American Economic Journal: Economic Policy 2019, 11(4): 159–182
https://doi.org/10.1257/pol.20170069

The Impact of College Diversity on Behavior toward Minorities†

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This paper estimates the impact of racially diverse peers on white males' subsequent behavior toward minorities. To overcome selection bias, we exploit data from the US Air Force Academy where students are randomly assigned to autonomous peer groups. A randomly assigned increase in freshman black peer ability causes white men to more frequently choose a black roommate in their sophomore year, after reassignment to a new peer group with a different set of black peers. We also find increased exposure to black students from the middle and top of the high school performance distribution, but not the bottom, increases future interactions. (*JEL* I23, J15)

What is the effect of racial diversity on college campuses? This question has long been of interest to colleges themselves as well as to the general public, especially since universities—particularly selective universities—have relatively little racial diversity. Under-representation is particularly acute for blacks, with only 5 percent of the student population at the top 200 institutions ranked by Barron's, compared to 16 percent of college-aged adults nationwide (Brint 2013, US Census Bureau 2010). This issue has also been highlighted in the recent racial protests occurring across college campuses, some of which have explicitly demanded increased admissions for black students (Griggs 2015, Hartocollis and Bidgood 2015, USA Today College Staff 2016).

Although there is consensus regarding the current level of racial diversity on campuses, there is considerable debate regarding the benefits of various policy options to increase diversity. Proponents of race-conscious admissions policies argue that diversity benefits both the majority and the minority, and in particular, that increased

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†Go to https://doi.org/10.1257/pol.20170069 to visit the article page for additional materials and author disclosure statement(s) or to comment in the online discussion forum.

interaction between groups would lead to improved relations and serve a compelling state interest. Critics of race-conscious admissions argue that targeted policies such as affirmative action are themselves a form of discrimination and can diminish race relations, particularly if diverse candidates have lower admission standards (National Public Radio Staff 2014).[1] Empirical evidence on both sides of this debate is sparse.

This paper assesses empirically how exposure to minority peers affects students in the majority. Importantly, we focus primarily on whether diversity causes members of the majority to change their subsequent *behavior* toward the minority. Within this broader space, we examine the effects of two aspects of diversity: the quantity of minority peers and the ability of minority peers. As a result, our analysis speaks directly to the policy question at hand, since many policies designed to increase campus diversity result in lowered admission standards along some dimension of ability or preparedness.

We study these questions using detailed data from the United States Air Force Academy (USAFA), exploiting the fact that freshman students are randomly assigned to peer groups, called squadrons, with whom they live, eat, and train. We then ask whether exposure to black peers within squadrons affects white students' subsequent behavior toward black students. Specifically, we examine whether white males decide to pair up with a black roommate in the second year, when they are randomly assigned to a new squadron with new and likely unknown peers. Because this measure of behavior reveals willingness to share personal space and time with a black male for an extended period of time, it is a more meaningful outcome of racial relations than can be captured by survey responses on attitudes.

Increased diversity has important effects on future behavior toward minorities. We find evidence that exposure to higher aptitude black peers, as well as a larger number of black peers, during freshman year leads to subsequent changes in behavior toward blacks. Specifically, we show that a one standard deviation increase in black peer aptitude increases a white male's likelihood of rooming with a black male by over 20 percent. Exposure to one additional black peer in a squadron of 30 increases the likelihood of a black roommate by over 2 percentage points, or 30 percent, for white males who come from racially homogeneous (i.e., white) states. This suggests a potential policy trade-off; while increased exposure to minorities may increase the type of subsequent behavior desired by advocates of increased diversity in higher education, it may not do so if it is done at the cost of lowering peer black ability.

We then directly examine the extent to which increased exposure to black peers from differing parts of the academic ability distribution affects future behavior toward blacks. We find that increased exposure to blacks from the top two terciles of the high school ability distribution results in significantly higher rates of biracial roommate pairing in the sophomore year; increased exposure to blacks from the bottom third of the ability distribution has no effect, positive or negative, on subsequent

[1] In addition, there is some evidence that increasing diversity leads to less cross-group interaction than expected due to sorting, which can undermine the effectiveness of increased diversity (Arcidiacono et al. 2013; Arcidiacono, Khan, and Vigdor 2011).

behavior toward minorities. This suggests that the positive effects from increased exposure are roughly offset by the negative effect of lower peer black ability.

In addition to contributing to the literature on race-based policies in higher education, this paper also contributes to the broader literature on the contact hypothesis. This concept was first introduced by Williams Jr. (1947) and Allport (1954) and states that interpersonal contact can be an effective way of reducing prejudice between groups. While the cross-sectional evidence is generally consistent with this hypothesis (Pettigrew 1998), a lingering concern is that this relationship could be driven by reverse causation or confounding factors that impact both attitudes and the choice to associate with other groups. While some recent studies have used quasi-experimental approaches to examine the effects of exposure to blacks in the United States (Merlino, Steinhardt, and Wren-Lewis 2016) and to poor students in India (Rao 2013), others have been able to exploit the randomization of intergroup contact. Most of these randomized studies have focused on settings such as college dormitory and roommate assignments, where increased proximity has been shown to increase frequency of interrace contact via email (Sacerdote and Marmaros 2006) and Facebook (Baker, Mayer, and Puller 2011) and friendships (Burns, Corno, and La Ferrara 2015), as well as more favorable racial attitudes as measured by survey responses (Boisjoly et al. 2006, Van Laar et al. 2005, Sidanius et al. 2008) and Implicit Association Tests (Burns, Corno, and La Ferrara 2015).[2]

Our findings make two important contributions to this literature. First, our results demonstrate that increased cross-race interaction can in fact lead to changes in meaningful *behavior* toward minorities. This is important, since there is always some question about whether elicited racial attitudes are truthful, or if they would lead to meaningful changes in behavior toward new and different members of the minority group, such as electing to spend significant time and share a small living space with a black peer. In addition, our findings demonstrate that the impact of intergroup contact depends not only on the amount of exposure to members of the other group, but also (and perhaps even more) to the type of individual from that group.

Our results also speak directly to the policy question faced by universities in determining the benefits of increased diversity. On the one hand, our findings provide suggestive evidence that diversity itself leads to meaningful increases in subsequent cross-race interaction for white students who had relatively little exposure to blacks. On the other hand, our results also show that this potential benefit of increased diversity can be reduced to the extent that increased diversity is achieved by lowering academic standards. In net, our results suggest that the marginal black admit in this context (i.e., black admits in the bottom third of the high school performance distribution) has neither a positive nor negative effect on whites' future behavior toward blacks.

The remainder of the paper proceeds as follows. Section I presents the institutional framework and data for our study. Section II discusses the methods and presents results. Section III presents robustness specifications, and Section IV concludes.

[2] For a recent excellent review and meta-analysis of research on the contact hypothesis, see Pettigrew and Tropp (2006).

I. Institutional Framework and Data

A. *Institutional Framework*

Our ability to reliably estimate changes in the behavior of majority group members toward members of minority groups is dependent upon an exogenous treatment (assignment into a peer group) followed by the observation of choices within an entirely new setting. Fortunately, the US Air Force Academy has long followed assignment procedures into military squadrons which do precisely this. Importantly, the context of the United States Air Force Academy also likely meets most of the conditions laid out by Allport (1954) under which intergroup contact can reduce prejudice. These conditions include equal status, common goals, support of authorities and customs, and (socially engineered) personal interaction. We expect that these conditions are also likely met in other colleges and universities outside of USAFA, though it remains an open question as to whether results found here extend to other contexts.

Squadrons at the Air Force Academy are comprised of approximately 30 members each of the freshman through senior classes. The primary source of social interaction for entering freshmen is the squadron. Members of a squadron share rooms, study together, dine together, play intramural sports together, and undergo military training together. In this way, freshmen at USAFA are given little opportunity to self-select into peer groups—at least outside of one's squadron—relative to freshmen at other universities. In addition, although freshmen do attend classes with freshmen from different squadrons, classroom interaction is quite limited and freshmen are prohibited from entering the dorm area of another squadron until the end of March. Therefore, with the exception of members of intercollegiate sports teams, freshmen have limited opportunities to build social relationships with students outside their own squadron.

