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Trends in Faculty Diversity at Selective Public Universities in the 21st Century

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Abstract

We document trends in racial-ethnic and gender diversity among faculty at selective public universities in the U.S. since the turn of the 21st century, overall and separately in science, technology, engineering, and mathematics (STEM) fields. Racial-ethnic and gender diversity have broadly increased during the 21st century, and racial-ethnic diversity has increased at an accelerated rate since racial protests swept across college campuses during the 2015-16 academic year. When we analyze STEM and non-STEM fields separately, we find the share of female faculty is increasing faster in STEM fields, which is decreasing the cross-field gender diversity gap. In contrast, the share of Black faculty in STEM fields is increasing at a much lower rate than in non-STEM fields, exacerbating the cross-field gap in the Black faculty share. A similar pattern is present among Hispanic assistant professors.

Key words: faculty diversity; faculty racial diversity; faculty gender diversity; STEM diversity; faculty diversity in STEM fields

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1. Introduction

We document changes to the diversity of tenured and tenure-track faculty at selective public universities in the U.S. since the turn of the 21st century. We show racial-ethnic and gender diversity among faculty has been modestly but persistently increasing. The share of White faculty declined from 83 to 66 percent between 2002 and 2022 and the shares of Asian, Black, and Hispanic faculty all increased. The share of female faculty increased from 25 to 36 percent. Since racial protests swept across college campuses nationwide in 2015-16, increases in the shares of Black and Hispanic faculty (especially among assistant professors) have accelerated.

We also document diversity trends separately in Science, Technology, Engineering, and Mathematics (STEM) fields. We find the share of female faculty in STEM fields is increasing faster than in non-STEM fields, which is helping to narrow the cross-field faculty gender gap. In contrast, the share of Black faculty is increasing much slower in STEM fields than in non-STEM fields. Moreover, among new assistant professors, recent gains in the Hispanic faculty share are also predominantly in non-STEM fields. These disparate trends by race-ethnicity are widening the cross-field diversity gap. Given research showing faculty serve as role models for demographically matched students, these findings imply unintended consequences of recent changes to the demographic composition of university faculty.

2. Faculty Diversity: Evidence and Action

A more diverse faculty impacts students primarily through two channels. First, it broadens the viewpoints covered in university curricula (Deo et al., 2010; Hurtado, 2001), which affects all students. Second, students from underrepresented backgrounds benefit when taught by someone who shares their demographic characteristics.

There is a large and growing literature documenting the effects of demographic match. For instance, Fairlie et al. (2014) find that same-race instructors in community college lower the achievement gap and dropout rate for URM students. And in STEM fields, where women are underrepresented, Hoffman and Oreopoulos (2009) find a same sex instructor increases academic performance and decreases the likelihood of dropping a class. Demographic match between students and college instructors also influences students' field trajectories. Fairlie et al. (2014) find racial minority students are more likely to enroll in subsequent courses and major in an area if they have a racial minority instructor, and Price (2010) shows having a Black STEM instructor increases the likelihood that Black students continue in a STEM major. Likewise, Bettinger and Long (2005) show female instructors cause female students to take more courses in the same field, and to major in the same field, and Carrell et al. (2010) replicate this finding for female students with high SAT math scores in STEM fields . These benefits of demographic match are commonly ascribed to role model effects.[1]

Research highlights the value of diversifying the faculty to make it more representative of the population, and at least on the surface, universities have long supported diversity efforts. However, a new urgency emerged from the wave of racial protests that swept across college campuses during the 2015-16 academic year. These protests prompted large university investments in improving diversity along many dimensions, including among faculty. For example, in 2016 the University of Michigan pledged $85 million to complete a strategic plan for Diversity, Equity and Inclusion (DEI), in addition to its existing $40 million annual budget (Allen, 2016). Similarly, in 2015 Yale launched a five year, $50 million initiative to improve faculty diversity (Salovey & Polak, 2015). More broadly, from 2015 to 2019, the share of universities with a Chief Diversity Officer increased by almost twenty percentage points (Bradley et al., 2022). Diversity investments have been largely targeted at racial-ethnic diversity, but gender diversity is also covered under DEI initiatives. The emphasis on gender equity is exemplified by newly formed committees on college campuses across the U.S., such as the Louisiana State University Council on Gender Equity and the Commission on Women and Gender Equity in Academia at the University of Rochester.

3. Data

We use two data sources for our analysis. First is IPEDS, which includes data from all universities in the U.S. that participate in federal student financial aid programs. We begin with a sample of all public R1 universities from IPEDS and focus on diversity trends among tenured and tenure-track faculty. Our IPEDS data cover the academic years 2001-02 through 2021-22 (hereafter we denote academic years by the spring year—e.g., 2001-02 as 2002).

The second data source is a panel dataset we built from the original dataset used in Li and Koedel (2017), which we refer to as the “L&K dataset.” The L&K dataset is a department-level panel dataset covering 120 academic departments at 40 selective public universities. Li and Koedel (2017) collected the first wave of data in 2016. In 2023, we conducted a follow-up data collection

[1] Similar results are also common in the K-12 education literature (a partial list of studies includes Dee, 2004; Egalite, Kisida, and Winters, 2015; Gershenson et al., 2022; Gottfried, Kirksey, and Fletcher, 2022; Lindsay and Hart, 2017)

of the same departments. The initial year of the L&K dataset is the year of the racial protests that spurred recent university investments in diversity, facilitating our investigation of post-protest changes to diversity. Details about the original Li and Koedel data collection in 2016, and our follow-up in 2023, are provided in Appendix A.

An advantage of the L&K dataset is that we can identify faculty by field, unlike in IPEDS. The original Li and Koedel (2017) sampling frame covered six academic departments: biology, chemistry, economics, English, educational leadership and policy, and sociology. Acknowledging some ambiguity in which fields should be defined as STEM, for our primary field comparison we categorize biology, chemistry, and economics as STEM fields, and English, educational leadership and policy, and sociology as non-STEM fields. We also show our findings are similar if we use narrower definitions of STEM and non-STEM fields—specifically, if we categorize biology and chemistry only as STEM, and English and sociology only as non-STEM (see below).

