

Measuring and calibrating the racial/ethnic densities of executives in US publicly traded companies

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Abstract

We measure the racial/ethnic densities (RAEDs) of executives in a random sample of 523 US public companies and the S&P 500[®]. When we calibrate the RAEDs of executives as a whole against the RAEDs of the 2019 US population, we find that American Indians/Alaska Natives, Blacks and Hispanics are underrepresented and Whites are overrepresented. However, when instead we calibrate executive RAEDs against a benchmark that seeks to take into account key features of the demand for and supply of proto-executive talent, namely the RAEDs of the cohorts of students graduating with a bachelor’s degree from the broad New York Times 2017 list of the top 100 US four-year colleges and universities, matched to executives’ BA/BS graduation years, we find mostly different and at times opposite results. For example, for executives as a whole in S&P 500[®] firms, Blacks and Hispanics are overdense relative to their top-bachelor’s-qualified benchmark RAEDs, while Whites are underdense. For CEOs in S&P 500[®] firms, Blacks are underdense whereas Asians/Pacific Islanders, Hispanics and Whites are at their top-bachelor’s-qualified benchmark expected densities. We conclude that because the sign and magnitude of a deviation from a racial/ethnic benchmark can influence the inferences that are made and policies that are proposed with regard to the presence and/or magnitude of racial bias or discrimination, the choice of benchmark against which executive RAEDs are calibrated is an important one.

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1. Introduction and Summary of Results

A view that is commonly expressed by academics, activists, business leaders, and commentators is that in the ranks of corporate executives, Blacks and Hispanics are underrepresented and Whites are overrepresented, particularly in large US publicly traded firms and at the C-Suite level (Zimmerman 2010; Green, Holman and Paskin 2018; Chen 2020; Larcker and Tayan 2020; Singh 2020).¹

In our study, we show that this view is empirically correct when under- and overrepresentation are defined by benchmarking executive racial and ethnic densities (RAEDs) against those of the 2019 US population. However, we also show that mainly different and at times opposite results emerge when under- and overrepresentation are instead defined as under- and overdensity by calibrating executive RAEDs against a benchmark that seeks to take into account key features of the demand for and supply of executive talent, namely the RAEDs of seniors who graduated from the New York Times (NYT) list of the top 100 US four-year colleges and universities (Ashkenas, Park, and Pearce, 2017), matched to executive BA/BS graduation years.² We propose that an advantage of our top-BA/BS-qualified (TBQ) approach to calibrating executive RAEDs is that it reflects the reality that because US publicly traded firms are financially successful, their demand in hiring potential executives (henceforth “proto-executives”) will center on the academically strongest BA/BS graduates, particularly when these students are graduating and their talent can be shaped to fit firms’ specific needs. We suggest that this feature of firms’ demand will be supplied by the colleges and universities that are on or are similar to those that are on the NYT list of its top 100 colleges and universities. Since this list includes at least one flagship public university per US state, we posit that the NYT list represents a large average supply of about 260,000 new BA/BS graduates per year over 1987–2008, enough we posit to absorb a substantial fraction of the annual demand for proto-executive talent coming from US publicly traded firms.

Our data consist of almost 11,000 executives whom we identified over the period June–August 2020 in two sets of companies: a random sample of 523 US publicly traded firms, and all 500 firms in the S&P 500® Index. The former were chosen so as to be able to make unbiased generalizations about the population of US publicly traded firms, and the latter because S&P 500® firms are large, visible and often the focus of public attention. We define an executive as any individual who is publicly disclosed by a

¹ In “Diversity in the C-Suite: The dismal state of diversity among Fortune 100 senior executives,” Larcker and Tayan (2020, p. 3) state, “Racially diverse executives hold only 16 percent of total C-suite positions. Only 16 have a non-white CEO. 26 of the Fortune 100 have no ethnic diversity at the C+1 level . . . The CFO role is the least racially diverse position in the C-suite. There are only 4 CFOs who are not white.” Green, Holman, and Paskin (2018) state that “the occupants of corner offices are a stunningly homogeneous bunch. There are now just three black CEOs running Fortune 500 companies . . . [E]xecutive ranks and upper management remain persistently, stubbornly white.”

² In this study, we use the term BA/BS to refer to all bachelor’s degrees, i.e., degrees received from a college or university at the completion of undergraduate study.

firm to be on its leadership team (this occurs most often on the firm’s website). We coded several characteristics for each executive, including his or her judged race or ethnicity (RAETH), judged and/or actual age, and formal position(s) and/or title(s). In judging an executive’s race or ethnicity, we studied their photo and first and last names, and ultimately classified them into one of five racial or ethnic groups: American Indian/Alaska Native, Asian/Pacific Islander, Black, Hispanic, and White.³

Our method enables us to estimate the RAETHs of a large total of 10,286 distinct executives. However, because we do not undertake in-depth biographical analysis, our method is likely to undercount non-Whites and overcount Whites, primarily because Hispanic and European faces and names can appear to be similar to each other. We seek to adjust for such biases by multiplying prima facie executive RAEDs by Visual Identification Adjustment Factors (VIAFs) that we calculate for Asian/Pacific Islander, Black, and Hispanic executives—with the White VIAF being the plug figure—using the overlaps between our data and a more exhaustively derived, and we believe accurate, CEO + CFO dataset provided by Crist|Kolder Associates (CK). We use the acronym VRAEDs for RAEDs that have been multiplied by their VIAFs, and we base all of our empirical analyses on VRAEDs.

We first determine the overall VRAEDs for the 4,057 random sample executives (6,931 S&P 500[®] executives): American Indian/Alaska Native 0.02% (0.01%), Asian/Pacific Islander 6.9% (7.6%), Black 2.6% (3.9%), Hispanic 3.4% (3.3%), and White 87.1% (85.1%). We then compare these executive VRAEDs to the common benchmark of the US population, USPopRAED. From 2019 US Census data, we estimate that the 2019 USPopRAED figures are as follows: American Indian/Alaska Native 1.0%, Asian/Pacific Islander 6.4%, Black 13.0%, Hispanic 18.5%, and White 61.2%. Calibrating executive VRAEDs against USPopRAED, and employing the terms underrepresentation, at representation, and overrepresentation to denote VRAEDs that are below, at, and above USPopRAED, respectively, we find that in both the random sample and S&P 500[®] firms, American Indian/Alaska Natives, Blacks and Hispanics are underrepresented and Whites are overrepresented. Asians/Pacific Islanders are at their US population representation in our random sample and are overrepresented in the S&P 500[®].⁴

We then develop an alternative benchmark against which to calibrate executive RAEDs, namely the RAEDs of the yearly cohorts of seniors graduating with their BA/BS from the broad New York Times 2017 list of the top 100 US four-year colleges and universities, matched to executives’ BA/BS graduation years. This benchmark is motivated by two propositions: that US publicly traded firms are financial

³ We employ these five racial/ethnicity categories to follow the National Center for Educational Statistics’ Integrated Postsecondary Education Data System (NCES IPEDS) categories that were in place during the majority of the window of time covered by our study. See sections 2.2 and 3.2 for further details.

⁴ US census data indicate that the RAEDs of the US civilian workforce, USCivRAED, are similar to those of the US population such that using USCivRAED yields similar representation inferences to using USPopRAED.

successful and both seek and can afford to hire the “academically best and brightest” young people into their executive pipeline; and that such individuals are most likely to be found at colleges and universities on and like those on the NYT list.⁵ The NYT list comprises a broad set of 58 large public flagship schools (at least one per state) plus 42 private institutions, and it represents an average supply of about 260,000 new BA/BS graduates per year over the period 1987–2008. Data on the numbers and races and ethnicities of the graduating cohorts in each college and university in the NYT list come from the NCES IPEDS database for the years 1987–2008, which allows us to compute the RAEDs of graduating seniors in those years. Since the median executive in our datasets graduated from college in 1988, we straight-line extrapolate backwards in time to estimate the RAEDs of seniors graduating in 1974–1986 and set the RAEDs of seniors graduating before 1974 at their 1974 levels. Matched to executives’ estimated BA/BS graduation years, our method yields what we term TBQ expected executive RAEDs, or ERAEDs for short. We then calculate VRAED – ERAED for executives as a whole and for 10 subsets of executives, and employ the terms underdensity, at density, and overdensity to denote VRAEDs that are below, at, and above their ERAEDs, respectively.

The main takeaway from our analyses of VRAED – ERAED is that the TBQ approach to calibrating executive racial/ethnic proportions yields mainly different and sometimes opposite under-, at, and overdensities relative to the under-, at, and overrepresentations that come from calibrating executive VRAEDs against those of the US population. We highlight five key findings.

First, we consider 11 groups of executives in each of our random sample and S&P 500® datasets: All executives; EVPs, SVPs and VPs; and CEOs, CFOs, GCs, COOs, CHROs, CIOs, and CTOs.⁶ We find that in only two of these 11 groups is it the case that the fraction of times where the Z-statistics on VRAED – USPopRAED and VRAED – ERAED yield the same statistical inference exceeds 50%, with the mean agreement frequency being 42%. Equivalently, for a given set of firms to which the racial/ethnic calibration of executives is applied, calibrating executive RAEDs using a TBQ labor supply benchmark rather than the US population benchmark yields different inferences 58% of the time.

Second, the frequency of inferential disagreement varies greatly by executive race/ethnicity. The mean frequency of inferential disagreement across the 11 groups of executives is 5% for Asians/Pacific Islanders, 36% for American Indians/Alaska Natives, 73% for Blacks, 77% for Whites, and 100% for

⁵ We recognize that high quality candidates are also at and come from colleges and universities outside of the NYT top-100. However, we posit that US public companies tend to focus their hiring efforts, based on the presumption that the proportion of quality candidates is highest at schools on or like those on the NYT top-100 list. Whether this presumption is an empirically valid one on the part of firms is difficult to test, in that hiring from a narrower list of schools may become circular in that the best candidates may go to the best schools because companies hire from those schools.

⁶ These acronyms represent the following common executive ranks and titles: Executive Vice President, Senior Vice President, and Vice President; and Chief Executive Officer, Chief Financial Officer, General Counsel, Chief Operating Officer, Chief Human Resource Officer, Chief Information Officer, and Chief Technology Officer.

Hispanics. The choice of benchmark therefore matters very little when evaluating the under-, at, or overrepresentation or under-, at, or overdensity of Asian/Pacific Islander executives, but it matters very much in making the same evaluations for Hispanic executives.

Third, for executives overall, in the random sample we find that Asians/Pacific Islanders are at their US population representation and at their TBQ expected density, Blacks are underrepresented and underdense, Hispanics are underrepresented but at their expected density, and Whites are overrepresented and overdense. In S&P® 500 firms Asians/Pacific Islanders are overrepresented and overdense, Blacks and Hispanics are underrepresented but overdense, and Whites are overrepresented but underdense. These contrasts suggest that inferences related to the racial/ethnic representation and density of executives can change based on the particular set of firms to which US population versus TBQ calibrations are applied.

Fourth, the degree of under- or overrepresentation $VRAED - USPopRAED$ is often an order of magnitude larger than the degree of under- or overdensity $VRAED - ERAED$. For example, in the random sample of firms, the underrepresentations for Blacks and Hispanics and overrepresentation for Whites are -10.4% , -15.1% , and 26.0% , respectively, whereas the underdensity for Blacks and overdensities for Hispanics and Whites are 10+ times smaller, at -1.0% , 0.2% , and 1.1% , respectively. We interpret these results as indicating that the substantial majority of the differences between the RAEDs of US publicly traded firm executives and the US population occurred before the executives were hired from the colleges and universities that firms most likely seek to hire from, rather than after they are hired and are working towards becoming an executive. We strongly emphasize that we are not proposing that the magnitudes of $VRAED - USPopRAED$, $VRAED - ERAED$, and the differences between them show or indicate that no racial bias and/or discrimination is present in firms' hiring and/or talent development (Bertrand and Mullainathan 2004). Rather, we believe that our analyses indicate that most of the gap between $VRAED$ and $USPopRAED$ occurs before TBQ proto-executive talent is hired by sample firms.

Fifth, we show that Blacks and Hispanics are underrepresented and Whites are overrepresented among CEO and CFO executives. However, we also find that while Blacks are also underdense in CEOs and CFOs, Hispanics are not—they are at their TBQ expected densities. Whites are likewise at density in CEOs at S&P 500® firms, not overdense. It is therefore not the case that non-Whites are always underdense, nor that Whites are always overdense, at the highest levels of publicly traded firms' C-suites.

Overall, we conclude that the benchmark against which executive racial/ethnic densities are calibrated matters to inferences, and often matters a lot. We see this as important to highlight, because the underrepresentation of a particular race or ethnicity in firms based on calibration against the US population influences narratives and policy formulations regarding racial bias, and it is often taken as indicating racial bias against a race or ethnicity by firms or by other races/ethnicities within firms. Our work seeks to align with the “honest broker” role proposed by Eagly (2016, p. 214), who in her 2015

Presidential Address to the Society for the Psychological Study of Social Issues states that “the honest broker encourages decision makers to think beyond personal values and ideologically driven preferences to consider options that may make sense from a variety of perspectives.”

The rest of our paper proceeds as follows. We describe our data in section 2, and our TBQ executive labor supply measure in section 3. In section 4 we present our empirical results, while in section 5 we discuss the ways in which we hope our TBQ calibration can contribute to the debate about race and ethnicity in business. We follow this in section 6 by identifying some of the questions that we see our study as raising, and we present concluding remarks in section 7.

2. Data

2.1 Firms and executives’ non-race/ethnicity characteristics

We gather executive race, ethnicity, and other data on two sets of firms that were in place as of 12/31/2019: a random sample of 523 US publicly traded firms, and all firms in the S&P 500® Index. We choose the former so as to be able to generalize our results to the population of US publicly traded companies, and the latter because S&P 500® firms are large and often the focus of public attention.

We follow the website-disclosure approach of Hunt, Layton, and Prince (2015) and define an executive as any individual who is publicly disclosed by a firm to be on its leadership team, most often on the firm’s website. In the infrequent cases in which no executives are found on the firm’s website, we define a firm’s executives as the employees listed on the firm’s Bloomberg or Yahoo! Finance profile page, else the firm’s annual report, or (when available) judged from its comparably.com page.⁷ We searched online for and captured, when available (primarily from firms’ websites), in a screenshot the facial photo of each executive, together with her or his first and last name(s).⁸

In table 1 we present the data availability waterfalls. Based on our definition of an executive and the availability of individual data items, we arrived at a final set of 510 randomly chosen firms and 497 S&P 500® firms for which we were able to identify at least one named executive with a facial photo.

In table 2 we present descriptive statistics on the industry composition and selected financial characteristics of our sample firms, as of 12/31/19 or for the fiscal year ending on or before 12/31/19. Panel A reveals that in terms of Fama-French 12-Industry classifications, randomly chosen firms are more tightly clustered in Finance and in Healthcare, Medical Equipment, and Drugs than are S&P 500® firms, due to the presence of many small banks and biotech companies. Apart from the expected differences in

⁷ Yahoo! Finance’s profile page lists up to five executives. Bloomberg’s profile page typically lists 3–10 executives. Comparably.com lists up to 50+ people who work for the firm, only some of whom we judged to be executives.

⁸ The bulk of the capturing of executive names and photos took place June 10–August 5, 2020. For documentation and authentication purposes, we saved all executive screenshots in a separate Word + PDF file for each firm.

the size and scale of firms for all fundamental and stock market-based firm characteristics, panel B shows that based on medians, S&P 500® firms (SP) are more profitable than the random sample of firms (RS) in terms of gross margin %, ROE, ROA, and ROS. S&P 500® firms are also more levered.

Table 3 reports descriptive statistics for selected executives' characteristics using all the available data on each executive.⁹ Panel A shows that SP firms have an average of 14.6 executives, as compared to 8.6 executives in RS firms. Panel B reports that RS and SP firms have statistically indistinguishable gender statistics: 78% (22%) of RS executives and 76% (24%) of SP executives are male (female). Panel C shows the frequencies of different Chief- and Officer-level positions. Not surprisingly, the most common executive positions are CEO and CFO. Presidents are also common, as are GCs, Corporate Secretaries (who are often the same person as the GC), CHROs, and COOs. In terms of seniority, the most senior level of Senior EVPs/EVPs slightly outnumber SVPs, which in turn outnumber VPs.

