

**THE ROLES OF FACULTY HIRING AND RETENTION IN SHAPING DIVERSITY AND  
REPRESENTATION IN U.S. HIGHER EDUCATION INSTITUTIONS:  
A RETROSPECTIVE AND PROSPECTIVE ANALYSIS FROM 2001 TO 2035**

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## **Abstract**

U.S. higher education institutions are adjusting their faculty hiring to respond to the demands of an increasingly diverse racial and ethnic student population. However, it is not always clear whether specific faculty policies are intended to address the matter of diversity or representation—two similar but qualitatively different concepts. Essentially, the policy choices that institutions make result in different implementation approaches and long-term outcomes. Using data from the Integrated Postsecondary Education Data System (IPEDS) from 2001 to 2021, this study measures and compares the changes in faculty diversity and student-faculty representation in U.S. higher education institutions over the past two decades. It then develops several simulated scenarios to project the future racial and ethnic landscape of American campuses, depending on the different policy choices that institutions make through their hiring and retention policies. Our recommendation calls for balanced efforts in the retention and hiring of minoritized and underrepresented faculty, adapted to the individual circumstances of institutions.

*Keywords:* diversity, representation, diversity index, representation index, faculty hiring and retention

## 1. Introduction

Universities' hiring strategies have striven to respond to the rising awareness of diversity, inclusion, and representation. In its 2017 Strategic Vision, the University of California, Davis, aimed to build a diverse community with its plans to “identify, attract and retain diverse faculty and staff,” noting that the institution “thrives when the workforce reflects the diversity of the students and patients [they] serve” (p. 15). Meanwhile, “broaden the recruitment process to encourage a world-class cadre of diverse full-time and adjunct faculty” was a goal of Brightpoint Community College—formerly John Tyler Community College—in its 2021–2027 Diversity, Equity and Inclusion Strategic Plan (2021, p. 6).

The strategic plans of UC Davis and Brightpoint reveal two common approaches among higher education institutions (HEIs) today: making their faculty reflect (i.e., represent) the student population and/or diversifying their faculty workforce. Although representation and diversity are similar concepts, they can manifest differently in the higher education context, which comprises several populations (e.g., students and faculty). It is worth recognizing the differences between these key concepts and how such definitional differences lead to contrasting policy choices and outcomes at the university and sector levels.

Extant research has shown that both faculty diversity and a good representation of students among faculty are crucial to student outcomes (Abdul-Raheem, 2016; Antonio, 2002; Bowman & Denson, 2022; Hurtado, 2001); thus, it is essential to understand the differences between these two distinct concepts. *Diversity* captures the heterogeneity in group composition in *one* population on some categorical variable such as race, gender, ethnicity, and so on (Budescu & Budescu, 2012). *Representation* involves *two* populations, measuring whether the distribution of the categorical variables

in one population is congruent with that in the other population (Pitts, 2005; Keiser et al., 2002).<sup>1</sup> In this paper, we use the term *diversity* to refer to faculty diversity and *representation* to refer to student-faculty representation.

Research has shown that diversity and representation benefit students via different mechanisms and achieve different outcomes (Abdul-Raheem, 2016; Antonio, 2002; Bowman & Denson, 2022; Hurtado, 200; Pitts, 2005). Nevertheless, current diversity plans at higher education institutions (HEIs) often include a series of aims and actions without clarifying whether the plans are designed to serve the goal of diversity, representation, or something else. The academic literature largely focuses on either diversity or representation rather than using a comparative lens (Keiser et al., 2002; Griffin & Muñiz, 2011; Gumpertz et al., 2017). One exception is Pitts (2005), who focuses on comparing diversity and representation in the K–12 education context. However, to the best of our knowledge, no study has examined diversity and representation as two distinctly different policy choices for HEIs and their long-term outcomes.

This paper strives to compare the long-term scenarios of diversity and representation at the sector-wide level when HEIs opt for one policy goal over the other. In addition to the distinctions between diversity and representation, we also consider the policy choices that involve hiring and retention. While increasing the number of minoritized/underrepresented faculty relies on both recruitment and retention strategies, the latter has received relatively less attention from administrators (Griffin, 2019; McChesney & Bichsel, 2020; Moreno et al., 2006). Moreover, the long-term goals that HEIs opt to pursue lead to different faculty hiring and retention strategies. For example, if the objective

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<sup>1</sup> In-depth discussion about representation includes branched concepts such as passive representation, active representation, political representation, bureaucratic representation, and so on. However, for the purposes of this paper’s focus (U.S. higher education) and scope (student and faculty populations), our approach is to define *representation* such that it can be clearly distinguished from *diversity*. For more discussion about diversity and representation as terminology and definitions, see Pitts (2005) and Abascal, Xu & Baldassarri (2021).

is to improve diversity, the HEI would aim to hire and retain more non-White faculty. If the aim is for better representation, an HEI would strive to hire and retain more faculty from underrepresented groups. Thus, in this study, we investigate how policy choices that target diversity and representation as separate issues affect an HEI's faculty hiring and retention strategies and, consequently, the racial/ethnic landscapes in higher education in the long run.

We used the Integrated Postsecondary Education Data System (IPEDS) from 2001 to 2021 to describe the current and projected racial/ethnic composition of faculty in higher education through 2035. We then generated unidimensional indices of diversity and representation for the higher education sector and different HEI types. Leveraging the data on total faculty (i.e., instructional staff) and hiring in IPEDS, we calculated the total number of new hires and leavers for each institution and developed four scenarios of different hiring and retention strategies that reflect either the diversity or representation goal.

The paper proceeds as follows. First, we summarize key literature and some of the strategies HEIs are using to improve diversity and representation on their campuses. Next, we present our data and measurements of the diversity index and representation index. We then provide an analysis of diversity and representation in the past two decades. Finally, we simulate and evaluate four scenarios of how diversity and representation may materialize in 2035 based on different assumptions.

## **2. Background**

The issues of underrepresentation and lack of diversity are interrelated. The student population in higher education is rapidly changing due to a sharp rise in students from minority backgrounds (Stout et al., 2018). However, faculty diversity lags behind student diversity in all HEIs (Davis & Fry, 2019). Although half of the college students were non-White by 2019, the American professorate has remained prominently White, male, and aging (McChesney & Bichsel, 2020). Whites account for around 50% of

the student population and 70% of the faculty population (McChesney & Bichsel, 2020), making students and faculty of all other racial/ethnic groups minoritized.

Both representation and diversity are important institutional goals for HEIs. Faculty diversity can expose students (regardless of their racial or ethnic backgrounds) to various cultural experiences and improve students' civic engagement and cognitive abilities (Abdul-Raheem, 2016; Hurtado, 2001). In addition, faculty from the same racial/ethnic groups as their students may serve as role models and elicit more positive interactions with such students, thereby improving their learning outcomes (Bowman & Denson, 2022; Oliver et al., 2021; Price, 2010; Stout et al., 2018). Studies have indicated that students perform better academically with same-race faculty in virtually all contexts and are more persistent in completing their training and graduating when studying with same-race faculty (e.g., Birdsall et al., 2020; Oliver et al., 2021; Price, 2010; Stout et al., 2018).

White students are more likely to have the opportunity to engage with instructors of their own race compared with minoritized students (Contreras, 2017; Fairlie, et al., 2014). At the national level, as of 2021, the ratio of full-time White students to full-time White faculty was 10.5:1 and 9.7:1 for Asian students. Meanwhile, the figure was 27:1 for Black students, 43:1 for Hispanic students, and ranged from 20:1 to 46:1 for other minorities.<sup>2</sup> At the level of course selection, Birdsall et al. (2020) examined a private top law school and found that while White students have a 0.82 likelihood of enrolling in a course taught by a same-race instructor, non-White students have a corresponding likelihood of only 0.05. Thus, the fact that non-White (or minoritized) students have low representation in the faculty population can lead to different academic interactions with faculty.

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<sup>2</sup> Authors' calculations using the 2021 NCES (National Center for Education Statistics) Digest of Education Statistics Table 306.10 ([https://nces.ed.gov/programs/digest/d22/tables/dt22\\_306.10.asp](https://nces.ed.gov/programs/digest/d22/tables/dt22_306.10.asp)) and Table 315.20 ([https://nces.ed.gov/programs/digest/d22/tables/dt22\\_315.20.asp](https://nces.ed.gov/programs/digest/d22/tables/dt22_315.20.asp)).

Diversifying the faculty population has been seen as a solution to achieve the goals of both diversity and representation. After the 2015 nationwide student protests against racial discrimination, hiring a more diverse faculty received increased attention from university policymakers. The rationale was that diversifying the faculty population would engender more representation for minoritized students (Matias et al., 2022).<sup>3</sup> It is at this time that the narrative of diversity and representation emerged in the long-term plans and strategies of higher education institutions. Postdoctoral diversity programs (e.g., at Harvard, Cornell, University of California) and targeted recruitment schemes (e.g., Rutgers Forward at Rutgers, Mizzou Forward at the University of Missouri) were launched at universities to hire junior and senior minoritized faculty to diversify the faculty stock. As diversifying the faculty population appeared to be the solution to increase representation, the two concepts of diversity and representation have been used rather interchangeably in some higher education policy contexts.

However, policy choices aimed at achieving diversity and representation might not always align for several reasons. First, because the student population is diversifying faster than the faculty population (McChesney & Bichsel, 2020), merely improving faculty diversity does not guarantee improvement in representation. Secondly, a minoritized group is not always an underrepresented group. As Kim and Cooc (2021) point out, Asians have been considered a minoritized group but are not always underrepresented in the faculty. In addition, international scholars have become an important source of faculty diversity in HEIs (Theobald, 2013). This means that while hiring more Asians and international scholars could enhance diversity, it might not guarantee improvement in representation.

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<sup>3</sup> 2015 witnessed the widespread student protests to challenge campus racism, which started at the University of Missouri and escalated nationwide. The protests resulted in considerable changes in many universities' diversity and inclusion strategies. See more details here (among other sources): <https://www.theguardian.com/us-news/2015/nov/13/student-activism-university-of-missouri-racism-universities-colleges>

Furthermore, adding recruits to the faculty population is only one side of the equation. Neither diversity nor representation can be improved if faculty leaving rates are high. Although scholars have raised concerns about the high replacement rate among minoritized faculty—noting that three out of five new minoritized hires were to replace leavers (Moreno et al., 2006)—HEI policy and strategies seem to dedicate less attention to retention (Griffith, 2019).

To navigate these challenges, faculty hiring and retention policies must have clear goals, either prioritizing diversity or representation. Otherwise, policy implementation may drift. Specifically, if the priority is to achieve diversity, an HEI would have to increase the recruitment of minoritized faculty, who are, in most cases, non-White in the current faculty population. If the priority is to achieve representation, an HEI would need to recruit faculty from underrepresented groups, which may vary contextually. This paper presents the different implementation approaches that HEIs can and should opt for if they prioritize diversity over representation or vice versa.

### **3. Data and Measurements**

We constructed a balanced panel dataset of all HEIs in the U.S. using the 2001–2021 Integrated Postsecondary Education Data System (IPEDS). We extracted the data from the National Center for Educational Statistics (NCES) and population data from the U.S. Census Bureau (for enrollment projections) for the projection of student body change in the long run.

#### ***3.1. Analytical Sample***

Our analytical sample consisted of 2,951 HEIs, constituting a balanced panel from 2001 to 2021. We followed the IPEDS' categories to divide the sample into six groups: public 4-year, public 2-year (including less than two years), private nonprofit 4-year, private nonprofit 2-year (including less than



two years), private for-profit 4-year, and private for-profit 2-year institutions.<sup>4</sup> We use “nonprofit institutions” to denote “private nonprofit institutions” and “for-profit institutions” to denote “private for-profit institutions” throughout the paper.

The faculty population is the number of full-time instructional staff at an institution as of November in a given year.<sup>5</sup> We excluded part-time faculty because IPEDS data reported the total number of part-timers, but not new hires—the latter being important for our calculations.<sup>6</sup> The student population is the number of full-time equivalent (FTE) undergraduates and graduates at an institution recorded in the fall semester of a given year.<sup>7</sup> To address missing data, we followed the method described by Fernandez et al. (2022) and Jaquette and Curs (2023), imputing the missing value by averaging the data of the same institutions in the surrounding years.

We based our racial/ethnic categories for faculty and students on the 7-bin scale used by IPEDS before 2010. (It later became a 9-bin scale; see below.) Our data used the following groupings: (i) White, (ii) Black/African American, (iii) Hispanic/Latino, (iv) Asian/Native Hawaiian/Pacific Islander (Asian/NHPI), (v) American Indians/Alaska Native (AIAN), (vi) Unknown Race, and (vii) Non-Resident Aliens (NRA). In 2010, IPEDS revised the groupings by adding a new group (“Two or More Races”) and separating Asians and NHPI into two groups. We used the 9-bin scale to produce the

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<sup>4</sup> It can be argued that using the Carnegie classification may make a better approach. However, we selected our approach for several reasons. First, this is what was used in the Projection of Education Statistics to 2028 by the Institute of Education Statistics (NCES, 2020), the most recent projection available at the time of this paper’s writing. As we wanted to leverage and make our projections comparable to these government data, we preferred to use the same classification system. Second, the Carnegie classification contains Special Focus Institutions and Tribal Institutions, which are either too heterogeneous or too small for our analyses. Third, we conducted a full analysis using the Carnegie classification, and the results were not qualitatively different (results are available from the authors upon request).

<sup>5</sup> We use the term *faculty* to indicate all full-time instructional staff, including those without faculty status. Medical instructional staff is included as faculty.

<sup>6</sup> Our examination shows that the racial composition of part-time faculty is aligned with that of full-time faculty, and our results are robust with the inclusion of part-time faculty.

<sup>7</sup> We included both undergraduate and graduate students in the analysis as faculty diversity and representation matter for both undergraduate and graduate students (Levin et al., 2013; Thorne et al., 2021). According to IPEDS reporting protocol for HEIs, three part-time students can be converted into one full-time student when reporting the total student population size (IPEDS, 2022).

representation and diversity indices for different HEI types and for our projections.<sup>8</sup> For both methods, Hispanic/Latino was a category distinct from other racial groups; that is, individuals identified as Hispanic/Latino were not counted as part of other groups such as White, Black, Asian, or Two or More Races. Hereafter, we use the term “Hispanic(s)” to indicate this ethnic group and Black to indicate the Black/African American racial group.

We classified faculty according to two professional tracks: the tenured/tenure-track group (TTT) and the non-tenure-track group (NTT). TTT faculty were tenured and on the tenure track, whereas the NTT group comprised instructional staff not on the tenure track and without faculty status.

### **3.2. *Measurements***

In this section, we present our formulas for measuring faculty diversity and student–faculty representation, as well as our methods to quantify the year-by-year changes in the faculty populations due to faculty hiring and leaving. As diversity and representation reflect the proportional compositions of different racial/ethnic groups, these indices attempt to translate the different proportions into unidimensional measures for analysis and projections.

#### **3.2.1. *Diversity index and representation index***

We applied a diversity index to the faculty population to create a unidimensional measurement for tracking the changes over time. We used a representation index to compare the racial/ethnic distribution of the student and faculty populations. Equation 1 shows the diversity index calculated by its normalized generalized variance (Budescu & Budescu, 2012); and Equation 2 shows the calculation of the representation index (Pitts, 2007).