Table 1 provides baseline shares of faculty by rank, race-ethnicity, and gender across the IPEDS and L&K datasets in 2016. The first three columns show the IPEDS and L&K datasets are broadly similar; the last two columns document differences in faculty representation between STEM and non-STEM fields. A discussion of the descriptive information provided in Table 1—including potential sources of some modest differences between the IPEDS and L&K datasets—is provided in Appendix A.

4. Results

Figure 1 shows trends in the shares of faculty who are Asian, Black, Hispanic, White, and Female since 2002 using data from IPEDS. Trends are reported overall and separately by faculty rank. For ease of presentation, we restrict the university sample in Figure 1 to match the universities in the L&K dataset (from column 2 of Table 1), but below we confirm the trends are nearly identical for the full sample of public R1 universities in IPEDS.[2]

The share of White faculty declined from 83 to 66 percent during the panel period. The shares of Asian, Black, and Hispanic faculty all increased, albeit with different patterns of growth. The Asian faculty share increased rapidly, more than doubling from 7.7 to 16.0 percentage points. The trend in the Asian assistant professor share was flat during the latter half of the data panel, but this was offset in the total trend by an accelerated increase at the associate level. The Black faculty

[2] Trends prior to 2017 use even-numbered years only because race-ethnicity data reporting was optional in odd-numbered years. Race-ethnicity data reporting was also optional in 2010, so it is omitted.

share has increased very modestly since 2002, rising from just 3.3 to 3.8 percent overall. Since 2016, however, there is a sharp increase in the Black assistant professor share, which has grown by almost 40 percent (albeit off a low base of just 4.2 percentage points). The Black associate professor share declined and the full professor share increased since 2016. A possible explanation is that promotion rates for Black associate professors have increased in recent years. The Hispanic faculty share at the beginning of the data panel was slightly below the Black faculty share, but it has grown rapidly since, doubling since 2002. And like with Black faculty, growth in the share of Hispanic assistant professors has risen sharply since 2016.[3]

Turning to gender diversity, panel E of Figure 1 shows a persistent increase in female faculty representation. Overall, the female faculty share increased from 25 to 36 percent. The female assistant professor share consistently exceeds the female share at other ranks, although the gender gap across ranks is closing over time. At the assistant professor level as of 2022, the female share is approaching gender parity, at 46 percent.

In Figure 2, we use the L&K dataset to explore heterogeneity between STEM and non-STEM fields. We report four different calculations of the change in the faculty share for each racial-ethnic and gender group, by rank: (1) overall in IPEDS using the L&K university sample from 2016-2022 (2023 IPEDS data are not yet available), (2) overall in the L&K dataset from 2016-2023, (3) in STEM fields in the L&K dataset, and (4) in non-STEM fields in the L&K dataset. The first two bars are for comparing the trends in IPEDS and the L&K datasets. The overall trends are very similar in panel A. When we split faculty by rank the trends are directionally aligned but differ in magnitude in some instances, which we attribute primarily to sampling variance.[4] The third and fourth bars document field heterogeneity between STEM and non-STEM fields.

We focus first on heterogeneity among all faculty in Panel A. Many of the total diversity trends are reflected in both STEM and non-STEM fields, with two exceptions. First, recent growth in the female faculty share is higher in STEM fields than in non-STEM fields, which will help to narrow the gender representation gap across fields over time. Second, virtually all of the growth

[3] The percentages of Asian, Black, Hispanic, and White faculty do not sum to 100 in the figure because IPEDS includes additional racial-ethnic categories (Table 1).

[4] The sampling variance explanation is consistent with the pattern of discrepancies in the figure. Namely, the largest discrepancies are at the assistant and associate levels, where the L&K sample size is smallest (Table 1). At the full professor level the discrepancies shrink considerably.

in the Black faculty share since 2016 has occurred in non-STEM fields. In contrast to the gender result, this suggests a widening of the Black faculty representation gap across fields.

The rank-specific changes in panels B to D reveal several additional insights. One is that growth in the Hispanic assistant professor share in Panel B is driven primarily by growth in non-STEM fields, but this is offset by the increase in the Hispanic full professor share in Panel D, which is almost entirely in STEM fields. This bears monitoring going forward, as it suggests a shift over time in the distribution of Hispanic faculty across fields. We also find recent growth in the share of female assistant professors is entirely in STEM fields, and in fact there was a modest decline in share of female assistant professors in non-STEM fields from 2016-2023. This further reinforces the finding that recent gender diversity dynamics are helping to narrow the gender imbalance between STEM and non-STEM fields.

5. Robustness

We briefly report on two robustness tests. First, Appendix Figure B1 shows the diversity trends in Figure 1 are almost identical if we use the full sample of public R1 universities in IPEDS, rather than the L&K university sample. Second, Appendix Figure B2 shows our findings in STEM and non-STEM fields are similar if we define these fields more rigidly (biology and chemistry as STEM; English and sociology as non-STEM).

6. Conclusion

We document diversity trends among tenured and tenure track faculty at selective public universities in the U.S. since the turn of the 21st century. Racial-ethnic and gender diversity have consistently increased during this period, and the shares of Black and Hispanic assistant professors have seen accelerated growth since the 2015-16 academic year. A unique contribution of our study is to document diversity trends in STEM and non-STEM fields. We find female faculty representation is increasing more rapidly in STEM than in non-STEM fields. The reverse is true for Black faculty (and similarly for Hispanic faculty at the assistant professor level). These disparate trends should help to narrow the female faculty representation gap across STEM and non-STEM fields over time but will exacerbate the Black and Hispanic gaps. Given robust evidence that (a) faculty draw demographically similar students into their fields (Bettinger & Long 2005; Carrell *et al.* 2010; Fairlie et al. (2014; Price, 2010) and (b) STEM fields are higher paying (Carnevale, Cheah, and Hanson, 2015; Webber, 2016), these changes may contribute to the overrepresentation of Black and Hispanic students in less lucrative fields (also see Bleemer and Mehta, 2023).