2.2 *Executive race and ethnicity*

In judging an executive's race or ethnicity (RAETH), we follow Hunt, Layton, and Prince (2015) by visually studying each executive's photo and first and last names and classifying them into nine granular RAETH categories. With our lowercase tag for each category shown in parentheses, these categories are African ancestry (aa), European ancestry (eur), Near Eastern (ne), East Asian (ea), South Asian (sa), Latino (lat), Native American (na), and Other (o). We only diverge from Hunt, Layton, and Prince (2015) by redefining the Other RAETH category to consist of Pacific Islander (pi) or Alaska Native (an). To ensure consistency, all RAETH judgments were made by one coauthor.

As the data we use in seeking to calibrate executive RAEDs come from the National Center for Educational Statistics' Integrated Postsecondary Education Data System (NCES IPEDS), and NCES IPEDS used five racial/ethnicity categories during the time period pertinent to our study (outside of Nonresident aliens, which we set aside), we collapse our nine RAETH categories into NCES IPEDS' five RAETH categories. With our lowercase tag for each broader category in parentheses, the IPEDS RAETH categories are American Indian/Alaska Native (aian), Asian/Pacific Islander (api), Black (b), Hispanic (h) and White (w), where we define $aian = ai + an$, $api = ea + sa + pi$, $b = aa$, $h = lat$, and $w = eur + ne$. IPEDS' RAETH categories closely match those used for US executives in Hunt, Prince, Dixon-Fyle, and Yee (2018) and Dixon-Fyle, Hunt, Dolan, and Prince (2020).

The strength of our method of classifying an executive's race or ethnicity based on their photo and first and last name(s) is that we obtain RAETH estimates for 10,286 unique executives. However, because we do not employ in-depth biographical analysis of each executive, our approach is likely to

⁹ A full description of the executive characteristics that we coded is provided in appendix A.

undercount non-Whites, mainly because some Hispanic and European faces and names can be similar. We therefore calculated Visual Identification Adjustment Factors (VIAFs) in order to adjust the numbers and densities of our prima facie judged RAETHs and RAEDs of executives. We estimate VIAFs for Asian/Pacific Islander, Black, and Hispanic executives, set the VIAF for American Indians/Alaska Natives at 1.0 and treat the VIAF-based number of Whites as the plug. The executive-level data we use to calculate the VIAFs was provided by Crist|Kolder Associates (CK) from their 2020 Volatility Report. CK's data consist of the first and last names of all the CEOs and CFOs that CK recorded as being in the union of firms in the S&P 500[®] and Fortune 500, the name of the firm the CEO or CFO works for, and CK's classification of the CEO's or CFO's race or ethnicity. Our approach to calculating VIAFs uses only the subset of CK firms that are also in our database of S&P 500[®] firms, and only those CEOs and CFOs whom both we and CK identify. We take CK's racial/ethnic identifications to be the gold standard, because CK puts a great deal of effort into its identification process, going well beyond our approach of relying on executives' facial photos and names.

We define an executive's ethnicity or race coding as being correct and not needing adjustment if both we and CK agree on the coding. Where our coding of an executive's race or ethnicity differed from CK's, we researched biographical and other sources to confirm the coding. Then, to use Asians/Pacific Islanders (api) as an example, we calculate $VIAF_{api}$ as the ratio of the number of CEOs + CFOs that CK correctly coded as api to the number of CEOs + CFOs that we correctly coded as api, multiplied by the ratio of the difference between the number of CEOs + CFOs that CK correctly coded as api versus incorrectly coded as api, and the number of CEOs + CFOs that CK correctly coded as api. Similar calculations were performed for Black and Hispanic race/ethnicity. The resulting VIAFs are $VIAF_{aian} = 1.00$, $VIAF_{api} = 1.073$, $VIAF_b = 1.100$, and $VIAF_h = 1.546$.¹⁰ $VIAF_h$ is larger than both $VIAF_{api}$ and $VIAF_b$ because some Hispanic and European faces and names can appear to be similar, likely leading us in our coding to undercount Hispanic and overcount White executives.

Based on the assumption that our VIAFs are independent of executive level and title, we apply our VIAFs to all our executive RAEDs.¹¹ We use the acronym VRAED to denote that RAEDs have been multiplied by their VIAFs, and we base all our analyses on VRAEDs.

¹⁰ A full description of the calculations behind each VIAF is provided in appendix B.

¹¹ As a validation check on our VIAF-based RAEDs, we also obtained RAETH estimates at the executive level from List Service Direct (LSD). LSD uses a person's names to estimate their RAETH. However, similar to other studies that have used LSD (Brochet et al. 2019; Flam et al. 2020), we find that while the average across RS and SP of our VRAEDs for aian, api, and h (0.01%, 7.25%, and 3.35%, respectively) are close to the RAEDs obtained from LSD (0.04%, 7.31%, and 3.83%, respectively), LSD's RAED for b (0.75%) is far smaller than our VRAED for b (3.25%). This is because many Black and White names are not distinguishable, leading LSD to underidentify (overidentify) the number of Black (White) individuals. Nevertheless, this provides some support for the accuracy of our average VRAED for b (3.25%) in that for our executives, the ratio of 0.75% to 3.25% (= 23%) is very close to a similar calculation that can be made using the LSD

Table 4 presents the raw and VIAF-based numbers and densities of executives in the random sample of firms (panel A) and S&P 500[®] firms (panel B). The top half of each panel classifies executives by the nine RAETH categories of Hunt, Layton, and Prince (2015), and the bottom half by the five NCES IPEDS RAETH categories. For the 4,057 executives in the random sample (and the 6,931 executives in S&P 500[®]), we observe that the VRAEDs for executives taken as a whole are as follows: American Indian/Alaska Native 0.02% (0.01%); Asian/Pacific Islander 6.9% (7.6%); Black 2.6% (3.9%); Hispanic 3.4% (3.3%); and White 87.1% (85.1%). Comparing across the two sets of firms, the density of Black executives in S&P 500[®] firms is 1.3% higher than in the random sample of firms, and the density of White executives is -2.0% lower, with *z*-statistics of 3.9 and -2.9, respectively.

3. Top-BA/BS-qualified executive labor supply

3.1 *Rationale and description*

A key innovation in our study is that we measure, calibrate, and contrast the racial/ethnic composition of executive teams in US publicly traded firms against both the common approach to representation that calibrates relative to the US population,¹² and a density approach that benchmarks against a measure of the supply of proto-executives. A strength of the latter approach is that it aims to take into account key features of the demand for and supply of the raw talent from which firms hire. In particular, we propose that since US publicly traded firms tend to be the most financially successful firms in the US, their demand in hiring future executive talent is likely to be oriented toward the academically highest-performing individuals, particularly when these proto-executives are young and their raw talent can be shaped to fit the specific needs of the hiring firm.

In line with this thinking, we use as our proxy for the supply of proto-executives facing firms the cohorts of seniors who graduated from institutions on the NYT 2017 list of the top 100 US four-year colleges and universities (CUs) (Ashkenas, Park, and Pearce, 2017). The NYT list consists of a broad set of 58 large public flagship schools (one per state, plus an additional eight from California), plus 42 private CUs.¹³ The 58 public schools account for 82% of the 218,716 graduating seniors in the NYT's list of CUs

versus manual RAETH identification numbers of Black analysts (= 27%) found by Green et al. (2020, combining data in fn. 8 and table 1).

¹² We estimate the 2019 RAEDS of the US population to be American Indian/Alaska Native 1.0%; Asian/Pacific Islander 6.4%; Black 13.0%; Hispanic 18.5%; and White 61.2%. A full derivation is shown in appendix C.

¹³ A full description of NYT's top 100 US four-year colleges and universities, together with the number of BA/BS degrees conferred by each school in 1987 and in 2008, is provided in appendix D. We use the NYT top 100 rather than, for example, the top 100 colleges and universities in the prominent US News & World Report (USNWR) rankings of the Best US Colleges and Universities because the top 100 USNWR colleges and universities tilt more heavily toward smaller private institutions (63% for USNWR versus 42% for NYT). In our judgment the USNWR top 100 US colleges and universities moves away from, rather than toward, obtaining a TBQ labor supply measure that accurately reflects the size

in 1987 and 84% of the 300,308 graduates in 2008; these degrees from public CUs comprise 22.8% (19.8%) of all bachelor's degrees conferred by postsecondary US institutions in 1987 (2008), excluding degrees conferred to nonresident aliens.¹⁴ In appendix E we present evidence that we interpret as indicating that the NYT list is a plausible proxy for the full set of CUs that we suggest are likely to supply proto-executive talent to US publicly traded firms.

We obtained the sizes and races/ethnicities of the graduating cohorts in each college and university in the NYT list from the NCES IPEDS database for 1987–2008, enabling us to compute overall annual RAEDs for seniors graduating from the NYT top 100 CUs list. The annual RAEDs are shown in figure 1 and in the unshaded rows of table 5. Since the median executive graduated from college in 1988, and NCES IPEDS data is unavailable before 1987, we estimate the annual RAEDs of graduating seniors in the NYT list of top 100 CUs in 1974–1986 using straight-line backwards-in-time extrapolation. The resulting estimated annual RAEDs for 1974–1986 are shown in the tan-shaded area in table 6. We set the RAEDs of seniors graduating before 1974 at their 1974 levels.

3.2 *Matching the top-BA/BS-qualified labor supply to executives by executive age*

We match each executive to their TBQ benchmark based on their age. For example, if a given executive is aged 60 in 2020, we assume that they graduated with their BA/BS in 1982, and we take their TBQ labor supply expected RAED, or ERAED, to be the RAED of the seniors that graduated in 1982 from an institution on the NYT list of the top 100 US four-year colleges and universities.

We arrived at each executive's age in three stages. First, for the 4,057 RS executives and 6,931 SP executives for whom we had a facial photo, we made a visually based judgment of their age, rounded to 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, and 90 years old.¹⁵ Second, we were able to identify the true age of 1,905 RS and 2,234 SP executives because they were listed in the Profile section of Yahoo! Finance's webpage for their firm and their Year Born was reported there. Third, we sought to improve the accuracy of our visually based judgments of executive age by regressing actual age on judged age and other actual or judged executive characteristics, enabling us to use the estimated regression parameters to calculate improved estimates of the ages of executives for whom we only have a judged age.¹⁶ In matching each executive to their TBQ benchmark based on their age, we took an executive's age to be their true age where available, else their fitted age based on our age regressions, else their judged age.

of the pool of academically talented undergraduates whom we posit firms are most likely to seek to hire with a view to building their pipeline of future executives.

¹⁴ We acknowledge that we focus on only US colleges and universities, thereby likely omitting some portion of the BA/BS-or-equivalent qualified labor supply outside the US that is available to many US publicly traded firms.

¹⁵ All age judgments were made by the same coauthor who made all of the judgments about executive race/ethnicity.

¹⁶ A full description of our approach and our regressions is provided in appendix F.

4. Empirical results

We measure the VRAED, ERAED, VRAED – USPopRAED, and VRAED – ERAED for each race/ethnicity, in both the random sample and S&P 500® datasets, and for each of 11 groups of executives: All executives (table 6); EVPs, SVPs, and VPs (table 7); and CEOs, CFOs, GCs, COOs, CHROs, CIOs, and CTOs (table 8). We focusing on assessing the degree of inferential agreement between the measures VRAED – USPopRAED and VRAED – ERAED, first summarizing the overall amount of agreement and then highlighting certain specific disagreements.

4.1 Overall degree of agreement of different calibration benchmarks

Let executive groups be indexed by $i = 1$ (all executives) to 11 (CTOs), race and ethnicity by $j = 1$ (aian) to 5 (w), and datasets by $k = 1$ (RS) to 2 (SP). Let $Z_{ijk}[USPopRAED]$ be the Z -statistic on $VRAED_{ijk} - USPopRAED_j$, and let $Z_{ijk}[ERAED]$ be the Z -statistic on $VRAED_{ijk} - ERAED_{ijk}$.

In panel A of figure 2 we color-code the full set of $11 \times 5 \times 1 = 55$ $Z_{ijk}[USPopRAED]$ statistics and the 55 $Z_{ijk}[ERAED]$ statistics that are reported in detail in each of tables 6–8. A red cell indicates $Z \leq -1.96$, a green cell $Z \geq 1.96$, and a white cell $-1.96 < Z < 1.96$. Panel A reveals that the largest (smallest) numbers of significantly negative Z -statistics are found for Black and Hispanic (White) executives, and that the converse is true for significantly positive Z -stats.

Panel B recharacterizes panel A by determining for each executive group, race/ethnicity, and dataset whether $Z_{ijk}[ERAED]$ yields the same or a dissimilar/non-same inference as $Z_{ijk}[USPopRAED]$. Dissimilar inferences are classified as either a different inference, defined as $Z_{ijk}[USPopRAED] \geq 1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$ or $Z_{ijk}[USPopRAED] \leq -1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$; or an opposite inference, defined as $Z_{ijk}[USPopRAED] \geq 1.96$ and $Z_{ijk}[ERAED] \leq -1.96$, or $Z_{ijk}[USPopRAED] \leq -1.96$ and $Z_{ijk}[ERAED] \geq 1.96$. If the inferences are the same, then we shade the compared cells yellow; if different, blue; and if opposite, red. We further calculate the mean fraction of times that inferences are dissimilar, different, and opposite, by executive group (shown in the far right-hand column of panel B) and by executive race/ethnicity (shown in the bottommost row).

Two main results emerge in panel B. First, in only two of the 11 groups of executives does the fraction of cases where $Z_{ijk}[USPopRAED]$ and $Z_{ijk}[ERAED]$ yield the same statistical inference exceed 50%; the mean fraction is 42%. Equivalently, holding constant the set of firms to which alternative racial/ethnic calibrations of executives is applied, using a TBQ labor supply benchmark rather than a US population benchmark yields dissimilar/non-same inferences about calibrated executive racial/ ethnic proportions 58% of the time (50% different plus 8% opposite).

Second, the degree and type of dissimilarity varies substantially by executive race/ethnicity. The mean rates of dissimilarity across the 11 groups of executives are 5% for Asians/Pacific Islanders, 36% for American Indians/Alaska Natives, 73% for Blacks, 77% for Whites, and 100% for Hispanics. Of the opposite inferences, 4/9 occur for Whites in S&P 500[®] firms, 3/9 for Blacks in S&P 500[®] firms, 1/9 for Hispanics in S&P 500 firms, and 1/9 for Hispanics in our random sample. Thus the choice of calibration benchmark matters little in evaluating the representation and density levels of Asian/Pacific Islander executives; it matters materially for Black and White executives, where inferential reversals are not uncommon; and it matters a great deal for Hispanic executives.

4.2 *Specific differences between results from alternative calibrations*

In table 6, we present the detailed results of calibrating the VRAEDs of all executives for the random sample and the S&P 500[®] against the RAEDs of the 2019 US population and against the TBQ labor supply. For executives as a whole, it is not the case that all non-Whites are underrepresented, nor are all non-Whites underdense. Relative to their representation in the 2019 US population, Asians/Pacific Islanders are at representation in the random sample and are overrepresented in the S&P 500[®] sample. Blacks and Hispanics are underrepresented but overdense in the S&P[®] 500 sample, while Whites are overrepresented but underdense. In the random sample, Hispanics are underrepresented but at their TBQ expected density. These results suggest that the composition of the set of firms to which racial/ethnic calibrations of executives are applied matters a great deal.

Table 6 also shows that the magnitude of the difference between a VRAED and its benchmark is often affected by the benchmark used to calibrate the VRAED, sometimes by an order of magnitude or more. For example, in the random sample of firms, the levels of underrepresentation for Blacks and overrepresentation for Whites are -10.4% and 26.0% , respectively. In contrast, the levels of underdensity for Blacks and overdensity for Whites are -1.0% and 1.1% , respectively. Similarly, the -15.1% underrepresentation for Hispanics in the random sample and the S&P 500[®] either disappears or converts to overdensity when calibration is measured against the TBQ supply of proto-executive labor (0.2% in the random sample and 0.4% in the S&P 500[®]). Thus, where the underrepresentation or underdensity of a given race or ethnicity in the ranks of executives in US publicly traded companies is determined to be a societal problem, our results suggest that the size of the problem is an order of magnitude smaller when viewed through the lens of calibrating executive RAEDs against the ERAED benchmark versus against the USPopRAED benchmark.

In table 7, we repeat the tests in table 6 for the seniority-based subgroups of SEVP/EVPs, SVPs, and VPs. The results are generally similar to those in table 6, suggesting that because VPs are on average

younger than SVPs, who in turn are on average younger than EVPs, the inferential inconsistencies and reversals documented for all executives are likely not related to executive age.