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<sup>8</sup> In order to capture the changes in racial/ethnic composition over time, we converted the post-2010 data back to the 7-bin scale by combining Asian with NHPI and Unknown Race with Two or More Races. While individuals in the latter two groups may differ, previous studies have noted that individuals with two or more races were very likely to be reported as Unknown Race prior to 2010 (Ford et al., 2020).

$$Diversity\ Index_{it} = \left( 1 - \sum_{j=1}^C (P_{ijt}^F)^2 \right) * \frac{C}{C-1} \quad (1)$$

$$Representation\ Index_{it} = 1 - \sqrt{\frac{\sum_{j=1}^C (P_{ijt}^F - P_{ijt}^S)^2}{2}} \quad (2)$$

In these formulas,  $C$  is the number of racial/ethnic groups, which is seven or nine in our setting.  $P_{ijt}$  is the proportion of racial/ethnic group  $j$  in institution  $i$  in year  $t$ . Superscript  $F$  indicates the proportion among the faculty population, and superscript  $S$  indicates that of the student population. Both diversity and representation indices range from 0 to 1. For the diversity index, a value of 0 indicates a population with only one racial/ethnic group (i.e., no diversity), and 1 indicates maximum diversity, meaning all categorical groups occupy equal population shares. For example, when there are nine racial/ethnic groups, the faculty diversity would be 1 if each faculty group accounts for the size of one-ninth of the population. For the representation index, a value of 0 means there is no common racial/ethnic group between the two populations, such as all faculty are White while all students are Black. A value of 1 means complete representation, indicating that the distribution by racial/ethnic group is fully congruent between the two populations.

Given the nature of the diversity index calculation, in a hypothetical situation where an institution puts great effort into recruiting more minoritized faculty, the diversity index would reach a peak of 1 and then start to decrease when the previously minoritized proportions continuously increase.<sup>9</sup> The current diversity indices of U.S. faculty populations are around 0.5 or below (see Table 1), substantially lower than the peak of 1. We consider this linear progression of the diversity index a

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<sup>9</sup> In most cases, minoritized faculty are non-White faculty. However, in specific cases, such as at an HBUC (Historically Black University and College) institution, White faculty could be a minoritized group.

positive sign that the workforce in higher education is diversifying.<sup>10</sup> Hence, one simulated scenario is better if it scores a higher diversity or representation index than the others.

Although incorporating the proportional values of multiple racial/ethnic groups into one unidimensional index may appear to oversimplify a complicated dynamic of interdependent group proportions, these instruments provide a situational overview for predictions. The formulas have been tested and used to measure diversity (Budescu & Budescu, 2012; McLaughlin et al., 2016; Rushton, 2008) and representation (Johnston & Holt, 2021; Moon & Jung, 2018; Pitts, 2005, 2007) in different educational or public institutions contexts. Using these measurements to compare the current diversity and representation of student and faculty populations, our analysis revealed a rapid shift in student diversity and some friction in faculty diversity, which aligns with previous studies.

### ***3.2.2. Changes in faculty population: New hires and leaving rate***

To project the long-term outcomes of HEIs' diversity- or representation-focused policy choices, we measured the changes in the faculty populations at each HEI by year and used these measurements to construct the simulated scenarios. Changes in the faculty population can be decomposed into the numbers of new hires and leavers. We were interested in determining the racial/ethnic composition of the new hires because this figure would reflect whether the HEI is opting for diversity (i.e., increasing the hiring/retention of minoritized faculty) or representation (i.e., increasing the hiring/retention of underrepresented faculty). For the same reason, we focused on measuring the annual leaving rate by race/ethnicity.

Hiring Composition is calculated as shown in Equation 3, and the Leaving Rate is calculated using Equation 4:

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<sup>10</sup> It may be argued that the optimal diversity index should be proportional to the local community demographics rather than the greater values the better. However, within the current value range of the faculty diversity index and for simulation purposes, we resort to considering the index's linear growth as a positive sign.

$$\text{Hiring Composition}_{ijkt} = \frac{\text{NewHires}_{ijkt}}{\sum_{j=1}^C \text{NewHires}_{ijkt}} \quad (3)$$

$$\text{Leaving Rate}_{ijkt} = \frac{\text{Leavers}_{ijkt}}{N.\text{Faculty}_{ijk(t-1)}} \quad (4)$$

In these formulas, similar to Equations 1 and 2, subscripts  $i, j$ , and  $t$  still denote institution, racial/ethnic group, and year, respectively. Subscript  $k$  indicates the professorial tracks of faculty (NTT or TTT).  $\text{NewHires}_{ijkt}$  refers to the number of newly hired faculty in institution  $i$  of racial/ethnic group  $j$  of professional track  $k$  in year  $t$ .<sup>11</sup>  $\sum_{j=1}^C \text{NewHires}_{ijkt}$  is the total hired faculty of all racial groups in institution  $i$  of professional track  $k$  in year  $t$ . Consequently, the hiring composition is the proportion of new hires from a specific racial/ethnic group among all new hires.  $\text{Leavers}_{ijkt}$  is the number of leavers in the corresponding category in year  $t$ .<sup>12</sup>  $N.\text{Faculty}_{ijk(t-1)}$  is the number of faculty of a given category in the preceding ( $t-1$ ) year. The leaving rate is thus the fraction of leaving faculty members out of the total number of faculty in a particular group.

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<sup>11</sup> Prior to 2016, IPEDS required institutions to report statistics on newly hired full-time permanent staff between July 1 and October 31 (a 4-month period) and still on the payroll of the institution as of November 1 and with more-than-9-month contracts. This changed in 2016, when IPEDS required HEIs to report the number of newly hired full-time permanent staff between November 1 and October 31 (a 12-month period) and with more-than-9-month contracts.

<sup>12</sup> IPEDS provides the number of new hires but not leavers; thus, we calculated the numbers independently. Note that IPEDS changed its reporting requirements for new hires in 2016 (see footnote 11). We calculated and reported post-2016 leaving only for data comprehensiveness. The number of leavers is imputed by taking the difference between the sum of “last year’s faculty and new hires in the past year” and “this year’s faculty.” The results should be zero or positive. In case of a negative value (6% of HEI-years), we imputed them with the average leaving rate of the same institution in other years. All institutions have at least one valid data point in our sample period.

## 4. Current Diversity and Representation in U.S. Higher Education

### 4.1. Summary Statistics

Table 1 describes the selected indicators of the student and faculty populations by racial categories and diversity indices in 2015.<sup>13</sup> The top panel, dedicated to the student population, shows that White students make up about 53% of the college student population nationwide and remain the majority group throughout the period studied. Hispanics are the second largest student group (16% of the student population) and constitute about a quarter of the students in public 2-year institutions. Asian students are more likely to enroll in public 4-year institutions and Black students in private 4-year institutions than other HEI types.

The faculty population demographics appear in the bottom panel of Table 1. This panel suggests that, as of 2015, White faculty accounts for roughly 73% of the faculty in HEIs. In other words, non-White faculty comprise less than 30% of the instructional staff. Considering that non-White students compose over half of the student population, this suggests that they are underrepresented by the faculty's racial/ethnic demographics. Black and Hispanic students are the most underrepresented by the faculty population, and this pattern is found in all HEI types.

As shown in Figure 1, we computed the representation gap between the faculty and student proportion of the same racial/ethnic groups at different HEI types over two decades from 2001 to 2021. We took the raw difference of the proportion of a racial/ethnic student group from that of a faculty group. In an ideal world, the gap should be 0. A positive (or negative) value indicates an overrepresentation (or underrepresentation) of faculty of a given race/ethnicity among the student population. We found positive gaps of 0.10 to 0.40 among the White faculty–student populations, with

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<sup>13</sup> We report the statistics as of 2015, as it is the year of the nationwide protests calling for faculty diversity and when the HEIs began to take action.

the public 4-year universities maintaining the lowest gap and for-profit 4-year universities the highest gap with some fluctuations. Asians demonstrated a representation gap of around 0, which became increasingly positive over 15 years. The Asian faculty–student representation showed upward trends in all HEI types and was the steepest in public 4-year universities, with an increase from 0.01 in 2001 to 0.04 in 2015. The gaps for Blacks and Hispanics were consistently negative, and given the increasing enrollment of Hispanic students, a widening representation gap was detected for this group.<sup>14</sup>

Both Table 1 and Figure 1 show the changes across all racial/ethnic groups of faculty and students on American campuses, though differing by HEI types. Asians are the only minoritized group with faculty overrepresenting students in public and nonprofit 4-year institutions. Overall, at the sector level, Whites are the majority and overrepresented group, and Asians are the minoritized and overrepresented group.<sup>15</sup> At the HEI-year level, however, a minoritized group is not necessarily an underrepresented group and vice versa, and minoritized or underrepresented groups may vary. Scrutinizing the data further, we also discovered that as of 2021, Whites are statistically a minoritized group in 2.2% of the HEIs and underrepresented in 6.6% of the HEIs of the sample studied. The rates for Blacks are 84% and 81%, for Hispanics 88% and 92%, and for Asians 93% and 40%. Details of racial/ethnic groups versus minoritized and underrepresented groups are reported in Table C1 in Appendix C.

#### **4.2. Faculty Diversity Versus Student–Faculty Representation**

In Figure 2, we show the changes in the faculty diversity and representation indices from 2001 to 2021, according to HEI types. Overall, as illustrated in Figures 2a and 2b, faculty diversity rose steadily,

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<sup>14</sup> Recent reports show an increasing trend of Hispanic enrollment in college (Mora, 2022) and K-12 school (Jimenez, 2022). Our analysis also confirms this upward trend at all HEIs (results available upon request).

<sup>15</sup> A *minoritized group* is a racial/ethnic group whose share of faculty is less than one-ninth for the 9-bin scale, while an *underrepresented group* is a racial/ethnic group whose share of faculty is less than the share of students of the same race/ethnicity.

whereas representation decreased, regardless of whether the 7-bin or 9-bin scales were used.<sup>16</sup> The diversity index increased by 0.2 points from 2001 to 2021 (as measured by a 7-bin scale) and 0.09 points from 2010 to 2021 (measured by a 9-bin scale). The representation index dropped by 0.03 and 0.02 points, respectively.<sup>17</sup>

In Figure 2c, arranged by HEI types, we show that all the 4-year universities (public, for-profit, and nonprofit) were better and more consistent with diversifying their faculty than the 2-year universities. Over the two decades, the 4-year institutions increased about 0.2 in their diversity indices. The 2-year institutions added about 0.14 to 0.15 points to their diversity indices in the same period. This observation may contrast with some rough estimates that found 2-year colleges perform better at some aspect of faculty diversity than research-intensive (mostly 4-year) universities (Griffin, 2019; Finkelstein et al., 2016).

The representation indices of different HEI types are presented in Figure 2d. This graph clarifies that the overall downward trend is more apparent in for-profit 4-year universities than in other 4-year institutions, with a drop of 0.07 points in the representation index compared to 0.03 in public 4-year and 0.04 in nonprofit 4-year institutions. The 2-year institutions demonstrated a similar reduction as for-profit 4-year institutions (from 0.06 to 0.08 points) on the representation indices. This could be because

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<sup>16</sup> It is worth noting that the diversity index is sensitive to the number of bins, while the representation index remains similar regardless of bin selection. This discrepancy arises from the calculation methods used. When additional bins are added, the diversity index may decrease if the added group has a smaller proportion compared to existing groups (refer to Equation 1). In contrast, the representation index typically remains unchanged when new bins are added, provided that the “faculty-student proportion gap” in the added group is similar to that of existing groups (refer to Equation 2). For instance, compared to the 7-bin scale, the 9-bin scale includes two or more races and NHPI groups, both of which have significantly smaller shares among faculty (see Table 1), yet they do not exhibit notably larger or smaller representation gaps compared to existing groups (see Figure 1). This phenomenon elucidates why the diversity index is more sensitive to bin selection. However, despite these considerations, our primary focus lies not in the *absolute* values of the index but rather in the *relative* changes over time. As depicted in Figure 2a (and also Figure C1a), the relative changes in the diversity index over time remain consistent across different bin selections.

<sup>17</sup> Appendix C, Figure C1a presents the trend in the student diversity index over time.



the student population in 2-year and for-profit 4-year institutions was already diverse, so diversifying the faculty population does not show as many changes in representation.<sup>18</sup>

It is apparent that the two indices behave in opposite trends over time. The opposite trend is because the student population diversifies faster than the faculty population, widening the representation gaps. Note that the reduction in the representation index ranged within the scale from 0.84 to 0.80, and the growth of the diversity index was from 0.34 to 0.52. That means the representation index would have dropped faster if faculty diversity had not grown at this stage.

We decomposed the total changes in the diversity and representation indices to identify the group that drives such changes and presented our results in Figure A1.<sup>19</sup> Figure A1a discloses that the changes in the White population contributed the most to the increase in the faculty diversity index. If we held all racial/ethnic groups to their level in 2001 and only allowed the White group to change, the faculty diversity index in 2021 would have increased by 0.09 points (as compared to 0.19 points in reality). When we conducted the same calculations for Blacks, Hispanics, and Asians/NHIP, the changes were about 0.011, 0.032, and 0.025, respectively.

Concerning the representation index, White students, White faculty, and Hispanic students appear to be the main drivers of the 0.03 drop from 2001 to 2021 (see Appendix A, Figure A1b). Students classified as NRA and Race Unknown may also contribute considerably to the 0.03 drop from 2001 to 2021; however, due to the confounding nature of these groups' measurement (Ford et al., 2020), we have refrained from overinterpreting these results. In addition, we found that the change in the

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<sup>18</sup> We calculated the diversity index of the student population (overall and by HEI types) and can confirm that 2-year and 4-year for-profit institutions serve a more diverse student body than 4-year nonprofit and 4-year public institutions (see Figure C1b Appendix C). We also decomposed the total changes in the diversity and representation indices to identify the group that drives the changes (see Figure C2 Appendix C).

<sup>19</sup> The details of the methodology for this decomposition can be found in Appendix A.

faculty population in all racial/ethnic groups contributes to the increases in the representation index, while the change in the student body draws down the index.

## **5. Forecasting Faculty Diversity and Faculty–Student Representation**

The different faculty hiring and retention strategies that HEIs adopt will have long-term impacts on overall diversity and representation. We now turn to our projections for the evolution of the diversity and representation indices, focusing on hiring and retaining strategies in different scenarios up to 2035. The simulation construction process is briefly outlined below, with a detailed methodology provided in Appendix B.

### **5.1. *Simulation Construction***

#### **5.1.1. *Baseline scenario***

We commenced with a baseline simulation, assuming HEIs would maintain their level of effort in diversity hiring and retention according to the average from 2016 to 2019. We selected this period for three reasons: First, reported faculty hiring data was more comprehensive after 2016.<sup>20</sup> Second, the 2015 nationwide protests triggered widespread improvements in faculty diversity in the higher education sector starting in 2016. Third, the 2019 cutoff allowed us to exclude data on hiring freezes due to the pandemic (Moody, 2022; Woolston, 2020).