Online Appendix Tables 1 and 2 provide evidence of the limited contact freshmen at the Air Force Academy have with students outside their squadron. We administered a survey to students from the graduating classes of 2011 and 2012 asking them to name their five closest friends and their five closest study partners. Online Appendix Table A.1 is based on responses of white male students, and online Appendix Table A.2 is based on responses of black male students. In column 1 of online Appendix Table A.1, 80.5 percent of named friends and 88.4 percent of study partners of white male students during the freshman year were from the same squadron. Importantly, in online Appendix Table A.2, we find a similar pattern for black males during the freshman year: 70.2 percent of named friends and 81.1 percent of named study partners were from the same squadron. A relatively high proportion of named friends and study partners not from the same squadron, shown in column 2, are recruited athletes. In contrast, as shown in columns 3 and 4, students in their sophomore year exhibit increased contact and collaboration with students outside of their own squadron.

The limited contact that freshmen have with those outside their squadron is important for two reasons. First, it shows that (random) changes in the composition of one's freshman squadron is likely to result in significant changes in the type

of individuals to whom one is exposed. In addition, understanding the extent to which social networks extend outside the squadron sheds some light on the likely mechanism at work causing changes in future behavior toward black students. The patterns described earlier suggest that compared to other colleges and universities, any effects found at USAFA are less likely to be due to changes in social networks, and more likely to be due to changes in underlying beliefs.

Incoming freshmen at USAFA are placed into military squadrons without any input from the affected students according to a stratified random sorting algorithm (Carrell, Fullerton, and West 2009; Carrell, Sacerdote, and West 2013). This algorithm uniformly distributes females, members of racial and ethnic minority groups, recruited athletes, and alumni of the Air Force Academy Preparatory School across each squadron. Within each group, assignment is performed without regard to academic ability. In addition, because of both the discrete nature of the number of black students as well as the order in which the assignment is done, the assignment also generates random variation in the number of black students per squadron.[3]

At the end of the freshman year, students are removed from their freshman squadron and placed by the same stratified random sort algorithm into a new squadron, from which they are required to choose a new roommate of the same gender.[4] Students are informed of their sophomore squadrons at the end of the spring semester of their freshman year, and the roommate match is formally made on the first day of the fall semester. Anecdotally, we know that some students may agree informally to pair up prior to the start of the fall semester by contacting prospective roommates over the course of the summer.[5] Additionally, we also know that other roommate pairings are not determined until the first day of the fall semester when all students are required to report to and move-in to their (new) squadron. Roommate pairings occur either informally in the hallway or during a squadron-level meeting. We note, however, that because the squadrons are new, very few white males are by chance randomly assigned to the same squadron as a black peer from their freshman year, and we exclude from the sample those 4.4 percent who are.

We expect that freshman year exposure to black peers is likely to affect outcomes through either of two mechanisms. The first is that white students' views of black students are updated by experiences in the freshman year. We expect these effects to be particularly strong for those who had relatively little exposure before that, or who previously held views in conflict with their freshman year experience. A second potential mechanism is that freshman year exposure increases white students' social network of blacks, thereby making them more likely to pair up with a black

[3] For example, because females are assigned before members of minority groups, some squadrons are randomly assigned a white female, while others are randomly assigned a black female.

[4] For one of the class years contained in our dataset, the graduating class of 2002, students were placed in new squadrons at the end of their sophomore year. We examine roommate choices made during junior year for those students.

[5] The summer is divided into three six-week training periods. During the summer, between the freshman and sophomore year, a typical student will spend one period in survival training, one period in the soaring program (flying gliders), and one period on leave. Students are exogenously assigned to each of these periods, irrespective of their freshman or sophomore squadron. As such, there is a chance that individuals assigned to the same sophomore squadron will interact with one another during the summer.

roommate. We argue that both of these mechanisms are important consequences of college diversity and discuss each of these mechanisms in more depth in Section IIC.

B. *The Dataset*

Our data are comprised of white male students at the US Air Force Academy in the first month of their first semester in their newly reassigned final squadron in August 2000 through 2004.[6]

These data contain five individual-level measurements of pre-Air Force Academy ability: *SAT* scores;[7] *High School Performance*, computed by USAFA Admissions as a weighted average of high school GPA; class rank; and the quality of the high school attended, a *Leadership Composite* of high school and community activities, *Selection Panel Score* given by Air Force Academy Staff, and a *Fitness Score*. Importantly, these are all of the components used to compute the overall score used to determine admission to the academy.[8] In this paper, we focus primarily on high school performance and SAT scores, since those are most predictive of academic success. However, our ability to control for all the other measures of peer ability used for admission reduces and likely eliminates the possibility that black peers who score lower on one measure—such as high school performance—score higher on some unobserved measure of ability.[9]

In addition, our data contain the state of residence and basic demographic information. In Table 1, we present summary statistics for white male students. Column 1 shows statistics for all white male students. Students assigned to squadrons that do not contain any potential black male roommates are omitted from our analysis. Summary statistics for the remaining white male students who have the ability to pair with a black male roommate are reported in column 2.

To these data, we match our primary outcome of interest: roommate matches in the second year after reassignment to a new squadron. Roommates in the second year are chosen among same-gender students within a cohort and squadron. To determine roommates, we were able to obtain the official key log, which contains records on the issuing and returning of keys to dorm rooms. By matching records, we were able to identify one or more roommates for 96.7 percent of white male students.

Since the purpose of our paper is to estimate the effect of contact with one set of black peers on the probability of matching with a black roommate in the subsequent

[6] The bulk of our sample is comprised of the USAFA graduating classes of 2002 and 2004–2007 with the exception of students who experienced a gap of one or more years between matriculation and graduation, the majority of whom are Mormon students who often complete a two-year mission work between the end of their sophomore year and beginning of their junior year. We omit the graduating class of 2003 from our sample because members of this class remained in their initial freshman squadrons through graduation.

[7] For students who took the ACT, we report converted SAT scores.

[8] SAT and high school performance make up 50 percent of the overall admission score, while the leadership score is given a 20 percent weight. The fitness score is used to demonstrate that applicants clear a minimum score required for consideration, but otherwise is not formally used to determine admission. The selection panel sees the SAT, high school performance, and leadership scores and then performs a draw within each congressional district. They then add their own score (which is given 30 percent weight) after reviewing the other three scores and interviewing the applicants (US Air Force Academy Admissions 2018).

[9] We control directly for black freshman fitness, leadership, and panel scores in column 5 of Tables 2 and 3.

