the differential effect between minority and non-minority students of being assigned to a minority-instructor in the same class. The focus on estimation of a fixed effects model from panel data such as ours permits enormous flexibility in the types of specifications that can be estimated. In particular, the explanatory variable of interest varies both within student and within classroom, allowing us to estimate models that simultaneously include student and classroom fixed effects and that mitigate omitted variable biases that typically plague the empirical literature on

[7] See U.S. Department of Education (2010); CCCCO (2009); Sengupta and Jepsen (2006).
[8] Random assignment takes place at the U.S. Air Force Academy that provides undergraduate education for officers in the U.S. Air Force (Carrell, Page, and West 2010).

student-instructor interactions.[9] Given the large number of fixed effects in our 2-way-model we conduct the first application of an algorithm that has been applied to the estimation of firm and worker fixed effects with large administrative data to the estimation of student and teacher fixed effects.[10]

While our empirical model addresses many of the potential threats to internal validity, we cannot directly control for differential sorting that may arise if, for example, highly motivated minority students systematically sort into minority-taught classes while highly motivated non-minority students do not. We implement a test for this hypothesis using a rich set of observables that are likely to be highly correlated with unobserved student abilities, such as past academic performance, and do not find any evidence of differential sorting. Nevertheless, we exploit the institutional features of our community college to generate samples of students in which the incidence of endogenous sorting of students by instructor type is greatly minimized. We focus on students with limited class enrollment choices due to their low standing on registration priority lists. We also estimate our model from a sample of courses in which students have no choice over instructor's race within a term or even academic year.

We find that the minority achievement gap is smaller in classes taken with minority instructors for several course outcome measures. Minority students obtain better grades, are less likely to drop a course, are more likely to pass a course, and are more likely to have a grade of at least a B. These gaps are reduced by 20 to 50 percent with a minority instructor and translate into longer-run impacts on taking subsequent courses in

[9] Here and subsequently we use the term “class” or “classroom” to refer to a particular offering or section of a course with a specific instructor during some term, such as "Principle of Microeconomics: ECON-100, section 001". Hence, a "class" or "classroom" is uniquely defined by course title, section, and term.
[10] See for example Abowd, Kramarz, and Margolis (1999) and Abowd, Creecy, and Kramarz (2002).

the same subject, major choice, retention, and degrees. Effects on dropping a course in the first few weeks, long-term outcomes, and performance in more objectively graded courses such as those commonly using multiple-choice exams and math courses, suggest that students are reacting to the race and ethnicity of the instructor rather than the other way around. We find evidence of both positive role model effects, with minority students performing better with minority instructors, and negative influences, with non-minority students performing worse with minority instructors.

Our paper is related to a number of studies, most notably Dee (2004, 2005, 2007) and Ehrenberg, Goldhaber and Brewer (1995), that use data from the elementary and 8th grade educational levels to estimate race and ethnicity interactions between students and teachers. They find some evidence of positive student-teacher interactions by race and gender. Our paper is also related to a small, but growing literature that focuses on gender interactions between students and instructors at the post-secondary level. Similar to our work, these studies rely increasingly on high-quality administrative student panel data that can be matched to instructor-level data. They tend to conclude that female students perform relatively better when matched to female instructors (e.g. Bettinger and Long 2005; Hoffmann and Oreopoulos 2009).[11] A recent study by Carrell, Page, and West (2010), which takes advantage of the random assignment of students to classrooms at the U.S. Air Force Academy, also finds that female students perform better in math and science courses with female instructors. None of these previous studies, however, examine the impact of an instructor's race or ethnicity on student outcomes at the post-

[11] A larger literature studies gender interactions at the primary or secondary school level. The findings are generally mixed (see for example, Nixon and Robinson 1999, Ehrenberg, Goldhaber, and Brewer 1995, Dee 2007, Holmlund and Sund 2008, Carrington, Tymms and Merrel 2008, Lahelma 2000, and Lavy and Schlosser 2011).

secondary education level, due to not being able to obtain race information on instructors and the lack of underrepresented minority faculty at more selective colleges. Even if a selective college existed with many minority faculty, the focus on a large, diverse community college such as ours is likely to be more representative of the average college experience for minority students in the United States. The lack of research on racial interactions at the college level might be an important omission in the literature, as the effects of minority faculty on minority students may be large due to the sizeable racial achievement gap and similarities in culture, language and economic backgrounds. In addition, measures of racial inequality in education, income and other outcomes have not decreased recently, in contrast to gender inequality.

I. Data

A. Administrative Data and Institutional Background

Our analysis is based on administrative data from De Anza College, a large community college that is located in the San Francisco Bay Area. It is part of the California Community College system, which is the largest higher educational system in the United States with 110 colleges and 2.9 million students per year. De Anza College has an average total enrolment of 22,000 students per year. It has a larger share of minority students than the nationally representative community college, reflecting the diversity of Northern California.

Our data contain information on course outcomes including grades, credits received, and course dropout behaviour for every class offered by and every student

enrolled at De Anza College from the fall quarter of 2002 to the spring quarter of 2007.[12] Each class is matched to corresponding instructor data, with information on demographic characteristics such as race, ethnicity, gender and age. Classroom data is also matched to all students who initially enrolled, including information on race, ethnicity, gender, age and various other characteristics. Administrative data from the college provide information on majors together with all associate and vocational degrees received through summer 2010 for each student enrolled over the five-year period. We obtain data on an additional long-term outcome – transfers to 4-year colleges – by linking National Student Clearinghouse data through summer 2012 to all of the students in our student-course level data.

An open enrolment policy – common to all community colleges in California – together with low tuition costs of $17 per quarter unit (roughly $850 per year in tuition and fees), mandated small class sizes (most below 50) and a desirable location, have created general excess demand for courses at the college. It has therefore established a strictly enforced registration priority system that determines the day on which students are allowed to register over an eight-day period. Registration priority is determined by whether the student is new, returning or continuing, the number of cumulative units earned at De Anza College, and enrolment in special programs.[13] By analyzing detailed administrative data on all registration attempts and wait-lists we find that students' registration priority indeed has a large impact on enrolling in preferred courses or time-slots: Among students with a low registration priority, only 54.9 percent of the course sections in which students first attempt to register result in an actual enrolment, compared

[12] See Fairlie, Hoffman and Oreopoulos (2013) for more details.
[13] We remove students enrolled in special and often minority-student focused programs, who receive special registration priority status even if they are new or returning students.

with approximately 74.5 percent for students with a higher registration priority We also find higher probabilities of being placed on wait lists for first registration attempts among low-registration priority students compared to students with higher registration priorities (7.2 percent compared with 3.4 percent).

B. Sample Restrictions and Summary Statistics

We exclude recreational courses, such as cooking, sports and photography, orientation courses, and summer courses from the analysis. In the main sample, we also exclude courses that have an average enrolment per session of less than 15 students, courses in small academic departments, and students who are over 35 years old at the time they enter the sample. These restrictions account for roughly 10 percent of the sample.[14] The remaining sample consists of 446,225 student-class observations. Table 1 reports descriptive statistics. At the student-class level, 29 percent of observations are from students with low registration priority status and 61 percent of observations are from course-quarters that have no variation in underrepresented minority status across sections. We use both of these subsamples to help address remaining course selection concerns.

In panel B of Table 1 we document important differences in academic outcomes across groups. White and Asian students have the highest average outcomes. Hispanics, African-American, and Native American, Pacific Islander and other non-white students are more likely to drop classes, are less likely to pass classes, receive lower average grades, and are less likely to receive a good grade (B or higher). For all outcomes, these differences are large and statistically significant, documenting that the largest differences

[14] See Fairlie, Hoffmann and Oreopoulos (2013) for details.

in academic outcomes take place along the minority-non-minority margin rather than along less aggregated measures of race and ethnicity. Aggregating up these statistics for the underrepresented minority group yields a dropout rate of 28 percent, an average GPA of 2.6 (where 4.0 is equivalent to an A), and a course pass rate of 83.5 percent. Fifty-seven percent of grades are at least a B. African-American, Latino and other underrepresented minority students also have substantially worse long-term outcomes – lower retention rates, a lower fraction of degree completion, and a smaller share of students who transfer to a 4-year college.

Panel C of Table 1 displays the racial and ethnic composition of the student and instructor body. Underrepresented minorities comprise 21 percent of the total student body, 14 percent of which are Hispanic, 4 percent are African-American, and 3 percent are other minorities. The racial distribution of instructors differs from the student distribution. Seventy percent of instructors are white, whereas only 6 percent of instructors are Hispanic. The share of African-American instructors, however, is slightly higher than the corresponding share of African-American students. The lack of minority instructors at De Anza College does not differ substantially from all colleges in the nation. Ten percent of all college instructors are from underrepresented minority groups, compared with 16 percent at De Anza College (U.S. Department of Education 2010).

II. Econometric Model and Estimation Strategy

Our main econometric model of student-course level outcomes y_{ijkst} is given by

$$y_{ijkst} = \alpha_0 + \alpha_1 * min\_inst_j + \alpha_2 * min\_stud_i + \alpha_3 * min\_inst_j * min\_stud_i + \mathbf{X}'_{ijkst}\boldsymbol{\beta} + u_{ijkst}. \quad (1)$$

where students are indexed by i, instructors by j, courses by k, sections by s, and term (i.e. quarter) by t.[15] The student and instructor-level variables min_stud_i and min_inst_j are indicator variables that are equal to one if student i and instructor j belong to an underrepresented minority group, respectively, and $\mathbf{X}_{ijkst}$ and u_{ijkst} are vectors of observable and unobservable variables. The parameter of interest is α_3 which measures the extent to which minority *gaps* in the outcome variables depend on whether the students are assigned to a minority or a non-minority instructor. It is greater than zero if minority students gain relative to non-minority students from being taught by a minority instructor, which is the student-instructor interaction of interest in our study. Including student fixed effects, γ_i, and classroom fixed effects, ϕ_{kst}, and dropping student- and class-level variables from equation (1) that are multicollinear with either of the fixed effects, we obtain our preferred empirical model:

$$(2) \qquad y_{ic} = \alpha_3 * min\_stud_i * min\_inst_c + \gamma_i + \phi_c + u_{ic}$$

where we have replaced the combination of the indices k, s, t by a classroom index c and indexed the minority-instructor dummy by c rather than j.

The focus on the interaction term between students' and instructors' minority status allows us to identify student and classroom fixed effects, thereby overcoming many threats to internal validity. Importantly, our specification implicitly controls for instructor fixed effects and minority-specific course fixed effects. The former controls for the possibility that minority students take courses from instructors who have systematically different grading policies from other instructors, while the latter controls

[15] See Fairlie, Hoffmann and Oreopoulos (2013) for a more detailed description.

for selection by comparative advantage where minority students are drawn to courses that are a particularly good match or in which minority instructors are relatively overrepresented. A further advantage of including classroom fixed effects is that they implicitly standardize testing procedures across student groups that we are comparing, since within the same classroom students are taking exactly the same tests and are subjected to the same class-level shocks such as an instructor's teaching performance or philosophy, the time of day, or external disruptions. Finally, we include individual fixed effects γ_i in our regressions to control for absolute sorting that takes place if students taking classes from minority instructors are systematically different from those who do not, irrespective of their minority background.

While our specification addresses many of the potential threats to internal validity, we cannot directly control for differential sorting that may arise if, for example, highly motivated minority students sort systematically into minority-taught classes, while highly motivated non-minority students sort systematically into non-minority-taught classes. Note, however, that if there are minority gaps that persist across all classes, independent of instructor characteristics, they are implicitly controlled for through the inclusion of individual fixed effects and the estimation of what is essentially a difference-in-difference approach.