Our simulations concurrently considered two crucial elements that can shape diversity and representation: changes in hiring composition (i.e., the racial/ethnic composition of total hires as defined in Equation 3) and leaving rates (i.e., the proportion of faculty leaving the HEI in a given year as defined in Equation 4). In the baseline scenario, we assumed HEIs would maintain the hiring composition and leaving rate for all faculty groups at the level of the 2016–2019 period. Given the predicted decline in college-aged populations in the late 2020s and early 2030s (Bransberger et al., 2020; Pavlov &

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<sup>20</sup> See footnotes 11 and 12.

Katsamakas, 2020), we projected total faculty hiring based on changes in the student enrollment and applied the hiring composition to the projected total hiring.<sup>21</sup>

In Table 2, we present essential statistics regarding faculty hiring compositions and leaving rates during the 2016–2019 period. The top panel of the table outlines the average hiring compositions by racial/ethnic groups, faculty positions, and HEI types. Notably, Whites constitute 61% of the total hiring, while Asians account for the second-highest proportion at 8.3%. NRA, Blacks, and Hispanics compose 7.8%, 7.7%, and 6.9% of the total hiring, respectively. The racial compositions are similar between the TTT and NTT groups. A detailed comparison of institution types in the right-hand panel highlights distinctions, with 4-year public and nonprofit institutions hiring more NRA and for-profit institutions hiring more Black and Hispanic faculty members.

The bottom panel of Table 2 shifts the focus to leaving rates from 2016 to 2019. White faculty members have the lowest average leaving rate at 7%, contrasting with the highest rates observed in the unknown race group (26%) and NRA (20%). Across all racial/ethnic groups, NTT positions experience higher leaving rates than TTT positions. A parallel examination of HEI types revealed that public 4-year and 2-year institutions generally enjoy lower faculty leaving rates than their private institution counterparts.

### **5.1.2. *Simulated scenarios***

We constructed the simulated scenarios using two factors: (1) whether HEIs adopt a diversity or representation strategy, and (2) whether HEIs focus more on hiring only or on both hiring and retention.<sup>22</sup> These considerations elicited four different scenarios, as presented in Table 3. These

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<sup>21</sup> See Appendix B, Step 2 for additional details on our prediction methodology.

<sup>22</sup> We applied our simulation to the TTT and NTT faculty separately. Finding no considerable discrepancy in outcome between the two approaches, we have used the combined version in the primary analysis.

scenarios encompass a range of approaches employed by HEIs in fostering diversity or representation and are elaborated on below.

(1) *Whether HEIs adopt policies to improve diversity or representation.* If HEIs adopt a diversity policy, we assume HEIs will focus their effort on minoritized groups—the faculty groups that account for less than one-ninth of the faculty population on the 9-bin scale. As the diversity index peaks when all racial/ethnic groups are equally distributed, an HEI focusing on faculty diversity should increase the faculty groups that have not reached the proportion of equal distribution and reduce the faculty groups in excess proportion.

If HEIs adopt a representation policy, we assume HEIs will focus their effort on underrepresented groups, i.e., the faculty racial/ethnic groups that account for a smaller proportion of the faculty population than the corresponding student groups account for in the student population. As the representation index would peak when faculty composition aligns with student composition, an HEI focusing on this goal should increase (reduce) the faculty groups that are proportionally smaller (larger) than the corresponding student groups.

(2) *Whether HEIs focus on hiring only or both hiring and retention.* In the hiring scenarios, we assume HEIs increase their hiring for either minoritized or underrepresented groups to 1.5 times the 2016–2019 average. For example, the average hiring composition of non-white faculty is 39% (see Table 2). For an institution following this average pattern, we increase the hiring composition of non-white faculty in this institution to 58.5% ( $39\% \times 150\%$ ); the hiring composition of White faculty would then be mechanically reduced to 41.5%.<sup>23</sup> The total *number* of faculty hiring remains unchanged across scenarios. In the retention scenarios, we assume HEIs reduce the leaving rate for either minoritized or

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<sup>23</sup> We customize calculations for each institution based on their specific situation, including considering the races and ethnicities of the minoritized/underrepresented groups and the institution's baseline hiring composition for each group. We detail the calculation of the hiring composition in Appendix B, Step 3.

underrepresented groups to 0.5 times the 2016–2019 average. For example, if the leaving rate was 10%, we reduce it to 5%. We also conduct a series of robustness checks for different effort levels (proportional change).

## **5.2. Scenario Evaluation**

To compare the projected diversity and representation in the long run, we show the diversity indices of all the scenarios in Figure 3a and the representation indices in Figure 3b. Furthermore, in Table 4, we offer the cross-scenario comparison of long-term diversity and representation using paired *t*-tests. Following, we interpret the visuals in Figure 3 and the corresponding statistics in Table 4 as we inspect different scenarios.

### **5.2.1. Diversity index**

Figure 3a illustrates changes in the faculty diversity index across various scenarios. In the baseline scenario, the diversity index remains relatively stagnant over time—increasing from 0.50 in 2021 to 0.51 as of 2035, corresponding to a 2% increase or 0.5 standard deviations.<sup>24</sup> This pattern emerges because we assume institutions will maintain their hiring and retention effort level as the average of that during the 2016–2019 period. If HEIs increase their efforts to diversify the faculty population through hiring and retention, the diversity index will grow over time. Among all strategies, hiring and retention of minoritized faculty performed the best on the boost diversity index, which brings about a diversity index of 0.62 by 2035 (a 23% increase from the baseline prediction or equivalent to 1.2 standard deviations).

Table 4 (Panel A) provides the paired *t*-test comparison of the diversity indices of every two scenarios. The hiring and retention of minoritized faculty scores significantly higher than in any other

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<sup>24</sup> Figure A2a in Appendix A provides a decomposition of this change. The change is primarily driven by White faculty, followed by Asian.

scenario (Panel A, Row 3). Focusing on both hiring and retention consistently results in a higher diversity index than only focusing on hiring.

Furthermore, a clear goal for the policy is critical. A policy to improve representation does not score as high on the diversity index as a policy to address diversity. For example, if HEIs opt to focus on hiring and retaining underrepresented faculty, the projected diversity index would be 0.57 by 2035, compared with 0.62 if HEIs focus on hiring and retaining minoritized faculty (a 0.05-point difference, or equivalent to 0.25 standard deviations). Other comparisons exhibit similar patterns with significant differences at the 0.01 level.

We decompose the gains in the diversity indices of different scenarios compared to the baseline prediction to explore the contribution of each racial/ethnic group. Appendix A, Figure A3a demonstrates that hiring and retaining minoritized faculty outperforms other scenarios primarily due to the reduction in the proportion of Whites and increases in the proportions of Blacks, Asians, and NRAs, which consequently add to the diversity of the faculty population. Hiring and retaining underrepresented faculty had slightly better performance in increasing the proportion of Hispanics only, resulting in slower diversification.

### ***5.2.2. Representation index***

Figure 3b and Table 4 (Panel B) shift the focus to the representation index, which accounts for the compositional congruence of faculty and student populations. We first predicted the racial/ethnic composition of the student population until 2035 based on the 2022 NCES report and the Census Bureau's population projection by age groups.<sup>25</sup> We then used the simulated faculty racial/ethnic composition to compare with the projected student composition.

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<sup>25</sup> See Appendix B, Step 1, for prediction methodology.

Overall, the projected representation index decreased in all scenarios, with the exception of hiring and retaining underrepresented groups, which boosted the representation index in the first three years but still declined in the long run. This drop is primarily due to the student body diversifying faster than the faculty population.<sup>26</sup>

Hiring and retaining underrepresented faculty would be, suggestively, the best-performing policy to improve representation. As of 2035, the strategy would bring about a representation index of 0.80 (0.06 points [8% or equivalent to 0.5 standard deviations] higher than the baseline prediction). As shown in Table 4, this is significantly higher than the indices of other scenarios.

Similar to the discussion about the diversity index, a clear goal of the policy is critical. In the scenarios with representation-focused policy (i.e., hiring and retaining underrepresented faculty), there would be a better representation index than in other scenarios. For example, if HEIs adopt the policy to hire and retain minoritized faculty, the representation index in this scenario by 2035 would be 0.77, which is 3% or 0.2 standard deviations lower than the hire and retain underrepresented faculty.

We further decompose the change in the representation index driven by each racial/ethnic group compared with the baseline prediction. Appendix A Figure A3b demonstrates that policies to hire and retain underrepresented groups are successful because, compared to other scenarios, they perform better in matching the size of Black and Hispanic faculty groups aligning with the student body.

### **5.3. Robustness Check**

We conducted robustness tests on the increased efforts (proportional change compared to the baseline period) set by HEIs to hire and retain faculty. In particular, our main analysis assumed that HEIs would increase their effort by 50% (i.e., increase hiring composition to 1.5 times or reduce leaving

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<sup>26</sup> Figure A2b in Appendix A decomposes the change in representation index by racial/ethnic groups. The results suggest that while the change in faculty composition contributes positively to the representation index, the change in student body contributes negatively to the index.

rate to 0.5 times). To explore how different effort levels in hiring and retention efforts may impact the faculty diversity and representation indices, we let the level of increased efforts range from 10% to 100%. For example, an institution with a 100% effort level, compared to a 50% effort level (in the main results), indicates that instead of increasing the hiring composition of non-White faculty from 39% to 58.5%, they now double the composition to 78%. This results in a further reduction in the relative proportion of White faculty hired but does not alter the total number hired.

The results are shown in Appendix C Figure C2. In a given scenario, a higher effort level provides better diversity and representation indices. The only exception is the hiring and retaining minoritized faculty policy, which shows a drop in representation when HEIs increase their efforts to over 85%. This suggests that overinvestment in diversity by HEIs might lead to reversed outcomes in representation. Additionally, the comparisons between hiring-only versus hiring and retention policies and between diversity and representation policies are similar to the main analysis across all effort levels.

Figure C2 in Appendix C also highlights the amount of effort it would take for faculty diversity to catch up with student diversity. In 2021, the student diversity index was 0.65. When HEIs choose the best-performing scenario (i.e., hiring and retaining minoritized faculty), they need an effort level of 70% to reach a faculty diversity to meet the student index. Similarly, in 2021, the representation index was 0.80. Only when HEIs choose to increase their effort level to over 55% and adopt the policy to hire and retain underrepresented NTT faculty would the representation index be around the 2021 level.

## **6. Conclusion and Discussion**

### ***6.1. A clear policy goal is critical in a changing racial environment.***

In this paper, we capture the compositional shifts in student and faculty populations in higher education over the past two decades and project changes for the coming decade. While HEIs acknowledge and issue policies in response to such changes, the specific goal for each policy



intervention is not always clear. A policy intended to diversify the faculty would lead to a more diversified faculty population, and one intended to increase student-faculty representation would create a more balanced representation scenario. However, we find that achieving the intended result is conditioned on HEIs operating with a clear intention. Faculty hiring policies designed without clearly identifying diversity or representation as the goal may not achieve any intended long-term outcomes.

The choice of strategies depends on the institution's demographic situation. Recall the policy statements of UC Davis and Brightpoint Community College. Brightpoint commits to a diversity goal, whereas UC Davis focuses on representation. UC Davis has a faculty diversity index of 0.76 (1.7 SDs higher than the national average) and a representation index of 0.77 (0.3 SDs lower than the national average). On the other hand, Brightpoint scores 0.44 on the faculty diversity index (around the national average) and 0.83 on the representation index (0.3 SDs above the national average). Hence, their choices of goals signify their awareness and commitment to address their weakness. However, a correctly identified goal would then need to be supported by a matched strategy. While UC Davis states that its goal is to make the workforce reflect (represent) the diversity of the students, the specific strategies it proposes are to recruit and retain a diverse faculty, cultivate a diverse pipeline [...] to make progress on hiring goals (UC Davis, 2017, p. 16). There was no specification on how to implement these actions in relation to the changes in the student population. Without careful triangulation, an HEI would miss out on how the student and faculty populations compositionally altered, leaving the representation outcome to chance.

At the societal level, universities or colleges making policies without a clear goal may generate confusion in the public and politics. A column was published in The Johns Hopkins Newsletter in March 2023 titled "Diversity Shouldn't Be Up for Debate: We Need More Representation in Academia" (The Editorial Board, 2023). It read as if diversity and representation were interchangeable, or one was the

solution to the other. Common narratives like this can be misleading and may indirectly undermine DEI efforts, which are being challenged or banned in an increasing number of states (Adams & Chiwaya, 2023; Lieb, 2024).

A clear focus on a set goal would guide policy readjustments if and when needed. In our projections, we find some evidence that if an HEI spends excessive efforts on faculty diversity purposes (e.g., increase effort levels by over 95% in hiring and retaining minoritized faculty), the student–faculty representation may be negatively affected. Given a changing environment, HEIs may be pressured to formulate policy responses to complicated inclusion matters. However, we call for HEI administrators to isolate the policy problem and develop a clear goal for each policy intervention regarding the matter it should address. Essentially, how a “problem” is defined and constructed already contains the “solution” in itself (Atkinson, 2000).

## ***6.2. Retention is essential for increasing diversity and representation.***

A combination of hiring and retention would produce better outcomes in all the simulated scenarios. Therefore, this study calls for attention to faculty retention. Recent initiatives to increase faculty diversity or student–faculty representation launched by HEIs and national consortia focus heavily on hiring. Universities have implemented various residential diversity and postdoctoral fellowships. Public and private institutions have developed comprehensive strategies to recruit a more diverse workforce. Community colleges have appointed chief diversity officers to their leadership to embed diversity into decision-making at all levels (Smith, 2018). However, a high leaving rate of minoritized or underrepresented faculty may negatively affect these expensive initiatives if HEIs do not pay enough attention to retaining their current faculty.

To our knowledge, studies emphasizing the need for retention remain scarce. This study is one of the first efforts to analyze faculty hiring and leaving interdependently and confirm that hiring and

retention are equally crucial to faculty diversity and student–faculty representation in an institution. Given that faculty retention is more complicated than hiring, HEIs take the path of least resistance when they focus on hiring new staff but ignore the glass ceiling effect, microaggressions, or hostile environments that current minoritized and underrepresented employees face daily (Dancy et al., 2018; Griffin, 2019; Griffin et al., 2011). Emphasizing one side over the other, such as overly focusing on hiring but not retaining, will achieve neither the diversity nor the representation objective.

This paper joins recent studies to call for more meticulous strategizing in U.S. higher education when using hiring and retention as tools to intervene in the racial/ethnic campus environment. One finding by Wapman et al. (2022) in their analysis of nearly 300,000 faculty concerns the long-term gender disparity across all fields in U.S. academia. Wapman et al. (2022) argue that the observable increased representation of women in academia could be driven by more women being hired than retiring. This is arguably not sustainable because women’s representation among those at retirement age is low. Echoing that message, this paper points out that the focus on faculty hiring over retention could be unsustainable in maintaining racial diversity and student representation in faculty populations.

Furthermore, when macroenvironmental factors are considered, nonacademic job markets offer equally promising career opportunities for minoritized high-skilled workers. Businesses are also under pressure to hire non-White staff (who may be frequently minoritized, underrepresented, or both in an HEI) to diversify their workforce (Hunt et al., 2020). Meanwhile, the path to academic career advancement is tougher with a “chilly climate” work environment (Myers & Turners, 2004), and new doctorates show disinterest in working in academia (Gibbs et al., 2016; Gibbs and Griffin, 2013). The push factors from academia and the pull factors from the industry may increase faculty turnover rates. The shift in demographics of students and faculty in higher education calls for a cultural shift in the academic workplace to remain a nurturing environment for teaching and learning in modern times.