Table 1—Summary Statistics: White Male Students

Variables	Mean (SD) (1)	Mean (SD) (2)	Mean (SD) (3)	Mean (SD) (4)	Mean (SD) (5)	Mean (SD) (6)	Mean (SD) (7)
Panel A. Black peer characteristics							
Number of black freshmen	1.762	1.779	1.787	1.797	1.777	1.049	2.013
	(0.751)	(0.754)	(0.899)	(0.757)	(1.023)	(0.718)	(0.826)
Black freshman HS performance	12.71	12.69	−0.0298	−0.793	0.742	−0.00147	−0.0385
	(1.931)	(1.923)	(0.962)	(0.496)	(0.653)	(0.418)	(1.074)
Black freshman SAT	12.05	12.05	−0.0156	−0.154	0.124	−0.200	0.0408
	(0.931)	(0.927)	(0.987)	(0.942)	(1.011)	(0.988)	(0.980)
Black freshman leadership	16.80	16.80	0.0144	0.0307	−0.00214	−0.143	0.0625
	(1.482)	(1.475)	(0.994)	(1.119)	(0.849)	(0.938)	(1.006)
Black freshman fitness	4.924	4.929	0.0133	0.0983	−0.0726	0.0533	0.00110
	(0.764)	(0.758)	(0.987)	(1.024)	(0.940)	(0.947)	(0.998)
Panel B. Own characteristics							
High school performance	12.68	12.68	12.73	12.85	12.62	12.78	12.72
	(2.157)	(2.143)	(2.153)	(2.154)	(2.147)	(2.130)	(2.160)
SAT score	13.06	13.06	13.06	13.08	13.04	13.06	13.06
	(1.034)	(1.035)	(1.041)	(1.051)	(1.031)	(1.079)	(1.030)
Leadership score	17.27	17.28	17.27	17.29	17.24	17.25	17.27
	(1.848)	(1.851)	(1.841)	(1.812)	(1.869)	(1.949)	(1.807)
Fitness score	4.819	4.822	4.836	4.845	4.828	4.899	4.817
	(0.940)	(0.938)	(0.932)	(0.959)	(0.904)	(0.938)	(0.929)
Recruited athlete	0.271	0.275	0.263	0.267	0.260	0.252	0.267
	(0.445)	(0.446)	(0.440)	(0.442)	(0.439)	(0.434)	(0.442)
From a low percent black state	0.492	0.496	0.496	0.492	0.500	0.532	0.485
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)	(0.500)
Panel C. Outcome variables							
Average roommate length			212.1	212.6	211.6	208.2	213.3
			(94.14)	(86.75)	(101.1)	(91.33)	(94.97)
Pr(*BlackRoommate*)			0.0669	0.0497	0.0842	0.0592	0.0692
			(0.250)	(0.217)	(0.278)	(0.236)	(0.254)
Sample: White male students							
With sophomore black male peers		Y	Y	Y	Y	Y	Y
With matched roommates			Y	Y	Y	Y	Y
Below-median black freshman HS performance				Y			
Above-median black freshman HS performance					Y		
Below-median black freshman peers						Y	
Above-median black freshman peers							Y
Observations	3,406	3,142	2,602	1,308	1,294	608	1,994

Notes: Column 1 contains all white male students. Column 2 is the subset of column 1, containing all white male students who are assigned to a sophomore squadron, which contains black males who could be chosen as roommates. Column 3 contains the sample used to estimate our specifications. White male students represented in column 2 are omitted if a roommate cannot be found, if they are assigned to a sophomore squadron containing a black male who was also a member of their freshman squadron, or if as a freshman they were athletic teammates with a black member of their sophomore squadron. Columns 4 and 5 divide the sample in column 3 by black freshman high school performance. Columns 6 and 7 divide the sample in column 3 by the number of black freshman peers.

year from a set of new black peers, we further restrict our sample to omit cases in which a white male student can choose a black roommate with whom he may be more familiar. As a result, we omit white male students who are (randomly) placed in a sophomore squadron with a black student from their same freshman squadron. We also omit white male students who are intercollegiate athletes and placed in a

sophomore squadron with a black member of their same team. Column 3 presents the summary statistics of the sample we use for analysis. On average, these men are exposed to 1.8 black students in their squadron during freshman year and pair with a black roommate during sophomore year at a rate of 6.7 percent. By comparison, our simulations indicate this is somewhat higher than the 6.0 percent match rate we would expect if pairings were random.

Columns 4 and 5 show summary statistics when the white male students contained in column 3 are split into groups whose black freshman peers had *High School Performance* below or above the sample median. Results in Table 1 show that the characteristics of these white students—shown in panel B of Table 1—are similar with respect to high school performance, SAT score, fitness score, and the percent who come from a state with below-median proportion of blacks.[10] However, results in panel C foreshadow our results in that white students who were randomly exposed to higher performing black males during the freshman year are much more likely to pair with a black roommate (8.4 percent compared to 5.0 percent).

Columns 6 and 7 divide the sample based on whether the white students were exposed to an above- or below-median number of black peers during freshman year. Again, panel B shows that the characteristics of the white students are similar across both groups, consistent with random assignment. However, white males from freshman squadrons with 2.0 black peers paired with black roommates during sophomore year at a rate of 6.9 percent, compared to a rate of 5.9 percent for white males who were exposed to only 1.0 black peers during freshman year.

C. *Squadron Assignment and Variation in Black Peer Characteristics*

To be a viable test of whether group diversity affects subsequent behavior, our research design relies on random sampling variation in the number and attributes of black peers across squadrons. Figure 1 shows the variation in our academic aptitude measures at the individual and squadron level for both blacks and white male students. Blacks and white males have similar standard deviations in individual SAT and high school performance scores. However, because there are on average 17.8 white males per squadron but only 1.7 black students, there is much more across-squadron variation in peer black ability. Specifically, while squadron-level mean high school performance is almost identical between white male and black members, the standard deviation among black members is approximately four times the magnitude of that of white males.[11]

Due to the stratified nature of the random assignment process, the variation in the number of black peers across squadrons is less than one would expect under pure random assignment. However, there still remains considerable variation in the

[10] Specifically, we define 25 states as having an above-median proportion of blacks and 25 states as having a below-median proportion of blacks. A total of 46.4 percent of students' permanent addresses are in states with above-median proportions of blacks, while 49.1 percent come from low proportion black states. The remaining students are either missing a state of residence or list their permanent residence overseas (e.g., APO or FPO).

[11] These statistics exclude the fifteen squadrons in our sample that had zero black male peers. Squadrons with zero black freshman peers are included in all estimated models of $\Pr(BlackRoommate)$ along with a relevant indicator variable.

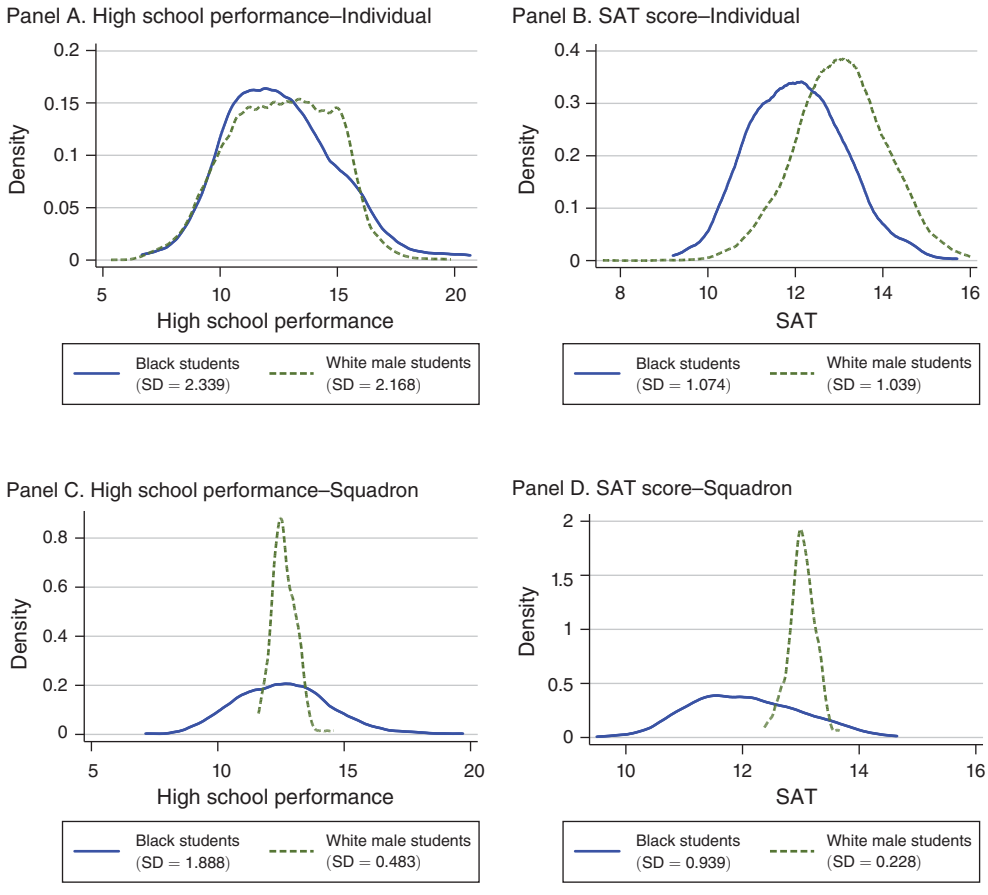

FIGURE 1. DISTRIBUTION OF ACADEMIC ABILITY BY RACE

Note: Individual high school performance (panel A) and SAT scores (panel B) are averaged over the number of black peers (sample average of 1.73) and white males (sample average of 17.8) in panels C and D, respectively.