A concrete policy recommendation is for universities to pay attention to the balance of faculty diversity across different fields of study. This is not a trivial recommendation given that the supply of PhDs—the key qualification necessary for a faculty position—is out of balance along the same dimensions as the faculty (Li and Koedel, 2017; Parsons, 2023). However, ignoring field imbalance in efforts to diversify the faculty may lead to unintended negative consequences for precisely the students who are meant to benefit most from such efforts.

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Tables and Figures

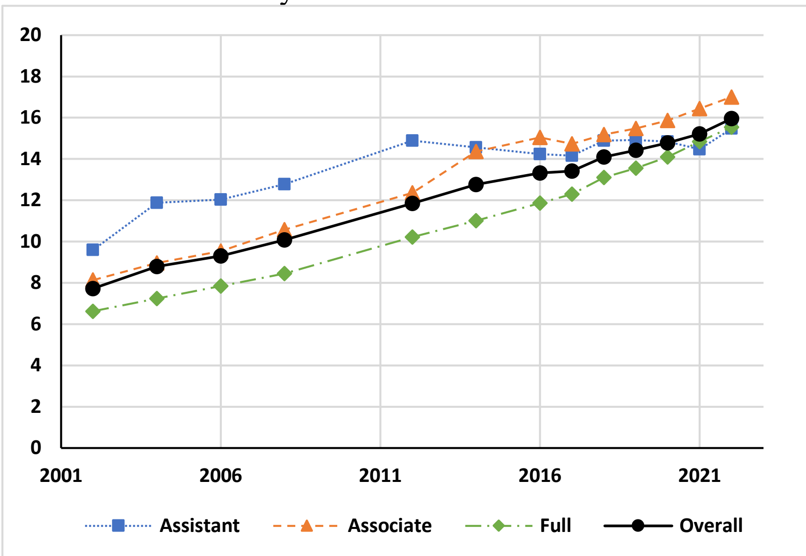
Table 1. Summary Statistics for the IPEDS and L&K Datasets.

	IPEDS: All Public R1 Universities	IPEDS: L&K University Sample	L&K Dataset	L&K Dataset: STEM	L&K Dataset: Non-STEM
Faculty Rank					
Assistant professor	23.8%	21.6%	19.2%	21.7%	15.2%
Associate professor	32.0	29.7	28.1	22.5	36.7
Professor	44.2	48.7	52.8	55.7	48.2
Racial-ethnic shares					
Asian or Pacific Islander	13.3	13.3	11.8	15.0	7.0
Black	3.4	3.4	4.7	1.3	9.9
Hispanic	4.3	4.2	4.1	3.3	5.2
White	71.0	71.6	79.0	80.3	76.9
American Indian/Alaska Native	0.4	0.3	0.2	0.0	0.5
Two or more races	0.7	0.7	0.0	0.0	0.0
Race unknown	2.5	2.0	0.2	0.1	0.5
Non-resident alien	4.4	4.4	0.0	0.0	0.0
Gender shares					
Female	34.0	32.8	34.6	25.5	48.6
Male	66.0	67.2	65.4	74.5	51.3
Gender Unknown	0.0	0.0	0.0	0.0	0.1
N (universities)	106	40	40	40	40
N (faculty)	111,055	55,421	4,139	2,517	1,622

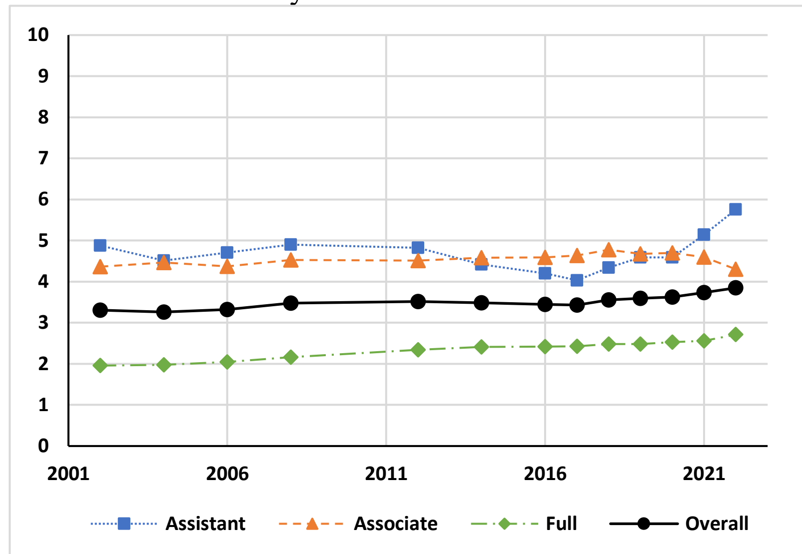
Notes. Each cell reports the percentage of the sample indicated by the column accounted for by the group indicated by the row. IPEDS = Integrated Postsecondary Education Data System. L&K = Li and Koedel. The “Asian or Pacific Islander” group is approximated in the L&K dataset by the “Asian” category. There is only one faculty member in the L&K dataset for whom gender was coded as unknown.

Figure 1. Racial-Ethnic and Female Faculty Percentages from 2002 – 2022 in IPEDS, Overall and by Rank