### **6.3. *Limitations and Avenues for Future Research***

This study remains with some limitations. First, we are aware that the simulated scenarios are generated with clear and strict assumptions and that the changes in U.S. higher education are complicated, especially after COVID-19. Moreover, the racial/ethnic compositions of the student or faculty populations may reflect those of the national or local population where the institution is located. Compositional changes due to demographic differences between recent hires and retiring faculty or due to faculty mobility may affect the diversity and representation scores. Though faculty mobility might be minimal, as the majority of faculty do not move within a five-year window (Koedel & Pham, 2023), recent hires of more underrepresented and/or minoritized faculty than the retiring population (McChesney & Bichsel, 2020) would help improve the indices faster than what is projected in this paper. Moreover, with these clear-cut predictions, we present a practical use of the diversity and representation indices and provide HEI leadership with an overview of possibilities for their long-term planning. We envision that the reality will be a combination of two or more scenarios. Note that our recommendations for policies with clear goal statements and increased efforts at faculty retention still hold.

Second, higher education administrators may argue that there are insufficient doctoral graduates from minoritized groups that they can hire to address the lack of diversity and representation in their faculty workforce. Thus, they may consider doubling the hiring composition of minoritized groups to be impractical. This is a valid concern. However, recent studies have shown heightened attention toward recruiting and constant growth of non-White doctoral graduates in some fields, such as medical training (Gibbs et al., 2016), STEM (Culpepper et al., 2021), and physics (Hodapp & Woodle, 2017). Nevertheless, the increasing supply of doctoral graduates does not always lead to greater representation (Myers and Turners, 2004). Therefore, it is still crucial to address the work environment factors at HEIs to increase hiring and retaining of non-White faculty.

Third, using unidimensional measures has pros and cons. Translating the proportional differences of different faculty and student groups into one dimension simplifies the calculations and thus helps provide general inputs for high-level planning. However, to some extent, these measurements may not fully capture the changes in the components of the faculty and student populations in detail. For example, two HEIs may achieve similar diversity indices even though one HEI hires more Hispanic faculty members, whereas the other retains more Black faculty members. Yet, this approach is practical and useful in providing inputs for long-term planning.

Finally, we show through this study that an in-depth diversity analysis may provide hints on other issues HEIs face, such as institutional-level planning. Additional research is needed to understand how the diversity of faculty and student populations connects with other large-scale problems in higher education. This would facilitate the development of targeted strategies and help to provide an inclusive educational environment for minority students.

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Tables

Table 1. Summary Statistics in 2015

	All	4-year			2-year		
		Public	Non-profit	For-profit	Public	Non-profit	For-profit
Number of Institutions	2,951	574	1,218	50	946	57	106
<b>Student Demographics</b>							
Average Student Enrollment (FTE)	13,654.69 (12,358.24)	20,516.34 (13,24.75)	7,893.51 (8,971.01)	4,229.40 (6,733.60)	7,98.59 (6,665.53)	811.44 (582.10)	2,892.95 (4,892.06)
Prop. White	.53 (.23)	.56 (.22)	.54 (.21)	.25 (.19)	.48 (.24)	.48 (.30)	.42 (.24)
Prop. Black	.11 (.14)	.10 (.15)	.10 (.15)	.29 (.25)	.13 (.13)	.15 (.18)	.19 (.18)
Prop. Hispanic	.16 (.19)	.13 (.16)	.12 (.18)	.17 (.24)	.23 (.21)	.18 (.29)	.24 (.26)
Prop. Asian	.06 (.07)	.07 (.08)	.06 (.06)	.04 (.05)	.06 (.07)	.02 (.02)	.03 (.04)
Prop. NHPI	.003 (.018)	.002 (.012)	.002 (.007)	.003 (.004)	.004 (.029)	.003 (.013)	.005 (.009)
Prop. AIAN	.007 (.033)	.006 (.026)	.004 (.015)	.005 (.006)	.010 (.045)	.065 (.227)	.013 (.025)
Prop. Two or More Races	.03 (.02)	.03 (.02)	.03 (.02)	.02 (.02)	.03 (.03)	.02 (.02)	.04 (.03)
Prop. Unknown Races	.04 (.04)	.03 (.03)	.05 (.05)	.11 (.12)	.04 (.04)	.05 (.10)	.05 (.08)
Prop. Non Resident Alien	.06 (.07)	.07 (.05)	.09 (.09)	.11 (.15)	.02 (.03)	.04 (.06)	.01 (.05)
Diversity Index (7-bin)	.64 (.19)	.63 (.18)	.64 (.22)	.70 (.22)	.66 (.18)	.52 (.23)	.65 (.23)
Diversity Index (9-bin)	.62 (.19)	.61 (.18)	.62 (.21)	.68 (.22)	.64 (.17)	.50 (.23)	.63 (.23)
<b>Faculty Demographics</b>							
Average Full-time Instructional Staff	873.23 (1,186.08)	1,367.14 (1,284.19)	786.14 (1,309.54)	101.02 (96.04)	215.60 (162.08)	38.72 (24.09)	139.65 (283.66)
Prop. White	.73 (.17)	.70 (.15)	.74 (.21)	.61 (.27)	.76 (.17)	.74 (.32)	.70 (.26)
Prop. Black	.06 (.10)	.05 (.10)	.05 (.10)	.19 (.26)	.07 (.09)	.05 (.12)	.10 (.13)
Prop. Hispanic	.06 (.12)	.05 (.10)	.07 (.17)	.09 (.23)	.07 (.09)	.12 (.30)	.12 (.24)
Prop. Asian	.08 (.06)	.10 (.05)	.07 (.06)	.05 (.06)	.05 (.05)	.02 (.03)	.03 (.05)
Prop. NHPI	.002 (.015)	.001 (.008)	.002 (.011)	.003 (.011)	.003 (.023)	.006 (.019)	.001 (.003)
Prop. AIAN	.005 (.017)	.005 (.014)	.003 (.010)	.006 (.018)	.007 (.022)	.030 (.126)	.006 (.031)
Prop. Two or More Races	.01 (.01)	.01 (.01)	.01 (.01)	.02 (.06)	.01 (.02)	.02 (.10)	.01 (.03)
Prop. Unknown Races	.03 (.05)	.03 (.04)	.02 (.06)	.03 (.07)	.02 (.05)	.00 (.01)	.02 (.05)
Prop. Non Resident Alien	.03 (.05)	.06 (.05)	.03 (.05)	.00 (.00)	.01 (.02)	.00 (.01)	.00 (.01)
Diversity Index (7-bin)	.46 (.19)	.52 (.15)	.40 (.19)	.45 (.20)	.42 (.22)	.23 (.20)	.39 (.27)
Diversity Index (9-bin)	.44 (.19)	.50 (.14)	.39 (.19)	.43 (.19)	.41 (.22)	.22 (.19)	.37 (.26)
<b>Representation Index</b>							
Representation Index (7-bin)	.80 (.11)	.84 (.10)	.81 (.10)	.67 (.15)	.75 (.11)	.74 (.19)	.73 (.14)
Representation Index (9-bin)	.80 (.11)	.84 (.10)	.81 (.10)	.67 (.15)	.75 (.12)	.74 (.20)	.73 (.14)

Note: Standard deviation in parentheses. Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The statistics are as of 2015. The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). All statistics are weighted by the number of full-time equivalent students of HEIs. 7-bin scale are: (1) White, (2) Black and African American, (3) Hispanic, (4) Asian and Pacific Islander, (5) American Indians and Alaska Natives, (6) Two or more races and unknown races, and (7) Non-resident alien. 9-bin scale are: (1) White, (2) Black and African American, (3) Hispanic, (4) Asian, (5) Native Hawaiian and Pacific Islander, (6) American Indians and Alaska Natives, (7) Two or more races, (8) unknown races, and (9) Non-resident alien.

Table 2 Summary Statistics for Hiring Composition and Leaving Rate (2016–2019)

	By Tenured Status			4-year			2-year		
	All	TTT	NTT	Public	Non-profit	For-profit	Public	Non-profit	For-profit
Number of Institutions	2,951	2,951	2,951	574	1,218	50	946	57	106
<b>Hiring Composition</b>									
White	.61 (.20)	.57 (.20)	.64 (.23)	.56 (.15)	.62 (.22)	.55 (.29)	.68 (.21)	.71 (.32)	.62 (.28)
Black	.08 (.11)	.07 (.11)	.08 (.14)	.07 (.10)	.08 (.12)	.22 (.25)	.09 (.12)	.09 (.11)	.13 (.17)
Hispanic	.07 (.12)	.07 (.10)	.07 (.14)	.05 (.06)	.08 (.17)	.10 (.25)	.09 (.11)	.13 (.29)	.16 (.26)
Asian	.08 (.07)	.11 (.09)	.07 (.09)	.10 (.06)	.08 (.07)	.07 (.10)	.06 (.08)	.03 (.06)	.02 (.05)
NHPI	.002 (.015)	.001 (.014)	.001 (.015)	.001 (.005)	.002 (.012)	.000 (.001)	.003 (.024)	.002 (.015)	.005 (.022)
AIAN	.005 (.027)	.005 (.025)	.005 (.024)	.004 (.017)	.003 (.020)	.003 (.012)	.007 (.040)	.021 (.104)	.004 (.013)
Two or More Races	.013 (.022)	.013 (.024)	.014 (.045)	.013 (.012)	.014 (.026)	.014 (.033)	.012 (.029)	.015 (.045)	.027 (.046)
Unknown Races	.06 (.10)	.06 (.11)	.06 (.12)	.07 (.10)	.06 (.10)	.04 (.10)	.05 (.10)	.01 (.03)	.03 (.07)
Non Resident Alien	.08 (.09)	.11 (.11)	.06 (.08)	.13 (.08)	.07 (.09)	.00 (.02)	.01 (.03)	.01 (.04)	.00 (.00)
<b>Leaving Rate</b>									
White	.07 (.06)	.06 (.05)	.16 (.18)	.06 (.05)	.08 (.06)	.18 (.15)	.08 (.04)	.17 (.11)	.23 (.14)
Black	.11 (.11)	.09 (.09)	.21 (.22)	.09 (.08)	.13 (.13)	.20 (.16)	.12 (.13)	.16 (.12)	.25 (.23)
Hispanic	.10 (.11)	.08 (.10)	.19 (.22)	.08 (.08)	.12 (.13)	.15 (.13)	.11 (.13)	.25 (.26)	.26 (.25)
Asian	.09 (.11)	.07 (.10)	.20 (.23)	.07 (.07)	.11 (.12)	.21 (.21)	.10 (.13)	.17 (.22)	.23 (.26)
NHPI	.16 (.25)	.12 (.22)	.20 (.28)	.13 (.20)	.21 (.26)	.38 (.20)	.22 (.33)	.03 (.14)	.13 (.33)
AIAN	.14 (.17)	.11 (.15)	.21 (.25)	.13 (.13)	.18 (.22)	.23 (.22)	.15 (.20)	.32 (.33)	.43 (.31)
Two or More Races	.17 (.22)	.14 (.19)	.23 (.26)	.15 (.19)	.19 (.24)	.29 (.34)	.18 (.26)	.40 (.41)	.29 (.28)
Unknown Races	.26 (.26)	.22 (.24)	.33 (.29)	.24 (.25)	.31 (.28)	.34 (.35)	.25 (.25)	.53 (.34)	.57 (.34)
Non Resident Alien	.20 (.18)	.21 (.18)	.29 (.26)	.21 (.16)	.22 (.20)	.27 (.14)	.16 (.22)	.25 (.27)	.47 (.40)

Note: Standard deviation in parentheses. Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The statistics are the average of 2016 to 2019. The hiring composition is calculated using the equation (3). The leaving rate is calculated using the equation (4). All statistics are weighted by the number of full-time equivalent students of HEIs.

Table 3 Scenarios Construction

	Diversity Strategy	Representation Strategy
Hiring	Increase the <u>hiring composition</u> of the <b>minoritized groups</b> to 1.5 times	Increase the <u>hiring composition</u> of the <b>underrepresented groups</b> to 1.5 times
Hiring + Retention	Increase the <u>hiring composition</u> of the <b>minoritized groups</b> to 1.5 times Decrease the <u>leaving rate</u> of the <b>minoritized groups</b> to 0.5 times	Increase the <u>hiring composition</u> of the <b>underrepresented groups</b> to 1.5 times Decrease the <u>leaving rate</u> of the <b>underrepresented groups</b> to 0.5 times

*Note:* The hiring composition is calculated using the equation (3). The leaving rate is calculated using the equation (4). Minoritized groups are defined as racial/ethnic groups with composition of less than 11.11% (one-ninth). Underrepresented groups are defined as racial/ethnic groups whose faculty composition is less than the student composition of the same group. NTT stands for non-tenured track faculty and instructional staff without faculty status. TTT stands for tenured and tenure-track faculty.

Table 4 Paired T-test of Projected Diversity and Representation Indices in Various Scenarios in 2035