The hypothesis of differential sorting is testable if one has access to some measurable characteristics, x_{ic}, that are highly correlated with u_{ic}. Consider minority-specific classroom averages of x_{ic}, denoted $\overline{X_{mc}}$, where $m \in \{0,1\}$ is an index equal to one if the average is computed for minority-students and zero if it is computed for non-minority students. Since a classroom is associated with exactly one instructor minority

status, these averages are the empirical counterparts of conditional expectations for the error terms. We can then test for differential sorting by estimating a difference-in-difference model:

(3) $$\overline{X_{mc}} = \delta_1 * min\_inst_c + \delta_2 * \mathrm{I}_m + \delta_3 * min\_inst_c * \mathrm{I}_m + \nu_{mc}.$$

where I_m is a dummy variable equal to one if $m = 1$ and zero otherwise, and δ_3 is an empirical estimate of the difference-in-difference in conditional expectations of minority gaps in error terms in which x_{ic} proxies for the error term. Hence, δ_3 quantifies the extent to which minority gaps in an observable variable, x_{ic}, vary across classes that are taught by instructors of different minority groups. Clearly, an estimate of δ_3 is only helpful in testing for differential sorting if x_{ic} is strongly related to the error term. Given the richness of our data, we are able to use several variables, such as past academic performance, age and gender, to estimate "sorting regressions" such as equation (3). Even though we do not detect any evidence of differential sorting when implementing this test, as discussed in the next section, we estimate specifications in which the sample of students and courses is chosen to minimize the possibility of differential sorting across classes. In particular, we estimate equation (2) using a sample of students who have the lowest registration priority status, samples that rule out variation in instructors' minority status across classes within course-term or course-year, and a sample of students who do not obtain their first section of choice identified by registration attempt data.

We estimate this model for five different student course outcome variables. The first four are a dummy variable for whether a student drops the course by the first three weeks of the quarter, a dummy variable for whether a student passes the course

conditional on finishing it, a course grade variable that is normalized to have mean zero and unit standard deviation within a course, and a dummy variable for whether the student has a grade above a B-. All of these outcomes relate to a student's academic achievement in a particular course. Our data also allow an exploration of whether minority interactions are relevant for a student's future curriculum. We therefore generate a fifth outcome variable that records whether a student takes another course in the same subject in the next quarter, which cannot be directly influenced by the instructor.

Estimation of the two-way fixed effects model of equation (4) with unbalanced panel data is computationally infeasible using OLS with the more than 30,000 students and over 20,000 classrooms in our data. We thus rely on recent advances in the estimation of firm-and worker fixed effects from administrative data.[16]

III. Results

A. Evidence against Sorting

With the inclusion of classroom and student fixed effects and the focus on the relative effect of assignment to a minority instructor, the primary threat to validity arises from the possibility of differential sorting. In particular, if classes where minority students tend to perform better relative to non-minority students are also classes with a minority instructor and if this effect is not due to the interaction itself but due to unobserved differences between the student groups, our estimates will be biased. We

[16] The seminal paper in this literature is Abowd, Kramarz and Margolis (1999). Refinements have been developed by Abowd, Creezy and Kramarz (2002) and Andrews et al (2008). Cornelissen (2008) has written a Stata-routine based on these algorithms. The literature estimating firm-and worker fixed effects also utilizes the fact that many workers never change firms, thus not contributing to identification of any of the firm fixed effects. This can further increase the speed of computation. In our example, we cannot apply this method since nearly all students take more than one class in the data and thus contribute to the identification of at least some classroom fixed effects. See Fairlie, Hoffmann and Oreopoulos (2013) for a more detailed discussion.

implement our test for differential sorting by estimating equation (3) for various background variables that are likely to be correlated with the unobserved ability term. Estimates of the interaction coefficient, δ_3, which measures the extent to which the minority-gap in outcomes varies across classes taught by minority and non-minority instructors, are reported in Table 2. All standard errors are clustered at the course-term-minority level.[17] We use the following four background variables: student age, gender, the cumulated number of courses, and the cumulated GPA prior to enrolment. As past GPA and present GPA are highly correlated, we view the last variable as a particularly good measure of a potential unobserved student component that might be related to differential selection. In particular, if the minority-non-minority gap of accumulated GPA prior to enrolment in the current course is different in classes that are taught by minority instructors, our assumption of no differential sorting is most likely violated.

We do not find evidence of sorting: None of the estimates are statistically significant at any conventional level. Furthermore, this insignificance is not driven by the imprecision of our estimates. Rather, point estimates fluctuate considerably as we explore the robustness of our estimates across sub-samples, indicating that we cannot detect any systematic or robust sorting patterns in the data.[18] Most importantly, minority gaps in accumulated GPA prior to course enrolment – a variable that is most likely to be highly correlated with unobserved student traits – do not depend on instructor race. In other words, we do not find evidence that high ability minority students are more likely to take

[17] We obtain similar results when standard errors are instead clustered at the instructor level (see Appendix Table 1).
[18] We find that these results are robust with respect to the regression specification, the sample, and the type of variation in instructor minority status across different class offerings of a course.

minority-taught classes compared with high ability non-minority students. We interpret this as strong evidence in favour of our working hypothesis of no differential sorting.

B. Main Results

Estimates of the minority interactions between students and instructors for our five course outcome variables using the full sample and a subsample of students who are low on the registration priority list are reported in Table 3. We explore the sensitivity of results with respect to the set of fixed effects; as we move along the columns, we increasingly restrict the variation used to identify our parameter of interest. Results from our preferred specification described in equation (2) which includes both student and classroom fixed effects are displayed in column (5). The other specifications reported in the table include minority-specific time fixed effects and a set of student and instructor controls (column 1), a specification with minority-specific course-time fixed effects (column 2), and specifications with student or classroom fixed effects (columns 3 and 4, respectively). Standard errors are clustered at the instructor-level.[19]

There are significant minority interaction effects on student dropout behaviour and grade performance that are robust with respect to the sample used and the set of fixed effects included. Our main estimates indicate a reduction of the minority gap in course dropout behaviour when taught by a minority instructor by 2 to 3 percentage points and

[19] We follow Cameron and Miller's (2013) suggestion of adapting a conservative strategy by choosing larger clusters. A natural choice is to cluster on the instructor level since this is the level of the treatment variation in our interaction analysis. However, a potential problem with this strategy is that the majority of the instructors in our sample teach multiple classes. As a consequence, standard errors clustered at the instructor level depend directly on classroom fixed effects which are estimated with (small-sample) bias. It is therefore plausible to assume that our standard errors are inflated. We have also estimated all specifications with clustering standard errors at the classroom level. This reduces standard error estimates slightly, but does not affect overall conclusions. We report these alternative results for our main specifications in Appendix Table 2.

in student grade by 5 percent of a standard deviation. These results are robust when including instructor or classroom fixed effects or when using minority-course fixed effects, implying that they are not being driven by grading differences across classes or student sorting by comparative advantage into subjects and courses.[20] Our baseline model with both class and student fixed effects also indicates strong minority interaction effects on the probability of passing a course among students and the probability of receiving a grade of B or higher. All of these estimates imply large effects relative to the minority base rates and the white-minority gaps in outcomes. Underrepresented minority students are 1.2 to 2.8 percentage points more likely to pass classes relative to a minority base of 83 percent, 2.0 to 2.9 percent less likely to drop out of classes relative to minority base of 29 percent, and 2.4 to 3.2 percentage points more likely to get a grade of B or higher relative to a minority base of 55 percent in classes with underrepresented instructors. Our evidence of interaction effects at the extensive margin, like remaining in a course, and at the intensive margin, like grades within a course, suggests that students are influenced in multiple ways from instructors' racial and ethnic composition. The minority gap in the probability of continuing a subject in the following quarter is significantly affected by the minority status of the instructor as well.[21] This is an important outcome of interest

[20] The inclusion of course-minority fixed effects also helps condition out for possible minority interactions from students having a comparative advantage in some subjects. Minority students may be better at some of the subjects that minority instructors tend to teach. The inclusion of course-minority fixed effects control for this possibility. Examining performance by subject directly, we find that minority students perform at a lower level than non-minority students in all subjects. We also estimated the minority-non-minority grade gap by the concentration of minority instructors in that subject and found no relationship (see Appendix Figure 1).

[21] We investigate this further by estimating three sets of regression specifications related to choosing college majors using the different sources of variation for identification discussed below in Section III.E. We examine the minority instructor effect on 1) the first course/s taken in a subject, 2) choosing to major in that subject and 3) taking any additional courses in that subject. We find evidence of positive effects of minority instructors on minority students in majoring in that subject, taking any additional courses in that subject, and the total number of additional courses in that subject. These results confirm the course-level results for continuing a subject in the following quarter.

because it cannot be directly manipulated by the instructor and is thus more consistent with students reacting to instructors through, for example, role model effects than through preferential grading (which we investigate in more detail in Section III.D).

Estimates vary across columns somewhat more when we use the restricted sample of low-registration priority students, however, estimates for all outcomes in our preferred specification reported in column 5 indicate significant minority interactions at least at the 10 percent significance level (the only exception is that we lose statistical significance for grades although the point estimate is very similar to the full sample). The lack of sensitivity of estimates to the low-registration priority students provides further evidence that is consistent with the lack of racial sorting across course offerings noted above. We continue to report estimates from both samples throughout because of the trade-off between restricting the sample to lessen concerns about potential sorting and using the full sample to increase precision.

Our specification using student-instructor interactions at the aggregated minority level implicitly assumes that minority students can be influenced by *any* minority instructor and by a similar amount. An alternative is to allow minority-interactions to operate only when a student is matched with an instructor of the same detailed race or ethnicity. The underlying assumptions for such a specification are that: 1) there is no effect across minority types and 2) the performance gap from white and black students being assigned to a black instructor is the same as that for Hispanic and black students being assigned to a black instructor. We reproduce Table 3 using this alternative definition of the student-instructor interaction in Appendix Table 3. If students were indeed only influenced by same-race or same-ethnicity instructors, we would expect the

results in Appendix Table 3 to be systematically stronger. This, however, is generally not the case, and in fact estimates of the interaction term in the two tables are quite similar.

To investigate further the level at which student-instructor interactions exist, we also report estimates from regressions that allow for separate interactions across all detailed racial and ethnic groups. While student fixed effects absorb the interaction for one of the student groups – in our case "whites" - the classroom fixed effects absorb the interaction for one of the instructor groups – again "whites". Thus, only 9 of the 16 race and ethnicity interactions are identified and all estimated interaction effects are relative to outcomes for white students with alternative instructor types within a class. Results from this specification are shown in Table 4. In addition to the point estimates we present the P-value from F-tests for two hypotheses of major interest, namely for the presence of an own-race interaction and for the presence of any race interaction. We find strong and robust evidence for own-race interactions. The positive interaction estimates are not overly sensitive to whether we use the full sample or limit the sample to low-registration priority students. We find positive interactions for all major racial groups with African-American students experiencing particularly large and robust relative gains from being taught by a same-race instructor. Another important finding is that there is evidence of minority students benefiting from assignment to a minority instructor of a different race, e.g. Hispanic student academic performance improves from assignment to black instructors, rather than to white instructors.

Estimation of the econometric model for grade outcomes is possible only for the sample of students who complete the course. At the same time, as shown in Table 3, the propensity to finish a course is affected by the variable of interest – the minority-status

interactions between students and instructors within classrooms. This creates a classical sample selection problem that is difficult to correct using a Heckman-selection estimator since any variable affecting dropout behavior arguably also affects potential grades. Instead, we estimate non-parametric bounds that are based on worst-case selection scenarios, following Lee (2005).[22] This estimator can only be used for continuous outcome variables. We thus compute the bounds only for the grade variable. Appendix Table 4 reports estimates.