In table 8 we present the same types of calibrations separately for CEOs, CFOs, GCs, COOs, CHROs, CIOs, and CTOs. Focusing on the CEO and CFO positions that have been the subject of much discourse, in panels A and B we confirm that Blacks and Hispanics are underrepresented and Whites are overrepresented in CEOs and CFOs. However, while Blacks are also underdense in CEOs and CFOs, Hispanics are not—they are at their TBQ expected densities. We also observe that White CEOs are at-density, not overdense, in S&P 500® firms. Thus, it is not the case that non-Whites are always underdense in the highest levels of the C-suite in US publicly traded companies. Moreover, for positions below the CEO and CFO, we note that several inferential reversals occur when calibrating executive VRAEDs against the US population, as compared to our measure of the TBQ supply of proto-executive labor facing firms. First, in GCs and COOs, Blacks and Hispanics are underrepresented but are at-density or overdense (panels C and D). Second, in CHROs, Blacks are not underrepresented in either sample of firms, but in S&P 500® firms they are overdense, while Whites are overrepresented but at-density or underdense (panel E). Third, in CIOs and CTOs, Blacks and Hispanics are underrepresented but not underdense, and Whites are overrepresented but not overdense (panels F and G). In contrast, Asians/Pacific Islanders are both overrepresented and overdense in CTOs in the random sample of firms and in the S&P 500® sample.

4.3 *Underdensity, at-density, and overdensity by executive age*

Given the marked trends over time in the racial/ethnic densities of seniors graduating from the top 100 US colleges and universities (table 5 and figure 1), we explore the extent to which the degrees of density of a given race/ethnicity exhibit similar time trends. In table 9, for all executives in the random sample plus the S&P 500® sample we report VREADs and ERAEDs (panel A), and also VRAED – ERAEDs and their Z-statistics (panel B), by executive age in five-year bins. If the increasing density of American Indians/Alaska Natives, Asians/Pacific Islanders, Blacks, and Hispanics and the decreasing density of Whites in the graduating seniors seen in table 5 and figure 1 feed proportionately and “naturally” over time into the ranks of firms’ executives, then there should be on average no relation between VRAED – ERAED and executive age.

Overall, we judge that such an expectation is borne out for the 96% of executives who are aged 42.5 to 67.5.¹⁷ For these executives, the only race/ethnicity where there is a consistent departure from at-density is American Indian/Alaska Natives. In every other race/ethnicity, the Z-statistics on VRAED –

¹⁷ The exceptions are the overdensity (underdensity) for old (young) Asians/Pacific Islanders and the overdensity (underdensity) for young (old) Whites. We note, however, that the executives in these comparisons—those over 67.5 or under 42.5—comprise only 4% of all sample executives.

ERAED are never always positive or negative, nor do they show a reliable trend by executive age. The relative stability of VRAED – ERAED by executive age is therefore consistent with there being little change in the racial/ethnic densities of the mainly exogenous supply of talent over time, from when the proto-executives were first hired through their conversion into executives.¹⁸

5. Discussion

Racial/ethnic representation is an important and sensitive topic for many people. In the US business world, the saliency of recent racial unrest has particularly increased the volume and intensity of calls for actions that would enlarge the number of Blacks in executive positions, especially at the CEO level. With this background in mind, we view our putting forward an alternative benchmark against which to measure and evaluate the racial/ethnic densities of executives in US publicly traded companies as an effort to contribute to the crucial societal debate on race and ethnicity in business in several ways. We enumerate some of these below, emphasizing that our goal in doing so is to present a balanced yet challenging set of different and potentially competing perspectives, all of which we propose may benefit from the inclusion of perspectives and thinking along the lines of a TBQ labor supply framework.

1. Our TBQ benchmark recognizes that the size and racial makeup of the supply of executive labor facing firms is predominantly exogenous to firms and largely outside their control. That is, the number and racial/ethnic backgrounds of the academically strongest undergraduates who US publicly traded firms most wish to hire are not to any material degree caused by nor directed by firms, especially in the short term. By isolating the portion of executive RAEDs that is more likely to be within a firm's control, VRAED – ERAED, a TBQ labor supply benchmark may enable greater attention to be focused on understanding the size and causal determinants of what can be affected by the firm and its employees, such as, but not limited to, racial discrimination that may exist within a firm, as well as the impartial fostering and development of executive talent.¹⁹
2. In measuring and evaluating changes over time in the racial/ethnic composition of executive teams, a TBQ benchmark also may have the advantage that it can help isolate and focus attention on the portion of intertemporal changes in executive RAETHs and RAEDs that are within the control of the firm. This may be useful in, for instance, focusing the compensation of executives who have race/ethnicity goals in their bonus contracts onto the racial/ethnic densities and outcomes that are within their control, rather than on the changes in representation and density that may come about over time through 'natural' changes in TBQ.
3. Calibrating executive RAEDs against the US population and our TBQ benchmark highlights that the amount of under- or overrepresentation VRAED – USPopRAED is often an order of magnitude larger than the amount of under- or overdensity VRAED – ERAED. For example, in the random sample of

¹⁸ We emphasize that we are not proposing that the magnitudes of VRAED – ERAED indicate that racial bias and/or discrimination is not present in firms' hiring decisions. For one recent perspective on racial discrimination in corporate hiring, see Quillian, Pager, Midtøen, and Hexel (2017).

¹⁹ In recognition of the potential that firms may have to exert influence on the racial/ethnic composition of the supply of proto-executive talent facing them, some firms have begun early education programs. See www.google.org/our-work and <https://ripplematch.com/journal/article/coding-bootcamps-that-are-helping-to-close-the-diversity-gap-in-tech-27fc364b/>.

firms, the levels of underrepresentations for Blacks and Hispanics and overrepresentation for Whites are -10.4% , -15.1% , and 26.0% , respectively. In contrast, the levels of underdensity for Blacks and overdensity for Hispanics and Whites are more than 10 times smaller, at -1.0% , 0.2% , and 1.1% , respectively. These differences suggest that the substantial majority of the differences between the RAEDs of US publicly traded firm executives and those of the US population arise before the executives are hired from the colleges that we propose that the firms in our samples are likely to seek to hire from, rather than after the proto-executives are hired and are working towards the executive level. In noting this, we strongly emphasize that we are not proposing that the magnitudes of $VRAED - USPopRAED$, $VRAED - ERAED$, and the differences between them indicate that no racial bias and/or discrimination is present in firms' hiring and/or talent development (Bertrand and Mullainathan 2004). Rather, our analyses suggest that the majority of the difference between $VRAED$ and $USPopRAED$ occurs before TBQ proto-executive talent is hired by firms, rather than afterwards.

4. Matching as it does to executive age, our TBQ benchmark recognizes that the racial/ethnic background of academically top undergraduates has substantially and systematically changed over the past 50 years (figure 1). If executives typically become CEOs at the average age of 55 when they have gained the set of skills that are needed through 30+ years of human capital investment and success, then we think that it is likely inappropriate to calibrate the density of, say, Hispanic CEOs in 2019 against the density of Hispanics in the 2019 US population, because the fraction of seniors graduating from top US colleges and universities in 1987 who were Hispanic was far smaller than is the fraction of Hispanics in the 2019 US population or seniors graduating in 2019 from the top 100 US colleges and universities. In this sense, we propose that, defined with regard to calibrations made against $USPopRAED$, there exists what is sometimes referred to as a “pipeline problem” with regard to non-Asian non-White individuals—primarily Blacks and Hispanics—in the domain of C-suite executives such as CEOs, and likewise for other ranks or groups of executives (Mac Donald, 2020).
5. We think the pipeline problem is one explanation for why, despite much pressure exerted by activists, politicians, and others, even the largest US publicly traded firms tend not to have had, nor currently have, American Indian/Alaska Native, Pacific Islander, Black, and Hispanic executives in densities that are close to those of the US population. For example, as of 2/17/21, we judged that Apple Inc. had no American Indian/Alaska Natives or Hispanics, and just one Black individual, on its 17-member [Leadership Team](#). It seems likely to us that were there not a pipeline shortage of American Indian/Alaska Native, Black, and Hispanic executives from which Apple could choose without discriminating against equally qualified other races/ethnicities, that this would not be the case.
6. We suggest that a TBQ benchmark perspective leads to the prediction that a rapid resolution of the pipeline problem is unlikely to be feasible for two reasons. First, the substantial supply of executive-qualified Blacks and Hispanics that would be required to rapidly solve the pipeline problem likely does not currently exist. Per table 6, the ratios of the densities of Blacks and Hispanics in the US population to those in our datasets of US publicly traded firms are 2.8 and 4.5, respectively—far higher than 1.0 (see Gayton 2021 and Epstein 2021 for differing perspectives on this in the context of corporate legal work). Second, rapid and widespread promotions of American Indian/Alaska Natives, Blacks and Hispanics into executive positions to the degree needed to remove current underrepresentation would seem likely to impose net costs on firms, in that were such actions feasible and firm-value-increasing, they would likely already have been undertaken. Among potential costs could be suboptimal and firm-value-reducing financing, investing, and/or operating decisions that might accrue if firms have less-experienced individuals in C-suite or other leadership positions, and potential legal challenges brought by those of other races/ethnicities who might argue that they had been inequitably treated and/or discriminated against in firm' ‘overly rapid’ hiring of American Indian/Alaska Natives, Blacks and Hispanics.

7. Does the passing of time help fix the pipeline problem highlighted by the TBQ benchmark? We suggest yes and no. On the “yes” side is that, all else held equal, we propose that the very different RAEDs of new hires made by firms in 2019 (as compared to the RAEDs of new hires that were made by firms in 1980) are likely to ‘naturally’ make their way over time through the corporate hierarchy. Figure 1 suggests this, as do the 2018–2019 RAEDs of the top 100 US colleges and universities (comparable RAEDs for the 2019 US population in parentheses): American Indian/Alaska Natives 0.4% (1.1%); Asian/Pacific Islanders 15.7% (6.4%); Blacks 5.4% (13.0%); Hispanics 13.3% (18.5%); Whites 65.2% (61.2%). However, on the “no” side of the coin there are two limitations to mention. First, we suggest that the RAEDs of new hires will likely take 20–40 years to fully show up in the RAEDs of senior executives. Second, the RAEDs of seniors graduating today from the top 100 US CUs differ from those of the US population in material and potentially contentious ways. For example, in the group of seniors graduating from the top 100 CUs, American Indian/Alaska Natives, Hispanics, and Blacks are currently underrepresented relative to the US population by 0.7%, 7.6%, and 6.2%, respectively, and Asians/Pacific Islanders and Whites are overrepresented by 9.1% and 4.0%, respectively. This suggests that removing the underrepresentation of Blacks and Hispanics will require removing the overrepresentation of Whites and Asians. As the [Harvard](#) and [UNC–Chapel Hill](#) court cases involving allegations of discrimination against Asians demonstrate, actively removing such overrepresentation in top US colleges and universities may be controversial and divisive.
8. By calibrating against all five of the race/ethnicity categories that we use, our TBQ benchmark seeks to treat all races/ethnicities on an equal and level playing field. We see this as pertinent in light of empirically supported concerns that have been raised in the area of corporate boards to the effect that Asians and Hispanics have been “left behind” Blacks (Barrett, 2020; Barrett and Rodriguez, 2020; Gow, Larcker, and Watts, 2020; Green, 2020).
9. A qualified labor supply approach provides for ERAEDs that conditionally flex to take into account the key supply and demand features of a wide variety of different labor markets. In support of this, in appendix G we calibrate the RAEDs of the 2019–2020 rosters of players in the NBA, MLB, MLS, and NFL against the RAEDs of the 2019 US population. The results show that Blacks are overrepresented in the NBA, MLS, and NFL and underrepresented in the MLB, while Hispanics are overrepresented in the MLB and MLS and underrepresented in the NBA and NFL. However, rather than these results necessarily being taken as indicating the presence of large racial biases, we propose that due to the intensely competitive nature of these professional sports labor markets, the differences likely instead indicate that the RAEDs of the qualified supplies of labor that feed each market are simply very different from one another. Such a view predicts that if one were to calibrate the densities of each race and ethnicity of players in the NBA, MLB, MLS, and NFL against their qualified labor supplies, such as NCAA Division 1 schools, one would find very small under- or overdensities.
10. A TBQ benchmark methodology could be applied to the boards of directors. For example, one could classify board members into our five racial/ethnic groups and calibrate their VRAEDs against those of both the US population and the RAEDs of the top 100 US colleges and universities. A plausible prediction is that results would emerge for boards of directors that are similar to what we find for senior executives such as CEOs, CFOs and EVPs, since it seems reasonable to suppose that both groups pull from the same (i.e., more experienced) executive TBQ labor pool/supply.
11. A TBQ benchmark approach could also be taken in calibrating the density of the genders of executives and board members. Such an approach might start with the densities of the genders of the cohorts of seniors who graduated with a BA/BS from the top 100 US colleges and universities, or it could potentially focus on seniors graduating with a business major and/or expand to individuals graduating with an MBA or other professional qualification(s) beyond a BA/BS. Given that the median executive age in our data of 54 points to a median executive BA/BS graduation year of 1987 (panel E of appendix

G), and given that women earned 47% of bachelor’s and 33% of master’s degrees in business and management conferred in the US 1986–1987,²⁰ a qualified labor supply benchmark approach might likely arrive at a lower level than the currently common level of 50%.

12. Our TBQ benchmark approach has deliberately focused on comparing unconditional mean differences between executive VRAEDs, USPopRAEDs and TBQ-based ERAEDs. Future studies might usefully extend our analyses by examining the degree to which unconditional inferences about under-, at- and over-densities across executive race/ethnicity are affected if conditioning variables such as executives’ undergraduate majors (Flynn and Quinn, 2010), and the presence, field/domain and quality of executives’ post-graduate degree qualifications held by executives (Arcidiacono and Lovenheim, 2016) are included. For example, such conditional analysis might be able to somewhat separate VRAED – ERAED into one component that is informative about “mismatch”, the degree to which outcomes for minority BA/BS graduates might have been worsened as a result of attending a top US college or university (Arcidiacono et al., 2011), and a separate component that speaks to the degree of racial bias or discrimination that occurs within a firm after a proto-executive is hired.
13. Lastly, we propose that the labor demand vs. supply underpinning of our TBQ benchmark suggests a new way to quantitatively measure the degree of racial/ethnic diversity in groups of employees and/or board members. Despite its pervasive use in business, the word ‘diversity’ is rarely defined in a way that facilitates quantitative calibration, analysis or critique. A notable exception is *DIV_McK*, the inverse normalized Herfindahl-Hirschman definition of racial/ethnic diversity in executive teams proposed and used by McKinsey in their influential reports on the correlations between the financial performance of large global firms and the racial/ethnic diversities of their executive teams:²¹

$$DIV_McK_j = 1 - \frac{\sum_{i=1}^N RAED_{ij}^2 - N^{-1}}{1 - N^{-1}}, \quad (1)$$

However, a weakness of McKinsey’s *DIV_McK* quantification of executive racial/ethnic diversity is that it maximizes at equal fractions of executives $RAED_{ij} = 1/N$ for each of the N races/ethnicities used in classifying executives. This is problematic in that neither the US population nor the US labor force contain equal numbers of each race/ethnicity, making maximum *DIV_McK* infeasible for many firms and firms as a whole.²² This problem leads us to propose an alternative quantitative measure of the racial/ethnic diversity of a firm’s executives, denoted *DIV_TBQ* that maximizes when executive RAEDs match the ERAEDs of the firm’s TBQ benchmark:²³

$$DIV_TBQ_j = 1 - \sum_{i=1}^N (RAED_{ij} - ERAED_{ij})^2 \quad (2)$$

²⁰ Tables 235 and 237 of the *Digest of Educational Statistics* (1990).

²¹ Hunt, Layton and Prince (2015), Hunt, Prince, Dixon-Fyle and Yee (2018), and Munt, Prince, Dixon-Fyle and Dolan (2020). McKinsey measure the racial/ethnic diversity of firm executives and board members at the end of the preceding 4-5 year period over which average industry-adjusted EBIT margin-based financial performance is measured.