within-cohort number of blacks across squadrons. The average freshman squadron has 1.73 black peers (both male and female), with a range from zero to five. The mean within-cohort standard deviation in the number of black peers is 0.875. The within-cohort variation in the number of black peers across squadrons comes from three sources of exogenous variation.[12] First, the squadron assignment algorithm places female students into squadrons irrespective of race, allowing for a nonuniform placement of black females to squadrons. Second, USAFA administrators determine assignments to squadrons well prior to matriculation and the start of basic military training. Thus, attrition from the sample through students failing to matriculate either by changing their mind and not showing up, suffering an injury during basic

[12]There is also considerable variation in the number of black students across cohorts, which ranges from 79 blacks in the graduating class of 2004 and 41 blacks in the class of 2007. We include cohort fixed effects in all of our models and thereby exploit only the within-cohort variation in the number of black peers across squadrons.

training,[13] or quitting during basic training offers an additional source of exogenous variation in the number of black peers across squadrons. Third, late admits and students who suffered injuries or illness during the previous year's basic training (called "turnbacks") are randomly assigned to squadrons irrespective of race and after the completion of the initial assignment process. These three processes affect the number of black students assigned to each squadron without regard to the characteristics of white male students. For this reason, we do not expect to find any systematic correlation between the number of black students per squadron and the characteristics of white peers, which is consistent with the last two columns in panel B of Table 1.

Previous studies provide empirical evidence consistent with random assignment into squadrons with respect to academic ability, athletic ability, and leadership ability (Carrell and West 2010; Carrell, Sacerdote, and West 2013). In online Appendix Tables A.4–A.6, we provide additional tests of whether there is any systematic correlation between attributes of white males and the average attributes of black peers assigned to the same squadron during the freshman and sophomore years.

For this and other regressions in the paper, we report statistical significance using randomization-based inference[14] where two-sided p-values are calculated based on 5,000 random reassignments of students to simulated squadrons by class years using the USAFA squadron assignment algorithm. As in Carrell and West (2010), we perform a χ^2-test of whether the $F\left(\hat{\beta}_i\right) = \left(1/N\right)\sum_i\left(\hat{\beta}_i^R < \hat{\beta}_i\right)$ are distributed uniformly over the $\left[0, 1\right]$ interval, as would be expected under random assignment.[15] Tables A.4 through A.6 each contain a panel A, where the re-sampled counterfactual is 5,000 draws of the USAFA squadron assignment algorithm. These tables also contain a panel B, where the re-sampled counterfactual is 5,000 random placements of each class year into 36 squadrons. We perform each to ensure both that actual squadron assignments are in conformity with the official USAFA squadron sorting algorithm and to ensure that the racial and ethnic stratification that occurs in the USAFA squadron sorting algorithm do not create mechanical correlations that differ substantially from squadrons composed of random draws from their respective class years. We fail to reject the null hypothesis of a uniform distribution at a 5 percent level in online Appendix Tables A.4, A.5, and A.6 against both re-sampled counterfactuals and are unable to find significant empirical evidence of systematic correlation between attributes of white and black students assigned to the same squadron.

[13] Students who are injured and cannot finish basic training are not allowed to matriculate into the fall academic semester.

[14] In their *Handbook of Economic Field Experiments* article, Athey and Imbens (2017) recommends the use of randomization-based inference in field experiments over sampling-based inference. Randomization-based inference was used in Carrell, Sacerdote, and West (2013) and figure 1 of Chetty, Looney, and Kroft (2009). Sampling-based inference with clustered standard errors is inconsistent in models estimating peer effects (Caeyers and Fafchamps 2016).

[15] Here, we do not perform a Kolmogorov-Smirnov test of uniformity as in Carrell and West (2010) because the number of coefficients being tested are not sufficiently large for reliable results.

II. Methods and Results

A. *Methods*

Let S_{isft} be a white male student who at time t is a member of squadron s and at time $t-1$ was a member of squadron f. White male student i must form a roommate match among the other male members of sophomore squadron s, some of whom are black. Let

$$BR_{isft} = \begin{cases} 1 & \text{if } S_{isft} \text{ is paired with a black roommate} \\ 0 & \text{if } S_{isft} \text{ is not paired with a black roommate.} \end{cases}$$

To determine whether white males are significantly affected by variation in the number or type of black peers they are exposed to during their freshman year, we estimate the following linear probability model:

$$BR_{isft} = \phi_1 + \phi_2 \bar{X}^B_{ft-1} + \gamma_t + \epsilon_{isft},$$

where $\bar{X}^B_{ft-1}$ are the average black peer characteristics in squadron f in year $t-1$. The primary peer characteristics of interest measure the academic aptitude of the black peers (mean SAT and high school performance scores) and the number of black peers by squadron. In addition, because we expect exposure to black peers to be more likely to affect those individuals who have had less exposure to blacks prior, we also interact these peer characteristics with a proxy for earlier exposure. Specifically, we interact it with an indicator for whether the proportion of the population of the home state of student i that is black in the 2000 census is below the median, which we designate a *Low Percent Black State*.

Our second primary analysis is aimed at directly examining the policy trade-off between increasing exposure to minorities and admitting minorities with lower academic qualifications. Specifically, we categorize black freshman peers by tercile of black high school performance and ask how exposure to the number of blacks from each of those three terciles affects future behavior toward blacks. For the second primary analysis, $\bar{X}^B_{ft-1}$ represents the number of black freshman peers in the low, medium, or high tercile of black high school performance. Because white males are exogenously assigned to black peers in the freshman year, estimates of these ϕ_2 coefficients are free from selection bias. The term γ_t is a cohort fixed effect, and ϵ_{isft} is a stochastic disturbance.

B. *Main Roommate Results*

We begin by showing the raw data on the relationship between exposure to black peers during the freshman year and our measure of behavior toward new and different black peers in the sophomore year. Panels A and B of Figure 2 are 20-point binned scatterplots of the relationship between black freshman peer high school performance and the frequency of a biracial roommate match along with the fitted linear relationship. Panel A is a scatterplot for the subsample of white male students who are residents of states we designate as being low percent black in the 2000