When using the full sample, estimates are bounded between 3.9 percent and 7.7 percent of a standard deviation in the course grade, and when using the sample of low-priority students the bounds are 2.7 percent and 8.2 percent of a standard deviation. Taken together, these results provide further evidence of a robust and quite substantial minority interaction effect on grades, in addition to a substantial effect on the probability of dropping a class. We interpret our uncorrected estimates as representing a lower bound of minority interactions, since those who are at the margin of dropping a class and who are induced not to do so because they share the minority status with their instructor are more likely to be from the lower part of the student ability distribution. Fairlie, Hoffmann and Oreopoulos (2013) provide some evidence for this hypothesis.

C. Robustness Checks and External Validity

In this section, we report results from several alternative specifications that provide additional robustness checks and explore issues around external validity. We experiment with three specifications that further restrict choice in instructor minority status and report estimates in Panel A of Table 5. Estimates from our preferred model

[22] See also Krueger and Whitmore (2002) and Hoffmann and Oreopoulos (2009) for a related application.

which includes student and classroom fixed effects are reported. First, we consider a specification that excludes observations for which courses in the same quarter are taught by both minority and non-minority instructors. Identification of minority student-instructor interactions therefore comes only from across quarter variation in instructor race. Second, we further restrict the sample to exclude variation in instructor minority status within an academic year for a given course. In this case, students would have to postpone taking a course for an entire academic year to satisfy a potential racial preference in their instructor, which may be very difficult given the required sequencing of many courses and two-year enrolment goals. The third specification focuses on a sample of students who failed to enrol in the course section of their first choice. We construct this sample from our administrative records of all student registration attempts to *any* section within a course. As noted earlier, we find that only 54.9 percent of low-registration priority students enrol in their first section choice.

For all of these specifications we find a consistent pattern of significant minority interactions which are similar to the estimates from the main sample when using all students. When relying on the sample of students with a low registration priority our point estimates are consistent with the evidence presented above. Although the estimates are imprecise for this sample, their confidence intervals mostly contain the estimates from the full sample.

Further robustness exercises that are estimated on other subgroups by type of student and type of course are shown in Appendix Table 5. To summarize, first, we do not find systematic evidence that the minority interactions are gender specific. Both male and female minority students perform relatively better with minority instructors

compared to non-minority instructors. Second, results are robust to the exclusion of language courses or video-delivered courses.

Panel B of Appendix Table 5 investigates the external validity of our estimates. It displays results that explore whether our findings are driven by particular institutional features of community colleges relative to 4-year colleges. A first potential concern is students who have an "unstable" academic career and periodically enrol in courses at community college. We therefore limit our sample of students who are lowest on the registration priority list to those who enrol at the College for the first time. This yields point estimates that are nearly identical to those obtained from a sample of all low registration priority students, suggesting that our results are not driven by more senior students who are frequently leaving and returning to the college. The smaller sample size, however, leads to insignificance of our estimates.

A second concern regarding external validity arises due to the types of courses that are offered at community colleges. We therefore allow parameters to depend on whether courses are vocational or not and whether they can be transferred to the University of California and California State University systems. If anything we find that transferable courses and non-vocational courses have larger minority interaction effects for most outcomes.

D. Mechanisms

We now explore the candidate mechanisms driving the social interactions estimated above. One key question is whether our estimated effects are due to students or instructors behaving differently. An obvious potential source of instructor discrimination

is through grading. Several pieces of evidence, however, point against this explanation. First, we identified courses and departments that commonly use multiple choice, true/false, matching and performance tests, and/or math courses over potentially more "subjective" essay-type tests, reports, presentations and class participation by conducting an extensive examination of course syllabi and web pages, course catalogues, and discussions with administrative staff and instructors. The use of multiple choice, true/false and matching type exams are prevalent at the college, which may be due in part to faculty having heavy teaching loads of 10-15 courses per academic year. Panel B of Table 6 shows that estimation of our model on this sample yields results that are very similar to the main results. Because these courses are graded more objectively, the results provide evidence in favour of interactions occurring from students reacting to instructors rather than the opposite.

Second, we have documented significant, robust, and sizable minority effects with respect to course dropout behaviour. The minority gap in this outcome decreases by 2 to 3 percentage points if the class is taught by a minority instructor. The decision to drop out of the class is made by the student and must be made in the first three weeks of a term, well before final grades are assigned by instructors. Third, as shown above and in the next section, we also find evidence that race/ethnicity interactions affect longer term outcomes, such as taking subsequent courses in the same subject, major choice, retention, and degree receipt. Instructors have no direct effect through grading but possibly serve as role models or generate interest and continuing studies in a subject.[23] Fourth, when allowing minority effects to vary across three age groups we find a robust absence of

[23] Estimates of minority-interactions for long-term outcome are not sensitive to controlling for first-term grades suggesting that the indirect effect of obtaining a better grade in a course is not driving the positive estimates.

interaction effects for older students, as shown in Panel B of Table 5. Instead we find that our point estimates are the largest for students who are younger than the median aged student. This also goes against the theory of instructor-based discrimination on the logic that race or ethnicity based discrimination should not depend significantly on student age.[24]

These results together suggest that our interaction estimates are likely due to students behaving differently in response to instructor type rather than vice versa. Appendix Table 6 explores whether there are particular student groups who may be especially likely to gain from assignment to an instructor with the same minority status. Estimating separate interactions for students by whether they receive financial aid, they went to a private school, their high school had a high fraction of students who were eligible for free-lunch programs, or they grew up in a poor or rich neighbourhood, we find minority effect estimates that are fairly homogeneous across groups. While standard errors for some of the interactions are fairly large, particularly those for small sub-populations, the point estimates are remarkably robust across subsamples. In most cases the minority effects are highly significant for the larger student group, and we cannot reject equality of the minority effects across more advantaged and disadvantaged

[24] Although we do not find evidence of preferential grading by type of instructor, another explanation for the interaction effects we estimate is that there exists a mechanical relationship whereby instructors' grading distributions are correlated with their minority status. Bar and Zussman (2012) find evidence from 'an elite research university' that grade distributions correlate with instructor voting behavior, which in turn may correlate with race or ethnicity. Since minorities tend to score lower grades than non-minorities on average, they systematically benefit from instructors that tend to compress grades towards the upper tail. We tested for this possibility directly and found no evidence of grade distribution differences by minority instructor status. The average grade given by a minority instructor across all courses is 2.86 compared with 2.85 for non-minority instructors. The standard deviation of grades is 1.20 for minority instructors and 1.15 for non-minority instructors. The robustness of our main results to including course-minority fixed effects in regression specifications reported in Table 3 also suggest that this is not the case. Finally we also do not find that minority instructors are clustered in fields in which grades are higher or there is less variance in grades (see Appendix Figures 2 and 3, also see Appendix Table 8 for enrolment and instructor counts across departments).

students. Thus, minority students from all economic backgrounds appear to share the relative gains from assignment to a minority instructor.

An important consideration for understanding these relative gains is whether they occur due to minority students performing better with minority instructors or non-minority students performing worse. The former may arise from instructors serving as role models, inspiring underrepresented students, whereas the latter may arise from group favouritism, where non-minorities, consciously or unconsciously, find it difficult to learn from a minority instructor. Our baseline results with classroom fixed effects have the advantage of conditioning on differences across classes and teaching styles, but they restrict our analysis to minority interactions that are only *relative* to non-minorities. However, to explore who benefits and who performs worse from different instructor types, we need to estimate student-instructor interactions separately for each student type, thus requiring the exclusion of instructor or classroom fixed effects. We also expand minority status into five groups: white, African-American, Hispanic, Asian, and other non-whites. Doing so allows us to estimate the full set of race/ethnic interactions to determine which kinds of social interactions matter the most. Appendix Table 7 reports each of these estimates of α_1 in equation (1) after adding student and course fixed effects as well as instructor characteristic controls. The coefficient is the effect from being matched to an instructor of a different racial type relative to being matched to an instructor of the same type. The table provides evidence that students perform better with instructors of the same race/ethnicity, both for minority or non-minority students. For example, white students are 3.8 percentage points less likely to drop a course with a white instructor compared to an African-American instructor, whereas African-American

students are 4.6 percentage points less likely to drop with an African-American instructor compared to a white instructor. This finding that whites do relatively worse with black instructors while black students do relatively better with them suggests that the negative effects on whites are not driven by overall instructor quality differences, since we also control for course fixed effects. The results also highlight challenges in determining a preferred instructor allocation, since alternate allocations generate both student gains and losses.[25]

Interestingly, we find robust negative effects on the performance of white students when being matched to non-white instructors for our other academic outcomes. The gains for African-American students of being matched to an African-American instructor are quite robust across samples and outcomes. We find less clear patterns for the other race- and ethnicity groups, including Hispanics. That some ethnic groups appear to respond less favourably when matched to instructors of their own type compared with the strong relative effects for white students deserves mention. Dee (2007) and Hoffmann and Oreopoulos (2009) observe similar patterns with respect to gender. In both studies, male students generally perform worse academically with female instructors while female students do as well with male or female instructors.

One explanation for this behaviour is that students from high status groups react more strongly to instructors from low-status groups, leading to a kind of self-fulfilling discrimination. Social psychologists often describe social interactions in terms of "in-group favouritism", where individuals that identify with each other tend to respond more positively because they perceive they have similar beliefs or culture, and respond

[25] Graham, Imbens, and Ridder (2009) provide more discussion on the policy implications of multiple social interactions in the context of student classroom allocation by gender.

negatively with others (Tajfel and Turner 1979). Less attention has been given to the moderating role that social status plays - the greater one's social status, the greater one's tendency to display in-group favouritism (Sidanius, Pratto, and Rabinowitz 1994). This may explain why white students benefit more from being with white instructors compared to Hispanic students with Hispanic instructors. The theory deserves more attention in future research.

E. Long-Term Outcomes

Do the social interactions we find at the course level affect longer-term outcomes? We have shown that they do for subsequent course selection, but what about other educational outcomes that are more directly correlated with labour market outcomes such retention, degree completion, and transferring to 4-year colleges? Table 6 reports estimates for these long-term outcomes. Because we only have one observation per student for aggregate outcomes we cannot estimate models that include classroom or student fixed effects. Instead, we start with a model that includes a rich set of student and instructor controls, year dummies for the first term of enrolment, and the number of courses taken in the first term. We focus on the student-instructor interactions for entering students, mainly because they are automatically assigned to the lowest level on the registration priority list and because students have more limited information on instructors in their first term. Furthermore, results would be confounded by dynamic accumulation effects otherwise. To address endogeneity concerns that arise because of aggregation we also estimate a model where, in the spirit of matching estimators, a set of fixed effects for each set of courses taken in the first term is included. Since students

taking the exact same set of courses in their first term are assigned the same fixed effect we compare individuals that "look very similar" with respect to their behaviour at college entry. The third approach follows Bettinger and Long (2005) and uses the average deviation in minority instructor shares from steady-state minority instructor shares by department as an instrumental variable. This instrument is arguably driven by exogenous variation from term to term due to, for example, sabbatical leaves, new hires, variability in the temporary lecturer pool, and retirements.[26]

The first outcome examined is an indicator variable for whether the student remains at the college over the next two quarters. The selection-on-observables model reported in Column 1 suggests that raising the share of minority instructors by one standard deviation (0.25) would increase the relative retention rate for minorities by about 2.5 percentage points (relative to a minority base rate of 62 percent). This change would close roughly one third of the white-minority gap in the retention rate. We obtain a similar estimate when adding fixed effects for the set of courses a student takes in the first term.[27] When instrumenting instructor share with deviations from trend we also estimate a statistically significant effect on retention, though larger and less precise. The second outcome examined is whether a student obtains an associates or vocational degree. A one standard deviation increase in the minority instructor share leads to roughly a 1.5 percentage point higher relative probability of receiving a degree (relative

[26] The instrumental variable is equal to the difference between the minority share of instructors in that department and term and the minority share of instructors in that department over all years (i.e. the steady-state minority instructor share for that department). For additional variation we follow Bettinger and Long (2005) and define separate steady-state minority instructor shares for fall, winter and spring quarters.