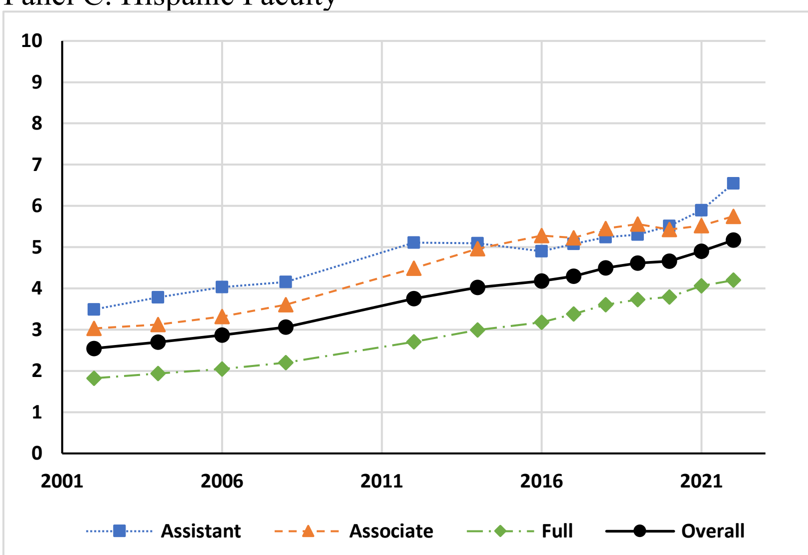
Panel A. Asian Faculty



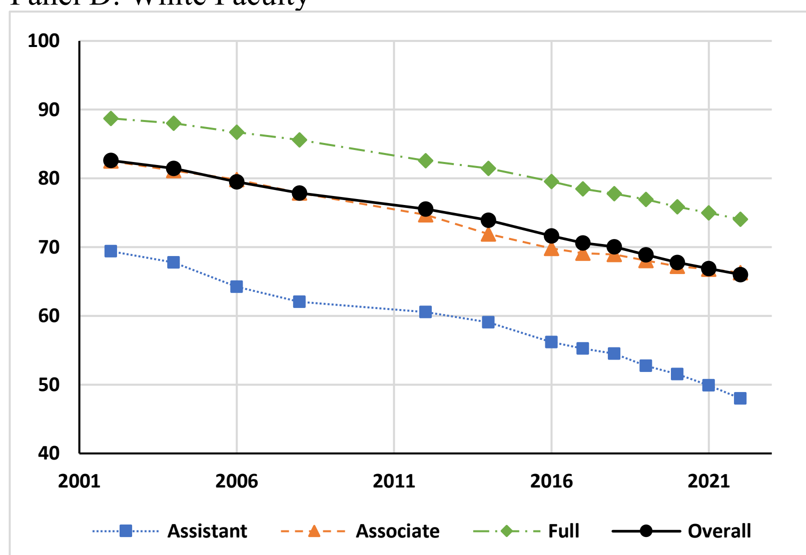
Panel B: Black Faculty



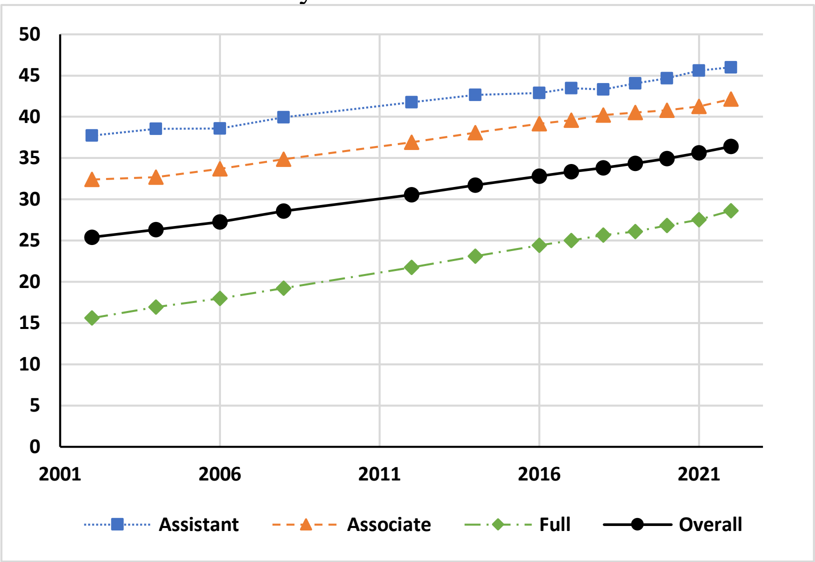
Panel C: Hispanic Faculty



Panel D: White Faculty



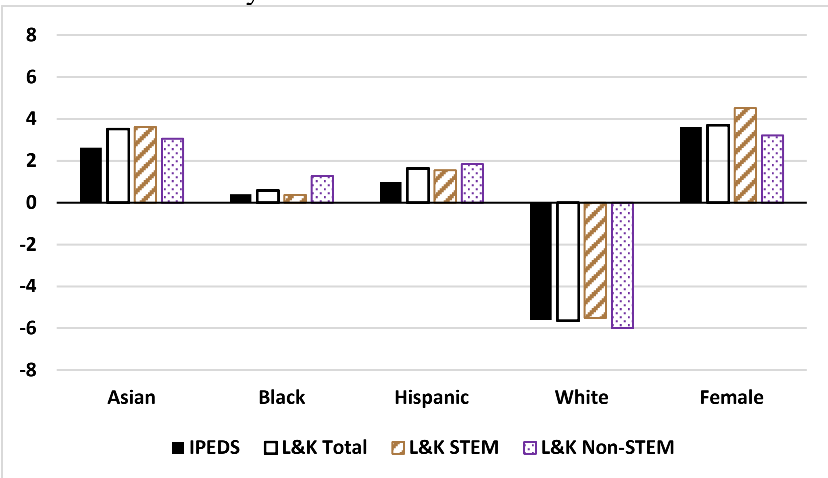
Panel E: Female Faculty



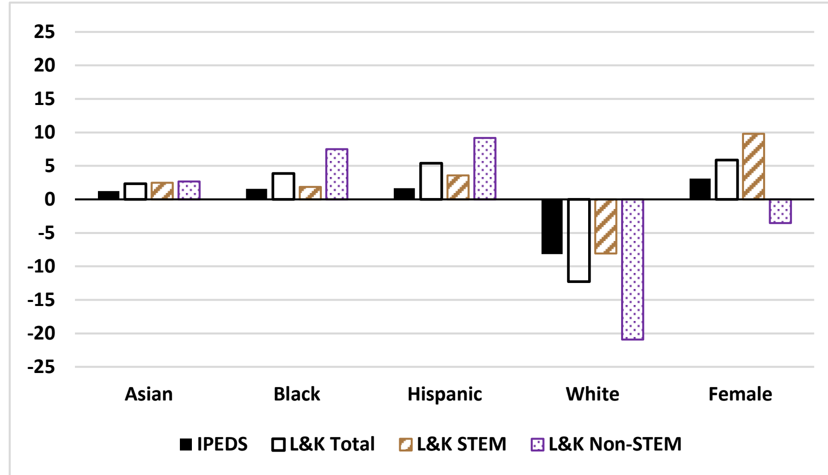
Notes. Data are from IPEDS for the L&K university sample. Odd-numbered years prior to 2017, and 2010, are omitted because reporting on faculty race-ethnicity in IPEDS was optional in these years. The racial-ethnic percentages in any given year do not sum to 100 because there are other racial-ethnic IPEDS categories not shown (see Table 1). The vertical scale is different in each graph to show trends over time for the different groups at appropriate scale.