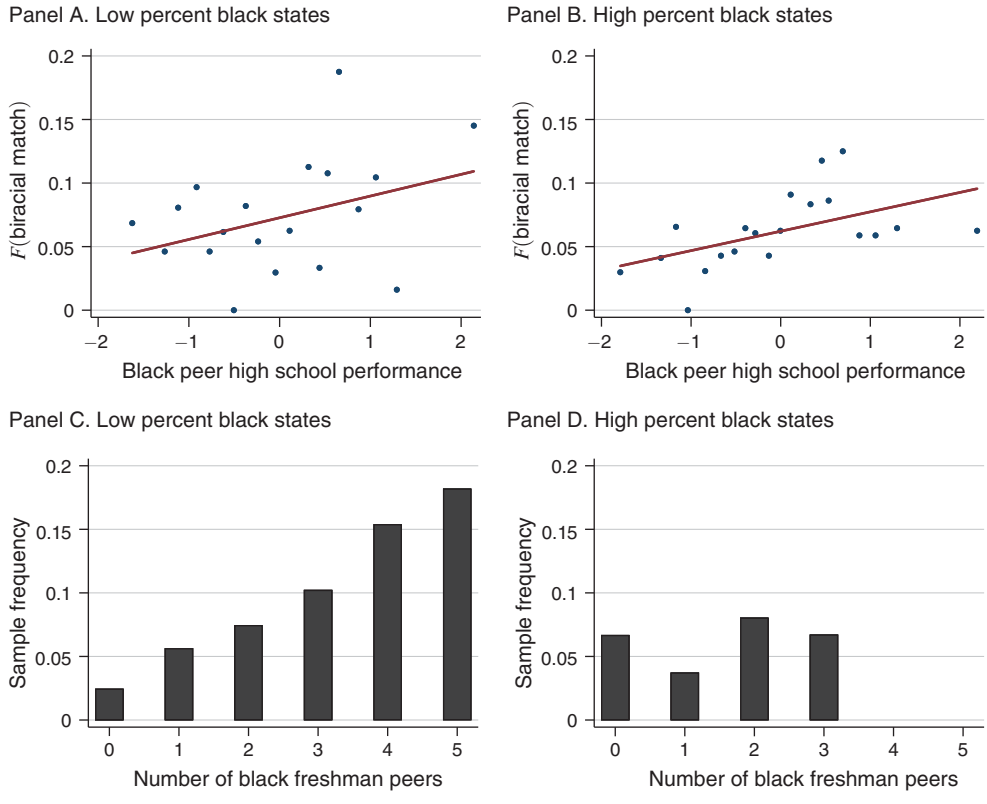

FIGURE 2. FREQUENCY OF BIRACIAL ROOMMATE MATCH BY FRESHMAN BLACK PEER HIGH SCHOOL PERFORMANCE AND NUMBER OF BLACK FRESHMAN PEERS

Notes: Panels A and B are 20-point binned scatterplots. Frequency in panels C and D represent the proportion of white male students with the indicated number of freshman black peers who were subsequently matched with a sophomore black roommate. Freshman black peer high school performance is standardized. Panels A and C are computed for a subsample of states with the percentage of the black population in the 2010 census below the national average. Panels B and D are for a subsample of states with the percentage of the black population in the 2010 census above the national average.

census. Similarly, panel B represents students from high percent black states. The results show a clear positive relationship between exposure to higher ability freshman black peers and the likelihood of a white male student choosing a roommate from among a set of new and different black peers in the following year. Given the random way in which students were allocated across squadrons in both freshman and sophomore years, this suggests that the type of black peers to whom white men are exposed significantly affects their behavior toward new and different black peers in the future. We note a similar effect of exposure to higher academic aptitude freshman black peers across students from low and high percent black states.

Panels C and D of Figure 2 show the relationship between the number of black peers to whom white men were exposed during freshman year and the likelihood of pairing in the sophomore year with a black roommate by low and high percent black states, respectively. We observe a strong positive effect of exposure to additional

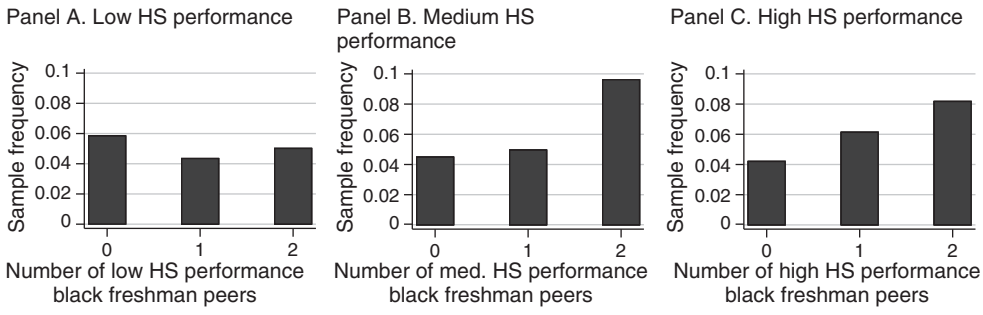

FIGURE 3. FREQUENCY OF BIRACIAL ROOMMATE MATCH BY NUMBER OF LOW, MEDIUM, AND HIGH HIGH SCHOOL PERFORMANCE BLACK FRESHMAN PEERS

Note: Frequency represents the proportion of white male students with the indicated number of low (panel A), medium (panel B), and high (panel C) freshman black peers who were subsequently matched with a sophomore black roommate.

black freshman peers for white male students from low percent black states and an absence of effect in white male students from high percent black states. This suggests that the number of black peers to whom college-aged white men are exposed also can affect the subsequent behavior toward other black peers in the future.

The raw data underlying our second primary analysis are shown in Figure 3, which disaggregates the number of black freshman peers from Figure 3 into separate plots of black freshman peers with low, medium, and high high school performance scores. In panels B and C, white males who were exposed to higher numbers of medium- and high-performance black freshman peers appear more likely to pair with a black roommate in their sophomore year. The relationship with the number of low-performance black freshmen peers is roughly flat, suggesting no relationship between exposure to those students and the likelihood of subsequently pairing up with a black roommate.

Table 2 presents our main estimation results, including *p*-values in square brackets from randomization-based inference. Panel A shows estimates of the effect of black freshman peer high school performance, black freshman peer SAT, and the number of black freshman peers on the probability of a sophomore biracial roommate match.

Column 1 begins by estimating a parsimonious regression that only includes the main explanatory variables of interest and a class year fixed effect. The estimates in column 1 of panel A indicate that exposure to higher ability black peers significantly increases the likelihood of pairing with a black roommate in the sophomore year. The estimate of 0.0157 in the first row is statistically significant at the 1 percent level and indicates that a one standard deviation increase in peer black ability, as measured by high school performance, is associated with a 1.57 percentage point increase in the likelihood of subsequently choosing to pair with a black roommate. We note that while this is a small absolute increase in the likelihood of pairing with a black roommate due to the fact that only 4.9 percent of potential roommates are black, it represents a 23 percent increase relative to the baseline biracial match rate

Table 2—Impact of Exposure to Black Peers on Roommate Matching

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Black freshman HS performance	0.0157	0.0162	0.0148	0.0153	0.0138	0.0140
	[0.005]	[0.005]	[0.009]	[0.008]	[0.022]	[0.015]
Black freshman SAT	0.0009	0.0000	−0.0006	0.0005	0.0009	−0.0001
	[0.915]	[0.953]	[0.862]	[0.945]	[0.914]	[0.958]
Number of black freshmen	0.0090	0.0093	0.0085	0.0071	0.0021	0.0077
	[0.227]	[0.218]	[0.261]	[0.377]	[0.864]	[0.308]
Black freshman fitness					−0.0070	
					[0.194]	
Black freshman leadership					−0.0008	
					[0.884]	
Black freshman admissions rating					0.0040	
					[0.525]	
Observations	2,602	2,602	2,602	2,602	2,602	2,602
R^2	0.016	0.028	0.031	0.068	0.032	0.052
Panel B						
Black freshman HS performance	0.0165	0.0170	0.0157	0.0144	0.0150	
	[0.030]	[0.024]	[0.037]	[0.072]	[0.055]	
Low percent black	−0.0012	−0.0014	−0.0019	0.0023	−0.0021	
× black freshman HS performance	[0.879]	[0.858]	[0.833]	[0.871]	[0.813]	
Black freshman SAT	0.0047	0.0035	0.0025	0.0053	0.0045	
	[0.610]	[0.710]	[0.819]	[0.509]	[0.658]	
Low percent black × black freshman SAT	−0.0082	−0.0074	−0.0067	−0.0105	−0.0071	
	[0.514]	[0.552]	[0.594]	[0.351]	[0.570]	
Number of black freshmen	−0.0023	−0.0018	−0.0031	−0.0057	−0.0097	
	[0.890]	[0.920]	[0.817]	[0.607]	[0.458]	
Low percent black	0.0221	0.0217	0.0227	0.0248	0.0227	
× number of black freshmen	[0.063]	[0.072]	[0.054]	[0.041]	[0.055]	
Low percent black state	−0.0274	−0.0287	−0.0308	−0.0342	−0.0305	
	[0.280]	[0.252]	[0.215]	[0.150]	[0.221]	
Black freshman fitness					−0.0071	
					[0.184]	
Black freshman leadership					−0.0008	
					[0.890]	
Black freshman admissions rating					0.0040	
					[0.523]	
Observations	2,602	2,602	2,602	2,602	2,602	
R^2	0.018	0.030	0.033	0.070	0.034	
Year effects	Y	Y	Y	Y	Y	Y
Own characteristics	–	Y	Y	Y	Y	Y
Freshman non-black peer characteristics	–	–	Y	Y	Y	Y
Black upper-class peer characteristics	–	–	Y	Y	Y	Y
Sophomore black peer characteristics	–	–	Y	Y	Y	Y
Sophomore squadron fixed effects	–	–	–	Y	–	–
Nonacademic black freshman peer characteristics	–	–	–	–	Y	–
State-of-residence fixed effects	–	–	–	–	–	Y