[27] Our earlier baseline results indicate that conditioning on observable student background characteristics leads to similar estimates as when using student fixed effects, and estimates from models with classroom and student fixed effects are similar to those with course and student fixed effects. These findings suggest that remaining selection bias in our long-term results from not being able to include classroom fixed effects may be small.

to a minority base rate of 14 percent). Estimates from the IV model indicate larger, but less precisely estimated effects. The evidence for effects on transferring to a 4-year college, however, is mixed. We find a small and insignificant estimate in column one, but negative and positive estimates in the remaining two specifications. When estimating effects on transferring only to UC or Cal State campuses, we find smaller and less significant estimates. Overall, the race or ethnicity of an instructor appears to exert an important influence on the long-term outcomes of students in addition to short-term effects on grades and other course outcomes.

IV. Conclusion

Using a unique administrative dataset that matches student course outcomes to instructor's race and ethnicity, we estimate for the first time the importance of racial interactions between instructors and students at the college level. The estimation of two-way fixed effect models for a very large number of both students and classrooms over five years addresses most concerns about potential biases in estimating racial interactions. Remaining concerns about the internal validity of our estimates are addressed by taking advantage of the severely restricted class enrolment options among low-registration priority students at a very popular and diverse community college, by restricting the variation in instructor minority status across classes within term or year, and by examining students who do not enrol in the course section of their first choice based on registration attempt data. We find that minority students perform relatively better in classes when instructors are of the same race or ethnicity. Underrepresented minority students are 1.2-2.8 percentage points more likely to pass classes, 2.0-2.9 percent less

likely to drop out of classes, and 2.4-3.2 percentage points more likely to get a grade of B or higher in classes with underrepresented instructors. All of these effects are large relative to achievement gaps, representing 20-50 percent of the total gaps in classroom outcomes between white and underrepresented minority students at the college. We also find relative effects on grades of roughly 5 percent of a standard deviation from being assigned an instructor of similar minority status. Taken together with the large class dropout interaction effects, these impacts are notably larger than those found for gender interactions between students and instructors at all levels of schooling.

Using a compilation of data from several administrative sources we also examine minority instructor impacts on long-term outcomes. We find evidence that an instructor's race or ethnicity affects the likelihood of taking subsequent courses in the same subject and majoring in the subject. The share of minority instructors in the first quarter also affects a student's likelihood of retention and degree completion. The finding that our classroom interaction effects appear to translate into consequential impacts on education attainment is also noteworthy in suggesting that race and ethnic influences may exist in other settings and cumulatively matter in other ways.

In examining courses that are more objectively graded such as those commonly using multiple choice tests and math courses, we find similar estimated effects on course outcomes. Taken together with the positive effects on long-term outcomes, negative effects on drop out behaviour, and similar effects for minority students of all ages, these results provide evidence that our positive estimates of minority interactions are likely due to students reacting to instructors rather than the other way around. Further evidence from the regression results suggests that these estimated positive minority interactions are due

to both positive influences, with minority students performing better with minority instructors, and negative influences, with non-minority students doing worse with minority instructors.

Our results suggest that the academic achievement gap between white and underrepresented minority college students would decrease by hiring more underrepresented minority instructors. However, the desirability of this policy is complicated by the finding that students appear to react positively when matched to instructors of a similar race or ethnicity but negatively when not. Hiring more instructors of one type may also lead to greater student sorting and changes to classroom composition, which may also impact academic achievement. A more detailed understanding of heterogeneous effects from instructor assignment, therefore, is needed before drawing recommendations for improving overall outcomes. The topic is ripe for further research, especially in light of the recent debates and legislative changes over affirmative action.

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TABLE 1 - DESCRIPTIVE STATISTICS

PANEL A: Sample Characteristics, Student-Class Level

	Mean	Std. Dev.	*Total Number of Obs.*
Low Registration Priority Student	0.29	0.46	*444,822*
Entering Student	0.10	0.30	
Course has no variation in instructor underrepresented-minority status within quarter	0.61	0.49	
Course has no variation in instructor underrepresented-minority status within academic year	0.52	0.50	
Language Course	0.03	0.16	*446,225*
Video-Delivered Course	0.06	0.24	
Course transferable to UC or CSU Systems	0.70	0.46	
Vocational Course	0.26	0.44	*442,061*

PANEL B: Student Outcomes by Race/Ethnicity

	White	*Asian*	***Underrepresented Minorities***		
			Hispanic	*African American*	*Other Minority*
Dropped Course	0.24	0.26	0.28	0.30	0.28
Total Nr of Obs: 446,225	*(0.43)*	*(0.44)*	*(0.45)*	*(0.46)*	*(0.45)*
Passed Course	0.89	0.89	0.84	0.82	0.86
Total Nr of Obs: 320,835	*(0.31)*	*(0.32)*	*(0.37)*	*(0.39)*	*(0.35)*
Grade	2.90	2.91	2.58	2.51	2.71
Total Nr of Obs: 279,110	*(1.14)*	*(1.14)*	*(1.19)*	*(1.21)*	*(1.19)*
Good Grade (B or higher)	0.68	0.68	0.57	0.53	0.61
Total Nr of Obs: 279,110	*(0.47)*	*(0.47)*	*(0.50)*	*(0.50)*	*(0.49)*
Retention after First Term	0.70	0.75	0.61	0.63	0.69
Total Nr of Obs: 14,899	*(0.46)*	*(0.43)*	*(0.49)*	*(0.48)*	*(0.46)*
Obtain Degree	0.16	0.18	0.15	0.12	0.13
Total Nr of Obs: 15,342	*(0.37)*	*(0.38)*	*(0.36)*	*(0.33)*	*(0.34)*
Transfer to 4-Year College	0.48	0.50	0.29	0.35	0.40
Total Nr of Obs: 15,341	*(0.50)*	*(0.50)*	*(0.45)*	*(0.48)*	*(0.49)*

PANEL C: Student and Instructor Shares by Race/Ethnicity

	Students			**Instructors**		
	Mean	S.D.	*N*	Mean	S.D.	*N*
White	0.28	0.20	*31,961*	0.70	0.21	*942*
Asian	0.51	0.25		0.14	0.12	
Hispanic	0.14	0.12		0.06	0.06	
African-American	0.04	0.04		0.06	0.05	
Other Minority	0.03	0.03		0.04	0.03	

NOTES: Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white.

TABLE 2 - SORTING REGRESSIONS

	OUTCOME			
	Student Age	***Female Student***	***Cumulated Courses Prior to Enrolment***	***GPA Prior to Enrolment***
Avg:	*22.2*	*0.49*	*7.15*	*2.78*
Sd:	*4.14*	*0.49*	*5.79*	*0.88*
All Students	0.046	0.014	0.077	0.017
	(0.112)	*(0.011)*	*(0.126)*	*(0.020)*
All Low Registration Priority Students	0.083	0.013	-0.073	0.026
	(0.174)	*(0.017)*	*(0.101)*	*(0.042)*
Entering Students (==> Low Registration Priority)	0.037	-0.012	-0.070	-0.003
	(0.233)	*(0.034)*	*(0.081)*	*(0.106)*
Continuing Students, Low Registration Priority	-0.050	0.024	-0.024	0.062
	(0.214)	*(0.026)*	*(0.076)*	*(0.073)*
Continuing Students, Not Low Registration Priority	0.011	0.012	0.034	0.013
	(0.118)	*(0.013)*	*(0.122)*	*(0.021)*
FIXED EFFECTS (BY UNDERREPRESENTED MINORITY STATUS)				
Course-Year-Quarter		**Yes**		

NOTES: This table displays results from regressions of the minority-specific average student outcomes in a classroom on an indicator equal to one if the average is associated with minority students, an indicator if the class is taught by a minority instructor, the interaction between these two variables, and a set of fixed effects. We only report the coefficient on the interaction term, to be interpreted as the extent to which minority students sort into classrooms taught by minority instructors. Each cell is associated with a different regression. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. Rows are defined by the subsample of students we consider. Outcomes used in the regressions vary across columns. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by course-term-minority.

TABLE 3 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS FOR STUDENT OUTCOMES

	(1)	(2)	(3)	(4)	(5)
OUTCOME: STUDENT DROPPED COURSE					
Number of Observations:	***446,225***				
All Students	-0.007	-0.022 **	-0.020 ***	-0.015 **	-0.020 ***
	(0.010)	*(0.011)*	*(0.007)*	*(0.007)*	*(0.007)*
All Low Registration Priority Students	-0.013	-0.033 **	-0.024 **	-0.025 **	-0.029 ***
	(0.014)	*(0.014)*	*(0.011)*	*(0.012)*	*(0.011)*
OUTCOME: STUDENT PASSED COURSE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***320,835***				
All Students	0.006	0.001	0.013 *	0.005	0.012
	(0.011)	*(0.010)*	*(0.008)*	*(0.008)*	(0.008)
All Low Registration Priority Students	0.025 *	0.040 ***	0.042 ***	0.014	0.028 *
	(0.015)	*(0.015)*	*(0.015)*	*(0.015)*	*(0.017)*
OUTCOME: STANDARDIZED STUDENT COURSE GRADE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***278,857***				
All Students	0.047	0.000	0.056 **	0.026	0.054 ***
	(0.033)	*(0.028)*	*(0.023)*	*(0.024)*	*(0.022)*
All Low Registration Priority Students	0.085 *	0.039	0.068 *	0.014	0.050
	(0.045)	*(0.043)*	*(0.037)*	*(0.039)*	*(0.040)*
OUTCOME: GOOD GRADE (B OR HIGHER), CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***279,110***				
All Students	0.011	-0.001	0.023 **	0.014	0.024 ***
	(0.019)	*(0.011)*	*(0.010)*	*(0.010)*	*(0.010)*
All Low Registration Priority Students	0.011	-0.004	0.029 *	0.003	0.032 *
	(0.023)	*(0.020)*	*(0.017)*	*(0.017)*	*(0.019)*
OUTCOME: STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM					
Number of Observations:	***217,950***				
All Students	0.028	0.016 **	0.012 *	0.007	0.013 *
	(0.019)	*(0.008)*	*(0.007)*	*(0.008)*	*(0.007)*
All Low Registration Priority Students	0.019	0.028	0.027 *	0.024	0.038 **
	(0.025)	*(0.017)*	*(0.015)*	*(0.018)*	*(0.018)*
FIXED EFFECTS:					
Year-Quarter-Minority	**Yes**	No	No	No	No
Course	No	No	**Yes**	No	No
Course-Minority-Year-Quarter	No	**Yes**	No	No	No
Student	No	No	**Yes**	No	**Yes**
Classroom	No	No	No	**Yes**	**Yes**
CONTROLS:					
Instructor Controls	**Yes**	**Yes**	**Yes**	No	No
Student Controls	**Yes**	**Yes**	No	**Yes**	No

NOTES: This table displays results from our main outcome regressions. We report the coefficient of the interaction between student's and instructor's underrepresented minority status. Each cell is associated with a different regression. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. Student controls include, gender, cumulated GPA and a 4th-order polynomial in age; instructor controls include gender, a part-time indicator and a 4th-order polynomial in age. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

TABLE 4 - ESTIMATED ROLE OF INSTRUCTOR RACE/ETHNICITY FOR STUDENT OUTCOMES, USING A SAMPLE WITH FOUR RACE/ETHNICITY-GROUPS