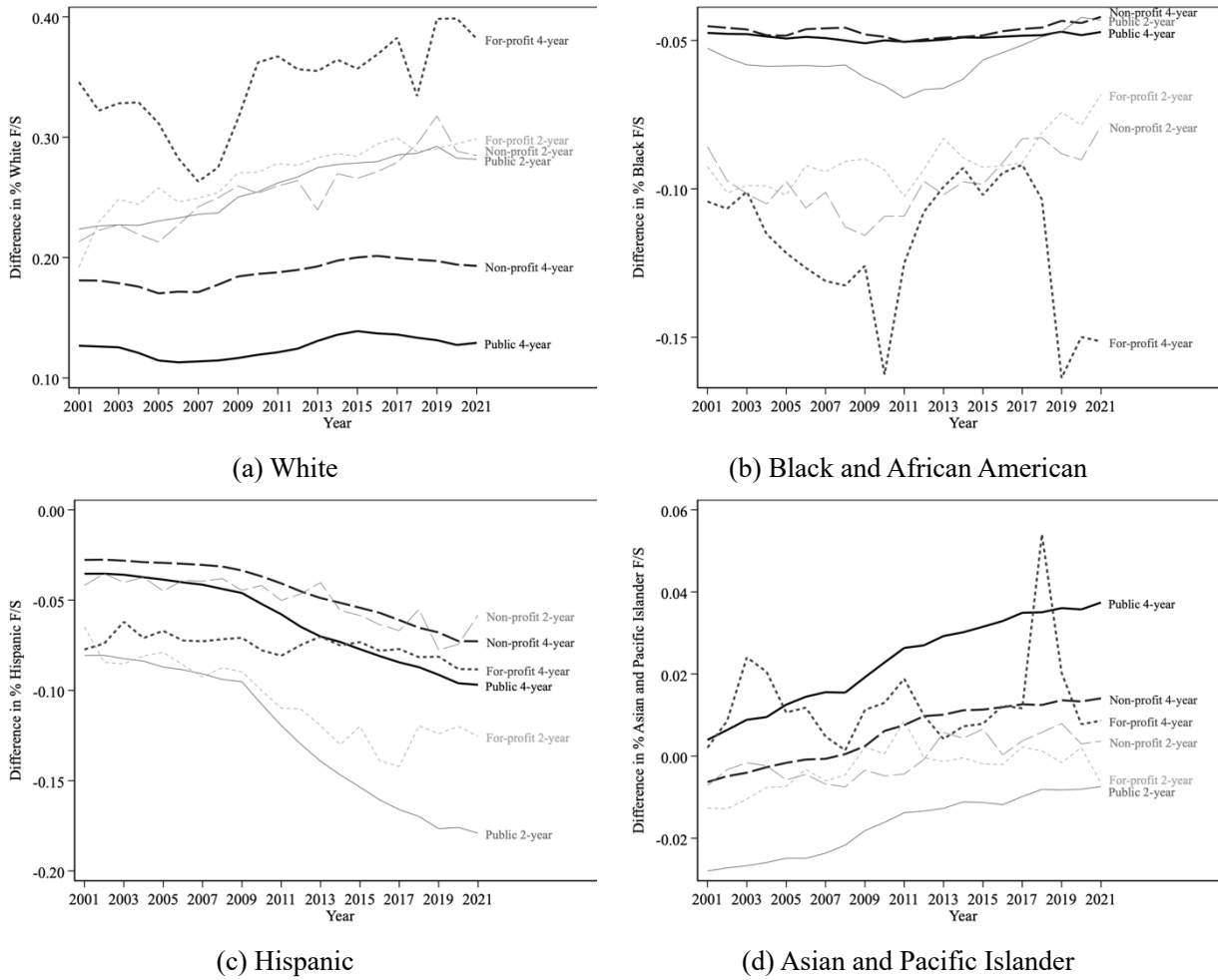
Scenarios	Estimates in 2035	Difference with Scenario [X] (Paired t-test)			
		(1)	(2)	(3)	(4)
<b>Panel A: Diversity Index</b>					
(1) Baseline	.509 (.198)				
(2) Diversity Hiring	.565 (.196)	.057*** [.001]			
(3) Diversity Hiring + Retention	.615 (.192)	.107*** [.001]	.050*** [.001]		
(4) Representation Hiring	.541 (.201)	.033*** [.001]	-.024*** [.001]	-.074*** [.001]	
(5) Representation Hiring + Retention	.574 (.200)	.065*** [.001]	.009*** [.001]	-.041*** [.001]	.033*** [.001]
<b>Panel B: Representation Index</b>					
(1) Baseline	.738 (.114)				
(2) Diversity Hiring	.759 (.115)	.021*** [.000]			
(3) Diversity Hiring + Retention	.774 (.113)	.036*** [.001]	.015*** [.000]		
(4) Representation Hiring	.769 (.109)	.031*** [.001]	.010*** [.001]	-.005*** [.001]	
(5) Representation Hiring + Retention	.796 (.101)	.058*** [.001]	.037*** [.001]	.022*** [.001]	.027*** [.000]

Note: Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The diversity index is calculated using the equation (1). The Representation index is calculated using the equation (2). Both indices are calculated using 9-bin scale. The estimates are as of 2035. All statistics are weighted by the number of full-time equivalent students of HEIs. Standard deviation in parentheses. Standard errors in squared brackets.

\*\*\*p < 0.01, \*\*p < 0.05, \*p < 0.1

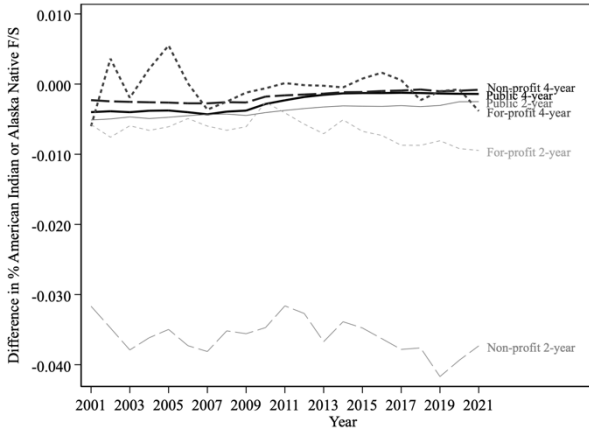
## Figures

Figure 1: Racial Composition Gap between Faculty and Student by Types of Institutions

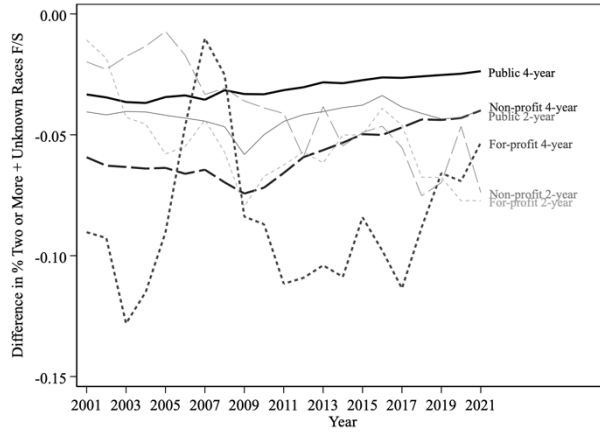


*Note:* Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The representation gap is calculated as the proportion of faculty in a given race/ethnicity minus the proportion of students in the corresponding group. All statistics are weighted by the number of full-time equivalent students of HEIs.

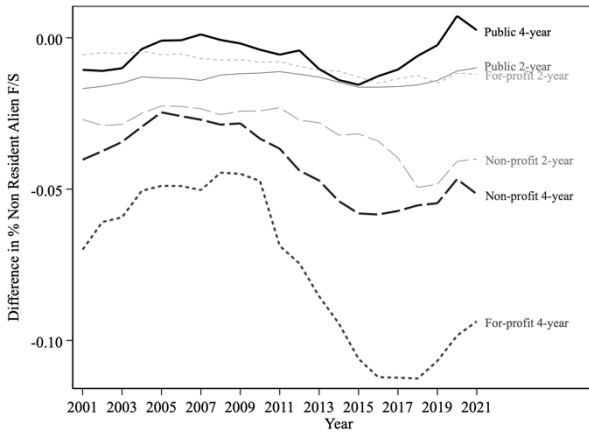
Figure 1: Continued



(e) American Indians and Alaska Natives



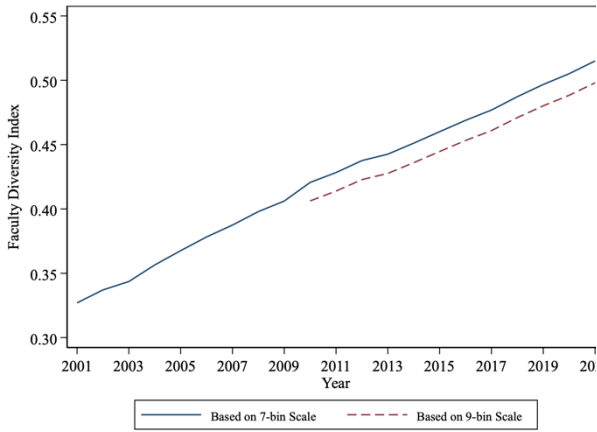
(f) Unknown Races and Two or More Races



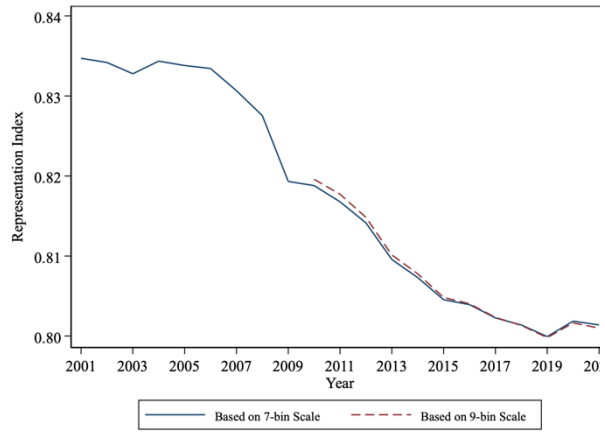
(g) Non Resident Alien

Note: Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The representation gap is calculated as the proportion of faculty in a given race/ethnicity minus the proportion of students in the corresponding group. All statistics are weighted by the number of full-time equivalent students of HEIs.

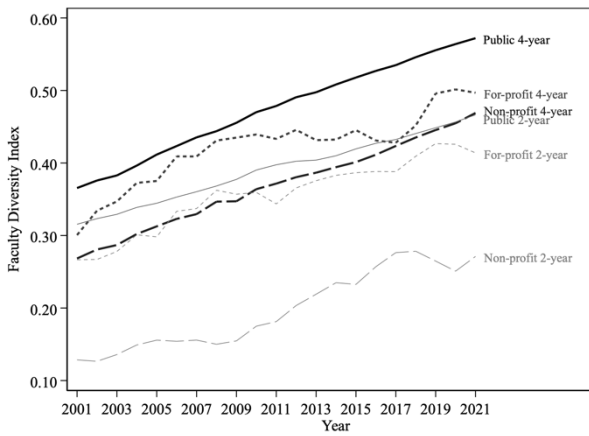
Figure 2: Trend in Faculty Diversity and Representation Indices Over Time



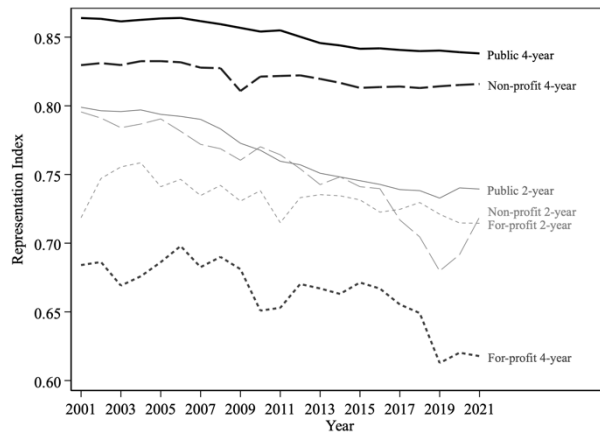
(a) Faculty Diversity Index



(b) Representation Index



(c) Faculty Diversity Index by HEI types

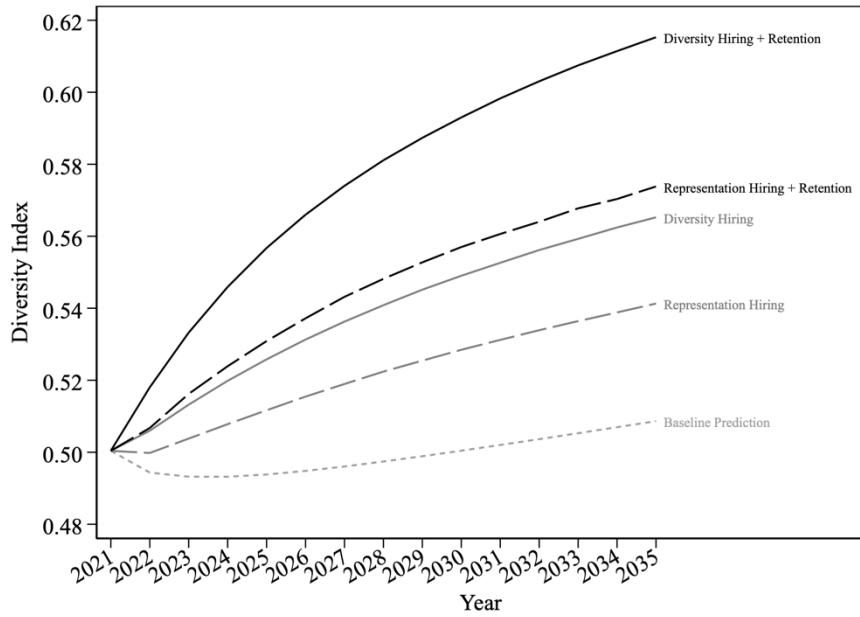


(d) Representation Index by HEI types

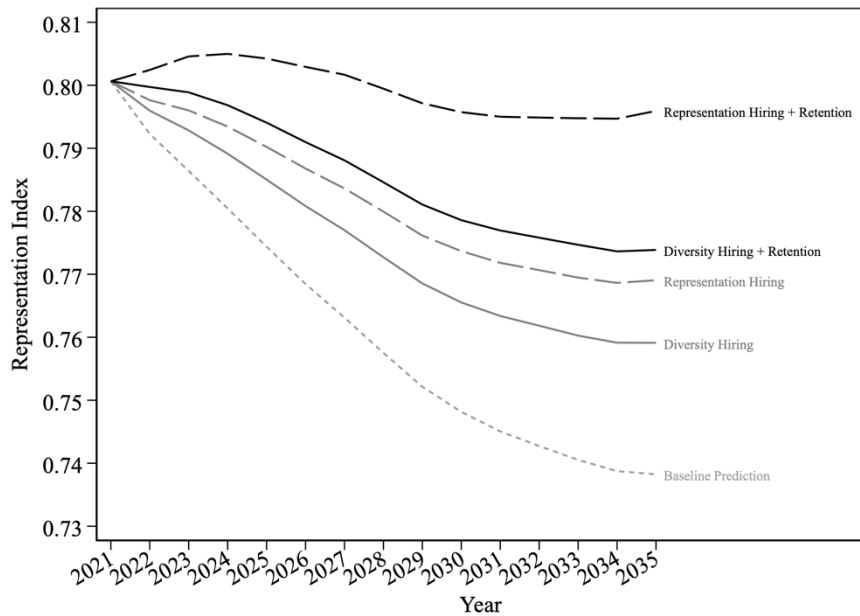
Note: Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. All statistics are weighted by the number of full-time equivalent students of HEIs. The diversity index is calculated using the equation (1). The Representation index is calculated using the equation (2). All statistics are weighted by the number of full-time equivalent students of HEIs. Figure 2c and 2d use 7-bin scale.



Figure 3: Projection of Diversity and Representation Indices in Various Scenarios



(a) Diversity Index



(b) Representation Index

*Note:* Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). Both indices are calculated using 9-bin scale. All statistics are weighted by the number of full-time equivalent students of HEIs.

## Appendix A. Decomposing Change in Diversity/Representation Index by Race/Ethnicity

The diversity and representation indices serve as unidimensional indicators of the racial/ethnic distribution among students and faculty. This appendix conducts a decomposition to elucidate which groups drive changes in the index.

The basic premise of our decomposition is to isolate the effect of one population group experiencing a compositional change while keeping other groups constant. For instance, to determine the contribution of changes in White faculty to the overall diversity index, we assume only the proportion of White faculty changed while proportions of other racial groups remained constant. However, we do not fix the composition of other racial groups; instead, we adjust them proportionally to maintain the sum of proportions as one, as required by the calculation of diversity and representation indices.