²² A normalized Herfindahl-Hirschman definition also yields the result that a firm that has RAEDs equal to USPopRAED is no more diverse than a firm that has the same RAED percentages but spread “oppositely” or in any way differently across races/ethnicities, which we suggest does not accord with intuition. For example, per Appendix C the 2019 USPopRAED are: American Indian/Alaska Native 1.0%, Asian/Pacific Islander 6.4%, Black 13.0%, Hispanic 18.5%, and White 61.2%. So $DIV_McK(\text{aian, api, b, h, w}) = DIV_McK(1.0\%, 6.4\%, 13.0\%, 18.5\%, 61.2\%) = DIV_McK(61.2\%, 18.5\%, 13.0\%, 6.4\%, 1.0\%) = DIV_McK(6.4\%, 18.5\%, 61.2\%, 13.0\%, 1.0\%) = 0.77$. This feature of *DIV_McK* seems to go counter to a key reason for creating an algebraic definition of racial/ethnic diversity to begin with, namely to be able to quantitatively compare and contrast the degree of racial/ethnic diversity in executive teams across different firms.

²³ *DIV_TBQ* per equation (1) is intended to be illustrative. It could readily be adapted to reflect asymmetric loss functions over the RAED – ERAED of one or more races/ethnicities, and/or include alternative power functions.

Finally, we propose that since ERAED conditionally flexes to take into account the key supply and demand features of a given labor market, DIV_TBQ or a similar metric could be used to quantitatively measure the degree of racial/ethnic diversity in a variety of private or public organizations, such as firms, government departments, K-12 public schools, or professional sports teams, or positions within an organization such as CEOs, GCs, CHROs and CTOs, or Boards of Directors. It could also be adapted to measure racial/ethnic diversity from an aspirational view, such as measuring progress towards the goal of attaining US population representation among a firm's executives:

$$DIV_USPop_j = 1 - \sum_{i=1}^N (RAED_{ij} - USPopRAED_i)^2 \quad (3)$$

6. Examples of the questions that may be raised by our study

The goal of our paper has been to carry out up-to-date measurements and calibrations of executive RAEDs in US publicly traded firms, and not to make normative inferences or statements. However, we recognize that our findings may raise a number of challenging questions. In this section we suggest some, readily noting that there are likely many others that could be, but are not, included.

- What do differences between executive RAEDs and those of the US population or the ERAEDs of a TBQ benchmark reveal? Why is it that Asians/Pacific Islanders are both overrepresented and overdense in CTOs, and Blacks are both underrepresented and underdense in CEOs and CFOs? Do these results reveal an equilibrium between the demand by firms for a portfolio of business skills and a supply of such skills that is not equally provided by each RAETH, whether for intrinsic or extrinsic reasons? Or do they reveal racial discrimination by one or more RAETHs in firms against one or more other RAETHs? Or do they reveal racial discrimination in where and how the pre-college segment of the US population is educated, or racial discrimination in the colleges and universities that firms choose to recruit TBQ talent from?
- If underrepresentation or underdensity of executives of a given RAETH in firms can reasonably be shown to be caused by discrimination, should interventions be made by firms or by the government to increase the size of underrepresented or underdense groups already in the executive labor market? Should such interventions occur when undergraduates first enter the corporate labor market, or further back in the educational or social timeline? Alternatively, should a laissez-faire, noninterventionist, free-market approach be taken by firms and encouraged by the US government?
- How should the benefits experienced by executives in overrepresented or overdense RAEDs in firms be weighed against the costs experienced by executives in underrepresented or underdense RAEDs?
- What implications does the trend toward organizational inclusiveness have for executive RAEDs? Can corporate inclusiveness be sufficiently well defined and quantitatively measured and analyzed alongside RAEDs, such that key cost/benefit tradeoffs and/or synergies in the relations between executive inclusivity and executive racial/ethnic densities can be well identified and understood?
- Should the executives featured in business cases used in undergraduate and MBA programs or in articles in top newspapers such as the *New York Times* and the *Wall Street Journal* reflect the actual and observed RAEDs of executives in today's US publicly traded companies? Or should they reflect the RAEDs of the US population? Which best prepares students for success in business, and why?²⁴

²⁴ For example, page R1 of the October 24, 2020 *Wall Street Journal C-Suite Strategies Report* titled "View from the Top" featured the photographs and names of five C-Suite executives in prominent public and private organizations

7. Conclusions

In this study, we have estimated the racial and ethnic densities (RAEDs) of executives in US publicly traded companies as of mid-2020 and have calibrated them against the US population and a measure of the TBQ supply of proto-executive talent facing firms. Our results show that when the RAEDs of executives as a whole are calibrated against the US population, American Indians/Alaska Natives, Blacks, and Hispanics are materially underrepresented, and Whites are materially overrepresented. In contrast, when executive RAEDs are calibrated against a benchmark that seeks to take into account firms' demand for and the supply of proto-executive talent, namely the seniors graduating from the institutions on the *New York Times* 2017 list of the top 100 US colleges and universities, matched to executives' BA/BS graduation years, a mainly different and at times opposite set of outcomes emerges.

We find that using a TBQ benchmark rather than the US population yields dissimilar inferences about calibrated executive racial/ethnic proportions 58% of the time, and that 8% of the time the inferences from calibrating against a TBQ benchmark rather than the US population are reliably the opposite of each other. Dissimilar inferences occur only 5% of the time for Asians/Pacific Islanders, but 36% for American Indians/Alaska Natives, 73% for Blacks, 77% for Whites, and 100% for Hispanics. We also find that Blacks and Hispanics in S&P 500® firms are typically underrepresented but overdense, while Whites are typically overrepresented but underdense. The magnitude of under- or overrepresentation is frequently an order of magnitude larger than the magnitude of under- or overdensity. For example, in the random sample of firms, the levels of underrepresentations for Blacks and Hispanics and overrepresentation for Whites are -10.4%, -15.1%, and 26.0%, respectively, while the levels of underdensity for Blacks and overdensities for Hispanics and Whites are 10+ times smaller at -1.0%, 0.2%, and 1.1%, respectively.

We conclude that choice of benchmark against which executive racial/ethnic densities are calibrated matters to inferences, sometimes a great deal. We see this as important to highlight because the underrepresentation of a particular race/ethnicity in firms' employees based on calibration against the US population is often taken as indicating racial bias and can influence narratives and policy formulations regarding racial discrimination. Our hope is that by also measuring, calibrating, and comparing executive

(position, firm, and our judgment of his/her race/ethnicity in parentheses): Judith Batty (CEO, Girl Scouts of the USA, Black), Matt Carey (CIO, Home Depot, White), James Park (CEO, Fitbit, Asian), Jill Woodworth (CFO, Peloton Interactive, White) and Kate Wik (CMO, Las Vegas Convention and Visitors Authority, Hispanic). On the one hand, the racial/ethnic and gender of the set of five executives comes close to being diversity-maximizing as measured using the Blau index (Blau 1977), in that four of the five races/ethnicities we include in our study are present, with two men and three women featured. On the other hand, our executive RAEDs data strongly suggest that the likelihood of observing this racial/ethnic and gender composition in a randomly chosen five-person executive team from a US publicly traded firm is remote. The article therefore illustrates the question of whether students are best prepared for success in business by engaging with what many would see as a desirable, almost-perfectly-race/ethnicity/gender-balanced set of executives that is very unlikely to be seen in practice, or by engaging with a more realistic but race/ethnicity/gender-unbalanced set of executives that is very likely to be seen in practice.

RAEDs through a TBQ-type perspective, a richer understanding can be gained and better decisions can be made by academics, executives, firms, journalists, politicians, policy makers, and regulators about the difficult, emotionally charged and important economic and moral issues surrounding race and ethnicity in US publicly traded firms and in US business as a whole. It is in this spirit that our study has sought to align with the “honest broker” role proposed by Eagly (2016, p. 214), who encourages academics to be “the honest broker [who] encourages decision makers to think beyond personal values and ideologically driven preferences to consider options that may make sense from a variety of perspectives.”

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Appendix A

This appendix presents screenshots of the raw firm and executive data items for four example firms in the random sample (RS), along with an explanation of what each data item means, how it was collected, and how it was coded. An identical data structure applies to firms in the S&P 500® sample (SP).

Panel A: Items 1-19

RS or SP	Is firm also in SP500 dataset?	YWP, YWN or NWN?	RS Firm ID	RS Company Name	RS Webpg 1	RS Webpg 2	RS Webpg 3	RS Webpg 4	RS Exec #	RS Last name(s)	RS First name(s)	RS Middle initial(s)	RS Chief or Officer 1	RS Chief or Officer 2	RS Chief or Officer Domain	RS Rank or Title	RS Rank or Title Domain	RS Area
RS	0	YWP	1	CENTRUS ENERGY CORP	Home	Who We	Leadersh	Executiv	1	Poneman	Daniel	B	CEO	President	CEO-PRES			
RS	0	YWP	1	CENTRUS ENERGY CORP					2	Cutlip	Larry	B				SVP	SVP	Field Oper
RS	0	YWP	1	CENTRUS ENERGY CORP					3	Dyke	Elmer					EVP	EVP	ELEU Oper
RS	0	YWP	1	CENTRUS ENERGY CORP					4	Scott	Dennis	J	CS	GC	Legal	SVP	SVP	
RS	0	YWP	1	CENTRUS ENERGY CORP					5	Strawbridg	Philip		CFO	Chief Acco	Finance	SVP	SVP	
RS	0	YWP	1	CENTRUS ENERGY CORP					6	Donelson	John	MA				SVP	SVP	
RS	0	YWP	1	CENTRUS ENERGY CORP					7	Howe	Jim					VP	VP	Governme
RS	0	YWP	1	CENTRUS ENERGY CORP					8	Leistikow	Dan					VP	VP	Corporate
RS	0	YWN	2	FIRST NATIONAL CORP/VA	Home	Investor	Corporat	Senior M	1	Harvard	Scott	C	CEO		CEO-PRES			
RS	0	YWN	2	FIRST NATIONAL CORP/VA					2	Dysart	Dennis	A	COO	President	Operations			
RS	0	YWN	2	FIRST NATIONAL CORP/VA					3	Bell	Shane	M	CFO		Finance	EVP	EVP	
RS	0	NWN	17	PLANET GREEN HOLDINGS CORP					1	Zhou	Bin		CEO		CEO-PRES			
RS	0	NWN	17	PLANET GREEN HOLDINGS CORP					2	Hu	Lili		CFO		Finance			
RS	0	NWN	17	PLANET GREEN HOLDINGS CORP					3	Cui	Daqi		COO		Operations			
RS	0	NWN	17	PLANET GREEN HOLDINGS CORP					4	Yin	Mingze					Director	BU-CEO-PR	Investor Re
RS	0	YWP	488	MEDIFAST INC	Investor:	Management			1	Chard	Daniel	R	CEO		CEO-PRES			
RS	0	YWN	488	MEDIFAST INC					2	Kelleman	Joe		CFO		Finance			
RS	0	YWP	488	MEDIFAST INC					3	Tyree	Tony		Chief Marketing Office	Marketing				
RS	0	YWP	488	MEDIFAST INC					4	Johnson	Nicholas					President	BU-CEO-PR	Coach & CI
RS	0	YWP	488	MEDIFAST INC					5	Baker	Bill					EVP	EVP	Informatio
RS	0	YWP	488	MEDIFAST INC					6	Groves	Jason	L	GC	CS	Legal	EVP	EVP	
RS	0	YWP	488	MEDIFAST INC					7	Greninger	Claudia					EVP	EVP	HR

- Item 1 RS or SP. Indicator to denote whether firm is from random sample or S&P® 500 sample.
- Item 2 Indicator = 1 if firm is in both the RS and SP datasets. There are 54 such overlap firms.
- Item 3 YWP = firm website shows the named executive and their photo.
YWN = firm website shows the named executive but not their photo.
NWN = firm website does not show an/the executive's name or photo.
- Item 4 Firm ID = for RS, runs from 1-523.
- Item 5 Firm name per Compustat.
- Item 6 Webpg 1 = 1st level in firm's website address identifying the page with the executive on it.
- Item 7 Webpg 2 = 2nd level in firm's website address identifying the page with the executive on it.
- Item 8 Webpg 3 = 3rd level in firm's website address identifying the page with the executive on it.
- Item 9 Webpg 4 = 4th level in firm's website address identifying the page with the executive on it.
- Item 10 Executive #, coded in the order shown on firm's website (if in a row, order taken is left to right).
- Item 11 Last name(s) of executive.
- Item 12 First name(s) of executive.
- Item 13 Middle initial(s) of executive.
- Item 14 Chief or Officer 1 = 1st of a maximum of two Chief or Officer positions ascribed to the executive.
- Item 15 Chief or Officer 2 = 2nd of a maximum of two Chief or Officer positions ascribed to the executive.
- Item 16 Chief or Officer Domain = category covering one or more Chief or Officer 1 or 2 positions.
- Item 17 Rank or Title = rank or title of executive, outside of Chief or Officer 1 and 2.
- Item 18 Rank or Title Domain = category covering one or more Ranks or Titles.
- Item 19 Area = area of business responsibility covered by the executive, as judged by authors based on the text provided about the executive on firm's website.

Appendix A (continued)

Panel B: Items 20-32

YWP, YWN or NWN?	RS Firm ID	RS Company Name	RS Photo	RS Photo Source	RS Gender	McK 2015 race/ethnicity aa,eur,ne,ea, sa,lat,na,pi,an	McK 2018 US + NCES IPEDS race/ethnicity w,b,h,api,aian	RS Visual est age	RS Formal attire?	RS Jacket?	RS Tie?	RS Smile (1-10)	RS Pay (\$M) Yahoo! Finance	RS Year Born Yahoo! Finance	RS True Age @ Feb-20
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	60	y	y	y	10	\$ 1.56	1956	64
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	55	y	y	y	5			
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	55	y	y	y	7	\$ 0.65	1964	56
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	55	y	y	y	8			
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	55	n	y	n	5		1955	65
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	40	y	y	n	7			
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	60	y	y	n	6			
YWP	1	CENTRUS ENERGY CORP	y	Website	m	eur	w	45	y	y	n	6			
YWN	2	FIRST NATIONAL CORP/VA	y	LIN	m	eur	w	65	y	y	y	7	\$ 0.44	1955	65
YWN	2	FIRST NATIONAL CORP/VA	y	LIN	m	eur	w	50	y	y	y	8	\$ 0.30	1972	48
YWN	2	FIRST NATIONAL CORP/VA	y	LIN	m	eur	w	45	y	y	y	6	\$ 0.28	1973	47
NWN	17	PLANET GREEN HOLDINGS CORP	n		m								\$ 0.10	1990	30
NWN	17	PLANET GREEN HOLDINGS CORP	n		f								\$ 0.05	1979	41
NWN	17	PLANET GREEN HOLDINGS CORP	y	LIN	m	ea	api	50	y	y	y	4	\$ 0.10	1967	53
NWN	17	PLANET GREEN HOLDINGS CORP	n		m										
YWP	488	MEDIFAST INC	y	Website	m	eur	w	55	y	y	y	7	\$ 2.04	1965	55
YWN	488	MEDIFAST INC	y	LIN	m	eur	w	60	y	y	n	5			
YWP	488	MEDIFAST INC	y	Website	m	aa	b	55	y	y	y	6	\$ 0.70	1965	55
YWP	488	MEDIFAST INC	y	Website	m	eur	w	45	y	y	y	4	\$ 0.56	1980	40
YWP	488	MEDIFAST INC	y	Website	m	eur	w	45	y	y	y	7	\$ 0.58	1972	48
YWP	488	MEDIFAST INC	y	Website	m	aa	b	45	y	y	y	5			
YWP	488	MEDIFAST INC	y	Website	f	lat	h	45	y	y	n	7			

- Item 20 Photo = y if a photo of the executive was found on the firm’s website, else the executive’s LinkedIn page (LIN), else the firm’s Bloomberg profile (BB), else business media (OTH).
- Item 21 Photo source: If photo = y, photo source = firm’s website, LIN, BB or OTH.
- Item 22 Gender: Male or female, based on the executive’s photo and/or bio, where available.
- Item 23 McK 2015 race/ethnicity. We classified an executive’s race or ethnicity by visually examining their photo and first and last name(s). All classifications were done by the same coauthor. The most granular racial and ethnic categories we employ are those of Hunt, Layton, and Prince (McKinsey, 2015). With our lowercase descriptor tag of each race/ethnicity category shown in parentheses, these are: African ancestry (aa), European ancestry (eur), Near Eastern (ne), East Asian (ea), South Asian (sa), Latino (lat), Native American (na), and Other (o). We specify Other as either Pacific Islander (pi) or Alaska Native (an). We use the nomenclature American Indian rather than Native American because American Indian is the nomenclature used in much of the historical data that we extract from the National Center for Educational Statistics’ Integrated Postsecondary Education Data System (NCES IPEDS) and use in calibrating executives’ observed racial and ethnic densities against their expected executive labor supply metric densities.
- Item 24 NCES IPEDS race/ethnicity. For the historical data we use to calibrate executives’ observed racial and ethnic densities against their expected densities, NCES IPEDS specifies five race/ethnicity categories outside of Nonresident aliens (lowercase descriptor tag of each race/ethnicity category in parentheses: American Indian/Alaska Native (aian), Asian/Pacific Islander (api), Black (b), Hispanic (h), White (w). We connect McK 2015 race/ethnicity categories into NCES IPEDS race/ethnicity categories by defining b = aa, w = eur + ne, api = ea + sa + pi, h = lat, aian = ai + an (see item 23 for McK category descriptor tags). NCES IPEDS’ race or ethnicity categories match closely with those used for US executives in McKinsey’s 2018 and 2020 studies (Hunt, Prince, Dixon-Fyle, and Yee, 2018; Dixon-Fyle, Hunt, Dolan, and Prince, 2020).
- Item 25 Visual est age. Age of the executive as judged by the same coauthor from their photo, assigned into one of the following point estimates: 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90.
- Item 26 Formal attire? = y if executive was wearing formal attire as judged by the same coauthor from the executive’s photo. Sometimes not possible if photo was only of the executive’s face.
- Item 27 Jacket? = y if executive was wearing a jacket as judged by the same coauthor from their photo. Sometimes not possible if photo was only of the executive’s face.