Notes: The dependent variable is the probability of a roommate match between black and white males for seven or more days. High school performance and SAT score are normalized. Square brackets contain *p*-values from randomization-based inference using a counterfactual of 5,000 randomly assigned roommates from within existing sophomore squadrons.

of 6.7 percent shown in Table 1.[16] In addition, in results not shown, we find that sophomore squadrons with whites who were previously exposed to higher ability blacks experience a net increase in white-black pairings. This suggests that exposure to higher ability blacks does not simply reshuffle black-white pairings within sophomore squadrons, but increases the net number of black-white pairings during sophomore year.[17,18]

In contrast, we find no statistically significant relationship between peer black SAT scores and the probability of a roommate match, though the estimated effects are positive. We note that the high school performance effect may dominate the SAT effect because the high school performance is a much better predictor of grade performance at USAFA, particularly for blacks. Finally, estimates of the effect of the number of black freshmen to whom one is exposed are positive, but not statistically significant.

A natural question is whether the effects we find are heterogeneous across students with different incoming attitudes toward race. Although we cannot directly measure incoming attitudes or levels of racial prejudice, our dataset does contain information on each student's home state of residence.[19] Using data from the US Census Bureau on the percentage of the population that was black in the 2000 census, in panel B, we interact explanatory variables from panel A with whether the black population of the student's home state was below median, indicated as *Low % Black*.

Results in column 1 indicate a roughly similar effect of peer ability. However, we do find that the differential effect of the number of black peers is marginally statistically significant ($p = 0.063$) for white students who come from states with below-median proportion of blacks. The point estimate of 0.0221 indicates that the marginal impact of exposure to a black peer on the likelihood of pairing with a black roommate is 2.2 percentage points larger for white students from states with relatively few blacks, compared to white students from more diverse states. Overall, the estimates indicate that exposure to one more black peer during freshman year increases the likelihood of pairing up with a black roommate during sophomore year by $-0.0023 + 0.0221 \approx 0.02$, or 2 percentage points.[20] This represents a

[16] This is a *net* increase since this exposure could potentially have negative effects on some white men that are more than offset by positive effects on others.

[17] Specifically, we regress the number of black-black pairings at the squadron level on our three measures of exposure as well as year fixed effects. The coefficient on freshman black peer high school ability is -0.062 and is significant at the 5 percent level, suggesting that squadrons with whites who were previously exposed to higher ability blacks were less likely to have black-black pairings and more likely to have white-black pairings.

[18] Similarly, to examine whether absolute or relative peer exposure matters, we also tested whether the exposure of one's white sophomore peers to blacks during freshman year affects the likelihood of pairing with a black roommate and find it does not. We estimate the same specification as column 4 of Table 2 except that we also include controls for freshman black high school performance and SAT scores experienced by white sophomore peers as well as the number of black peers. The clustered *t*-statistics are 0.38, -0.89, and -0.07.

[19] The military academies are unique in the fact that admissions are made within each congressional district and state. Each member of the US House of Representatives and Senate is allotted five total slots at each service academy in any given year. This process ensures the student body is representative of population centers throughout the United States.

[20] In alternate specifications, we find this combined effect to be significant at the 5 percent level with a *p*-value of 0.046.

30 percent increase over the baseline likelihood of 6.7 percent for white students from *Low Percent Black States*.

In columns 2–6, we continue to find large, positive effects as we add controls for own demographic characteristics, freshman and sophomore peer characteristics, sophomore squadron fixed effects, nonacademic black freshman peer characteristics, and state-of-residence fixed effects. The similarity of the point estimates as we add controls is consistent with our expectation given the absence of selection in the squadron assignment process. In panel A, estimates of the impact of peer black ability remain statistically significant at the 1 percent level in column 2 and are significant at a 5 percent level in columns 3 and 4. Likewise, in panel B, the differential impact of the number of black peers among students from low percent black states remains relatively unchanged across specifications and is significant at the 5 percent level in column 4. In column 4, estimates indicate that a one-standard deviation increase in the high school performance of freshman black peers is associated with a 1.53 percentage point increase in the probability of having a black roommate, which represents a 23 percent increase.[21] Similarly, the differential impact of exposure to an additional black peer is 2.48 percentage points larger for white male students from states with a low percentage of the population that is black, relative to students from more diverse states.

In columns 5 and 6, we estimate specifications to check the robustness of our findings. In column 5, we control for other black peer characteristics that are potentially correlated with academic aptitude (military preparatory school attendance, recruited athlete, leadership composite, and fitness score). And, in column 6, we control for state-of-residence fixed effects. In these robustness specifications, our estimated coefficients of interest remain large, positive, of similar magnitude, and statistically significant. Nevertheless, the similarity of the point estimates indicates that exposure during the freshman year to more and higher aptitude black peers increases the probability of a white-black roommate match in the sophomore year irrespective of the academic aptitude of potential sophomore black roommates.

The findings described above suggest that policymakers and university administrators may face a trade-off in that while increasing exposure to diversity may improve relations, ceteris paribus, exposure to lower ability members of the minority may offset that to some extent. Specifically, results suggest that lowering admission thresholds with respect to high school performance in order to increase enrollment of minorities may not be beneficial. By comparison, our results suggest there is not a similar trade-off when lowering the admission threshold with respect to SAT scores. This suggests that schools may be able to accept lower scoring minority students on the SAT in an effort to increase diversity without offsetting the positive effect of increased exposure on some white students. We note that while this seems feasible in this setting—40 percent of black students at the academy scored in the bottom tercile of SAT but in the middle or top tercile of high school performance—we suspect that universities would be hesitant to do this since entering SAT scores are a major metric used to determine university rankings.

[21] We also note that this effect is just over half the magnitude of the impact of an additional black sophomore squadron mate, which is 2.8 percentage points as estimated (but not shown) in column 3.

In order to more directly examine this trade-off, next we present our second primary analysis, which directly examines the impact of additional freshman black peers by tercile of high school performance. This enables us to distinguish between the impact of being exposed to a black student in the bottom, middle, or top of the academic ability distribution.

Results are shown in Table 3. As in Table 2, column 1 shows results from a specification including only year fixed effects, while additional controls are included in columns 2 through 6. Results across specifications indicate that exposure to black students from the middle tercile and especially the top tercile result in significantly increased biracial roommate matching. In contrast, there is no effect of exposure to black students from the bottom tercile. For example, estimates in column 4 indicate that while exposure to a black freshman from the top tercile increases the likelihood of pairing with a black roommate by 1.9 percentage points (28.4 percent, $p = 0.058$), exposure to a black freshman from the bottom tercile reduces that likelihood by an insignificant 0.7 percentage points. This suggests that for these marginal black applicants, any impact of increased exposure is roughly canceled out by the effect of lower ability.[22]

C. *Interpretation and Mechanism*

There are two potential mechanisms that could be responsible for the effects. The first is that exposure to black peers during the freshman year changes students' underlying racial attitudes toward blacks more generally. This is consistent with a Bayesian updating process in which views of groups are formed on the basis of previous interactions with members of those groups. Alternatively, effects can be due to expanded social networks. For example, exposure to more black peers or to higher ability black peers in freshman year may result in white male students being directly or indirectly more familiar with black students in their sophomore squadron. While this is arguably more likely to explain effects of exposure to additional black peers rather than to the average academic ability of black peers, our reduced-form estimates capture the net effect of both of these mechanisms.