For instance, if we wish to decompose the change in diversity index from time period  $t - 1$  to period  $t$ , we first compute the contribution of a racial group  $j = 1$ , which experienced a change in proportion at institution  $i$  from  $P_{i,j=1,t-1}^F$  to  $P_{i,j=1,t}^F$ . Subsequently, for all other racial groups  $j \neq 1$ , their proportions adjust to  $(1 - P_{i,j=1,t}^F)$  due to the change in the first racial group. However, we maintain their relative shares from time period  $t - 1$ . Therefore, the assumed proportion of racial group  $j = 2$  would be its relative share at  $t - 1$  multiplied by the sum of proportions given the mechanical change, as expressed in formula (A1) below:

$$P_{i,j=2,t}^F = \frac{P_{i,j=2,t-1}^F}{\sum_{j \neq 1} P_{i,j,t-1}^F} \times (1 - P_{i,j=1,t}^F) \quad (\text{A1})$$

Subsequently, the change in diversity index driven by racial group  $j = 1$  is calculated using formula (A2) below, subtracted from the diversity index in time period  $t - 1$ :

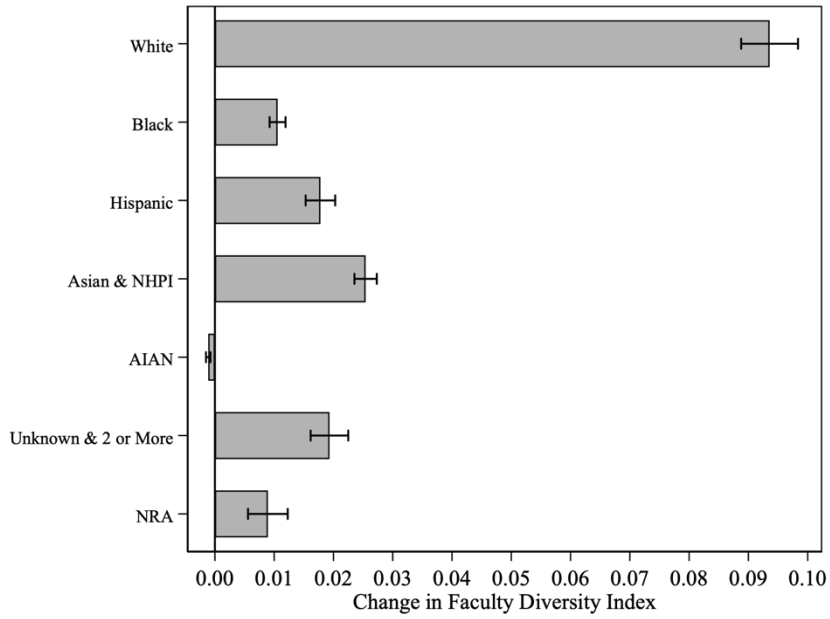
$$Diversity\ Index_{i,t,j=1} = \left( 1 - P_{i,j=1,t}^F - \sum_{j \neq 1}^C (P_{ijt^*}^F)^2 \right) * \frac{C}{C-1} \quad (A2)$$

This method provides a point estimate of decomposition without confidence intervals. We obtain standard errors of the estimates using bootstrapping, where we resample the same number of institutions from our sample with replacement and reperform the analysis 1,000 times to derive a distribution of estimates. The standard error is then defined as the standard deviation of the bootstrap estimates.

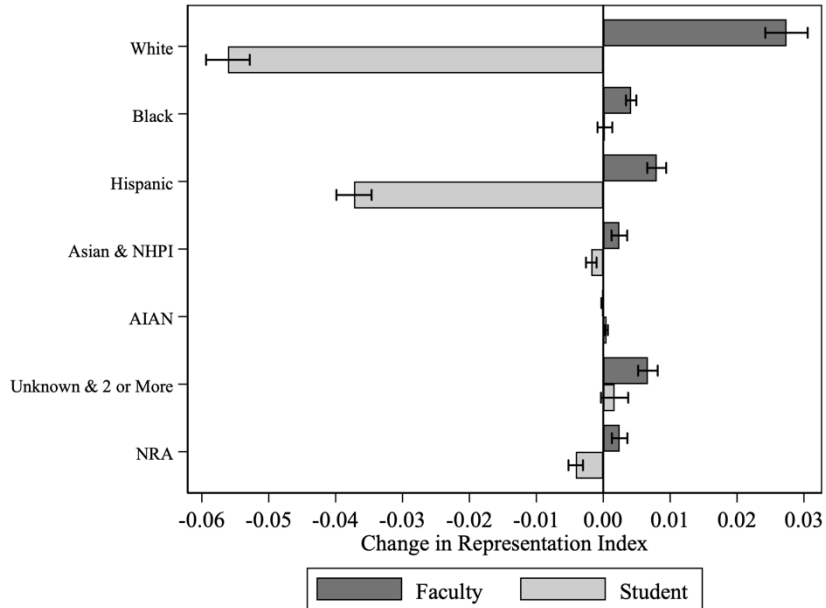
Figure A1a illustrates the decomposition of the changes in the diversity index from 2001 to 2021. Overall, the diversity index increased by 0.2 points over this period. Nearly half of this change (0.09) was attributed to shifts in the composition of White faculty, with Asians and NHPI contributing 0.025 (12.5%), while Blacks and Hispanics contributed 5% and 9%, respectively. The high share attributed to the unknown and “two or more” race groups primarily reflects the introduction of the “two or more” group in 2010 rather than increased hiring from these groups.

A similar technique is employed to decompose changes in the representation index, where the contribution of changes in the student body is analyzed while assuming faculty distribution remains constant, and vice versa. Figure A1b presents the result. From 2001 to 2021, the representation index dropped by 0.03 points. However, when student composition is fixed, the change in the faculty body actually pushes up the representation index. On the other hand, the diversification of the student population (in particular, the change in White and Hispanic) draws down the index.

Figure A1: Decompose the Change in Diversity and Representation Indices from 2001 to 2021



(a) Diversity Index



(b) Representation Index

*Note:* The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). Both indices are calculated using 7-bin scale. The decomposition is computed by calculating the index with only one change in one racial/ethnic group while fixing the composition of other groups as they were in 2001. The error bars denote the 95% confidence interval. Standard errors are obtained from 1,000 times bootstrapping.

Figure A2 applies a similar practice to the change in the diversity/representation index from 2019 to 2035 (our baseline projection). This projection assumes HEIs maintain the same hiring composition and leaving rates for each faculty group as observed from 2016 to 2019, while the student body projection is based on population data (see Appendix B for details).

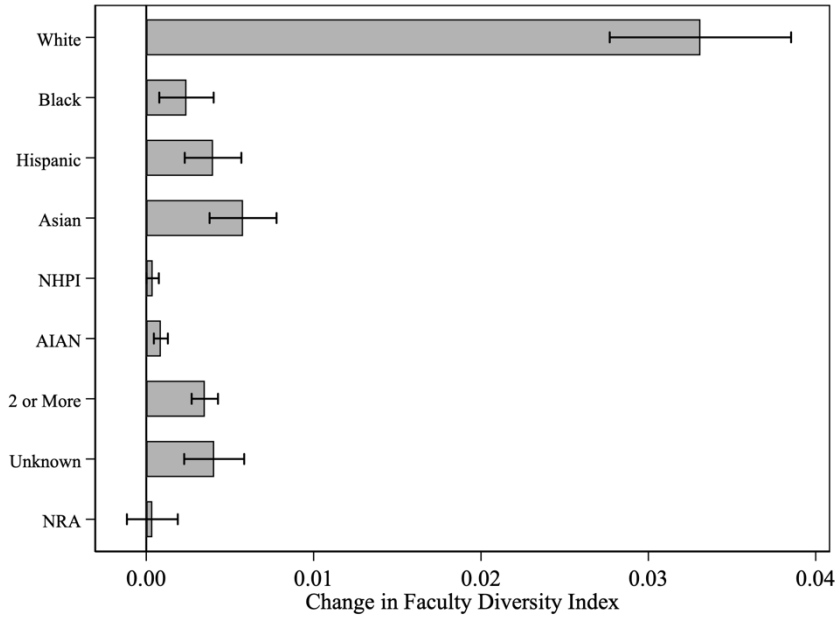
Figure A2a demonstrates a similar pattern as Figure A1a. The increase in the diversity index is primarily driven by a change in White faculty, followed by Asian. Figure A2b turns to the representation index. In general, the change in faculty in the major racial group contributes positively to the representation index, while the change in the student body (particularly White and Hispanic) contributes negatively to the change in the representation index.

We then apply a similar decomposition technique to the comparisons across multiple scenarios. However, the comparisons are now established between scenarios and the baseline projection. A similar version of Equations (A1) and (A2) are applied. However, the composition at period  $t - 1$  is substituted by the composition in the baseline scenarios.

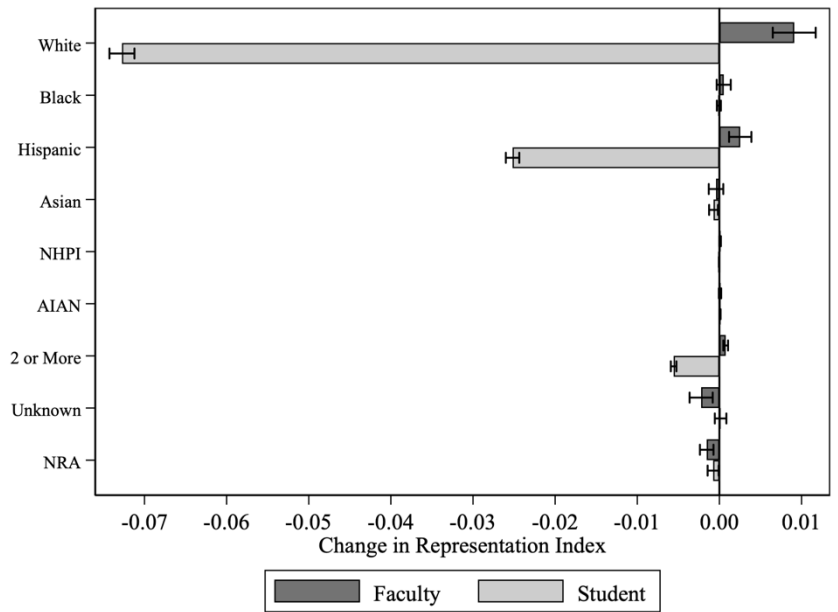
Figure A3 demonstrates decomposition results across multiple scenarios compared to the baseline projection. Larger positive values for a given racial group indicate that the difference in diversity (representation) index between a given scenario and the baseline projection is largely driven by changes in the composition of that racial group. In the primary result, we found that hiring and retaining minoritized groups outperform other strategies in the diversity index. Figure A3a further suggests that this pattern is primarily driven by changes in White, Black, and Asian groups. Conversely, the best performance in the representation index is observed with the hiring and retention of underrepresented groups, predominantly driven by changes in White, Black, and Hispanic groups (see Figure A3b).

Figure A2: Decompose the Change in Diversity and Representation Indices from 2019 to 2035

(Baseline Projection)



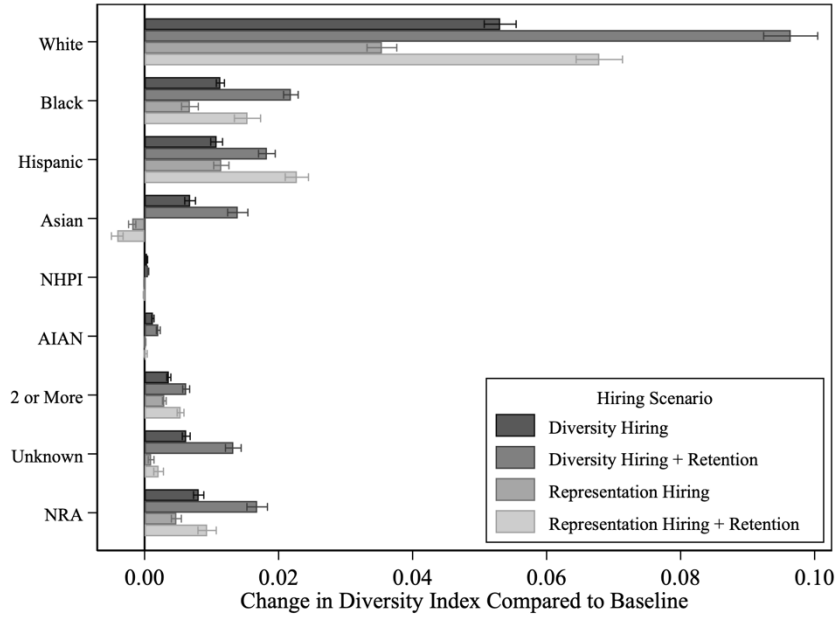
(a) Diversity Index



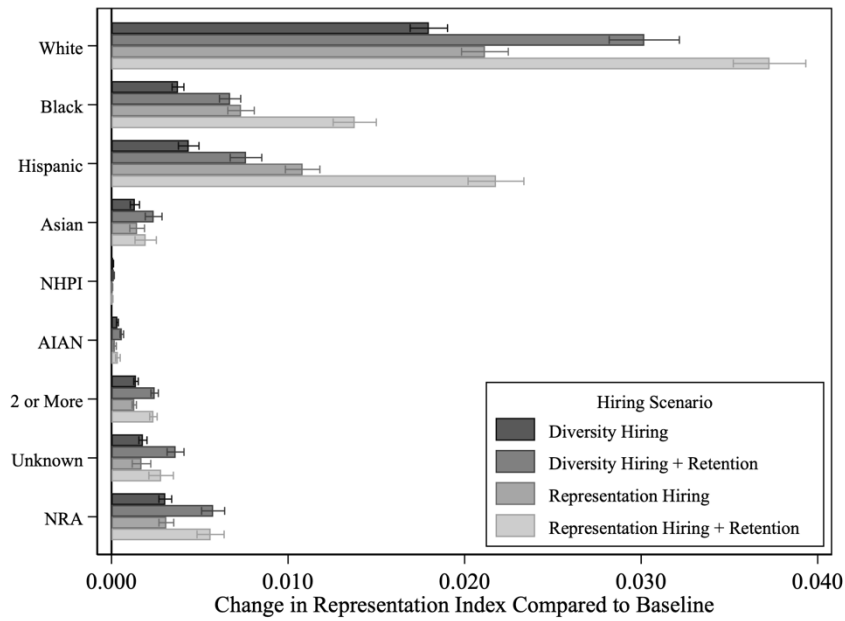
(b) Representation Index

*Note:* The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). Both indices are calculated using 7-bin scale. The decomposition is computed by calculating the index with only one change in one racial/ethnic group while fixing the composition of other groups as they were in 2019. The error bars denote the 95% confidence interval. Standard errors are obtained from 1,000 times bootstrapping.

Figure A3: Decompose the Improvement in Diversity and Representation Indices of Various Scenarios Compared to the Baseline Scenario



(a) Faculty Diversity Index



(b) Representation Index

*Note:* The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). Both indices are calculated using 9-bin scale. The decomposition is computed by calculating the index with only improvement (or deterioration) in one racial/ethnic group brought by a given scenario while fixing the composition of other groups as the baseline scenario. The error bars denote the 95% confidence interval. Standard errors are obtained from 1,000 times bootstrapping.

## **Appendix B. Projection Methodology**

Below, we provide the steps and models used to construct our projections and simulations. Our methodology is based on that used in the *Projections of Education Statistics to 2028* report by the National Center for Education Statistics (2020), which we adjusted to extend the projection of student enrollment and faculty hiring until 2035. We then applied our simulation scenarios to project change in faculty composition in the long run. Our methodology consists of three steps:

- 1) Predict college student enrollment by racial/ethnic groups at each HEI based on the reported college-aged population by the U.S. Census Bureau.
- 2) Predict faculty hiring based on college student enrollment.
- 3) Apply different assumptions to manipulate the hiring composition and leaving rate of different racial/ethnic groups, which feed into the scenario projection models.

Each step is fully described below.