	All Students			All Low Registration Priority Students		
	Instructor Race/Ethnicity			*Instructor Race/Ethnicity*		
	African-American	*Hispanic*	*Asian*	*African-American*	*Hispanic*	*Asian*
OUTCOME:STUDENT DROPPED COURSE						
Number of Observations:		***418,270***			***122,883***	
Student Race/Ethnicity						
African-American	-0.078 ***	-0.018	0.011	-0.083 ***	-0.018	0.092 ***
	(0.020)	(0.019)	(0.016)	(0.034)	(0.038)	(0.033)
Hispanic	-0.019 *	-0.025 **	0.022 **	-0.007	-0.042 ***	0.050 ***
	(0.011)	(0.013)	(0.011)	(0.024)	(0.017)	(0.018)
Asian	-0.016 **	-0.011	-0.014 *	0.008	-0.003	-0.003
	(0.009)	(0.010)	(0.008)	(0.018)	(0.018)	(0.015)
F-test: Own-Race/Ethnicity Effect (P-value)		***0.000***			***0.006***	
F-test: Race/Ethnicity-Effect (P-value)		***0.000***			***0.000***	
OUTCOME: STUDENT PASSED COURSE, CONDITIONAL ON FINISHING THE COURSE						
Number of Observations:		***300,503***			***89,031***	
African-American	0.067 ***	-0.013	-0.009	0.094 ***	0.038	-0.010
	(0.016)	(0.025)	(0.015)	(0.031)	(0.050)	(0.030)
Hispanic	0.020 *	0.009	-0.026 **	0.066 **	0.023	-0.008
	(0.012)	(0.017)	(0.011)	(0.029)	(0.030)	(0.020)
Asian	0.007	0.000	0.004	0.010	0.017	0.015
	(0.010)	(0.008)	(0.006)	(0.019)	(0.016)	(0.016)
F-test: Own-Race/Ethnicity Effect (P-value)		***0.000***			***0.015***	
F-test: Race/Ethnicity-Effect (P-value)		***0.001***			***0.113***	
OUTCOME: STANDARDIZED STUDENT COURSE GRADE, CONDITIONAL ON FINISHING THE COURSE						
Number of Observations:		***260,466***			***70,871***	
African-American	0.187 **	0.018	0.010	0.153	0.071	0.041
	(0.044)	(0.088)	(0.031)	(0.096)	(0.184)	(0.087)
Hispanic	0.068 **	0.097 *	-0.029	0.103 *	0.092	-0.044
	(0.029)	(0.058)	(0.023)	(0.062)	(0.113)	(0.063)
Asian	0.054	0.012	0.047 **	0.066	0.072	0.019
	(0.036)	(0.031)	(0.021)	(0.054)	(0.058)	(0.048)
F-test: Own-Race/Ethnicity Effect (P-value)		***0.000***			***0.339***	
F-test: Race/Ethnicity-Effect (P-value)		***0.000***			***0.619***	
OUTCOME: GOOD GRADE (B OR HIGHER), CONDITIONAL ON FINISHING THE COURSE						
Number of Observations:		***260,707***			***70,925***	
African-American	0.090 ***	0.025	0.007	0.129 ***	0.044	0.025
	(0.024)	(0.037)	(0.018)	(0.044)	(0.083)	(0.040)
Hispanic	0.029 *	0.039 *	0.001	0.063 *	0.013	-0.010
	(0.016)	(0.022)	(0.012)	(0.033)	(0.053)	(0.028)
Asian	0.009	0.006	0.028 ***	0.035	0.003	0.006
	(0.015)	(0.012)	(0.009)	(0.025)	(0.031)	(0.021)
F-test: Own-Race/Ethnicity Effect (P-value)		***0.000***			***0.031***	
F-test: Race/Ethnicity-Effect (P-value)		***0.000***			***0.248***	
OUTCOME: STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM						
Number of Observations:		***203,951***			***59,417***	
African-American	0.022	0.010	-0.013	0.077	0.042	-0.069
	(0.024)	(0.025)	(0.019)	(0.056)	(0.069)	(0.047)
Hispanic	0.011	0.001	-0.009	0.026	0.045	0.005
	(0.010)	(0.014)	(0.013)	(0.035)	(0.043)	(0.038)
Asian	0.005	-0.008	-0.003	0.036	-0.006	0.025
	(0.013)	(0.013)	(0.010)	(0.030)	(0.033)	(0.025)
F-test: Own-Race/Ethnicity Effect (P-value)		***0.809***			***0.288***	
F-test: Race/Ethnicity-Effect (P-value)		***0.938***			***0.435***	

NOTES: This table displays results from outcome regressions in which we allow for interactions between all observed student and instructor races/ethnicities. We only show results for our preferred specification, which includes student and classroom fixed effects. We report the full set of 9 identified interactions for each regression. Since we include student- and instructor fixed effects, all interactions involving white students or instructors are unidentified. Same-Race/Ethnicity interactions are shown in red. P-values for a F-test of the existence of same-race/ethnicity interactions and for the existence of any race/ethnicity-interactions are also listed. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

TABLE 5 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS FOR STUDENT OUTCOMES: ROBUSTNESS AND MECHANISMS

	Dropped Course	Passed Course	Grade (Standar-dized)	Good Grade (B or higher)	Takes Same-Subject Course Subsequently
PANEL A: ROBUSTNESS					
	ALL STUDENTS				
Course-Quarters without Variation in Instructor Underrepresented Minority Status					
Minority Interaction	-0.014	0.023 **	0.097 ***	0.045 ***	0.002
	(0.012)	(0.010)	(0.038)	(0.014)	(0.020)
Course-Years without Variation in Instructor Underrepresented Minority Status					
Minority Interaction	-0.021	0.012	0.065	0.042 ***	-0.013
	(0.015)	(0.011)	(0.046)	(0.016)	(0.027)
Students who do not sit in the Section of their Choice					
Minority Interaction	-0.010	0.017 *	0.052 **	0.025 **	0.009
	(0.009)	(0.009)	(0.023)	(0.012)	(0.015)
	LOW REGISTRATION PRIORITY STUDENTS				
Course-Quarters without Variation in Instructor Underrepresented Minority Status					
Minority Interaction	-0.010	0.041	0.073	0.042	0.085
	(0.029)	(0.034)	(0.121)	(0.047)	(0.069)
Course-Years without Variation in Instructor Underrepresented Minority Status					
Minority Interaction	-0.007	0.059	0.089	0.067	-0.042
	(0.036)	(0.045)	(0.185)	(0.074)	(0.091)
Students who do not sit in the Section of their Choice					
Minority Interaction	0.004	0.030	0.033	0.027	0.043
	(0.021)	(0.023)	(0.056)	(0.024)	(0.030)
PANEL B: MECHANISMS					
	ALL STUDENTS				
Objectively Graded Courses Only					
Minority Interaction	-0.019 **	0.013	0.030 *	0.019 **	0.012
	(0.009)	(0.010)	(0.018)	(0.009)	(0.008)
Different Age Groups of Students					
Minority Interaction*_Student younger than 21.5 years_	-0.018 **	0.006	0.038	0.017	0.009
	(0.008)	(0.012)	(0.028)	(0.013)	(0.010)
Minority Interaction*_Student between 21.5 and 35 years_	-0.001	0.013	0.041	0.016	0.003
	(0.009)	(0.013)	(0.032)	(0.016)	(0.015)
Minority Interaction*_Student older than 35 years_	-0.016	-0.004	-0.048	-0.020	0.008
	(0.018)	(0.018)	(0.053)	(0.026)	(0.028)
	LOW REGISTRATION PRIORITY STUDENTS				
Objectively Graded Courses Only					
Minority Interaction	-0.011	0.027	0.027	0.040 **	0.044 **
	(0.015)	(0.019)	(0.039)	(0.019)	(0.023)
Different Age Groups of Students					
Minority Interaction*_Student younger than 21.5 years_	-0.029 **	0.039 *	0.078	0.043 *	0.029
	(0.013)	(0.023)	(0.053)	(0.023)	(0.022)
Minority Interaction*_Student between 21.5 and 35 years_	0.013	-0.022	-0.067	-0.025	0.009
	(0.018)	(0.026)	(0.078)	(0.035)	(0.038)
Minority Interaction*_Student older than 35 years_	-0.032	-0.061	-0.125	-0.046	0.018
	(0.034)	(0.042)	(0.129)	(0.056)	(0.094)

NOTES: This table explores the heterogeneity of our results across different student groups and types of courses considered. We report the coefficient of the interaction between student's and instructor's underrepresented minority status - referred to as "Minority Interaction." "Objectively Graded Courses" include those courses and departments that commonly use multiple choice, true/false, and other objectively graded tests, and/or math courses. We only report results for our preferred specification, which includes student and classroom fixed effects. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

TABLE 6 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS FOR LONG-TERM OUTCOMES

	Main Model		Course FE Model		IV Model	
OUTCOME: RETENTION						
Number of Observations:	***14,899***					
Minority Interaction	0.092	***	0.103	**	0.878	***
	(0.033)		(0.044)		(0.218)	
OUTCOME: OBTAIN DEGREE						
Number of Observations:	***15,342***					
Minority Interaction	0.058	**	0.066	*	0.366	**
	(0.028)		(0.036)		(0.182)	
OUTCOME: TRANSFER TO 4-YEAR COLLEGE						
Number of Observations:	***15,341***					
Minority Interaction	-0.059		-0.129	***	0.422	**
	(0.036)		(0.046)		(0.234)	
OUTCOME: TRANSFER TO 4-YEAR COLLEGE (ONLY INCLUDE CAL STATE AND UC CAMPUSES)						
Number of Observations:	***15,341***					
Minority Interaction	-0.016		-0.086	**	0.258	
	(0.034)		(0.043)		(0.225)	

NOTES: This table displays results from long-term outcome regressions. We report the coefficient of the interaction between student's underrepresented minority status and instructor's underrepresented minority share. Only courses taken in the first term of a student's academic career at the college are included in the measurement of underrepresented minority instructor share. Each cell is associated with a different regression. We explore the sensitivity with respect to the regression specification: column 1 reports the main specification, column 2 reports estimates after including course set fixed effects for the initial set of courses taken by students in the term, and column 3 reports estimates in which the deviation from steady state minority instructor share for each department is used as an instrument for the minority instructor share. Controls included in all regressions are student's age, age squared, gender, financial aid receipt, educational goals at the time of application, free and reduced lunch rate of high school, private high school, year dummy for quarter of first term, number of courses taken in that quarter, instructor's full-time status, and instructor's age. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level.