As discussed earlier, we believe that the social network mechanism is less important here than it would be on traditional college campuses. This is due to the social isolation of freshmen within squadrons at USAFA, as reflected by the fact that white men report that 80 percent of their friends and 88 percent of their study partners are within squadron, respectively. In addition, we exclude from our analyses all white males who coincidentally were assigned to the same squadron as a black freshman from their same squadron, or who were on the same athletic team as a black sophomore student. In the next section, we also show that our main results are robust to controlling for the characteristics of black students from the same freshman classes, and to excluding white males who roomed with a black student during freshman year.

[22] To further explore varying effects of freshman black peers by academic ability, we present the effect of an additional freshman black peer by decile of high school performance in online Appendix Table A.7. Results indicate that exposure to a black peer from the lowest decile of the ability distribution has a positive but small and insignificant effect on the probability of a multiracial roommate match.

Table 3—Impact of Exposure to High-, Medium-, and Low-Ability Black Peers on Roommate Matching

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Number of low HS performance black freshmen	−0.0068 [0.477]	−0.0066 [0.481]	−0.0056 [0.566]	−0.0072 [0.479]	−0.0084 [0.465]	−0.0057 [0.558]
Number of medium HS performance black freshmen	0.0184 [0.056]	0.0192 [0.049]	0.0180 [0.068]	0.0160 [0.134]	0.0134 [0.300]	0.0174 [0.082]
Number of high HS performance black freshmen	0.0218 [0.020]	0.0217 [0.020]	0.0196 [0.042]	0.0193 [0.058]	0.0141 [0.252]	0.0181 [0.060]
Year effects	Y	Y	Y	Y	Y	Y
Own characteristics	–	Y	Y	Y	Y	Y
Freshman non-black peer characteristics	–	–	Y	Y	Y	Y
Black upper-class peer characteristics	–	–	Y	Y	Y	Y
Sophomore black peer characteristics	–	–	Y	Y	Y	Y
Sophomore squadron fixed effects	–	–	–	Y	–	–
Nonacademic black freshman peer characteristics	–	–	–	–	Y	–
State-of-residence fixed effects	–	–	–	–	–	Y
Observations	2,602	2,602	2,602	2,602	2,602	2,602
R^2	0.017	0.030	0.032	0.069	0.032	0.053

Notes: The dependent variable is the probability of a roommate match between black and white males for seven or more days. Square brackets contain *p*-values from randomization-based inference using a counterfactual of 5,000 randomly assigned roommates from within existing sophomore squadrons.

In addition, we also empirically test whether exposure to more black peers or higher ability black peers is correlated with the probability of a white male having a black friend who is outside the freshman squadron. In doing so, we ask whether exposure results in an expansion of a social network of black friends. To implement this test, we regress an indicator for whether a white male names a black friend, conditional on naming a friend outside their freshman squadron, on our two measures of exposure to black freshmen.

Results are shown in panel A of online Appendix Table A.3. Although we recognize this test is somewhat limited by the 26 percent survey response rate, results indicate that white male students who are exposed to more black freshmen are actually *less* likely to name a black friend outside their squadron, which is in contrast to the main results we find in our paper. In panel B, we find negative and significant effects for the number of black freshman peers with low high school academic performance and medium high school academic performance. Again, this contrasts with the main results shown in Table 3 in which black peers in the lowest tercile of the ability distribution have no effect, and black peers in the upper two terciles have positive effects. Thus, while these empirical tests should not be viewed as definitive evidence on mechanism, the results suggest our main findings are not driven by (observed) changes in social network.

III. Robustness Specifications

With the abundance of data we possess about USAFA and its students, we are able to estimate a number of alternate specifications, which we present as robustness specifications in Tables 4 and 5. In both Tables 4 and 5, column 1 repeats specification from column 4 in panel B of Table 2. This specification controls for own

Table 4—Robustness Specifications: Part I

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Black freshman HS performance	0.0144	0.0142			0.0163	0.0136	0.0147
	[0.072]	[0.078]			[0.043]	[0.088]	[0.079]
Low percent black	0.0023	0.0033			0.0018	0.0029	0.0004
× black freshman HS performance	[0.871]	[0.805]			[0.904]	[0.835]	[0.999]
Black freshman SAT	0.0053		0.0048			0.0045	0.0069
	[0.509]		[0.556]			[0.586]	[0.432]
Low percent black	−0.0105		−0.0077			−0.0093	−0.0085
× black freshman SAT	[0.351]		[0.491]			[0.414]	[0.488]
Number of black freshmen	−0.0057			−0.0036	−0.0039	−0.0068	−0.0094
	[0.607]			[0.753]	[0.728]	[0.529]	[0.388]
Low percent black	0.0248			0.0241	0.0239	0.0254	0.0264
× number of black freshmen	[0.041]			[0.044]	[0.045]	[0.038]	[0.044]
Low percent black state	−0.0342	0.0105	0.0105	−0.0328	−0.0368	−0.0343	−0.0342
	[0.150]	[0.335]	[0.324]	[0.168]	[0.121]	[0.152]	[0.172]
Black freshman SAT-V					0.0099		
					[0.135]		
Black freshman SAT-M					−0.0099		
					[0.136]		
Black classmate HS performance						0.0007	
						[0.913]	
Black classmate SAT score						0.0064	
						[0.310]	
Number of black classmates						0.0013	
						[0.157]	
Observations	2,602	2,602	2,602	2,602	2,602	2,567	2,269
R^2	0.070	0.068	0.065	0.067	0.072	0.072	0.079

Notes: The dependent variable is the probability of a roommate match between black and white males for seven or more days. All specifications include year fixed effects, own characteristics, freshman non-black peer characteristics, black upper-class peer characteristics, sophomore black peer characteristics, and sophomore squadron fixed effects. As in Table 2, column 4, high school performance and SAT score are normalized. Square brackets contain *p*-values from randomization-based inference using a counterfactual of 5,000 randomly assigned roommates from within existing sophomore squadrons.

characteristics, freshman non-black peer characteristics, black upper classman peer characteristics from the freshman squadron, sophomore black peer characteristics, and a sophomore squadron fixed effect. In addition, it interacts the main effects with an indicator for whether the white male student is from a state with below-median percentage of black residents. In columns 2 through 4 of Table 4, we separately estimate the impact of our three main explanatory variables of black freshman high school performance, black freshman SAT, and the number of black freshman peers. In each case, the magnitude and significance of the estimated coefficients matches that of column 1 that includes all three explanatory variables.

In column 5, SAT scores are disaggregated into SAT-Verbal and SAT-Math scores. Under this specification, black freshman peer high school performance and the number of black freshman peers have similar patterns of magnitude and significance as our baseline specification in column 1. Black freshman peer SAT-Math and SAT-verbal scores have coefficients of the same magnitude but opposite sign. Both lack statistical significance.