Appendix A (continued)

- Item 28 Tie? = y if executive was wearing a tie as judged by the same coauthor from the executive's photo. Sometimes not possible if photo was only of the executive's face.
- Item 29 Smile (1-10). Degree of genuine smile on the executive's face as judged by the same coauthor from the executive's photo, where 1 = not at all smiling/"very grumpy" and 10 = very wide, "joyous" smile.
- Item 30 Pay (\$M) Yahoo! Finance. If executive is one of the maximum of five individuals listed on the firm's Yahoo! Finance Profile page, Pay is the amount of "salary, bonuses etc." for the last fiscal year ending December 31, 2019.
- Item 31 Year Born Yahoo! Finance. If executive is one of the maximum of five individuals listed on the firm's Yahoo! Finance Profile page, Year Born is the executive's YYYY year of birth.
- Item 32 True Age @ Feb-20. If Year Born is available, True Age @ Feb-20 is the age of the executive to the nearest one year as of February 2020.

Appendix B

Description of the calculations behind the Visual Identification Adjustment Factors (VIAs) used to adjust the raw numbers and densities of the judged races/ethnicities of executives in our (GH) RS and SP datasets to take into account the likely undercounting of non-Whites. VIAs are estimated for Asian/Pacific Islander, Black, and Hispanic executives, with the VIAF-based number and density of Whites being a plug. The data we use to calculate the VIAs were generously provided by Crist|Kolder Associates (CK) from their 2020 Volatility Report. It consists of (1) the first and last names of all the CEOs and CFOs that during the summer of 2020 CK identified as being in the union of firms in the S&P 500® and the Fortune 500; (2) the name of the firm that the CEO or CFO works for; and (3) CK’s classification of the CEO’s or CFO’s race/ethnicity. Our approach to calculating VIAs uses only the subset of CK’s firms that are also in our database of S&P 500® firms, and only those CEOs and CFOs who are identified by both CK and ourselves. We define an executive’s race/ethnicity coding as being correct if both we and CK agree on the coding. For every case where our coding of an executive’s race/ethnicity differed from CK’s, we carefully researched biographical and other data sources to confirm the classification. In testimony to the substantial resources that CK spend on their highly visible and respected Volatility Report, we found only one executive out of 83 whose CK classification we believe is incorrect, as compared to 14 out of 82 from our own less resource-intensive classification process. Using Blacks as the example, we calculate VIAF_b as the ratio of the number of CEOs + CFOs that CK coded as b to the number of CEOs + CFOs that we coded as b, multiplied by the number of correct b CEOs + CFOs divided by the total number of b CEOs + CFOs.

For CK firms in the S&P® 500 and where the CK-identified executive is the same as the GH-identified executive:

		CK race/ethnicity using NCES IPEDS classifications				Total
		aian	api	b	h	
i	# CK CEOs + CFOs coded correctly	0	44	11	27	82
ii	# CK CEOs + CFOs coded incorrectly	0	0	0	1	1
iii	# GH CEOs + CFOs coded correctly	0	41	10	17	68
iv	# GH CEOs + CFOs coded incorrectly	0	3	1	10	14
VIAF = (i / iii) * [(i - ii)/i]		1.0	1.073	1.100	1.546	

Note: VIAF for aian is set at 1.0 since denomination in VIAF calculation = 0.

VIAF for w is not calculated, but is treated as a plug.

GH stands for the authors of the study.

Appendix C

Derivation of the estimated racial/ethnic densities of the US population (USPopRAED) at July 1, 2019 using the race and ethnicity categories defined in the US Department of Education’s National Center for Educational Statistics’ Integrated Postsecondary Education Data System (NCES IPEDS).²⁵

Panel A: Annual Estimates of United States Resident Population by Sex, Race, and Hispanic Origin: April 1, 2010 to July 1, 2019 (see [link](#) for raw data file NC-EST2019-SR11H, June 2020)

Sex, Race, and Hispanic Origin	Population estimate as of		
	July 1, 2019	Hispanic	Not Hispanic
TOTAL POPULATION	328,239,523	60,572,237	267,667,286
One Race:			
White	250,522,190	53,212,368	197,309,822
Black or African American	44,075,086	2,927,598	41,147,488
American Indian and Alaska Native	4,188,092	1,753,184	2,434,908
Asian	19,504,862	598,983	18,905,879
Native Hawaiian and Other Pacific Islander	806,937	211,029	595,908
Two or More Races	9,142,356	1,869,075	7,273,281

Panel B: Rules in Reporting Race and Ethnicity Data to IPEDS (see [link](#) for full details)

Institutions **MUST** give students and staff the opportunity to self-report their race and ethnicity. Students and staff do **NOT** have to respond. Institutions **MUST** use a 2-part question to collect these data. The questions must be presented in this order:

1. Are you Hispanic or Latino?
2. Select one or more of the following races:
 - American Indian or Alaska Native
 - Asian
 - Black or African American
 - Native Hawaiian or Other Pacific Islander
 - White

Report race and ethnicity data to IPEDS as follows:

If the individual self identifies as...	Report to IPEDS as...	IPEDS tag
Hispanic only, or Hispanic and any race category	Hispanic	h
Not Hispanic; American Indian or Alaska Native	American Indian or Alaska Native	aian
Not Hispanic; Asian only	Asian	api
Not Hispanic; Black or African American only	Black or African American	b
Not Hispanic; Native Hawaiian or Other Pacific	Native Hawaiian or Other Pacific Islander	api
Not Hispanic; White only	White	w
Not Hispanic; more than one race category	Two or more races	tomr

²⁵ The Integrated Postsecondary Education Data System is a system of interrelated surveys conducted annually by the National Center for Education Statistics, a part of the Institute for Education Sciences within the United States Department of Education. IPEDS consists of twelve interrelated survey components that are collected over three collection periods each year as described in the Data Collection and Dissemination Cycle. The completion of all IPEDS surveys is mandatory for all institutions that participate in, or are applicants for participation in, any federal financial assistance program authorized by Title IV of the Higher Education Act of 1965, as amended.

Appendix C (continued)

Panel C: Estimated Racial and Ethnic Densities by IPEDS Label after Allocating Two or More Races (tomr) to aian, api, b, w

IPEDS label	Population estimate as of July 1, 2019	tomr allocations to aian, api, b, w	Population estimate as of July 1, 2019 after allocating tomr to aian, api, b, w	Estimated densities by IPEDS tag after allocating tomr to aian, api, b, w
h	60,572,237		60,572,237	18.5%
aian	2,434,908	1,010,678	3,445,586	1.0%
api	19,501,787	1,463,435	20,965,222	6.4%
b	41,147,488	1,383,906	42,531,394	13.0%
w	197,309,822	3,415,261	200,725,083	61.2%
tomr	7,273,281			
Total	328,239,523	7,273,281	328,239,523	100.0%

Notes:

1. Per US Office of Management and Budget guidelines, the terms White, Black or African American, Asian, American Indian and Alaska Native, and Native Hawaiian and Other Pacific Islander are used to describe the race of people. Beginning in 2003, people in these categories are those who selected that race group only. Those who identify multiple race groups are categorized as people of Two or More Races. Prior to 2003, people identified a group as their main race.
2. Hispanic or Latino ethnicity refers to people who identify themselves as being of Hispanic, Latino, or Spanish origin. Hispanic ethnicity subcategories consist of Mexican, Puerto Rican, Cuban, Central and South American, and Other Hispanic or Latino.
3. The allocation of the 7,272,381 tomr people to aian, api, b and w in panel C was done using the data in table 2 ("Two or More Races Population by Specific Combination: 2000 and 2010") reported on p. 6 of the 2010 Census Brief [The Two or More Races Population: 2010](#). In that table 2, for each *j*-race tomr group 2-races, 3-races, 4-races, 5-races and 6-races, and within each tomr group for each permutation of the 6 races aian, a, b, pi, w, and sor (some other race), the total number of people in that permutation was allocated equally to the races (and only to those races) in that permutation. For example, for the aian/a/b/w/sor permutation in the 5-race group, 1/5 of the 1,023 people in that permutation were estimated to be aian, 1/5 a, 1/5 b, 1/5 w, and 1/5 sor. Then, because there is no sor category in IPEDS, that data in sor were in turn then indirectly allocated to aian, a, b, pi, and w through multiplying the total of 7,273,281 people in tomr by the fraction that each of the estimated-within-tomr numbers of aian, a, b, pi, and w people were of the total estimated-within-tomr numbers.

Appendix E

This appendix presents descriptive statistics on the overlaps between the US colleges and universities (CUs) from which the executives in our S&P 500[®] (SP) and random sample (RS 523) datasets and (1) all CUs, (2) CUs ranked by US News & World Report (USNWR), (3) the subset of CUs consisting of those that supplied 6+ executives to SP firms or 5+ executives to RS 523 firms, and (4) the subset of the CUs in (3) that are also in the *New York Times* 2017 list of the top CUs (NYT top 100 CUs). We obtained executives' education background from BoardEx via WRDS. BoardEx's data provided us with executives' demographic information, employment history, compensation, networks, and educational background. Educational background includes college and graduate education, as well as certificates and executive education programs. As we are interested in college education, we use the dataset *BoardEx - Individual Education Profile* to identify the institutions and qualifications earned at each institution for each executive in our SP and RS 523 datasets. We match each executive to BoardEx by their names and firm. BoardEx contains several variables that can be used to link to other databases, including International Security Identification Number (ISIN) and Central Index Key (CIK). For firms that are missing these identifiers, we hand-match the firms using a combination company name, company web address, telephone number, and fax number. If we did not find an exact match by executive name and firm, we sought to hand-match executives and firms one-by-one.

	S&P 500 [®] firms	Random sample of 523 firms
# CUs in US per Statista in 2018-2019	2,698	2,698
# CUs ranked by USNWR @ 2/15/2019	1,400	1,400
# CUs that sample executives come from	1,312	900
% of all CUs that sample executives come from	49%	33%
	S&P 500 [®] firms	Random sample of 523 firms
# executives in sample dataset	6814	3853
# of sample executives with BA data in BoardEx	5470	2961
% sample executives with BA data in BoardEx	80%	77%
	S&P 500 [®] firms	Random sample of 523 firms
Of executives in dataset with BA/BS data in BoardEx:	# CUs # execs % execs	# CUs # execs % execs
# CUs with 1 exec	661 661 12%	496 496 17%
# CUs with 2 executives	214 428 8%	128 256 9%
# CUs with 3 executives	109 327 6%	58 174 6%
# CUs with 4 executives	58 232 4%	46 184 6%
# CUs with 5 executives	47 235 4%	44 220 7%
# CUs with 6+ executives	223 3,587 66%	128 1,631 55%
	1,312 5,470 100%	900 2,961 100%
	S&P 500 [®] firms	Random sample of 523 firms
% of S&P 500 [®] executives whose BA/BS is from one of the 223 CUs that supplied 6+ executives to S&P 500 [®] firms	66%	
% of S&P 500 [®] executives who come from the 78 NYT top 100 CUs that are in the 223 CUs that have supplied 6+ executives to S&P 500 [®] firms	35%	
% of RS 523 executives whose BA/BS is from one of the 172 CUs that supplied 5+ executives to RS 523 firms		63%
% of RS 523 executives who come from the 78 NYT top 100 CUs that are in the 172 CUs that have supplied 6+ executives to RS 523 firms		34%

Appendix E (continued)

We also estimated the fraction of Black executives in our SP and RS datasets who graduated with their BA/BS from a Historically Black College or University (HBCU). We propose that the smaller this fraction, the more accurate is the NYT top 100 list as a proxy for the schools that SP and RS firms hire their proto-executive talent from, given that there are no HBCUs in the NYT top 100 list. Based on the 2020 list of 79 HBCUs on the USNWR website, we find that just 13% of SP and RS Black executives are from HBCUs (33 of 246 in SP firms and 13 of 95 in RS firms).

Our conclusion from the statistics above is that the NYT is a reasonable proxy for the full set of US colleges and universities from which US publicly traded firms hire proto-executive talent, in the form of BA/BS-graduating seniors. Taking S&P 500[®] firms as the example, we calculate that the 223 “material supplier” CUs have supplied 66% of all the executives in S&P 500[®] firms, where we define a CU as a material supplier of proto-executive talent if 6+ of the 5,470 executives with BA/BS data in BoardEx obtained their BA/BS at the CU. For S&P 500[®] firms, of the executives coming from these 223 CUs, 53% come from the NYT top 100 CUs, leading us to conclude that because the NYT top 100 CUs are well scattered within the 223 6+ execs CUs, and not unduly clumped in the 1st thru 100th of the 223 material supplier CUs, that the NYT top 100 is a reasonable proxy for the full set of US colleges and universities from which US publicly traded firms hire proto-executive talent.

Appendix F

Results of analysis that seeks to improve the judged age of an executive when the executive's true age is unknown, using the regression-estimated relations between an executive's true age when known from the firm's Yahoo! Finance's profile page, the visually judged age of the executive, and judgments of the executive's gender, attire, smile, race/ethnicity, Chief/Officer position, and organizational rank.