APPENDIX TABLE 1 - SORTING REGRESSIONS WITH CLUSTERING BY INSTRUCTOR

	OUTCOME			
	Student Age	***Female Student***	***Cumulated Courses Prior to Enrolment***	***GPA Prior to Enrolment***
All Students	0.046 *(0.102)*	0.014 *(0.010)*	0.077 *(0.105)*	0.017 *(0.023)*
All Low Registration Priority Students	0.083 *(0.143)*	0.013 *(0.016)*	-0.073 *(0.086)*	0.026 *(0.040)*
Entering Students (==> Low Registration Priority)	0.037 *(0.169)*	-0.012 *(0.033)*	-0.070 *(0.066)*	-0.003 *(0.085)*
Continuing Students, Low Registration Priority	-0.050 *(0.160)*	0.024 *(0.022)*	-0.024 *(0.068)*	0.062 *(0.056)*
Continuing Students, Not Low Registration Priority	0.011 *(0.111)*	0.012 *(0.012)*	0.034 *(0.116)*	0.013 *(0.023)*
FIXED EFFECTS (BY UNDERREPRESENTED MINORITY STATUS)				
Course-Year-Quarter	**Yes**			

NOTES: This table displays results from regressions of the minority-specific average student outcomes in a classroom on an indicator equal to one if the average is associated with minority students, an indicator if the class is taught by a minority instructor, the interaction between these two variables, and a set of fixed effects. We only report the coefficient on the interaction term, to be interpreted as the extent to which minority students sort into classrooms taught by minority instructors. Each cell is associated with a different regression. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. Rows are defined by the subsample of students we consider. Outcomes used in the regressions vary across columns. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 2 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS FOR STUDENT OUTCOMES WITH STANDARD ERRORS CLUSTERED BY CLASSROOM

	(1)	(2)	(3)	(4)	(5)
OUTCOME: STUDENT DROPPED COURSE					
Number of Observations:	***446,225***				
All Students	-0.007	-0.022 ***	-0.020 ***	-0.015 ***	-0.020 ***
	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)
All Low Registration Priority Students	-0.013	-0.033 ***	-0.024 ***	-0.025 **	-0.029 ***
	(0.010)	(0.012)	(0.009)	(0.011)	(0.011)
OUTCOME: STUDENT PASSED COURSE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***320,835***				
All Students	0.006	0.001	0.013 ***	0.005	0.012 ***
	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)
All Low Registration Priority Students	0.025 ***	0.040 ***	0.042 ***	0.014	0.028 **
	(0.010)	(0.013)	(0.010)	(0.011)	(0.012)
OUTCOME: STANDARDIZED STUDENT COURSE GRADE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***278,857***				
All Students	0.047 ***	0.000	0.056 ***	0.026 **	0.054 ***
	(0.015)	(0.019)	(0.014)	(0.014)	(0.013)
All Low Registration Priority Students	0.085 ***	0.039	0.068 **	0.014	0.050
	(0.028)	(0.036)	(0.029)	(0.031)	(0.033)
OUTCOME: GOOD GRADE (B OR HIGHER), CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***279,110***				
All Students	0.011	-0.001	0.023 ***	0.014 **	0.024 ***
	(0.008)	(0.009)	(0.006)	(0.006)	(0.006)
All Low Registration Priority Students	0.011	-0.004	0.029 **	0.003	0.032 **
	(0.014)	(0.016)	(0.013)	(0.014)	(0.016)
OUTCOME: STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM					
Number of Observations:	***217,950***				
All Students	0.028 ***	0.016 **	0.012 *	0.007	0.013 *
	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)
All Low Registration Priority Students	0.019	0.028 *	0.027 **	0.024 *	0.038 **
	(0.016)	(0.016)	(0.014)	(0.015)	(0.018)
FIXED EFFECTS:					
Year-Quarter-Minority	**Yes**	No	No	No	No
Course	No	No	**Yes**	No	No
Course-Minority-Year-Quarter	No	**Yes**	No	No	No
Student	No	No	**Yes**	No	**Yes**
Classroom	No	No	No	**Yes**	**Yes**
CONTROLS:					
Instructor Controls	**Yes**	**Yes**	**Yes**	No	No
Student Controls	**Yes**	**Yes**	No	**Yes**	No

NOTES: This table displays results from our main outcome regressions. We report the coefficient of the interaction between student's and instructor's underrepresented minority status. Each cell is associated with a different regression. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. Student controls include, gender, cumulated GPA and a 4th-order polynomial in age; instructor controls include gender, a part-time indicator and a 4th-order polynomial in age. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by classroom.

APPENDIX TABLE 3 - ESTIMATED STUDENT-INSTRUCTOR INTERACTION EFFECTS ASSUMING ONLY OWN RACE/ETHNICITY INTERACTIONS

	(1)	(2)	(3)	(4)	(5)
OUTCOME: STUDENT DROPPED COURSE					
Number of Observations:	***446,225***				
All Students	-0.011	-0.021	-0.026 **	-0.028 ***	-0.033 ***
	(0.015)	*(0.015)*	*(0.012)*	*(0.009)*	*(0.009)*
All Low Registration Priority Students	-0.029 *	-0.033 **	-0.037 ***	-0.057 ***	-0.057 ***
	(0.015)	*(0.015)*	*(0.014)*	*(0.014)*	*(0.014)*
OUTCOME: STUDENT PASSED COURSE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***320,835***				
All Students	0.029 **	0.006	0.021 *	0.013	0.021 **
	(0.015)	*(0.013)*	*(0.013)*	*(0.010)*	(0.011)
All Low Registration Priority Students	0.033 *	0.017	0.039 **	0.004	0.026
	(0.017)	*(0.017)*	*(0.018)*	*(0.017)*	*(0.019)*
OUTCOME: STANDARDIZED STUDENT COURSE GRADE, CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***278,857***				
All Students	0.075 *	0.074 *	0.106 ***	0.064 **	0.091 ***
	(0.043)	*(0.039)*	*(0.039)*	*(0.032)*	*(0.033)*
All Low Registration Priority Students	0.072	0.048	0.076	0.008	0.034
	(0.055)	*(0.054)*	*(0.058)*	*(0.059)*	*(0.063)*
OUTCOME: GOOD GRADE (B OR HIGHER), CONDITIONAL ON FINISHING THE COURSE					
Number of Observations:	***279,110***				
All Students	0.048 **	0.016	0.042 ***	0.030 **	0.042 ***
	(0.025)	*(0.015)*	*(0.015)*	*(0.013)*	*(0.013)*
All Low Registration Priority Students	0.028	-0.017	0.025	-0.001	0.024
	(0.031)	*(0.023)*	*(0.026)*	*(0.025)*	*(0.029)*
OUTCOME: STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM					
Number of Observations:	***217,950***				
All Students	0.045	0.010	0.013	-0.003	0.009
	(0.030)	*(0.009)*	*(0.009)*	*(0.011)*	*(0.010)*
All Low Registration Priority Students	0.019	0.010	0.020	0.004	0.054 **
	(0.033)	*(0.020)*	*(0.018)*	*(0.025)*	*(0.026)*
FIXED EFFECTS:					
Year-Quarter-Minority	**Yes**	No	No	No	No
Course	No	No	**Yes**	No	No
Course-Minority-Year-Quarter	No	**Yes**	No	No	No
Student	No	No	**Yes**	No	**Yes**
Classroom	No	No	No	**Yes**	**Yes**
CONTROLS:					
Instructor Controls	**Yes**	**Yes**	**Yes**	No	No
Student Controls	**Yes**	**Yes**	No	**Yes**	No

NOTES: This table displays results from our main outcome regressions when using an alternative definition of the student-instructor interaction. In particular, the interaction variable is equal to one only if student and and instructor have the same racial/ethnic background ***in addition to*** belonging to an underrepresented minority group. We only report the coefficient for this variable. Each cell is associated with a different regression. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. Student controls include, gender, cumulated GPA and a 4th-order polynomial in age; instructor controls include gender, a part-time indicator and a 4th-order polynomial in age. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 4 - UPPER AND LOWER BOUNDS FOR ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS FOR STUDENT GRADE

	TRUNCATION BY OVERALL DROPOUT BEHAVIOUR		TRUNCATION BY COURSE-SPECIFIC DROPOUT BEHAVIOUR	
	All Students	**Low Reg-Priority Students**	**All Students**	**Low Reg-Priority Students**
Lower Bound	0.039 *	0.027	0.039 *	0.034
	(0.022)	(0.041)	(0.024)	(0.041)
Uncorrected Estimate	*0.054 ****	*0.050*	*0.054 ****	*0.050*
	(0.022)	*(0.040)*	*(0.022)*	*(0.040)*
Upper Bound	0.077 ***	0.082 **	0.072 ***	0.062 *
	(0.022)	(0.042)	(0.022)	(0.041)
Student Controls	No		Yes	
Student FE	Yes		No	
Classroom FE	Yes		Yes	

NOTES: This table shows uncorrected and sample-selection corrected estimates for the minority interaction when grade is used as the outcome variable. Sample corrected estimates are non-parametric bounds as described in Lee (2005) and implemented in Hoffmann and Oreopoulos (2009). Lower (upper) bounds are computed under the assumption that minority students induced to stay in a class come from the upper (lower) tail of the outcome distribution . The fraction to be dropped come from first-stage dropout-regressions.The first two columns report results when the trimming procedure relies on estimates of the minority interaction in dropout regressions that use the full sample; the last two columns report results when the trimming procedure relies on estimates of the minority interaction in dropout regressions we run for each course separately; in the latter case we need to replace student fixed effects by student controls to achieve identification. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 5 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS: ADDITIONAL ROBUSTNESS CHECKS AND EXTERNAL VALIDITY

	Dropped Course	Passed Course	Grade (Standar-dized)	Good Grade (B or higher)	Takes Same-Subject Course Subsequently
PANEL A: ROBUSTNESS CHECKS					
	ALL STUDENTS				
Male vs. Female Students					
Minority Interaction**Male Students*	-0.021 ***	0.012	0.029	0.021	0.006
	(0.008)	(0.010)	(0.030)	(0.014)	(0.010)
Minority Interaction**Female Students*	-0.019 **	0.012	0.073 ***	0.026 **	0.019 **
	(0.009)	(0.009)	(0.028)	(0.012)	(0.009)
Excluding Language Courses					
Minority Interaction	-0.018 ***	0.008	0.039 *	0.019 **	0.016 **
	(0.007)	(0.008)	(0.021)	(0.009)	(0.007)
Excluding Video-Delivered Courses					
Minority Interaction	-0.015 **	0.012	0.053 **	0.025 ***	0.013 *
	(0.007)	(0.008)	(0.022)	(0.010)	(0.007)
	LOW REGISTRATION PRIORITY STUDENTS				
Male vs. Female Students					
Minority Interaction**Male Students*	-0.019	0.038	0.021	0.031	0.020
	(0.016)	(0.024)	(0.053)	(0.026)	(0.027)
Minority Interaction**Female Students*	-0.037 ***	0.019	0.075	0.034	0.039 *
	(0.014)	(0.018)	(0.051)	(0.025)	(0.023)
Excluding Language Courses					
Minority Interaction	-0.027 **	0.022	0.021	0.025	0.030
	(0.012)	(0.018)	(0.034)	(0.017)	(0.019)
Excluding Video-Delivered Courses					
Minority Interaction	-0.024 **	0.030 *	0.056	0.033 *	0.030
	(0.012)	(0.018)	(0.041)	(0.020)	(0.019)
PANEL B: EXTERNAL VALIDITY					
	ALL STUDENTS				
Vocational vs. Non-Vocational Courses					
Minority Interaction**NonVocational Course*	-0.025 ***	0.011	0.055 **	0.021 **	0.011
	(0.008)	(0.010)	(0.024)	(0.011)	(0.007)
Minority Interaction**Vocational Course*	0.000	0.016	0.052	0.034 *	0.002
	(0.010)	(0.010)	(0.055)	(0.019)	(0.018)
Courses that are Transferable to UC and CSU Systems					
Minority Interaction**NonTransferable Course*	-0.004	0.015	0.026	0.023	0.015
	(0.010)	(0.011)	(0.043)	(0.018)	(0.011)
Minority Interaction**Transferable Course*	-0.030 ***	0.010	0.065 ***	0.024 **	0.012
	0.008	0.010	0.025	0.011	0.008
	LOW REGISTRATION PRIORITY STUDENTS				
Vocational vs. Non-Vocational Courses					
Minority Interaction**NonVocational Course*	-0.034 ***	0.031	0.072	0.041 **	0.026
	(0.013)	(0.020)	(0.045)	(0.021)	(0.019)
Minority Interaction**Vocational Course*	0.010	0.011	-0.072	-0.019	0.104 **
	(0.023)	(0.031)	(0.083)	(0.036)	(0.053)
Courses that are Transferable to UC and CSU Systems					
Minority Interaction**NonTransferable Course*	-0.017	0.038	0.057	0.046 *	0.050 *
	(0.020)	(0.028)	(0.054)	(0.024)	(0.030)
Minority Interaction**Transferable Course*	-0.038 ***	0.021	0.048	0.027	0.031
	0.013	0.017	0.047	0.024	0.022
Entering Students (==> Low Registration Priority)					
Minority Interaction	-0.025	0.032	0.048	0.033	0.024
	(0.029)	(0.028)	(0.097)	(0.050)	(0.053)