Figure 2. Changes in Faculty Percentages Since 2016 by Racial-Ethnic and Gender Category, Overall and in STEM and non-STEM Fields.

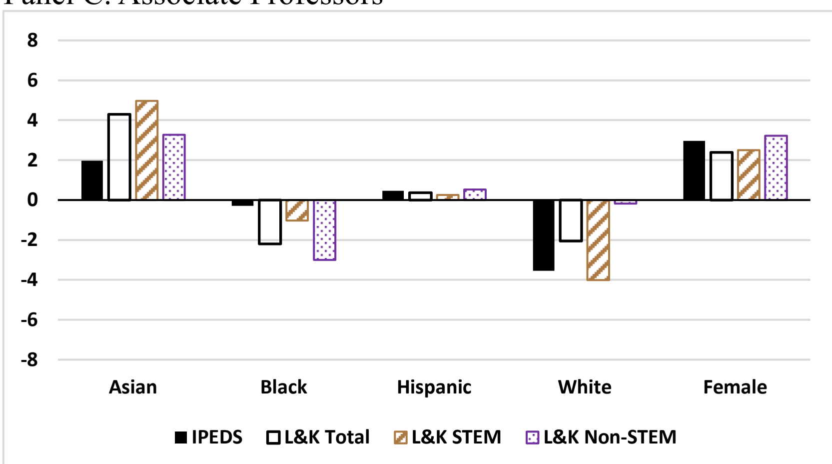
Panel A. All Faculty



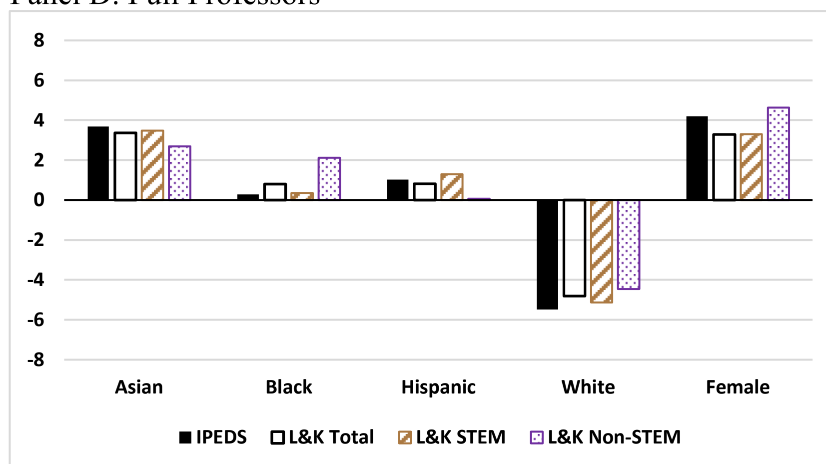
Panel B. Assistant Professors



Panel C. Associate Professors



Panel D. Full Professors



Notes. IPEDS = Integrated Postsecondary Education Data System. L&K = Li and Koedel Data. Changes in faculty percentages are from 2016 to 2022 in IPEDS and 2016 to 2023 in the L&K dataset (IPEDS data from 2023 are not yet available). IPEDS data are restricted to the L&K university sample. STEM fields are defined as biology, chemistry and economics; non-STEM fields are defined as English, educational leadership and policy, and sociology.

Appendices

Appendix A
Data Appendix

A.1 IPEDS Data

IPEDS includes data from all universities in the U.S. that participate in federal student financial aid programs. For ease of presentation, our analysis in the main text uses data from IPEDS for the same 40 universities used by Li and Koedel (2017), which are listed in Appendix Table A1 below. But as noted in the text, and shown in Appendix B, the broad trends in diversity indicated in IPEDS for all public R1 universities are very similar to the trends in the 40-university sample used by Li and Koedel (2017).

We use data from IPEDS covering the years 2002 to 2022. As noted briefly in the text, demographic reporting on faculty was not required in odd-numbered years prior to 2017, and in 2010, so we omit those years from the trends.[5]

A.2 Li & Koedel Data

We refer interested readers to Li and Koedel's original 2017 article for a detailed discussion of their original data collection effort during the 2015-16 academic year. In this section, we briefly highlight some key aspects of their data collection, along with our follow-up collection in 2022-23.

During the 2015-16 academic year, Li and Koedel (2017) collected data on individual faculty from six academic departments—biology, chemistry, economics, English, educational leadership and policy, and sociology—across 40 selective public universities. The universities in the original dataset correspond roughly to the highest-ranked universities by *U.S. News & World Report* in 2015, with several adjustments as described in their original article (Li & Koedel, 2017). Three of the six focal departments were sampled at random at each university, generating a dataset of faculty in 120 unique academic departments. For selected departments, information was collected for all tenured and tenure-track faculty.[6] Appendix Table A1 lists the universities and departments included in Li and Koedel's original dataset.

We conducted a follow-up data collection of all faculty in the same departments during the 2022-23 academic year to construct the department-level panel used for our analysis. For the follow-up data collection, we collected data for each tenured and tenure-track faculty member on race-ethnicity, gender, and academic rank. Many of the faculty members in these departments in 2022-23 were also present in 2015-16, but there were many new additions and exits. We also identified a small number of likely errors in the original Li and Koedel dataset, which we corrected during the process of building our data panel.[7]

In Li and Koedel's original dataset, faculty race-ethnicity and gender designations were made by visual inspection of faculty pictures, origins of names, and in some cases, biographical details (*e.g.,* the country of the undergraduate institution listed on their CV). We used the same approach in our follow-up data collection. In both waves of the dataset, interrater reliability of the

[5] Optionally reported data are available in those years in IPEDS, but there are some oddities with the data so we omit them.