### ***Step 1: Projection of Student Enrollment by Racial/Ethnic Groups at Each HEI***

As NCES did not disclose the models in their report, we used NCES's prediction until 2028, then reverse-engineered from their predicted results to reconstruct reasonable formulas for our projections until 2035. Here is the summary of the two sub-steps we took to project the number of students enrolled in one HEI-year and their racial/ethnic composition:

1.1) Predict the total college enrollment and students' racial/ethnic distribution nationwide annually until 2035 using NCES's prediction and population demographic data, including age groups (18 to 24 and 25 to 29), sex, and race/ethnicity of the college-aged population.



1.2) Predict the college enrollment and students' racial/ethnic distribution of each HEI using results predicted in Step 1 and institutional data (2-year/4-year; public/private; proportion of full-time/part-time students).

Here are the detailed model-building and interim results:

Step 1.1: To predict total student enrollment, we first fitted a regression model with the dependent variable being predicted total enrollment by 2028 (from NCES report) and two independent variables being the proportion of 18- to 24- and 25- to 29-year-olds:

$$TotE_{mnt}^{NCES} = \alpha_0 + \sum_{j=1}^C \beta_{jmn} \times Pop_{jt}^{1824} + \sum_{j=1}^C \gamma_{jmn} \times Pop_{jt}^{2529} + \varepsilon_{mnt} \quad (B1)$$

Where  $TotE_{mnt}^{NCES}$  is the NCES projection on postsecondary student enrollment in the institution type  $m$  (public 4-year, public 2-year, private 4-year, and private 2-year) of student attendance status  $n$  (full-time or part-time) in year  $t$  (for which we have data on  $2017 \leq t \leq 2028$  and want to predict for  $2029 \leq t \leq 2035$ ).<sup>27</sup>  $Pop_{jt}^{1824}$  is the population of those aged 18 to 24 of race/ethnicity  $j$  (includes total population, non-Hispanic White, Black, Hispanic, Asian, and the remaining groups)<sup>28</sup> in year  $t$ . Similarly,  $Pop_{jt}^{2529}$  is the population of 25- to 29-year-olds of race/ethnicity  $j$  in year  $t$ . The regression is estimated separately for each institution type and student attendance status. The  $R$ -squared values of the regression models range from 0.977 to 0.999 (varying across models), indicating a good model fit. We obtained a series of  $\hat{\beta}$  and  $\hat{\gamma}$  and

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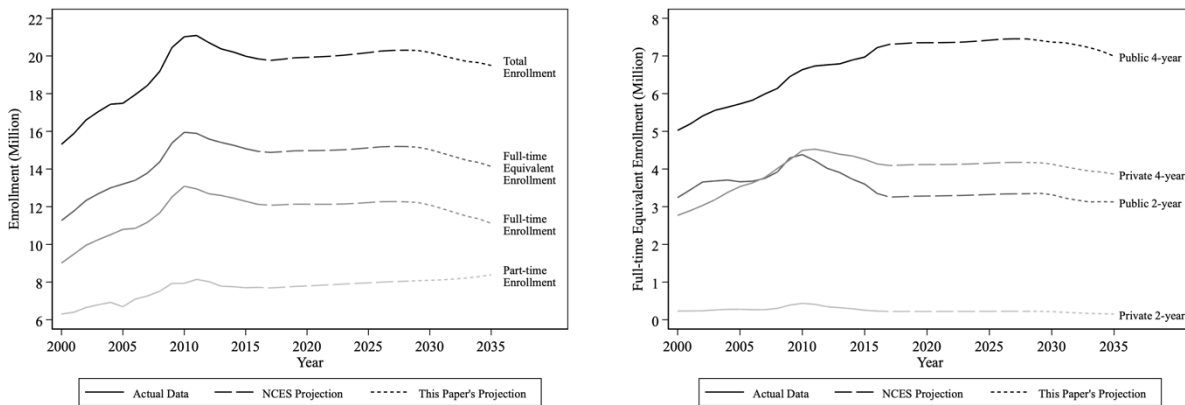
<sup>27</sup> At the time the NCES projection was conducted, actual data for 2017 was not yet available. Hence, their projection was for the period from 2017 to 2028.

<sup>28</sup> The Census Bureau reports the population of each race/ethnicity group, including NHPI, AIAN, and two or more races. However, if we include all racial groups in the regression, the number of parameters would be greater than the available data points, resulting in nonidentifiable regressions. Therefore, we include only the groups non-Hispanic White, Black and African American, Hispanic, and Asian in the regression. Including any one additional racial group does not substantially alter the estimation results.

then predicted the enrollment type at each institution type and student attendance status from 2029 to 2035.

Figure B1 illustrates the projection results. We retrieved NCES' projections from 2017 to 2028, showing that postsecondary student enrollment would slightly increase. Then, based on our projection, we predicted that the enrollment would start to decrease in 2030, largely due to the drop in the college-aged population. The drop in student enrollment is primarily driven by the reduction of full-time enrollment (see Figure B1a) and is greatest in public 4-year institutions (see Figure B1b).

Figure B1: Post-secondary Enrollment Projection through 2035



(a) Enrollment Projection by Student Attendance Status

(b) Enrollment Projection by Institution Types

*Note:* This figure presents the actual and projected post-secondary enrollment in the degree-granting institutions from 2000 to 2035. The solid line stands for the actual enrollment from 2000 to 2016 (data comes from the IPEDS). The long dash line stands for the projection from the NCES report from 2017 to 2028. The short dash line stands for the projection constructed by this paper from 2029 to 2035. The projection was based on the population of age 18 to 29 as reported by the Census Bureau. Full-time equivalent is defined as the sum of full-time enrollment and one-third of part-time enrollment.

Similarly, we fitted the following model to predict the proportions of different racial/ethnic student groups until 2035.

$$TotPropE_{jt}^{NCES} = \alpha_0 + \beta_j \times PropPop_{jt}^{1824} + \gamma_j \times PropPop_{jt}^{2529} + \varepsilon_{jt} \quad (B2)$$

Where  $TotPropE_{jt}^{NCES}$  is the NCES projection on the national level share of postsecondary student enrollment of race/ethnicity  $j$  in year  $t$  (for which we have data on  $2017 \leq t \leq 2028$  and want to predict for  $2029 \leq t \leq 2035$ ).  $PropPop_{jt}^{1824}$  is the share of population of race/ethnicity  $j$  within age 18 to 24 in year  $t$ . Similarly,  $PropPop_{jt}^{2529}$  is the share of population of race/ethnicity  $j$  within age 25 to 29 in year  $t$ . The regression is estimated separately for each race/ethnicity group. The  $R$ -squared values of the regression models range from 0.800 to 0.996 (worse for Asians<sup>29</sup> and best for Whites), indicating a good model fit. We obtained a series of  $\hat{\beta}$  and  $\hat{\gamma}$  and then predicted the racial/ethnic composition of student enrollment from 2029 to 2035.

Figure B2 illustrates the projection results. The proportion of White students is predicted to continue to decrease through 2035, though the reduction would become milder in the latter period. Similarly, the population of Hispanic students is predicted to continue to increase in the long run but not as much as it did from 2010 to 2015.

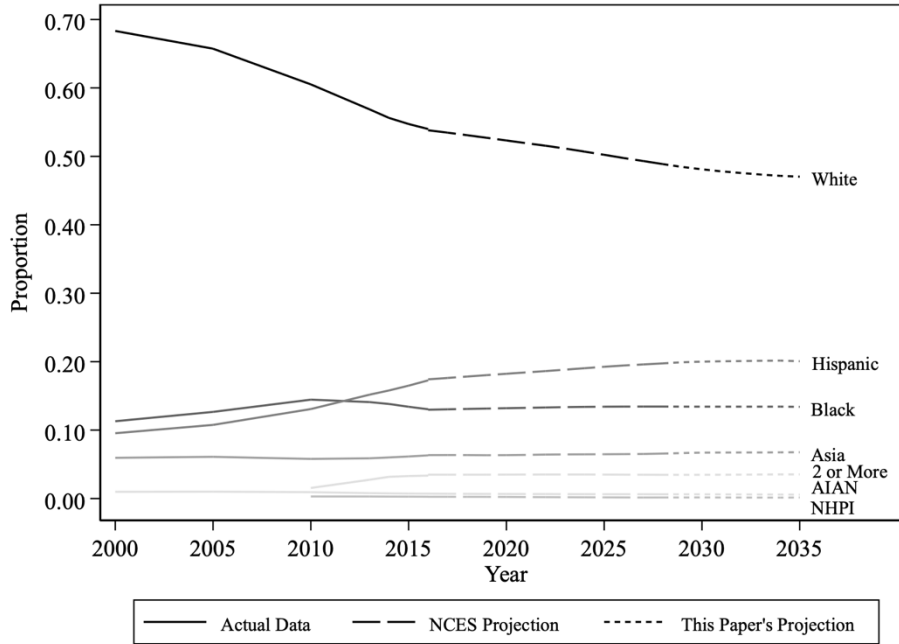
Step 1.2. To predict the enrollment at each HEI, we used the actual enrollment data for the 2001–2019 period, the NCES projection for the 2022–2028 period, and our own projection (obtained from Equation B1) for the 2029–2035 period. Specifically, we fitted the following equation:

$$E_{imnt} = \alpha_0 + \beta_{mn} \times TotE_{mnt} + \theta_i + \varepsilon_{imnt} \quad (B3)$$

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<sup>29</sup> The relatively worse-off position of the Asian group is because their enrollment rate does not catch up as quickly as their growth rate in the population. This pattern could be due to the relative high baseline enrollment of the Asian group compared to other racial groups.

Figure B2: Racial Composition Projection of Post-secondary Enrollment through 2035



*Note:* This figure presents the actual and projected racial/ethnic composition in post-secondary student enrollment in the degree-granting institutions from 2000 to 2035. The solid line stands for the actual enrollment from 2000 to 2016 (data comes from the IPEDS). The long dash line stands for the projection from the NCES report from 2017 to 2028. The short dash line stands for the projection constructed by this paper from 2029 to 2035. The projection was based on the population of age 18 to 29 of each race/ethnicity as reported by the Census Bureau. The data on 2 or more races and NHPI are not available prior to 2010 as the IPEDS had no such group in that period.

Where  $E_{imnt}$  is the student enrollment in the institution  $i$  of type  $m$  (public 4-year, public 2-year, private 4-year, and private 2-year) of student attendance status  $n$  (full-time or part-time) in year  $t$  (for which we use data from  $2001 \leq t \leq 2019$  and want to predict for  $2022 \leq t \leq 2035$ ).<sup>30</sup>  $TotE_{mnt}$  is the nationwide total enrollment of institution type  $m$  of student attendance status  $n$  in year  $t$ .

In the next step, we applied the overall projection on student racial/ethnic composition to each HEI. We fit a regression model with the racial/ethnic composition at each institution as the dependent variable and the actual overall racial/ethnic composition of national postsecondary

<sup>30</sup> We exclude the year 2020 and 2021 since the enrollments in this period were largely affected by COVID.

enrollment as the independent variable. Then, we used the model and the student composition projection to predict the composition of each institution through 2035, according to the following equation:

$$PropE_{ijt} = \alpha_0 + \beta_j \times TotPropE_{jt} + \theta_i + \varepsilon_{ijt} \quad (B4)$$

Where  $PropE_{ijt}$  is the share of student enrollment of racial/ethnic  $j$  in institution  $i$  in year  $t$ .  $TotPropE_{jt}$  is the national level share of student enrollment of racial/ethnic group  $j$  in year  $t$ .  $\theta_i$  is the institution fixed effect. Our estimates are calculated separately for each racial/ethnic group. The  $R$ -squared values of the regression models range from 0.910 to 0.996, indicating a good model fit. We obtained a series of  $\hat{\beta}$ , then predicted the racial/ethnic composition of each institution from 2029 to 2035.

### ***Step 2: Projection of Faculty Hiring***

We based our projection of faculty hiring on student enrollment. The assumption is that the number of new hires is a function of student enrollment: If enrollment drops, institutions are likely to reduce their hiring of instructional staff. To model the relationship between student enrollment and faculty hiring, we fitted the following formula:

$$NewHires_{ikt} = \alpha_0 + \beta_k \times E_{it}^{FT} + \gamma_k \times E_{it}^{PT} + \delta_k \times Year_t + \theta_i \times Post_t^{2016} + \varepsilon_{ikt} \quad (B5)$$

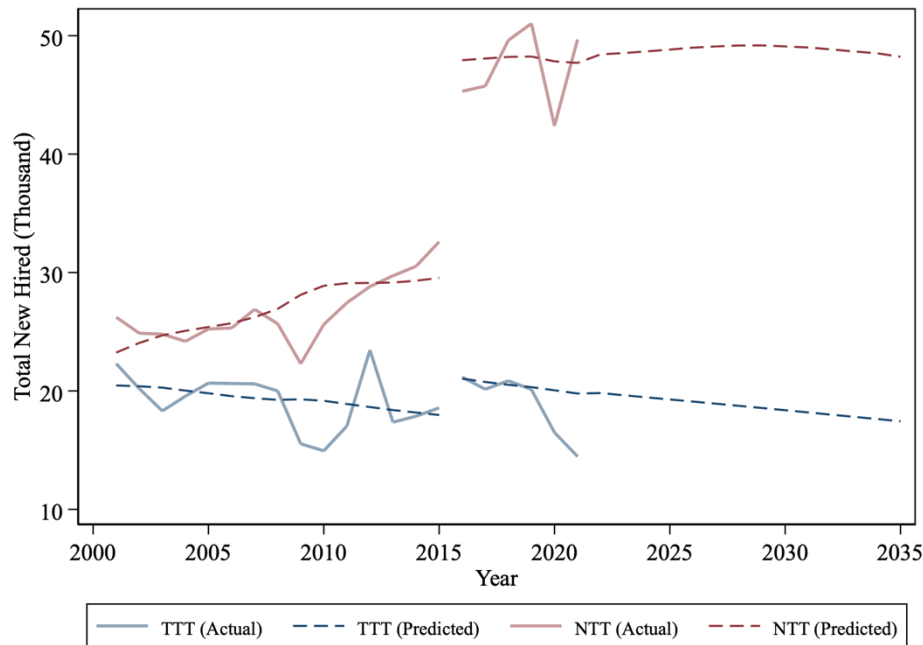
Where  $NewHires_{ikt}$  is the number of newly hired full-time instructional staff of institution  $i$  of faculty group  $k$  (TTT or NTT) in year  $t$ .  $E_{it}^{FT}$  is the number of full-time enrollment students of institution  $i$  in year  $t$ . And  $E_{it}^{PT}$  is the part-time enrollment.  $Year_t$  captures the linear time trend of the hiring for each faculty group.

There is an adjustment in this formula, with  $\theta_i \times Post_t^{2016}$  being the interaction term between institution fixed effect and a dummy indicating post-2016 data. Prior to 2016, IPEDS asked institutions to report their new hires between July 1 and October 31 (a 4-month period). However, in 2016 IPEDS began asking institutions to report their new hires based on a 12-month period (November 1 last year through October 31 this year). Therefore, the data on new hires collected up to 2015 are not comparable to those collected after 2016. Equation B5 includes separate institution-fixed effects based on the data reporting system to account for this change.