NOTES: This table explores the heterogeneity of our results across different student groups and types of courses considered. We report the coefficient of the interaction between student's and instructor's underrepresented minority status. We only report results for our preferred specification, which includes student and classroom fixed effects. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 6 - ESTIMATED ROLE OF INSTRUCTOR MINORITY STATUS AND STUDENT'S SOCIO-ECONOMIC BACKGROUND

	Dropped Course	Passed Course	Grade (Standar-dized)	Good Grade (B or higher)	Takes Same-Subject Course Subsequently
			ALL STUDENTS		
Received Financial Aid					
Minority Interaction**Financial Aid*	-0.021 ***	0.011	0.053 *	0.025 *	0.017 *
	(0.009)	(0.009)	(0.029)	(0.014)	(0.009)
Minority Interaction**No Financial Aid*	-0.019 ***	0.013	0.055 ***	0.022 **	0.009
	(0.008)	(0.008)	(0.022)	(0.010)	(0.010)
Graduated from Private School					
Minority Interaction**Private High School*	-0.016	0.016	0.036	-0.008	0.032
	(0.025)	(0.023)	(0.067)	(0.033)	(0.037)
Minority Interaction**Non-Private High School*	-0.027 ***	0.016 *	0.058 **	0.021 *	0.014 *
	(0.008)	(0.009)	(0.025)	(0.012)	(0.008)
Fraction of Students in Free Lunch Programs at High School of Graduation					
Minority Interaction**few Free Lunch Students at HS*	-0.023 ***	0.016 *	0.062 ***	0.025 **	0.012
	(0.007)	(0.009)	(0.023)	(0.011)	(0.008)
Minority Interaction**many Free Lunch Students at HS*	-0.034	0.024	0.118 *	0.060 *	0.062
	(0.029)	(0.025)	(0.076)	(0.036)	(0.043)
Average Income in High School Neighborhood					
Minority Interaction**poor neighborhood*	-0.027 **	0.013	0.073 *	0.020	0.027
	(0.015)	(0.016)	(0.040)	(0.020)	(0.019)
Minority Interaction**avg neighborhood*	-0.027 ***	0.015	0.046 *	0.016	0.012
	(0.007)	(0.010)	(0.028)	(0.012)	(0.010)
Minority Interaction**rich neighborhood*	-0.033	0.019	0.087 *	0.028	0.019
	(0.022)	(0.019)	(0.048)	(0.024)	(0.026)
			LOW REGISTRATION PRIORITY STUDENTS		
Received Financial Aid					
Minority Interaction**Financial Aid*	-0.033 *	0.017	0.014	0.004	0.055 **
	(0.019)	(0.022)	(0.054)	(0.026)	(0.024)
Minority Interaction**No Financial Aid*	-0.026 **	0.039 **	0.079 *	0.054 ***	0.023
	(0.012)	(0.018)	(0.045)	(0.021)	(0.024)
Graduated from Private School					
Minority Interaction**Private High School*	-0.078 *	0.030	0.035	0.049	0.075
	(0.044)	(0.058)	(0.169)	(0.091)	(0.082)
Minority Interaction**Non-Private High School*	-0.038 **	0.038 *	0.052	0.035	0.038
	(0.016)	(0.023)	(0.055)	(0.026)	(0.026)
Fraction of Students in Free Lunch Programs at High School of Graduation					
Minority Interaction**few Free Lunch Students at HS*	-0.032 **	0.036 *	0.057	0.035 *	0.038 *
	(0.013)	(0.019)	(0.047)	(0.022)	(0.022)
Minority Interaction**many Free Lunch Students at HS*	0.029	0.009	-0.028	-0.042	0.123
	(0.065)	(0.075)	(0.191)	(0.100)	(0.115)
Average Income in High School Neighborhood					
Minority Interaction**poor neighborhood*	-0.024	0.023	0.149	0.059	0.072
	(0.031)	(0.037)	(0.108)	(0.049)	(0.055)
Minority Interaction**avg neighborhood*	-0.044 ***	0.044 **	0.057	0.036	0.034
	(0.016)	(0.023)	(0.059)	(0.028)	(0.028)
Minority Interaction**rich neighborhood*	-0.041	0.032	-0.039	-0.002	0.047
	(0.038)	(0.046)	(0.116)	(0.070)	(0.069)

NOTES: This table explores the heterogeneity of our results across different student groups defined by proxies for their socio-economic background. We report the coefficient of the interaction between student's and instructor's underrepresented minority status - referred to as "Minority Interaction". In cases where we allow minority effects to vary across student groups we report the interaction between the main variable of interest and indicator variables that are equal to one if a student belongs to a certain subgroup. To find high schools with a high fraction of free lunch students we first compute the empirical distribution of the school-level fraction of pupils who receive free lunch. We then define high schools to have "many free lunch students" if its fraction of free lunch students exceeds the 90%-percentile of the corresponding empirical distribution. Likewise, a neighborhood is defined to be an "average income neighborhood" if its average income is contained in the 80% symmetric confidence interval of its distribution. We only report results for our preferred specification, which includes student and classroom fixed effects. Students and instructors belong to the group of "Underrepresented Minorities" if their race/ethnicity is Hispanic, African-American, or Native American, Pacific Islander or other non-white. *** Significant on 1%-level; ** Significant on 5%-level: * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 7 - ESTIMATED ROLE OF INSTRUCTOR RACE/ETHNICITY FOR STUDENT OUTCOMES, GROUP BY GROUP REGRESSIONS

All Students

	Instructor Race/Ethnicity *(Comparison Group: Own Race/Ethnicity Instructors)*				
	White	*African-American*	*Hispanic*	*Asian*	*Other Minority*
PANEL A: OUTCOME - STUDENT DROPPED COURSE					
White		0.038 **	0.026	0.027 *	-0.002
		(0.017)	*(0.018)*	*(0.015)*	*(0.020)*
African-American	0.046 **		0.091 ***	0.116 **	-0.077
	(0.023)		*(0.032)*	*(0.051)*	*(0.064)*
Hispanic	-0.012	0.039		0.038	-0.121 *
	(0.030)	*(0.031)*		*(0.046)*	*(0.065)*
Asian	-0.011	-0.008	-0.038		-0.060 **
	(0.016)	*(0.029)*	*(0.036)*		*(0.029)*
Other Minority	0.096 ***	0.114	0.131 *	0.181 **	
	(0.028)	*(0.103)*	*(0.077)*	*(0.078)*	
PANEL B: OUTCOME - STUDENT PASSED COURSE					
White		-0.008	-0.015	0.000	-0.041 *
		(0.018)	*(0.021)*	*(0.011)*	*(0.025)*
African-American	-0.060 **		-0.081	-0.067	-0.054
	(0.029)		*(0.065)*	*(0.053)*	*(0.109)*
Hispanic	0.031	0.032		-0.018	-0.033
	(0.032)	*(0.042)*		*(0.048)*	*(0.054)*
Asian	-0.005	0.016	-0.006		0.030
	(0.011)	*(0.025)*	*(0.026)*		*(0.025)*
Other Minority	0.078 *	0.260 **	0.141	-0.033	
	(0.046)	*(0.134)*	*(0.135)*	*(0.086)*	
PANEL C: OUTCOME - COURSE GRADE					
White		-0.050	-0.029	-0.005	-0.125 *
		(0.058)	*(0.094)*	*(0.039)*	*(0.073)*
African-American	-0.136 *		-0.179	-0.151	0.275
	(0.076)		*(0.175)*	*(0.137)*	*(0.305)*
Hispanic	0.035	-0.023		-0.123	-0.048
	(0.114)	*(0.128)*		*(0.140)*	*(0.228)*
Asian	-0.002	-0.014	0.073		0.039
	(0.037)	*(0.092)*	*(0.113)*		*(0.085)*
Other Minority	0.153	0.154	0.401	-0.056	
	(0.118)	*(0.341)*	*(0.464)*	*(0.260)*	
PANEL D: OUTCOME - GRADE OF AT LEAST B					
White		0.006	-0.025	-0.004	-0.041
		(0.027)	*(0.034)*	*(0.018)*	*(0.026)*
African-American	-0.103 ***		-0.051	-0.055	0.240 *
	(0.034)		*(0.073)*	*(0.066)*	*(0.145)*
Hispanic	-0.014	0.015		0.021	-0.065
	(0.039)	*(0.042)*		*(0.058)*	*(0.092)*
Asian	-0.008	-0.017	0.002		-0.011
	(0.017)	*(0.047)*	*(0.043)*		*(0.033)*
Other Minority	0.026	-0.027	0.094	-0.011	
	(0.043)	*(0.180)*	*(0.202)*	*(0.127)*	
PANEL E: OUTCOME - STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM					
White		-0.008	0.011	-0.005	-0.002
		(0.009)	*(0.010)*	*(0.009)*	*(0.015)*
African-American	0.008		0.173 ***	0.023	-0.014
	(0.022)		*(0.061)*	*(0.077)*	*(0.178)*
Hispanic	-0.009	-0.073 **		-0.033	0.061
	(0.014)	*(0.032)*		*(0.038)*	*(0.067)*
Asian	0.015 **	-0.011	0.012		-0.001
	(0.006)	*(0.017)*	*(0.013)*		*(0.020)*
Other Minority	0.033	-0.054	-0.062	-0.115	
	(0.034)	*(0.177)*	*(0.212)*	*(0.166)*	