Panel A: Determination of Executive Age (from the firm's Yahoo! Finance's profile page; the visually judged age of the executive; and judgments of the executive's gender, attire, smile, race/ethnicity, Chief/Officer position, and organizational rank)

Independent variable	Random sample	S&P® 500
Intercept	19.0 (14.1)	24.0 (18.9)
Visually estimated age of executive (in 5-year bins, 25 - 90)	0.70 (37.7)	0.62 (37.1)
Executive gender (male = 0, female = 1)	2.36 (4.6)	1.77 (4.5)
Is exec in formal attire? (y = 1, n = 0)	-0.47 (-0.6)	-0.46 (-0.7)
Is exec wearing a jacket? (y = 1, n = 0)	-0.59 (-0.8)	-0.72 (-1.3)
Is exec wearing a tie? (y = 1, n = 0)	0.72 (2.0)	1.08 (3.9)
Degree of smile on exec's face (1-10)	-0.05 (-0.5)	-0.20 (-1.8)
Exec is African ancestry? (y = 1, n = 0)	-1.18 (-0.8)	-0.35 (-0.5)
Exec is Near Eastern? (y = 1, n = 0)	-3.00 (2.0)	-0.63 (-0.7)
Exec is East Asian? (y = 1, n = 0)	1.18 (1.3)	1.70 (2.2)
Exec is South Asian? (y = 1, n = 0)	-0.73 (-0.9)	-0.97 (-1.7)
Exec is Latino? (y = 1, n = 0)	-2.19 (-2.1)	-1.02 (-1.3)
Exec is CEO or President (y = 1, n = 0)	-0.53 (-1.2)	-0.50 (-1.6)
Exec is non-CEO Chief (y = 1, n = 0)	-0.98 (-2.9)	-1.02 (-4.3)
Exec is EVP or Senior EVP (y = 1, n = 0)	0.20 (0.5)	0.11 (0.4)
Exec is SVP (y = 1, n = 0)	-0.41 (-0.9)	-0.36 (-1.0)
Exec is VP (y = 1, n = 0)	-0.45 (-0.6)	-0.36 (-1.0)
# observations	1,736	2,192
Adj. R ²	49.9%	44.9%

Appendix F (continued)

Panel B: Executives with a Visually Estimated Age

Visually estimated executive age	# execs	Min.	10%	Median	Mean	90%	Max	Std. Dev.
Random sample (RS)	4,057	25	40	50	50.9	60	85	8.3
S&P® 500 (SP)	6,930	30	45	50	51.7	60	90	7.0
RS - SP					-0.8			
z-statistic on mean{RS - SP}					-5.2			

Panel C: Executives with a True Age

True executive age	# execs	Min.	10%	Median	Mean	90%	Max	Std. Dev.
Random sample (RS)	1,905	30	44	55	55.1	65	90	8.6
S&P® 500 (SP)	2,234	33	47	56	55.5	63	91	6.7
RS - SP					-0.4			
z-statistic on mean{RS - SP}					-1.6			

Panel D: Executives with Both a True Age and a Visually Estimated Age

Random sample	# execs	Min.	10%	Median	Mean	90%	Max	Std. Dev.
True executive age (T)	1,742	31	44	55	55	65	90	7.1
Visually estimated exec age (V)	1,742	30	45	55	53.4	65	85	8.4
T - V	1,742	-18	-6	1	1.6	10	31	6.5
z-statistic on RS mean{T - V}					10.3			
S&P® 500	# execs	Min.	10%	Median	Mean	90%	Max	Std. Dev.
T	2,194	33	47	56	55.5	63	91	6.7
V	2,194	35	45	55	54.2	65	90	7.1
T - V	2,194	-20	-6	1	1.3	9	21	5.7
z-statistic on SP mean{T - V}					10.7			

Panel E: Executives' True Age, Else OLS-Model Age, Else Visually Estimated Age

True else OLS-model else visually estimated executive age	# execs	Min.	10%	Median	Mean	90%	Max	Std. Dev.
Random sample (RS)	4,220	30	45.1	53	53.6	63	90	7.1
S&P® 500 (SP)	6,970	33	48.2	53.7	54.2	60.2	91	5.2
RS - SP					-0.6			
z-statistic on mean {RS - SP}					-4.8			

Appendix G

The estimated RAEDs of the players listed in Appendix III of the Institute for Diversity and Ethics in Sport's (TIDES) 2020 Racial and Gender Report Cards on the [NBA](#), [MLB](#) and [MLS](#) and the 2019 Racial and Gender Report Card for the [NFL](#). The derivation of the 2019 US population RAEDs is per appendix C. Z-statistics in red < -1.96 (green > 1.96) indicate significant underrepresentation (overrepresentation) of the players in the sport relative to the 2019 US population. All percentages are rounded to the nearest 0.1%.

NBA Roster 2018-19 n = 461*	Race / ethnicity of players				
	aian	api	b	h	w
RAED_NBA 2019-20	0.0%	0.4%	79.2%	2.4%	18.0%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
RAED_NBA - US population	-1.1%	-6.0%	66.2%	-16.1%	-43.1%
z-stat (RAED_NBA - US popln)	-2.2	-5.2	42.3	-8.9	-19.0

* excludes n=31 players classified by TIDES as Other

MLB Roster 2019-20 n = 896	Race / ethnicity of players				
	aian	api	b	h	w
RAED_MLB 2019-20	0.2%	2.2%	7.5%	29.9%	60.2%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
RAED_MLB - US population	-0.8%	-4.2%	-5.5%	11.5%	-1.0%
z-stat (RAED_MLB - US popln)	-2.4	-5.1	-4.9	8.8	-0.6

MLS Roster 2019-20 n = 756*	Race / ethnicity of players				
	aian	api	b	h	w
RAED_MLS 2019-20	2.0%	1.6%	23.3%	31.6%	41.5%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
RAED_MLS - US population	0.9%	-4.8%	10.3%	13.2%	-19.6%
z-stat (RAED_MLS - US popln)	2.5	-5.4	8.4	9.3	-11.1

* excludes n=31 players classified by TIDES as 2 or more races

NFL Roster 2019-20 n = 1,456*	Race / ethnicity of players				
	aian	api	b	h	w
RAED_NFL 2019-20	0.2%	1.7%	67.0%	0.5%	30.5%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
RAED_NFL - US population	-0.8%	-4.7%	54.1%	-17.9%	-30.7%
z-stat (RAED_NFL - US popln)	-3.2	-7.3	61.4	-17.6	-24.0

* excludes n=150 players classified by TIDES as 2 or more races

Table 1

Waterfall criteria applied in arriving at two sets of firms that were publicly traded on US stock exchanges at 12/31/19 and for which at least one named executive was found on the firm's website, or the firm's Yahoo! Finance profile page, or the firm's Bloomberg profile page, or the firm's Annual Report, or on comparably.com. Executives are defined as employees whose names are disclosed on the firm's website as part of the firm's executive, leadership, or management team(s) or in its set of officers.

Panel A: Random Sample of 523 US Publicly Traded Firms at 12/31/19

Step	Waterfall	# RS firms
	1. # firms randomly selected (RS firms) from all the firms on Compustat that were publicly traded on US stock markets at 12/31/2019	523
<i>less:</i>	2. # RS firms with no website or no executive/s on firm's website	(39)
<i>plus:</i>	3. # firms of the n = 39 RS in Step 2 where ≥ 1 executive was found on Yahoo! Finance, Bloomberg, Annual Report, or comparably.com	33
	= # RS firms with ≥ 1 named executive	517
<i>less:</i>	4. # SP firms in the n = 517 above where no executive photo could be found	(7)
	= # RS firms with ≥ 1 executive with a face photo	510

Panel B: All S&P 500® Index Firms

Step	Waterfall	# SP firms
	1. # firms in S&P 500® Index (SP) at 12/31/2019	500
<i>less:</i>	2. # SP firms with no website or no executive/s on firm's website	(9)
<i>plus:</i>	3. # firms of the n = 9 SP in Step 2 where ≥ 1 executive was found on Yahoo! Finance, Bloomberg, Annual Report, or comparably.com	6
	= # SP firms with ≥ 1 named executive	497
<i>less:</i>	4. # RS firms in the n = 497 above where no executive photo could be found	0
	= # SP firms with ≥ 1 executive with a face photo	497

Table 2

Descriptive statistics on the industry composition and selected financial characteristics for the random sample of firms (RS) and S&P 500® Index firms (SP) at 12/31/19 or for FYE on or before 12/31/19

Panel A: Industry Composition

	# firms	
	RS	SP
Fama-French 12-industry:		
Business Equipment	64	82
Chemicals and Allied Products	7	19
Consumer Durables	11	9
Consumer Nondurables	18	31
Finance	133	97
Healthcare, Medical Equipment, and Drugs	96	37
Manufacturing	38	39
Oil, Gas, and Coal Extraction and Products	28	20
Other	63	52
Telephone and Television Transmission	7	11
Utilities	15	30
Wholesale, Retail, and Some Services	38	44
	518	471

Panel A: Selected Firm Financial Characteristics at 12/31/19 or for FYE on or before 12/31/19

	RS			SP		
	10%	Median	90%	10%	Median	90%
Market cap	\$ 23	\$ 748	\$ 12,657	\$ 9,258	\$ 22,422	\$ 125,125
Total assets	\$ 18	\$ 1,090	\$ 18,518	\$ 5,027	\$ 20,497	\$ 14,498
Total liabilities	\$ 6	\$ 689	\$ 13,099	\$ 2,693	\$ 13,411	\$ 104,156
Total equity	\$ 3	\$ 289	\$ 4,186	\$ 1,103	\$ 6,266	\$ 33,742
Revenue	\$ 1	\$ 371	\$ 6,555	\$ 2,640	\$ 10,168	\$ 64,888
R&D	\$ -	\$ -	\$ 97	\$ -	\$ -	\$ 1,276
EBIT	\$ (45)	\$ 32	\$ 901	\$ 509	\$ 1,600	\$ 8,150
Net Income	\$ (93)	\$ 13	\$ 571	\$ 215	\$ 1,001	\$ 5,889
CFOPS	\$ (36)	\$ 31	\$ 999	\$ 529	\$ 1,685	\$ 8,772
CAPEX	\$ -	\$ 7	\$ 327	\$ 43	\$ 392	\$ 3,498
Gross margin	0%	40%	83%	19%	43%	78%
ROE	-87%	7%	36%	0%	15%	45%
ROA	-53%	1%	10%	1%	6%	15%
ROS	-90%	4%	25%	2%	11%	29%
TATO	0.0	0.4	1.6	0.1	0.5	1.3
LEVG	1.1	2.4	9.5	1.5	2.9	9.2
# firms	518	518	518	471	471	471

Table 3

Descriptive statistics on key characteristics, excluding age and race/ethnicity, of the named executives with a facial photo in the random sample of firms (RS) versus the named executives with a facial photo in the S&P 500® Index firms sample (SP).

Panel A: Number of Executives and Salary + Bonus in Most Recent Fiscal Year

	Random sample of firms (RS, n = 510/523)				S&P® 500 Index firms (SP, n = 497/500)			
	Min.	Mean	Max	# execs	# execs	Min.	Mean	Max
# executives per firm	1	8.7	59	4,423	7,246	2	14.6	79
Exec salary + bonus pay, MRFY (\$M)	0	1.3	47.1	1,674	2,108	0	2.4	47.1

Panel B: Executive Gender

	Male	Female	# RS execs	# SP execs	Male	Female
	Gender: #	3,439	984	4,423	7,246	5,533
%	78%	22%			76%	24%

Panel C: Chief and Officer Positions Occupied by Executives, and Executive Presidential Rank

Chief or Officer (outright or Co-) position	C-Label	# RS execs	# SP execs
CEO	CEO	515	501
President	Pres	372	351
Chief Financial Officer	CFO	481	491
General Counsel or Chief Legal Officer	GC,CLO	299	452
Chief Operating Officer	COO	190	170
Corporate Secretary	CS	189	242
Chief Human Resources (or People) Officer	CHRO	103	228
Chief Information Officer	CIO	79	143
Chief Technology Officer	CTO	77	113
Chief Marketing Officer	CMO	63	87
Chief Accounting Officer	CACO	50	84
Executive Chairman	Exec-CH	31	39
Chief Diversity/Equity/Inclusion Officer	CDEIO	8	19
Senior Executive Vice-President	SEVP	11	65
Executive Vice-President	EVP	797	1,686
Senior Vice-President	SVP	783	1,676
Vice-President	VP	688	1,162

Table 4

Racial/ethnic categories and VIAF-based number and densities of executives in the random sample of 523 firms and all firms in the S&P 500® Index. The definition of each racial/ethnic category and how the data was coded is in appendix A. Visual Identification Adjustment Factors (VIAFs) for aian, api, b and h are calculated as described in appendix B.

Panel A: Random Sample of 523 US Publicly Traded Firms at 12/31/19

Classification by ethnic & racial category per McKinsey study by Hunt, Layton & Prince (2015)

Racial/ethnic category per McKinsey study by Hunt, Layton & Prince (2015)			Native American	Other	East Asian	South Asian	African ancestry	Latino	European ancestry	Near Eastern	Total
McKinsey racial/ethnic descriptor tag			na	≡pi + an	ea	sa	aa	lat	eur	ne	
Non-VIAF based	All Executives	#	0	1	112	150	95	88	3,568	43	4,057
	RAED	%	0.0%	0.02%	2.8%	3.7%	2.3%	2.2%	87.9%	1.1%	100%

Classification per National Center for Education Statistics' Integrated Post-Secondary Education System (NCES IPEDS)

Data			American Indian / Alaska Native	Asian / Pacific Islander	Black Non-Hispanic	Hispanic	White non-Hispanic	Total
			aian = na + an	api = ea + sa + pi	b = aa	h = lat	w = eur + ne	
Non-VIAF based	All Executives	#	1	262	95	88	3,611	4,057
	RAED	%	0.02%	6.5%	2.3%	2.2%	89.0%	100%
	VIAF		1.00	1.07	1.10	1.55		
VIAF based	All Executives	#	1	281	105	136	3,534	4,057
	VRAED	%	0.0%	6.9%	2.6%	3.4%	87.1%	100%
VIAF based	CEO	#	0	20	3	8	447	478
	VRAED	%	0.0%	4.3%	0.7%	1.6%	93.4%	100%
VIAF based	President	#	0	12	3	6	331	352
	VRAED	%	0.0%	3.4%	0.9%	1.8%	94.0%	100%
VIAF based	CFO	#	0	29	3	15	382	430
	VRAED	%	0.0%	6.7%	0.8%	3.6%	88.9%	100%
VIAF based	GC or CLO	#	0	9	10	3	254	276
	VRAED	%	0.0%	3.1%	3.6%	1.1%	92.2%	100%
VIAF based	COO	#	0	12	2	5	159	178
	VRAED	%	0.0%	6.6%	1.2%	2.6%	89.5%	100%
VIAF based	Corporate Secretary	#	0	8	7	2	164	180
	VRAED	%	0.0%	4.2%	3.7%	0.9%	91.3%	100%
VIAF based	CHRO	#	0	5	8	3	90	106
	VRAED	%	0.0%	5.1%	7.3%	2.9%	84.8%	100%
VIAF based	CIO	#	0	9	3	2	63	76
	VRAED	%	0.0%	11.3%	4.3%	2.0%	82.3%	100%
VIAF based	CTO	#	0	14	0	2	62	77
	VRAED	%	0.0%	18.1%	0.0%	2.0%	79.9%	100%
VIAF based	CMO	#	0	4	2	2	55	63
	VRAED	%	0.0%	6.8%	3.5%	2.5%	87.2%	100%
VIAF based	Chief Accounting Officer	#	0	1	0	6	52	59
	VRAED	%	0.0%	1.8%	0.0%	10.5%	87.7%	100%
VIAF based	CDO/CIO/CDIO/DIO	#	0	1	6	0	1	8
	VRAED	%	0.0%	13.4%	68.8%	0.0%	17.8%	100%
VIAF based	SEVP or EVP	#	0	46	25	25	648	744
	VRAED	%	0.0%	6.2%	3.4%	3.3%	87.1%	100%
VIAF based	SVP	#	0	42	23	36	634	735
	VRAED	%	0.0%	5.7%	3.1%	4.8%	86.3%	100%
VIAF based	VP	#	1	40	17	23	527	607
	VRAED	%	0.2%	6.5%	2.7%	3.8%	86.8%	100%

Table 4 (continued)

Panel B: All S&P 500® Index Firms at 12/31/19

Classification by ethnic & racial category per McKinsey study by Hunt, Layton & Prince (2015)

Racial/ethnic category per McKinsey study by Hunt, Layton & Prince (2015)	Native American	Other	East Asian	South Asian	African ancestry	Latino	European ancestry	Near Eastern	Total
McKinsey racial/ethnic descriptor tag	na	≡ pi + an	ea	sa	aa	lat	eur	ne	
Non-VIAF based	All Executives #	0	191	302	246	149	5,944	98	6,931
	RAED %	0.0%	2.8%	4.4%	3.5%	2.1%	85.8%	1.4%	100%

Classification per National Center for Education Statistics' Integrated Post-Secondary Education System (NCES IPEDS)

Data	American Indian / Alaska Native	Asian / Pacific Islander	Black Non-Hispanic	Hispanic	White non-Hispanic	Total
	aian = na + an	api = ea + sa + pi	b = aa	h = lat	w = eur + ne	
Non-VIAF based	All Executives #	1	493	246	149	6,042
	RAED %	0.01%	7.1%	3.5%	2.1%	87.2%
	VIAF	1.00	1.07	1.10	1.55	
VIAF based	All Executives #	1	529	271	230	5,900
	VRAED %	0.0%	7.6%	3.9%	3.3%	85.1%
VIAF based	CEO #	0	25	7	14	456
	VRAED %	0.0%	4.9%	1.3%	2.8%	91.0%
VIAF based	President #	0	25	4	11	310
	VRAED %	0.0%	7.1%	1.3%	3.1%	88.6%
VIAF based	CFO #	0	24	7	9	442
	VRAED %	0.0%	4.9%	1.4%	1.9%	91.8%
VIAF based	GC or CLO #	0	19	36	11	371
	VRAED %	0.0%	4.4%	8.3%	2.5%	84.8%
VIAF based	COO #	0	9	4	6	147
	VRAED %	0.0%	5.2%	2.7%	3.7%	88.5%
VIAF based	Corporate Secretary #	0	13	15	5	196
	VRAED %	0.0%	5.6%	6.7%	2.0%	85.6%
VIAF based	CHRO #	0	13	28	8	199
	VRAED %	0.0%	5.2%	11.1%	3.1%	80.5%
VIAF based	CIO #	0	23	3	2	145
	VRAED %	0.0%	13.1%	1.9%	0.9%	84.1%
VIAF based	CTO #	0	27	1	3	86
	VRAED %	0.0%	22.9%	0.9%	2.6%	73.5%
VIAF based	CMO #	0	11	3	3	115
	VRAED %	0.0%	8.1%	2.5%	2.3%	87.0%
VIAF based	Chief Accounting Officer #	0	3	3	2	89
	VRAED %	0.0%	3.3%	3.4%	1.6%	91.7%
VIAF based	CDO/CIO/CDIO/DIO #	0	1	9	2	10
	VRAED %	0.0%	5.1%	41.9%	7.4%	45.6%
VIAF based	SEVP or EVP #	0	107	80	48	1,486
	VRAED %	0.0%	6.2%	4.7%	2.8%	86.3%
VIAF based	SVP #	0	128	62	97	1,309
	VRAED %	0.0%	8.0%	3.9%	6.1%	82.0%
VIAF based	VP #	0	70	36	26	901
	VRAED %	0.0%	6.8%	3.5%	2.5%	87.2%

Table 5

Numbers and racial/ethnic densities of seniors graduating in 1974–2008 from the top 100 US colleges and universities as defined by Ashkenas, Park, and Pearce (*New York Times*, 2017). Actual data values from NCES IPEDS are shown in white; linear interpolations of missing-data years that are bounded by nonmissing years are in grey; and linear extrapolations for years before the first year of data available in NCES IPEDS are in light tan.