We used data from 2001 to 2019 to estimate  $\beta_k$  and  $\gamma_k$ . The models are separately estimated by institution type and faculty group. The average *R*-squared values of the model are 0.579 for TTT and 0.785 for NTT. The relatively worse performance of the prediction compared to the student enrollment model is due to the fluctuation of hiring (which is more sensitive to macroenvironmental changes). We obtained a series of estimated parameters of  $\beta_k$ ,  $\gamma_k$ , and  $\delta_k$ , and then applied the model to predict future hiring through 2035 based on student enrollment projections obtained from Equation B3.

Figure B3 illustrates the projection results. It predicts that HEIs will reduce their hiring of TTT staff but slightly increase the hiring of NTT staff in the long term. However, hiring of NTT staff will start to decrease in 2030, which could be explained by the reduction in student enrollment.

Figure B3: Projection of New Hired by Faculty Group through 2035



*Note:* This figure presents the actual and projected new-hired instructional staff by tenured status from 2001 to 2035. The solid line stands for the actual new hires from 2001 to 2021 (data comes from the IPEDS). Prior to 2015, the data only included new hires from July 1 to October 31, while after 2016, the data included a full-year length hiring. The dashed line stands for the projection from 2022 to 2035. The projection was based on student enrollment projection as computed from equations (B1) and (B2).

### ***Step 3: Simulation of Different Hiring and Retention Strategies***

To evaluate different diversity hiring and retention strategies, we based our prediction model on a baseline assumption. The baseline assumption considers that HEIs might change their total hiring due to the shift in student enrollment (as predicted by Equation B5) but assumes that HEIs will maintain their current effort in diversity hiring and retention. That is, we fixed the racial composition in hiring and the leaving rate of each race/ethnicity at the average of 2016 to 2019. In other words, we assume HEIs will hire the same proportion of each race/ethnicity (i.e., inflow) as they did in the baseline period, and the existing faculty will maintain a leaving rate (i.e., outflow) consistent with the baseline period. The prediction model is constructed for each institution, faculty racial group, and position type separately. The prediction formula is as follows:

$$\begin{aligned}
N.Faculty_{ijkt} = & \overbrace{N.Faculty_{ijk(t-1)}}^{Stock} + \overbrace{NewHires_{ikt} \times HiringComposition_{ijk}}^{Inflow} \\
& - \underbrace{N.Faculty_{ijk(t-1)} \times LeavingRate_{ijk}}_{Outflow}
\end{aligned} \tag{B6}$$

Where  $N.Faculty_{ijkt}$  is the number of faculty (i.e., the stock) of institution  $i$  of race/ethnicity  $j$  of position type  $k$  (TTT or NTT) in year  $t$ .  $N.Faculty_{ijk(t-1)}$  refers to similar statistics in the preceding year.  $NewHires_{ikt}$  is the predicted total newly hired faculty of institution  $i$  of position type  $k$  in year  $t$  as obtained from Equation B5, which accounts for the long-run change in student enrollment.  $HiringComposition_{ijk}$  is the average hiring composition (as calculated by Equation 3) of race/ethnicity  $j$  of position type  $k$  in institution  $i$  from 2016 to 2019. The product of these two terms becomes the inflow of the faculty of a particular group in year  $t$ .

On the other hand, the outflow is calculated as the product of last year's stock and the leaving rate.  $LeavingRate_{ijk}$  is the average leaving rate (as calculated by Equation 4) for the race/ethnicity  $j$  of position type  $k$  in institution  $i$  from 2016 to 2019.

Our next set of assumptions regarding *diversity/representation* hiring strategies. These scenarios are similar, as we apply the same logic that HEIs will increase their hiring composition of *minoritized/underrepresented* faculty in both TTT and NTT. In the main analysis, we set the increase to be 50% (or 1.5 times), but we test for different levels of effort in the robustness check. Specifically, we calculated the adjusted hiring composition as follows:

$$BoostedHiringComposition_{ijk} = HiringComposition_{ijk} \times 1.5 \tag{B7}$$

For example, if a minoritized/underrepresented group has an average hiring composition of 10%, we will increase it to 15%. As we set the total hiring at a fixed number, an increase in



the hiring composition of one group would lead to a reduction in the composition of the remaining group. Therefore, we first calculate the sum of the reduced hiring composition of *majority/overrepresented groups* by subtracting the sum of the boosted hiring composition of *minoritized/underrepresented groups* from 1. The formula is as follows:

$$\sum_{\substack{j=\text{major} \\ /over}} \text{ReducedHiringComposition}_{ijk} = 1 - \sum_{\substack{j=\text{minor} \\ /under}} \text{BoostedHiringComposition}_{ijk} \quad (\text{B8})$$

For example, suppose that in an institution, Blacks and Hispanics are underrepresented groups, and Whites and Asians are overrepresented groups (and no other racial groups are present at this institution). Suppose the hiring compositions are 10% for Blacks, 20% for Hispanics, 30% for Asians, and 40% for Whites. When we boost the compositions of underrepresented groups by 1.5 times, they will become 15% for Blacks and 30% for Hispanics, with a sum of 45%. Therefore, the sum of hiring in overrepresented groups must be reduced to 55%. We then redistribute the proportion between Asians and Whites at the initial share, leading to 23.57% for Asians and 31.43% for Whites. In a case where the sum of the hiring compositions for all the underrepresented groups exceeds 100%, we set the sum of compositions at 100% and readjust the compositions based on the original share.<sup>31</sup> However, this manipulation occurs in only 7% of cases. We then apply the adjusted hiring compositions to Equation B6 to compute the

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<sup>31</sup> For example, suppose that in an institution, only Black, Hispanic, and Asian were underrepresented groups. The hiring compositions were 30% for Black, 30% for Hispanic, and 10% for Asian, and 30% for White. When we boost the compositions of underrepresented groups by 1.5 times, they become 45% for Black, 45% for Hispanic, and 15% for Asian, with a sum of 105%. In this case, we set the sum of underrepresented groups as 100% and redistributed them to be 42.86% for Black, 42.86% for Hispanic, and 14.28% for Asian. White, in this case, would get a 0% of hiring composition.

change in the faculty body. We conducted the calculation separately for each institution-by-race/ethnicity group-by-position type cell and then calculated the diversity and representation index for each institution.

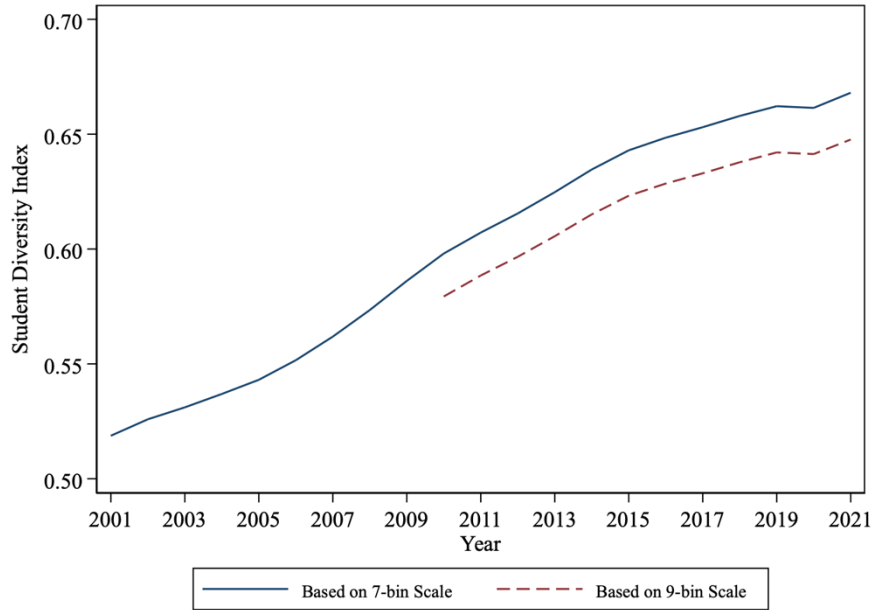
The last set of scenarios is the *Hiring + Retention* strategy. Besides assuming an increase in the hiring composition of minoritized/underrepresented groups, we further assume the leaving rate among these groups decreased by 50%. Specifically, the formula is as follows:

$$ReducedLeavingRate_{ijk} = LeavingRate_{ijk} \times 0.5 \quad (B9)$$

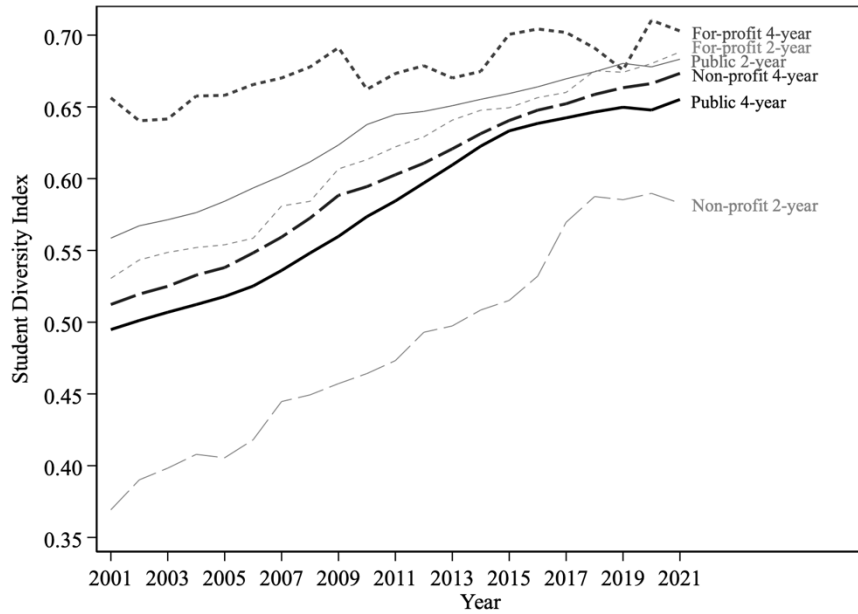
This formula is only applied to the minoritized/underrepresented groups, while the majority/ overrepresented group remains at the same rate as the average from 2016 to 2019. We then apply the adjusted hiring compositions and leaving rates to Equation B6 to compute the change in the faculty body.

## Appendix C: Additional Results

Figure C1: Trend in Student Diversity Index Over Time



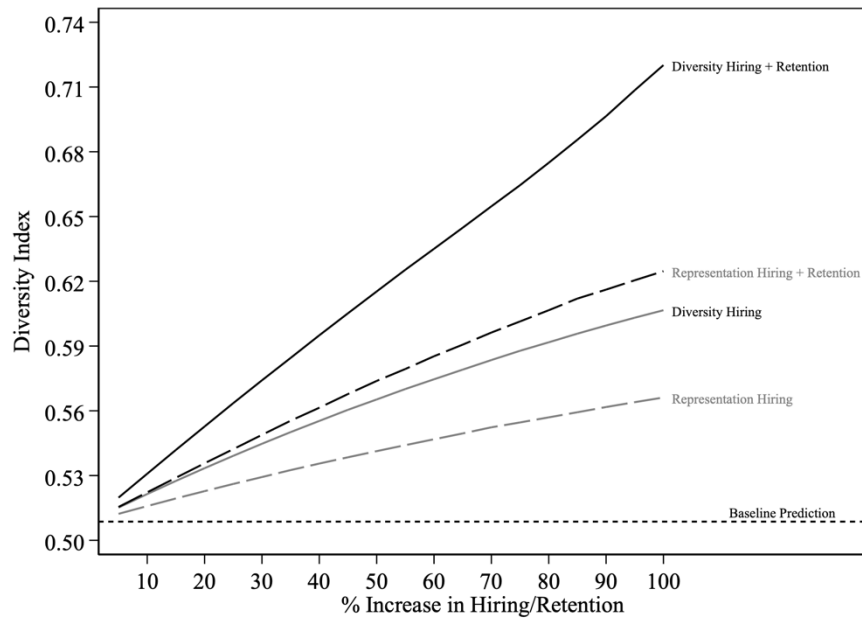
(a) Student Diversity Index



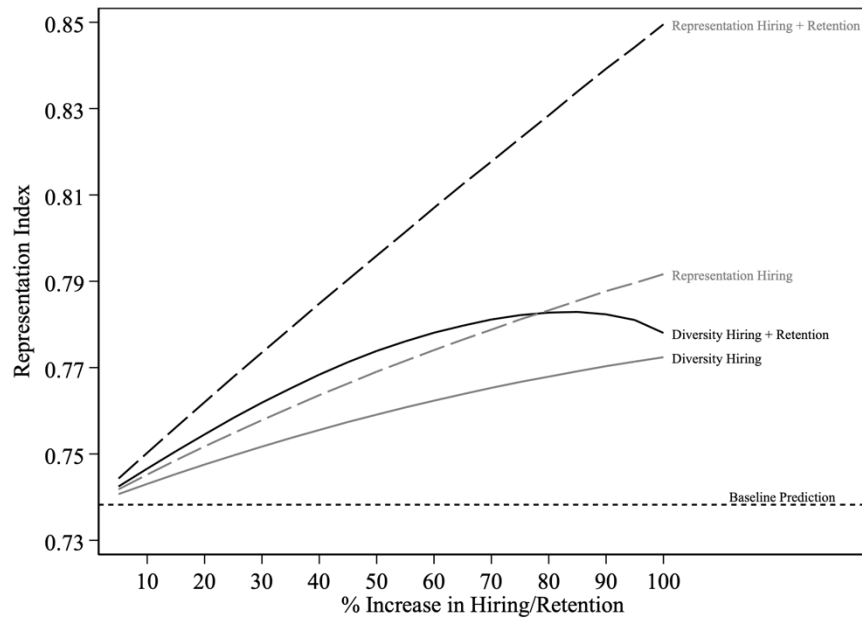
(b) Student Diversity Index by HEI types

*Note:* Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. All statistics are weighted by the number of full-time equivalent students of HEIs. The diversity index is calculated using the equation (1). All statistics are weighted by the number of full-time equivalent students of HEIs. Figure 2c and 2d use 7-bin scale.

Figure C2: Projection of Diversity and Representation Indices by the Hiring/Retention Efforts



(a) Diversity Index



(b) Representation Index

*Note:* Samples are HEIs in the US that were continuously reported in the IPEDS from 2001 to 2021. The sample size is 2,951 HEIs. The diversity index is calculated using the equation (1). The representation index is calculated using the equation (2). Both indices are calculated using 9-bin scale. A 50% effort level indicates boosted hiring compositions for minoritized/underrepresented groups to be 1.5 times of the 2016–2019 average and reduce the leaving rates for minoritized/underrepresented groups to be 0.5 times of the 2016–2019 average. All statistics are weighted by the number of full-time equivalent students of HEIs.

Table C1: Summary Statistics of Minoritized and Underrepresented Groups

Race/Ethnicity	% HEIs categorized the racial/ethnic group as:	
	Minoritized	Underrepresented
White	2%	7%
Black	84%	81%
Hispanic	88%	92%
Asian	83%	40%
NHPI	100%	68%
AIAN	99%	68%
Two or More Races	99%	85%
Unknown Races	94%	67%
Non-Resident Alien	97%	66%

Note: A minoritized group is a racial/ethnic group whose share of faculty is less than one-ninth, while an underrepresented group is a racial/ethnic group whose share of faculty is less than the share of students of the same race/ethnicity. The statistics presented in the Table are as of 2021.