APPENDIX TABLE 7 - CONTINUED

All Low Registration Priority Students

	Instructor Race/Ethnicity (Comparison Group: Own Race/Ethnicity Instructors)				
	White	*African-American*	*Hispanic*	*Asian*	*Other Minority*
PANEL A: OUTCOME - STUDENT DROPPED COURSE					
White		0.022	0.037	0.021	-0.015
		(0.022)	*(0.024)*	*(0.017)*	*(0.021)*
African-American	0.067 *		0.279 **	0.105	-0.264
	(0.038)		*(0.132)*	*(0.155)*	*(0.247)*
Hispanic	-0.031	0.014		0.076	-0.089
	(0.027)	*(0.064)*		*(0.079)*	*(0.139)*
Asian	-0.012	0.023	-0.025		-0.022
	(0.017)	*(0.039)*	*(0.048)*		*(0.042)*
Other Minority	0.143 ***	0.406	0.617	0.202	
	(0.049)	*(0.925)*	*(0.526)*	*(0.328)*	
PANEL B: OUTCOME - STUDENT PASSED COURSE					
White		-0.029	-0.021	-0.002	-0.048
		(0.025)	*(0.026)*	*(0.016)*	*(0.033)*
African-American	-0.097 **		-0.044	-0.029	-0.213
	(0.046)		*(0.220)*	*(0.211)*	*(0.151)*
Hispanic	-0.006	-0.022		-0.010	-0.226
	(0.041)	*(0.108)*		*(0.109)*	*(0.232)*
Asian	-0.002	-0.057	0.035		-0.036
	(0.013)	*(0.047)*	*(0.054)*		*(0.065)*
Other Minority	0.076	-0.594	0.130	-1.082 **	
	(0.090)	*(0.640)*	*(0.704)*	*(0.540)*	
PANEL C: OUTCOME - COURSE GRADE					
White		-0.066	-0.049	0.017	-0.155
		(0.081)	*(0.088)*	*(0.049)*	*(0.067)* **
African-American	-0.194		1.572	-0.091	-
	(0.155)		*(1.388)*	*(0.485)*	
Hispanic	0.084	-0.102		-0.321	-0.211
	(0.095)	*(0.281)*		*(0.251)*	*(0.594)*
Asian	0.025	-0.204	0.138		0.036
	(0.045)	*(0.145)*	*(0.204)*		*(0.185)*
Other Minority	0.327	2.001	0.437	-1.296	
	(0.255)	*(1.854)*	*(2.288)*	*(0.926)*	
PANEL D: OUTCOME - GRADE OF AT LEAST B					
White		-0.001	-0.009	0.002	-0.031
		(0.035)	*(0.039)*	*(0.022)*	*(0.036)*
African-American	-0.131 **		0.748	0.126	-
	(0.063)		*(0.962)*	*(0.254)*	
Hispanic	0.028	0.005		-0.009	0.084
	(0.047)	*(0.115)*		*(0.167)*	*(0.288)*
Asian	0.009	-0.073	0.070		0.022
	(0.020)	*(0.078)*	*(0.074)*		*(0.089)*
Other Minority	0.052	0.660	0.247	-1.482 ***	
	(0.101)	*(1.432)*	*(1.381)*	*(0.364)*	
PANEL E: OUTCOME - STUDENT ENROLS IN A SAME-SUBJECT COURSE IN THE SUBSEQUENT TERM					
White		-0.008	-0.018	-0.018	-0.023
		(0.022)	*(0.021)*	*(0.019)*	*(0.027)*
African-American	-0.006		0.336	-0.229	0.541
	(0.051)		*(0.279)*	*(0.270)*	*(0.368)*
Hispanic	0.011	-0.032		-0.010	-0.139
	(0.032)	*(0.165)*		*(0.195)*	*(0.307)*
Asian	0.007	-0.014	0.002		-0.022
	(0.014)	*(0.049)*	*(0.069)*		*(0.090)*
Other Minority	0.019	-	-	-2.193	
	(0.082)			*(1.707)*	

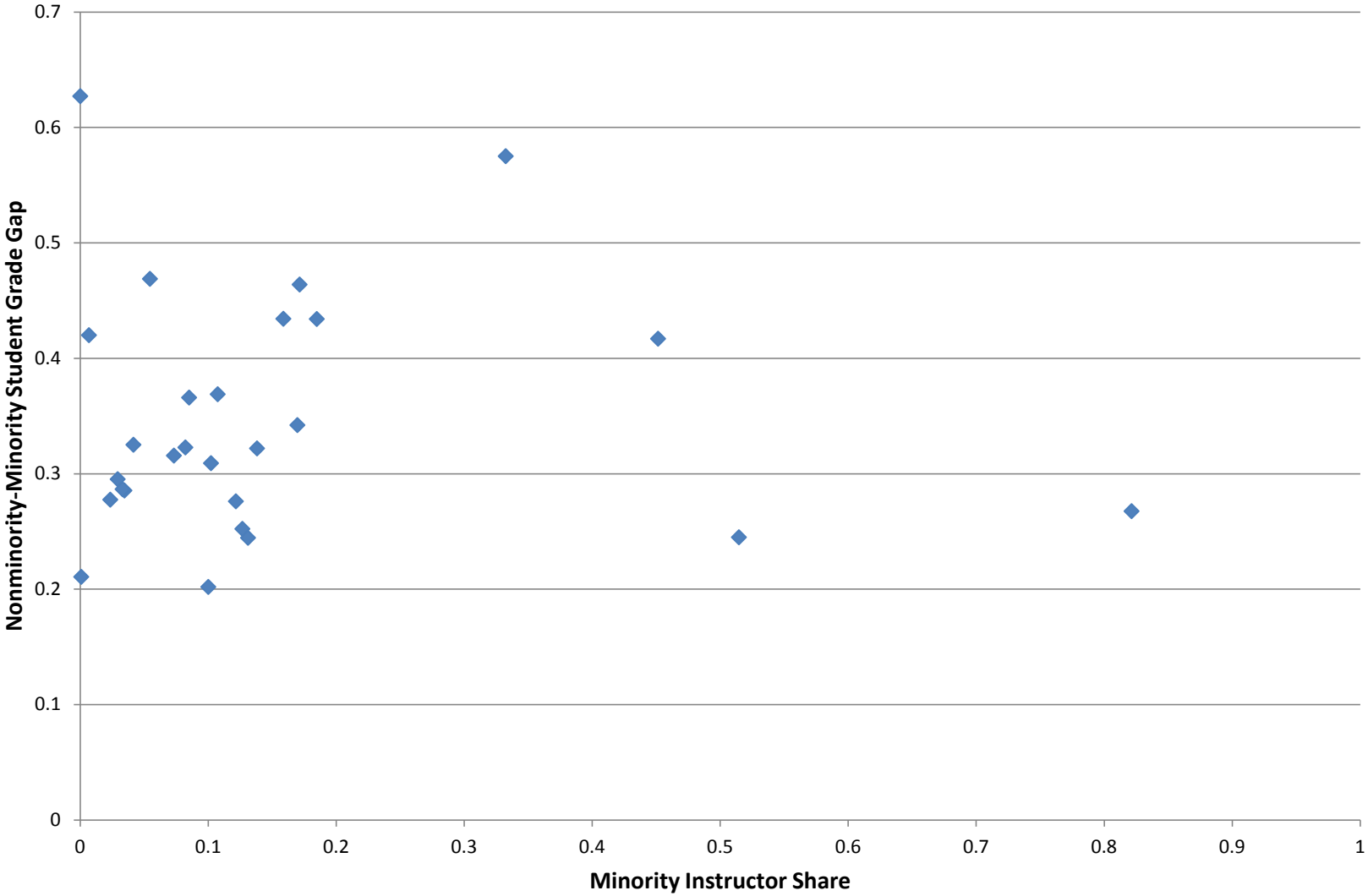
NOTES: In this table we investigate in detail if students loose from being taught by an instructor of a different race/ethnicity. Each cell reports the estimated coefficient from a different regression that only uses one student group and two instructor groups. We only show results for our preferred specification, which includes student and course fixed effects. We also compute the regression coefficients for a sample of all students and a sample of students with a low standing on class enrollment lists. *** Significant on 1%-level; ** Significant on 5%-level; * Significant on 10%-level. Standard errors are clustered by instructor.

APPENDIX TABLE 8 - TOTAL ENROLLMENT AND INSTRUCTOR COUNTS BY DEPARTMENT

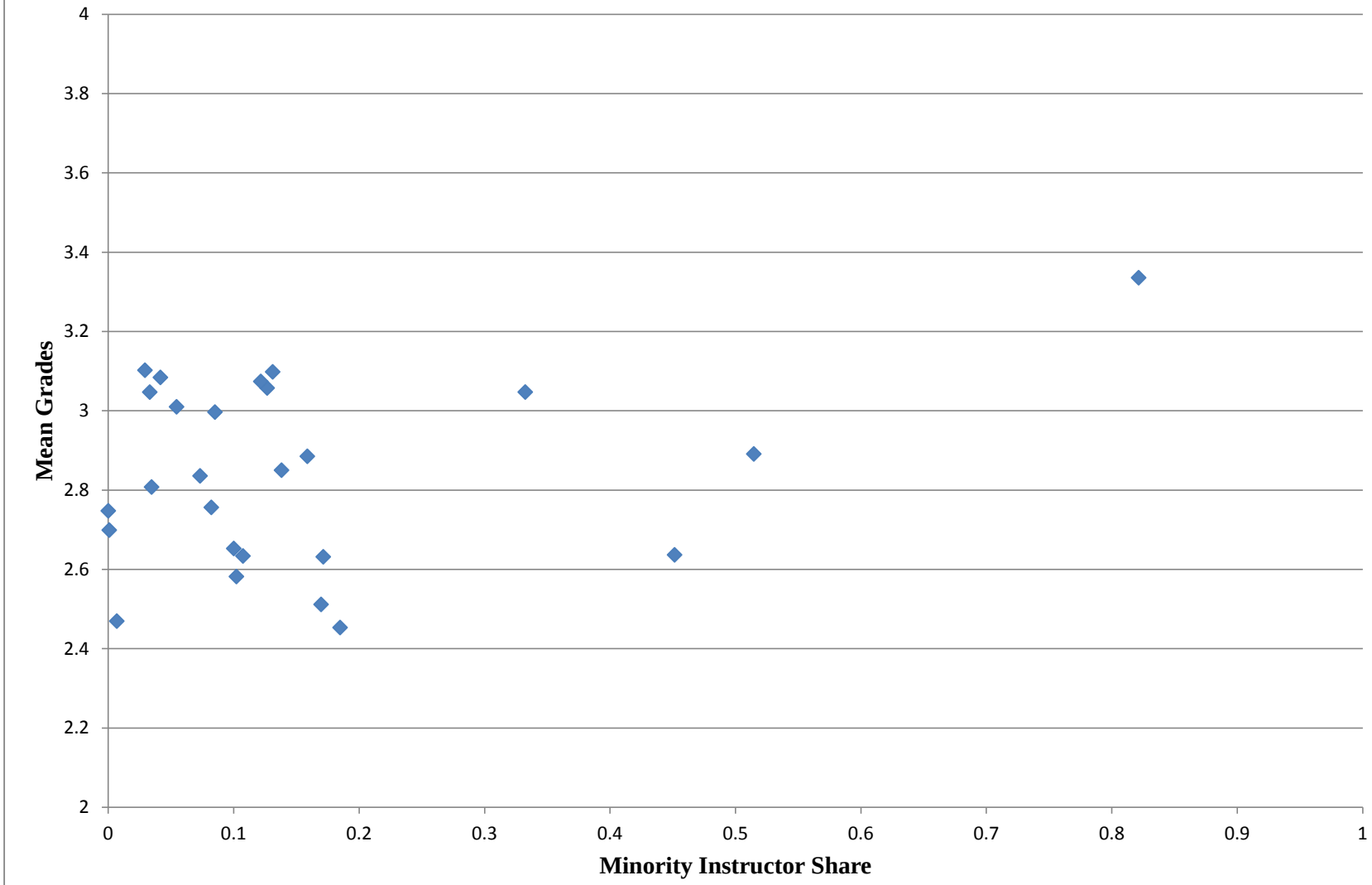
Department	*Enrollments*	*Number of Instructors*
Total	365,651	941
Accounting	16,187	37
Anthropology	9,941	15
Astronomy	7,960	3
Automotive Technology	5,339	13
Biology	14,896	34
Business	12,759	38
Child Development & Education	7,049	26
Computer Appl. & Ofc. Systems	7,077	15
Chemistry	7,460	21
Computer Information Systems	11,710	73
Economics	12,920	19
English/Writing	36,410	137
Film and Television Production	7,459	28
History	17,029	31
Human Development	6,471	15
Humanities	9,637	30
Mathematics	48,348	86
Nursing	6,059	32
Philosophy	7,871	22
Physics	5,203	14
Political Science	9,413	19
Psychology	13,132	36
Reading	9,701	22
Sociology	5,942	24
Speech/Communication	13,657	51

NOTES: This tables includes all enrollments in courses after the drop period, but prior to the withdrawal period. For confidentiality reasons only departments with at least 1 percent of total enrollment at college are included.

Appendix Figure 1: Nonminority-Minority Student Mean Grade Gap vs. Minority Instructor Share by Department



Appendix Figure 2: Mean Grades vs. Minority Instructor Share by Department



Appendix Figure 3: Standard Deviation of Grades vs. Minority Instructor Share by Department