Race/ethnicity of graduating undergraduates					
	aian	api	b	h	w
1974	0.16%	0.47%	2.23%	0.04%	97.07%
1975	0.18%	0.92%	2.32%	0.26%	96.31%
1976	0.20%	1.36%	2.41%	0.47%	95.54%
1977	0.22%	1.81%	2.50%	0.68%	94.77%
1978	0.24%	2.26%	2.59%	0.89%	94.00%
1979	0.26%	2.70%	2.69%	1.11%	93.23%
1980	0.28%	3.15%	2.78%	1.32%	92.47%
1981	0.30%	3.59%	2.87%	1.53%	91.70%
1982	0.32%	4.04%	2.96%	1.74%	90.93%
1983	0.34%	4.48%	3.05%	1.96%	90.16%
1984	0.36%	4.93%	3.14%	2.17%	89.40%
1985	0.38%	5.38%	3.23%	2.38%	88.63%
1986	0.39%	5.82%	3.32%	2.59%	87.86%
1987	0.44%	5.52%	3.39%	2.60%	88.04%
1988	0.41%	6.01%	3.41%	2.73%	87.43%
1989	0.37%	6.50%	3.44%	2.86%	86.83%
1990	0.42%	7.13%	3.45%	3.19%	85.80%
1991	0.41%	7.46%	3.61%	3.33%	85.16%
1992	0.47%	8.02%	3.95%	3.78%	83.80%
1993	0.52%	8.75%	4.02%	4.13%	82.54%
1994	0.59%	9.57%	4.21%	4.59%	80.97%
1995	0.60%	10.75%	4.22%	4.80%	79.62%
1996	0.64%	11.54%	4.26%	5.08%	78.47%
1997	0.67%	12.25%	4.28%	5.47%	77.33%
1998	0.70%	12.41%	4.48%	5.66%	76.75%
1999	0.74%	12.49%	4.63%	5.81%	76.32%
2000	0.75%	12.80%	4.83%	5.86%	75.77%
2001	0.75%	12.98%	4.90%	5.87%	75.50%
2002	0.69%	13.00%	4.90%	5.96%	75.45%
2003	0.72%	13.30%	4.89%	6.01%	75.08%
2004	0.71%	13.63%	4.97%	6.27%	74.42%
2005	0.73%	13.89%	5.01%	6.42%	73.94%
2006	0.75%	14.21%	4.94%	6.56%	73.54%
2007	0.73%	14.38%	5.04%	6.72%	73.13%
2008	0.76%	14.31%	5.10%	7.04%	72.80%

Table 6

For **executives as a whole** in the random sample (RS) and S&P 500® (SP), this table presents calibrations of executives' VIAF-based racial/ethnic densities (VRAEDs) against the RAEDs of the 2019 US population and executives' TBQ-based expected densities (ERAEDs). Z-statistics shown in red < -1.96 (green > 1.96). Percentages are rounded to the nearest 0.1%. VIAFs for American Indian/Alaska Native (aian), Asian/Pacific Islander (api), Black (b), and Hispanic (h) executives are per table 4, with the VIAF applied to White (w) being a plug. 2019 US population RAEDs are per appendix C. Z-statistics in red < -1.96 (green > 1.96). Percentages are rounded to the nearest 0.1%.

	Race / ethnicity of all executives				
Random sample (RS) n = 4,057	aian	api	b	h	w
VRAED	0.02%	6.9%	2.6%	3.4%	87.1%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.0%	0.5%	-10.4%	-15.1%	26.0%
z-stat (VRAED - US population)	-6.4	1.4	-19.7	-24.8	33.9
ERAED	0.4%	6.9%	3.5%	3.1%	86.0%
VRAED - ERAED	-0.4%	0.0%	-1.0%	0.2%	1.1%
z-stat (VRAED - ERAED)	-4.0	0.1	-3.3	0.9	2.0
S&P® 500 (SP) n = 6,931	aian	api	b	h	w
VRAED	0.0%	7.6%	3.9%	3.3%	85.1%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.0%	1.2%	-9.1%	-15.1%	24.0%
z-stat (VRAED - US population)	-8.5	4.2	-22.4	-32.5	41.0
ERAED	0.4%	6.4%	3.5%	2.9%	86.8%
VRAED - ERAED	-0.4%	1.2%	0.5%	0.4%	-1.7%
z-stat (VRAED - ERAED)	-5.2	4.1	2.1	2.1	-4.1
SP vs. RS	aian	api	b	h	w
VRAED_SP - VRAED_RS	-0.01%	0.7%	1.3%	0.0%	-2.0%
z-stat.	-0.4	1.4	3.9	-0.1	-2.9
ERAED_SP - ERAED_RS	-0.03%	-0.5%	-0.1%	-0.2%	0.8%
z-stat.	-0.2	-1.0	-0.2	-0.6	1.2

Table 7

For **SEVPs/EVPs, SVPs and VPs** in the random sample (RS) and S&P 500® (SP), this table presents calibrations of their VIAF-based racial/ethnic densities (VRAEDs) against the RAEDs of the 2019 US population and their TBQ-based expected densities (ERAEDs). Z-statistics in red < -1.96 (green > 1.96). Percentages are rounded to the nearest 0.1%.

Panel A: SEVP + EVP

Random sample (RS) n = 744	Race/ethnicity of SEVP or EVP				
	aian	api	b	h	w
VRAED	0.0%	6.2%	3.4%	3.3%	87.1%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-0.2%	-9.6%	-15.1%	25.9%
z-stat (VRAED - US population)	-2.8	-0.2	-7.8	-10.6	14.5
ERAED	0.4%	6.4%	3.4%	2.9%	86.9%
VRAED - ERAED	-0.4%	-0.2%	0.0%	0.4%	0.2%
z-stat (VRAED - ERAED)	-1.8	-0.2	-0.1	0.7	0.2

S&P 500® (SP) n = 1,722	aian	api	b	h	w
VRAED	0.0%	6.2%	4.7%	2.8%	86.3%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-0.2%	-8.2%	-15.7%	25.1%
z-stat (VRAED - US population)	-4.3	-0.3	-10.2	-16.8	21.4
ERAED	0.4%	6.3%	3.4%	2.8%	87.1%
VRAED - ERAED	-0.4%	0.0%	1.3%	0.0%	-0.8%
z-stat (VRAED - ERAED)	-2.6	-0.1	3.0	-0.1	-1.0

Panel B: SVP

Random sample (RS) n = 735	Race/ethnicity of SVP				
	aian	api	b	h	w
VRAED	0.0%	5.7%	3.1%	4.8%	86.3%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-0.7%	-9.8%	-13.6%	25.2%
z-stat (VRAED - US population)	-2.8	-0.8	-7.9	-9.5	14.0
ERAED	0.4%	7.2%	3.6%	3.2%	85.6%
VRAED - ERAED	-0.4%	-1.5%	-0.4%	1.6%	0.8%
z-stat (VRAED - ERAED)	-1.8	-1.5	-0.7	2.4	0.6

S&P 500® (SP) n = 1,596	aian	api	b	h	w
VRAED	0.0%	8.1%	3.9%	3.5%	84.5%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	1.7%	-9.0%	-15.0%	23.4%
z-stat (VRAED - US population)	-4.1	2.7	-10.7	-15.4	19.2
ERAED	0.4%	6.7%	3.5%	3.0%	86.3%
VRAED - ERAED	-0.4%	1.4%	0.4%	0.4%	-1.8%
z-stat (VRAED - ERAED)	-2.6	2.2	0.9	1.0	-2.1

Table 7 (continued)

Panel C: VP

	Race/ethnicity of VP				
Random sample (RS) n = 607	aian	api	b	h	w
VRAED	0.2%	6.5%	2.7%	3.8%	86.8%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-0.9%	0.2%	-10.2%	-14.6%	25.6%
z-stat (VRAED - US population)	-2.1	0.2	-7.5	-9.3	12.9
ERAED	0.5%	7.6%	3.7%	3.4%	84.9%
VRAED - ERAED	-0.3%	-1.0%	-0.9%	0.4%	1.9%
z-stat (VRAED - ERAED)	-1.1	-1.0	-1.2	0.5	1.3
S&P 500® (SP) n = 1,033	aian	api	b	h	w
VRAED	0.0%	6.8%	3.5%	2.5%	87.2%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	0.4%	-9.4%	-15.9%	26.0%
z-stat (VRAED - US population)	-3.3	0.5	-9.0	-13.2	17.2
ERAED	0.4%	7.0%	3.6%	3.2%	85.9%
VRAED - ERAED	-0.4%	-0.2%	-0.1%	-0.6%	1.3%
z-stat (VRAED - ERAED)	-2.1	-0.3	-0.1	-1.1	1.2

Table 8

For **CEOs, CFOs, GCs, COOs, CHROs, CIOs and CTOs** in the random sample (RS) and S&P 500® (SP), this table presents calibrations of their VIAF-based racial/ethnic densities (VRAEDs) against the RAEDs of the 2019 US population and their TBQ-based expected densities (ERAEDs). Z-statistics in red < -1.96 (green > 1.96). Percentages are rounded to the nearest 0.1%.

Panel A: CEO

Random sample (RS) n = 478	Race / ethnicity of CEO				
	aian	api	b	h	w
VRAED	0.0%	4.3%	0.7%	1.6%	93.4%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-2.1%	-12.3%	-16.8%	32.3%
z-stat (VRAED - US population)	-2.3	-1.9	-8.0	-9.5	14.5
ERAED	0.4%	5.2%	3.2%	2.3%	89.0%
VRAED - ERAED	-0.4%	-0.9%	-2.5%	-0.7%	4.4%
z-stat (VRAED - ERAED)	-1.3	-0.9	-3.1	-1.0	3.1

S&P 500® (SP) n = 501	aian	api	b	h	w
VRAED	0.0%	4.9%	1.3%	2.8%	91.0%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-1.5%	-11.6%	-15.7%	29.8%
z-stat (VRAED - US population)	-2.3	-1.3	-7.8	-9.0	13.7
ERAED	0.4%	4.8%	3.1%	2.1%	89.5%
VRAED - ERAED	-0.4%	0.1%	-1.8%	0.6%	1.4%
z-stat (VRAED - ERAED)	-1.3	0.1	-2.3	1.0	1.0

Panel B: CFO

Random sample (RS) n = 430	Race / ethnicity of CFO				
	aian	api	b	h	w
VRAED	0.0%	6.7%	0.8%	3.6%	88.9%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	0.3%	-12.2%	-14.9%	27.7%
z-stat (VRAED - US population)	-2.1	0.3	-7.5	-7.9	11.8
ERAED	0.5%	7.2%	3.6%	3.3%	85.5%
VRAED - ERAED	-0.5%	-0.5%	-2.8%	0.3%	3.4%
z-stat (VRAED - ERAED)	-1.4	-0.4	-3.2	0.4	2.0

S&P 500® (SP) n = 482	aian	api	b	h	w
VRAED	0.0%	4.9%	1.4%	1.9%	91.8%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-1.5%	-11.6%	-16.5%	30.7%
z-stat (VRAED - US population)	-2.3	-1.3	-7.6	-9.4	13.8
ERAED	0.4%	7.1%	3.6%	3.2%	85.6%
VRAED - ERAED	-0.4%	-2.2%	-2.2%	-1.3%	6.2%
z-stat (VRAED - ERAED)	-1.5	-1.9	-2.6	-1.6	3.9

Table 8 (continued)

Panel C: GC or Chief Legal Officer

	Race/ethnicity General Counsel or Chief Legal Officer				
Random sample (RS) n = 276	aian	api	b	h	w
VRAED	0.0%	3.1%	3.6%	1.1%	92.2%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-3.3%	-9.4%	-17.3%	31.0%
z-stat (VRAED - US population)	-1.7	-2.2	-4.6	-7.4	10.6
ERAED	0.4%	6.9%	3.5%	3.1%	86.0%
VRAED - ERAED	-0.4%	-3.8%	0.1%	-2.0%	6.1%
z-stat (VRAED - ERAED)	-1.1	-2.5	0.1	-1.9	2.9
S&P 500® (SP) n = 432	aian	api	b	h	w
VRAED	0.0%	4.5%	8.4%	2.5%	84.6%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-1.9%	-4.6%	-15.9%	23.5%
z-stat (VRAED - US population)	-2.1	-1.6	-2.8	-8.5	10.0
ERAED	0.4%	6.1%	3.4%	2.8%	87.3%
VRAED - ERAED	-0.4%	-1.7%	5.0%	-0.3%	-2.7%
z-stat (VRAED - ERAED)	-1.3	-1.4	5.7	-0.3	-1.7

Panel D: COO

	Race/ethnicity of COO				
Random sample (RS) n = 178	aian	api	b	h	w
VRAED	0.0%	6.6%	1.2%	2.6%	89.5%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	0.2%	-11.7%	-15.8%	28.4%
z-stat (VRAED - US population)	-1.4	0.1	-4.7	-5.4	7.8
ERAED	0.4%	6.9%	3.5%	3.1%	85.9%
VRAED - ERAED	-0.4%	-0.3%	-2.3%	-0.5%	3.6%
z-stat (VRAED - ERAED)	-0.9	-0.2	-1.7	-0.4	1.4
S&P 500® (SP) n = 165	aian	api	b	h	w
VRAED	0.0%	5.2%	2.7%	3.7%	88.4%
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%
VRAED - US population	-1.1%	-1.2%	-10.3%	-14.7%	27.2%
z-stat (VRAED - US population)	-1.3	-0.6	-3.9	-4.9	7.2
ERAED	0.4%	6.0%	3.4%	2.7%	87.5%
VRAED - ERAED	-0.4%	-0.8%	-0.7%	1.0%	0.9%
z-stat (VRAED - ERAED)	-0.8	-0.5	-0.5	0.8	0.4

Table 8 (continued)

Panel E: Chief HR Officer

		Race/ethnicity Chief HR Officer, Chief People Officer				
Random sample (RS) n = 99	aian	api	b	h	w	
VRAED	0.0%	2.2%	6.7%	3.1%	88.0%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	-4.2%	-6.3%	-15.3%	26.9%	
z-stat (VRAED - US population)	-1.0	-1.7	-1.9	-3.9	5.5	
ERAED	0.4%	7.3%	3.7%	3.3%	85.2%	
VRAED - ERAED	-0.4%	-5.2%	3.0%	-0.2%	2.8%	
z-stat (VRAED - ERAED)	-0.7	-2.0	1.6	-0.1	0.8	
S&P 500® (SP) n = 228	aian	api	b	h	w	
VRAED	0.0%	4.7%	11.6%	2.7%	81.0%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	-1.7%	-1.4%	-15.7%	19.9%	
z-stat (VRAED - US population)	-1.6	-1.0	-0.6	-6.1	6.1	
ERAED	0.4%	6.9%	3.6%	3.1%	85.9%	
VRAED - ERAED	-0.4%	-2.2%	8.0%	-0.4%	-4.9%	
z-stat (VRAED - ERAED)	-1.0	-1.3	6.5	-0.4	-2.1	