[6] This differentiates the Li and Koedel dataset from survey-based datasets of faculty, which are not comprehensive for any departments due to non-response (Li and Koedel, 2017).

[7] We dropped 25 faculty that we determined based on their biographical details should not have been included in the original dataset. We also added 117 faculty whose biographies indicated they should have been included in the original Li and Koedel dataset but were missing. Overall, these adjustments imply an error rate in faculty categorizations in the original Li and Koedel dataset of approximately 3.5 percent.

race-ethnicity and gender designations is high.[8] Interrater agreement does not ensure measurement accuracy (i.e., both raters could be in agreement but wrong); however, a high interrater reliability rules out at least some types of measurement error. Conceptually, there are strengths and weaknesses of the external approach used to code race-ethnicity and gender in the L&K dataset. We do not relitigate these strengths and weaknesses here, but they are discussed in depth in the original Li and Koedel article (Li and Koedel, 2017), and in follow-up commentaries by Laughter (2018) and Li and Koedel (2018).

The approach to coding race-ethnicity and gender in the L&K dataset differs from the approach in IPEDS, which is ultimately sourced from faculty self-reporting. Table 1 in the main text shows the racial-ethnic and gender shares are broadly similar between IPEDS and the L&K dataset, although there are some differences. One source of differences is that IPEDS tracks more racial-ethnic categories than the L&K dataset. Two notable groups represented in IPEDS but not in the L&K dataset are multi-race faculty (0.7 percent in IPEDS) and non-resident alien faculty (4.4 percent in IPEDS). In addition, in IPEDS there is a much larger share of faculty with unknown race-ethnicity (2.0 percent versus 0.2 percent in the L&K dataset), which we attribute to the nondisclosure option in racial-ethnic self-reporting (in contrast, virtually all faculty are assigned a racial-ethnic group in the L&K dataset).

Another factor that likely contributes to some differences in the racial-ethnic (and perhaps gender) shares across datasets is that IPEDS covers faculty in all fields, whereas the L&K dataset covers faculty in just six fields. To the extent the six fields covered in the L&K dataset are not representative of faculty in all fields, some differences may emerge. Unfortunately, because we lack information from IPEDS about faculty fields, we cannot investigate this possibility in depth. Still, on the whole, we interpret the IPEDS and L&K datasets as broadly aligned in their racial-ethnic and gender shares.

[8] In wave-1 during the 2015-16 academic year, Li and Koedel (2017) report race-ethnicity and gender interrater reliabilities of 95.5 and 99.75 percent, respectively. In wave-2 during the 2022-23 academic year, our interrater reliabilities were 96 and 100 percent, respectively.

Appendix Table A1. Sample of Universities and Departments in the L&K Dataset.

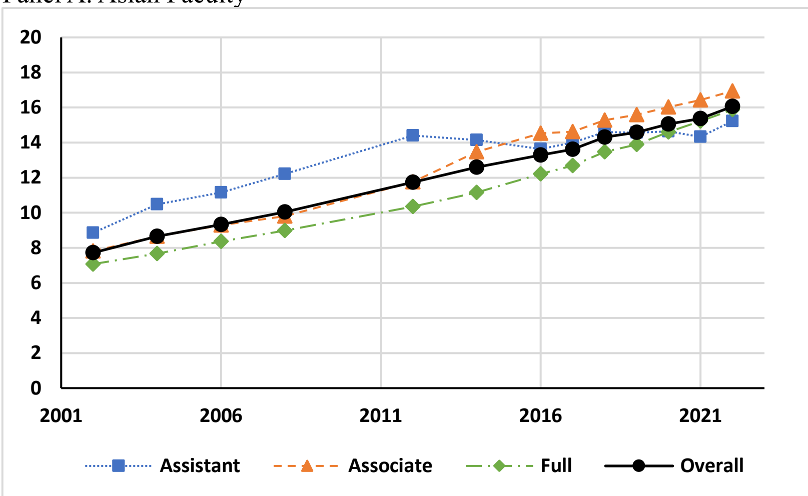
	Biology	Chemistry	Economics	Education (Leadership/ Policy)	English	Sociology
University of California-Berkeley				X	X	X
University of California-Los Angeles		X	X	X		
University of Virginia			X	X	X	
University of Michigan-Ann Arbor			X	X		X
University of North Carolina-Chapel Hill		X	X			X
College of William & Mary		X	X		X	
Georgia Institute of Technology	X		X			X
University of California-Santa Barbara	X				X	X
University of California-Irvine	X	X	X			
University of California-San Diego	X				X	X
University of Illinois-Urbana-Champaign	X				X	X
University of Wisconsin-Madison		X		X		X
University of Florida	X		X		X	
Ohio State University-Columbus			X	X	X	
University of Texas-Austin		X		X		X
University of Washington	X		X	X		
University of Connecticut	X	X	X			
University of Maryland-College Park	X	X				X
Clemson University	X			X		X
Purdue University-West Lafayette	X		X	X		
University of Georgia		X		X	X	
University of Minnesota-Twin Cities	X		X	X		
Texas A&M University-College Station		X		X	X	
Virginia Tech	X			X	X	
Rutgers University-New Brunswick	X			X		X
Indiana University-Bloomington			X	X	X	
Michigan State University	X	X	X			
University of Massachusetts-Amherst	X		X		X	
Miami University-Oxford	X		X			X
University of Iowa		X	X		X	
Binghamton University-SUNY	X	X	X			
North Carolina State University-Raleigh	X		X		X	
Stony Brook University-SUNY	X				X	X
University of Vermont	X		X			X
Florida State University				X	X	X
University at Buffalo-SUNY		X		X	X	
University of Missouri		X		X	X	
University of Nebraska-Lincoln	X	X				X
University of Oregon			X	X	X	
Iowa State University	X	X				X
Total Departments	23	17	22	20	20	18

Notes: The sampling design is such that Li and Koedel would have expected to collect data from 20 departments in each field. The small deviations from the expected number by field are the result of sampling variability (Li and Koedel, 2017).