TABLE 5—ROBUSTNESS SPECIFICATIONS: PART II

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Black freshman HS performance	0.0144	0.0140			0.0134		0.0157
	[0.072]	[0.081]			[0.094]		[0.056]
Low percent black	0.0023	0.0038			0.0019		0.0005
× black freshman HS performance	[0.871]	[0.766]			[0.895]		[0.986]
Black freshman SAT	0.0053	0.0054			0.0064		0.0055
	[0.509]	[0.508]			[0.437]		[0.494]
Low percent black	−0.0105	−0.0095			−0.0110		−0.0107
× black freshman SAT	[0.351]	[0.401]			[0.329]		[0.346]
Number of black freshmen	−0.0057		−0.0059		−0.0026		−0.0064
	[0.607]		[0.600]		[0.823]		[0.572]
Low percent black	0.0248		0.0253		0.0259		0.0245
× number of black freshmen	[0.041]		[0.038]		[0.032]		[0.077]
Low percent black state	−0.0342	0.0061	−0.0274		−0.0352		−0.0615
	[0.150]	[0.172]	[0.138]		[0.136]		[0.062]
Proportion of freshman squadron black		−0.0618					
		[0.640]					
Low percent black		0.0563					
× prop. of freshman squadron black		[0.628]					
Black freshman predicted GPA			0.0132				
			[0.114]				
Low percent black			−0.0138				
× black freshman predicted GPA			[0.224]				
Black male freshman HS performance				0.0231			
				[0.000]			
Black male freshman SAT				0.0003			
				[0.973]			
Number of freshman black males				0.0040			
				[0.662]			
Freshman black dropout					−0.0336		
					[0.063]		
Rank freshman black HS performance						0.0030	
						[0.001]	
Rank freshman black SAT						−0.0001	
						[0.853]	
Rank number freshman black						0.0014	
						[0.230]	
Abs diff. HS performance							−0.0164
							[0.046]
Low percent black							0.0211
× abs diff. HS performance							[0.070]
Observations	2,602	2,602	2,602	2,602	2,602	2,602	2,449
R^2	0.070	0.068	0.068	0.071	0.072	0.070	0.070

Notes: The dependent variable is the probability of a roommate match between black and white males for seven or more days. All specifications include year fixed effects, own characteristics, freshman non-black peer characteristics, black upper-class peer characteristics, sophomore black peer characteristics, and sophomore squadron fixed effects. As in Table 2, column 4, high school performance and SAT score are normalized. Square brackets contain *p*-values from randomization-based inference using a counterfactual of 5,000 randomly assigned roommates from within existing sophomore squadrons.

In columns 6 and 7, we return to the question of whether the effect of exposure to black peers can be explained by increased social networks. In column 6, we explicitly control for the number and aptitude of black freshman students from the same sections of academic classes taken. Results are similar in magnitude to the baseline results shown in column 1. In addition, we note that neither high school performance, SAT, nor the number of black freshman classmates has any effect on the probability of a sophomore biracial roommate match. We find this result to be consistent with the limited interaction that normally takes place within freshman academic classes at the Air Force Academy.

Finally, in column 7, we exclude from the sample the white male students who had at least one black freshman roommate. We do so in order to exclude those students most likely to have developed a network of black friends from outside the squadron. Patterns of significance remain the same, and significant estimated coefficients are slightly larger.[23]

In column 2 of Table 5, we replace the number of black freshman peers with the proportion of the freshman squadron that is black. The proportion as opposed to number of the freshman squadron that is black lacks statistical significance. In column 3, variables measuring black freshman peer academic aptitude (high school performance and SAT score) are replaced with predicted freshman GPA, using all available pre-college explanatory variables. Predicted GPA does not have any effect on the probability of a biracial roommate match. We view this as evidence that the mechanism through which peer black high school performance matters is not academic preparedness per se. Rather it is likely a proxy for other peer black characteristics—such as grit or teachability—that leads to increased cross-race interactions in the future.

We next test the robustness of our results to defining freshman black peer characteristics using only male black peers. Results are shown in column 4, and indicate that the estimated impact of black male freshman high school performance is almost a full percentage point higher than that of the baseline estimate that defines peers as both male and female (0.0231 versus 0.0144) and is significant at the 1 percent level.

In column 5, we add an additional measure of black peers to our baseline specification that is an indicator of whether a student had a black freshman peer who dropped out of the Air Force Academy.[24] We interpret the negative and marginally significant estimate as additional evidence of the effect of black peer ability on the probability of a subsequent biracial roommate match.

In columns 6 and 7 of Table 5, we examine the impact of alternative ways of measuring black peer ability during freshman year. In column 6, we use measures of the rank of one's exposure to black peers in place of our typical measures. We find that white males exposed to relatively higher ability black freshman peers were significantly more likely to pair with a black roommate sophomore year. In

[23] We also exclude the 2002 graduating cohort, which was not reassigned to a new squadron until junior year. The estimate of the effect of peer black ability changes from 0.0157 to 0 (significant at the 1 percent level). This is consistent with this cohort being treated for a longer time period than the other cohorts.

[24] We note that in contrast to our preferred definition of peers, this definition is potentially subject to the reflection and common shock problems.

column 7, we add a control measuring the absolute difference between own high school performance and freshman peer high school performance. Interestingly, we find a negative and significant effect upon the likelihood of a biracial roommate match that is counteracted by a somewhat larger but marginally significant positive effect for students from low percent black states. This suggests that wide differences in academic ability between white and black peers may affect white students particularly from high percent black states.

Finally, we also report the robustness of our estimates to alternative roommate definitions. In our main analysis, we define two students as roommates if they were reported in the key log as having shared the same key to the same room for more than seven days. This time frame was chosen because it was the shortest time frame such that there did not appear to be overlap of multiple roommates due to keys being turned in (or recorded as being turned in) a few days late. In online Appendix Table A.8, we show estimates corresponding to roommate definitions from 1 day through 240 days. As shown there, estimates of the impact of black freshmen high school performance range from 0.0152 (1 day) to 0.0174 (30 days) to 0.0106 (240 days). All estimates are significant at the 1 percent level except for the 240 day specification, which has a *p*-value of 0.070. The vast majority of roommate relationships we observe last either one semester or the entire academic year, as can be seen from the histogram of the duration of roommate relationships in online Appendix Figure A.1.

IV. Discussion and Conclusion

This study provides an empirical test of whether increased diversity on a college campus influences the subsequent behavior of the majority toward the minority. Specifically, we examine whether white males are affected by either the number or type of black peers to whom they are exposed. To do so, we use data from the US Air Force Academy (USAFA) in which students are randomly assigned to peer groups in their freshman year and subsequently reassigned into different peer groups in their sophomore year. Results indicate that white males exposed to higher ability black peers in their freshman year were significantly more likely to pair with a black roommate in their sophomore year. That is, exposure to higher ability black peers leads white students to decide to share a significant amount of personal space and time with a different black peer the following year. In addition, we also find some suggestive evidence that exposure to additional black peers leads to increases in the likelihood of pairing with a black roommate the following year, with effects concentrated primarily among whites from states with relatively few blacks.

These results provide several important takeaways. First, in addition to complementing the existing literature on the impact of exposure to more members of the minority group, we also document that the type of members from that group affects racial attitudes. This highlights the importance of the type of individual with whom one interacts, which is consistent with models in which individuals update prior attitudes regarding other groups.

In addition, the importance of the type of individuals with whom one interacts also speaks directly to the potential costs and benefits of increasing diversity in

higher education. That is, the benefits of increased exposure may be partially offset if increased enrollment of underrepresented minorities is accomplished by lowering an admission threshold. We show that exposure to additional black peers from the middle and especially the top third of the high school performance distribution has a large, positive effect on the probability of pairing with a black roommate the following year. However, we also show that exposure to an additional marginal black peer who ranks in the bottom third of high school performance has no effect—positive or negative—on subsequent racial relations. This suggests that at least in this context, any positive effect of increased exposure is roughly canceled out by the negative effect of exposure to a black peer of lower academic ability. We note, however, that it is an open question as to whether the net impact of these two effects is similar for marginal applicants in other contexts. In addition, we emphasize that understanding this trade-off is one of potentially many considerations in evaluating whether race-conscious admissions policies are socially desirable.

Finally, our results demonstrate that exposure to more and higher aptitude black peers can lead to significant changes in subsequent *behavior*. Importantly, these changes in behavior are toward a new and different set of black peers. This provides evidence that increased diversity does more than change self-reported attitudes; it also leads to meaningful changes in future behavior.

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