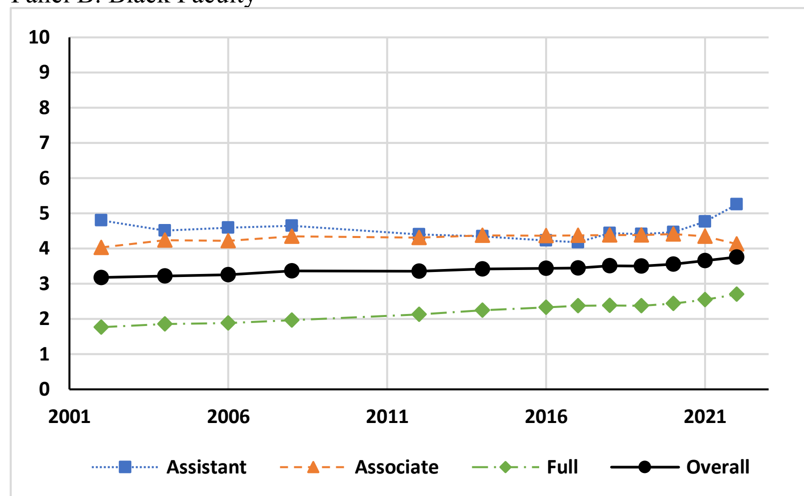
Appendix B
Supplementary Figures

Appendix Figure B1. Racial-Ethnic and Female Faculty Percentages from 2002 – 2022 in IPEDS, Overall and by Rank. All Public R1 Universities.

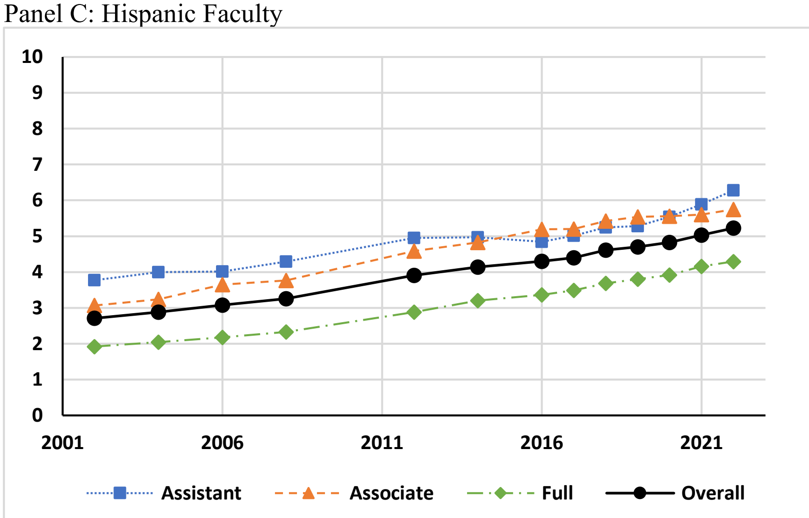
Panel A. Asian Faculty



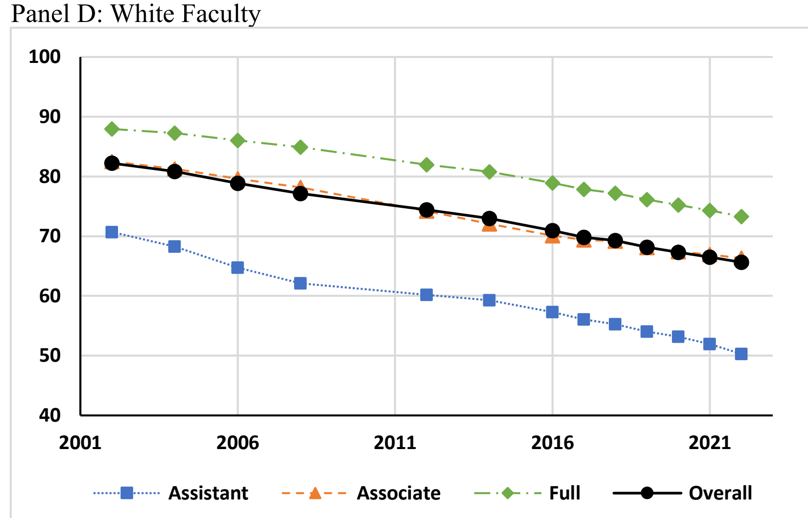
Panel B: Black Faculty



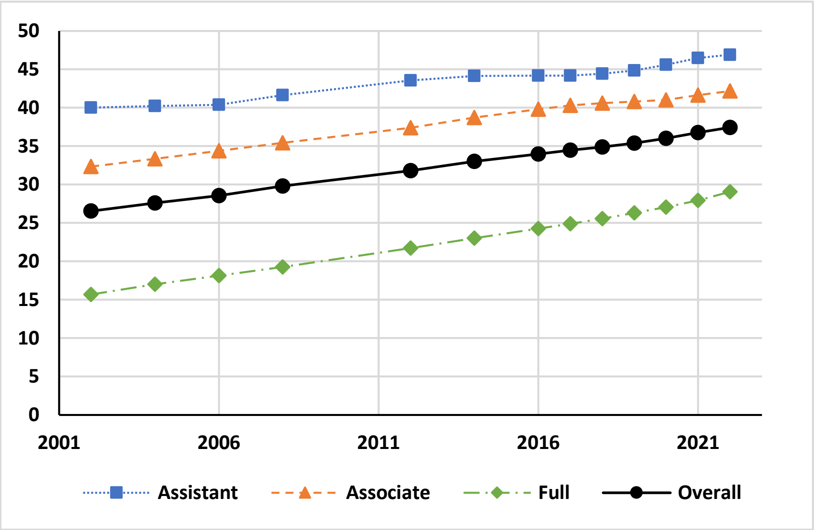
Panel C: Hispanic Faculty



Panel D: White Faculty



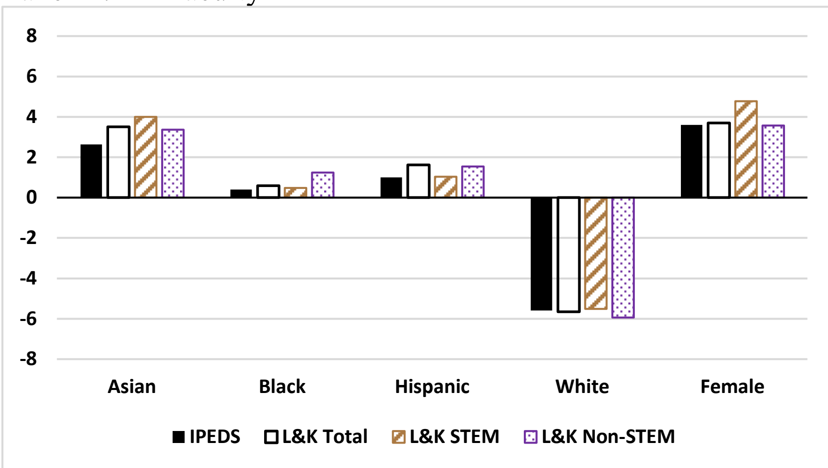
Panel E: Female Faculty



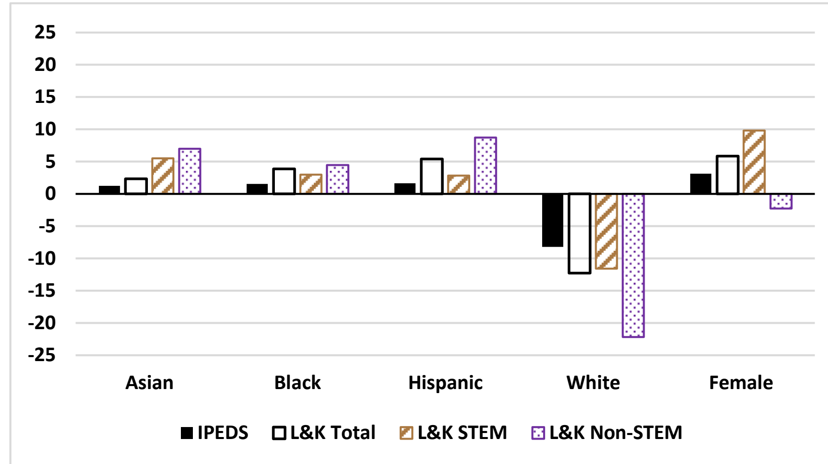
Notes. Data are from IPEDS for all public R1 universities. Odd-numbered years prior to 2017, and 2010, are omitted because reporting on faculty race-ethnicity in IPEDS was optional in these years. The racial-ethnic percentages in any given year do not sum to 100 because there are other racial-ethnic IPEDS categories not shown (see Table 1). The vertical scale is different in each graph to show trends over time for the different groups at appropriate scale.

Appendix Figure B2. Changes in Faculty Percentages Since 2016 by Racial-Ethnic and Gender Category, Overall and in STEM and non-STEM Fields Using More Restrictive Definitions of STEM and non-STEM Fields

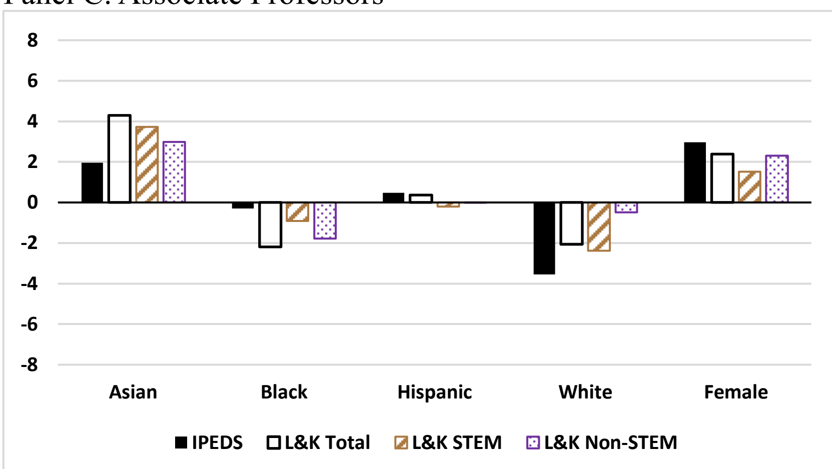
Panel A. All Faculty



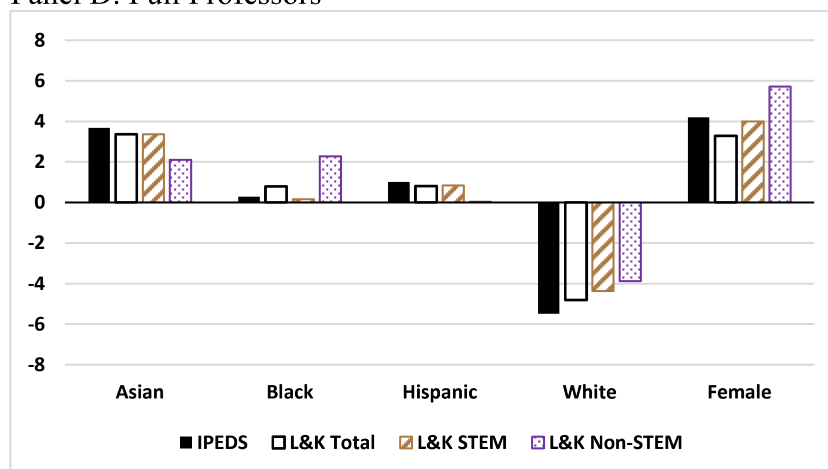
Panel B. Assistant Professors



Panel C. Associate Professors



Panel D. Full Professors



Notes. IPEDS = Integrated Postsecondary Education Data System. L&K = Li and Koedel Data. Changes in faculty percentages are from 2016 to 2022 in IPEDS and 2016 to 2023 in the L&K dataset (IPEDS data from 2023 are not yet available). IPEDS data are restricted to the L&K university sample. STEM fields are defined as biology and chemistry; non-STEM fields are defined as English and sociology.