Panel F: CIO

		Race/ethnicity of Chief Information Officer				
Random sample (RS) n = 76	aian	api	b	h	w	
VRAED	0.0%	11.3%	4.3%	2.0%	82.3%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	4.9%	-8.6%	-16.4%	21.2%	
z-stat (VRAED - US population)	-0.9	1.7	-2.2	-3.7	3.8	
ERAED	0.4%	7.0%	3.6%	3.2%	85.8%	
VRAED - ERAED	-0.4%	4.3%	0.8%	-1.2%	-3.5%	
z-stat (VRAED - ERAED)	-0.6	1.5	0.4	-0.6	-0.9	
S&P 500® (SP) n = 166	aian	api	b	h	w	
VRAED	0.0%	12.9%	1.3%	0.9%	84.8%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	6.5%	-11.6%	-17.5%	23.7%	
z-stat (VRAED - US population)	-1.3	3.4	-4.5	-5.8	6.3	
ERAED	0.4%	6.7%	3.5%	3.0%	86.4%	
VRAED - ERAED	-0.4%	6.3%	-2.2%	-2.1%	-1.6%	
z-stat (VRAED - ERAED)	-0.8	3.2	-1.5	-1.6	-0.6	

Table 8 (continued)

Panel G: CTO

		Race/ethnicity of Chief Technology Officer				
Random sample (RS) n = 74	aian	api	b	h	w	
VRAED	0.0%	18.9%	0.0%	2.1%	79.1%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	12.5%	-13.0%	-16.4%	17.9%	
z-stat (VRAED - US population)	-0.9	4.4	-3.3	-3.6	3.2	
ERAED	0.5%	7.4%	3.6%	3.4%	85.1%	
VRAED - ERAED	-0.5%	11.4%	-3.6%	-1.3%	-6.0%	
z-stat (VRAED - ERAED)	-0.6	3.8	-1.7	-0.6	-1.5	
S&P 500® (SP) n = 111	aian	api	b	h	w	
VRAED	0.0%	24.2%	1.0%	2.8%	72.1%	
2019 US population	1.1%	6.4%	13.0%	18.5%	61.2%	
VRAED - US population	-1.1%	17.8%	-12.0%	-15.7%	10.9%	
z-stat (VRAED - US population)	-1.1	7.7	-3.8	-4.3	2.4	
ERAED	0.4%	6.7%	3.5%	3.0%	86.4%	
VRAED - ERAED	-0.4%	17.5%	-2.5%	-0.2%	-14.3%	
z-stat (VRAED - ERAED)	-0.7	7.4	-1.4	-0.1	-4.4	

Table 9

VIAF-based racial/ethnic densities (VRAEDs) of all executives in the random sample and S&P 500® firms. ERAEDs are expected TBQ-based labor supply densities derived from the RAEDs of seniors graduating from the top 100 US colleges & universities (per Ashkenas, Park and Pearce 2017) in the same years as the executives. All percentages are visually but not intrinsically rounded to the nearest 0.1%.

Panel A: VRAEDs and ERAEDs

RS + S&P 500 samples			VRAED					ERAED				
Age bin	#	%	aian	api	b	h	w	aian	api	b	h	ERAED w
≥ 72.5	73	0.7%	0.0%	7.4%	0.0%	0.0%	92.6%	0.2%	0.5%	2.2%	0.0%	97.1%
(67.5, 72.5)	102	0.9%	0.0%	9.5%	0.0%	0.0%	90.5%	0.2%	0.5%	2.2%	0.0%	97.1%
(62.5, 67.5]	647	5.9%	0.0%	2.2%	1.0%	0.7%	96.1%	0.2%	2.2%	2.6%	0.9%	94.1%
(57.5, 62.5]	1,873	17.0%	0.0%	4.4%	1.5%	2.2%	91.9%	0.3%	4.2%	3.0%	1.8%	90.7%
(52.5, 57.5]	3,763	34.2%	0.0%	6.5%	3.2%	2.7%	87.6%	0.4%	5.9%	3.4%	2.7%	87.7%
(47.5, 52.5]	3,309	30.1%	0.0%	10.7%	5.0%	4.3%	80.0%	0.5%	8.0%	3.8%	3.7%	83.9%
(42.5, 47.5]	989	9.0%	0.1%	8.5%	5.4%	6.6%	79.4%	0.6%	11.6%	4.3%	5.2%	78.3%
(37.5,42.5]	193	1.8%	0.0%	7.8%	1.1%	4.0%	87.1%	0.7%	13.0%	4.9%	5.9%	75.4%
< 37.5	38	0.3%	0.0%	8.5%	2.9%	4.1%	84.6%	0.7%	14.2%	5.0%	6.7%	73.4%
Total execs	10,987	100.0%										

Panel B: VRAED – ERAED and Z-statistics

Age bin	#	%	VRAED - ERAED					Z-statistic on VRAED - ERAED				
			aian	api	b	h	w	aian	api	b	h	w
≥ 72.5	73	0.7%	-0.2%	6.9%	-2.2%	0.0%	-4.4%	-0.3	8.6	-1.3	-0.2	-2.2
(67.5, 72.5)	102	0.9%	-0.2%	9.0%	-2.2%	0.0%	-6.5%	-0.4	13.3	-1.5	-0.2	-3.9
(62.5, 67.5]	647	5.9%	-0.2%	0.0%	-1.6%	-0.1%	2.0%	-1.2	-0.1	-2.5	-0.4	2.1
(57.5, 62.5]	1,873	17.0%	-0.3%	0.2%	-1.5%	0.4%	1.3%	-2.5	0.4	-3.9	1.3	1.9
(52.5, 57.5]	3,763	34.2%	-0.4%	0.6%	-0.2%	0.1%	0.0%	-3.9	1.5	-0.7	0.2	-0.1
(47.5, 52.5]	3,309	30.1%	-0.5%	2.7%	1.2%	0.6%	-4.0%	-3.9	5.6	3.5	1.9	-6.2
(42.5, 47.5]	989	9.0%	-0.5%	-3.1%	1.1%	1.4%	1.2%	-2.1	-3.1	1.8	1.9	0.9
(37.5,42.5]	193	1.8%	-0.7%	-5.2%	-3.7%	-1.9%	11.6%	-1.2	-2.2	-2.4	-1.1	3.8
< 37.5	38	0.3%	-0.7%	-5.7%	-2.1%	-2.6%	11.1%	-0.5	-1.0	-0.6	-0.6	1.6
Total execs	10,987	100.0%										

Figure 1

Racial and ethnic densities of seniors graduating in 1974-2008 from the top 100 US colleges and universities as defined by Ashkenas, Park and Pearce (2017). Year is the academic year ending May; so 1987 is June 1986-May 1987. Actual data values from NCES IPEDS are shown in thicker solid lines, and linear extrapolations for years that before the first year of data available in NCES IPEDS are shown in dotted lines.

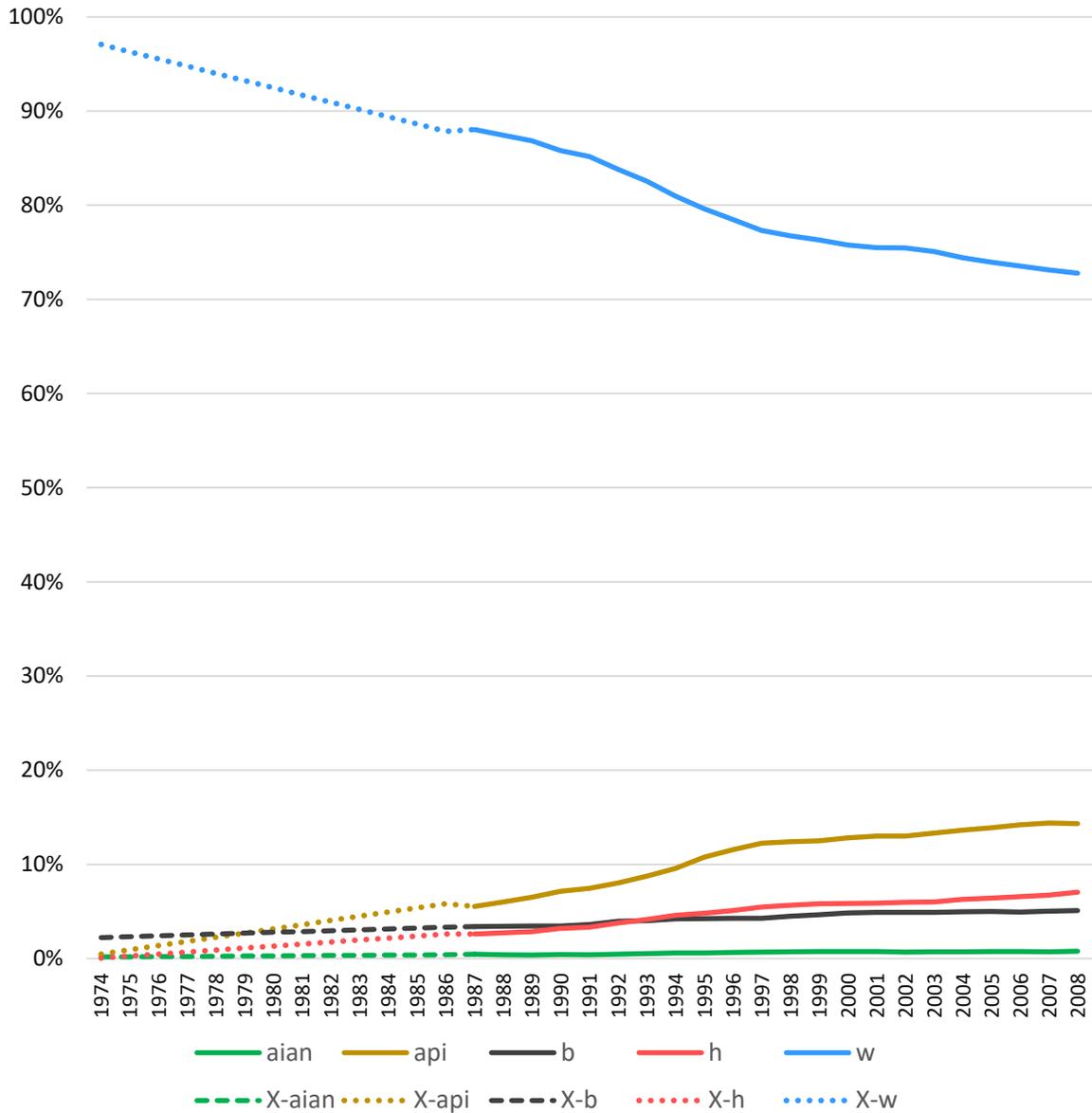


Figure 2

Graphical summary of the Z-statistics reported in Tables 6-8 for executive VIAF-based racial/ethnic densities (VRAEDs) calibrated against the 2019 RAEDs of the US population and against TBQ-based expected densities (ERAEDs). Z-statistics in red < -1.96 (green > 1.96). Percentages are rounded to the nearest 0.1%.

Panel A: Distribution of statistically significant and insignificant Z-statistics

Executive group	Benchmark that executive VRAEDs are calibrated against	Executive race or ethnicity									
		American Indian / Alaska Native		Asian / Pacific Islander		Black		Hispanic		White	
		RS	SP	RS	SP	RS	SP	RS	SP	RS	SP
All execs	US population	-6.4	-8.5	1.4	4.2	-19.7	-22.4	-24.8	-32.5	33.9	41.0
	BA-qualified ERAED	-4.0	-5.2	0.1	4.1	-3.3	2.1	0.9	2.1	2.0	-4.1
SEVP + EVP	US population	-2.8	-4.3	-0.2	-0.3	-7.8	-10.2	-10.6	-16.8	14.5	21.4
	BA-qualified ERAED	-1.8	-2.6	-0.2	-0.1	-0.1	3.0	0.7	-0.1	0.2	-1.0
SVP	US population	-2.8	-4.1	-0.8	2.7	-7.9	-10.7	-9.5	-15.4	14.0	19.2
	BA-qualified ERAED	-1.8	-2.6	-1.5	2.2	-0.7	0.9	2.4	1.0	0.6	-2.1
VP	US population	-2.1	-3.3	0.2	0.5	-7.5	-9.0	-9.3	-13.2	12.9	17.2
	BA-qualified ERAED	-1.1	-2.1	-1.0	-0.3	-1.2	-0.1	0.5	-1.1	1.3	1.2
CEO	US population	-2.3	-2.3	-1.9	-1.3	-8.0	-7.8	-9.5	-9.0	14.5	13.7
	BA-qualified ERAED	-1.3	-1.3	-0.9	0.1	-3.1	-2.3	-1.0	1.0	3.1	1.0
CFO	US population	-2.1	-2.3	0.3	-1.3	-7.5	-7.6	-7.9	-9.4	11.8	13.8
	BA-qualified ERAED	-1.4	-1.5	-0.4	-1.9	-3.2	-2.6	0.4	-1.6	2.0	3.9
GC	US population	-1.7	-2.1	-2.2	-1.6	-4.6	-2.8	-7.4	-8.5	10.6	10.0
	BA-qualified ERAED	-1.1	-1.3	-2.5	-1.4	0.1	5.7	-1.9	-0.3	2.9	-1.7
COO	US population	-1.4	-1.3	0.1	-0.6	-4.7	-3.9	-5.4	-4.9	7.8	7.2
	BA-qualified ERAED	-0.9	-0.8	-0.2	-0.5	-1.7	-0.5	-0.4	0.8	1.4	0.4
CHRO	US population	-1.0	-1.6	-1.7	-1.0	-1.9	-0.6	-3.9	-6.1	5.5	6.1
	BA-qualified ERAED	-0.7	-1.0	-2.0	-1.3	1.6	6.5	-0.1	-0.4	0.8	-2.1
CIO	US population	-0.9	-1.3	1.7	3.4	-2.2	-4.5	-3.7	-5.8	3.8	6.3
	BA-qualified ERAED	-0.6	-0.8	1.5	3.2	0.4	-1.5	-0.6	-1.6	-0.9	-0.6
CTO	US population	-0.9	-1.1	4.4	7.7	-3.3	-3.8	-3.6	-4.3	3.2	2.4
	BA-qualified ERAED	-0.6	-0.7	3.8	7.4	-1.7	-1.4	-0.6	-0.1	-1.5	-4.4
Number of Z-statistics ≤ -1.96		18		3		23		20		3	
Number of Z-statistics ≥ 1.96		0		6		4		2		25	
% Z-statistics ≤ -1.96		41%		7%		57%		50%		9%	
% Z-statistics ≥ 1.96		0%		23%		9%		5%		61%	

Color key: **RED** = Z-statistic ≤ -1.96
WHITE = Z-statistic between -1.96 and 1.96
GREEN = Z-statistic ≥ 1.96

Figure 2 (continued)

Panel B: Distribution of same versus dissimilar/non-same inferences about whether executive VRAEDs are under-, at- or overrepresented versus under-, at, or overdense, using the Z-statistics in panel A. Denoting $Z_{ijk}[USPopRAED]$ as the Z-statistic on $VRAED_{ijk} - USPopRAED_j$, and $Z_{ijk}[ERAED]$ as the Z-statistic on $VRAED_{ijk} - ERAED_{ijk}$, non-same inferences are classified as different or opposite. Different inferences arise when $Z_{ijk}[USPopRAED] \geq 1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$, or when $Z_{ijk}[USPopRAED] \leq -1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$. Opposite inferences arise when $Z_{ijk}[USPopRAED] \geq 1.96$ and $Z_{ijk}[ERAED] \leq -1.96$, or when $Z_{ijk}[USPopRAED] \leq -1.96$ and $Z_{ijk}[ERAED] \geq 1.96$. Executive groups are indexed by $i = 1$ (all executives) to 11 (CTOs), race and ethnicity by $j = 1$ (aian) to 5 (w), and datasets by $k = 1$ (random sample) and 2 (S&P 500®)

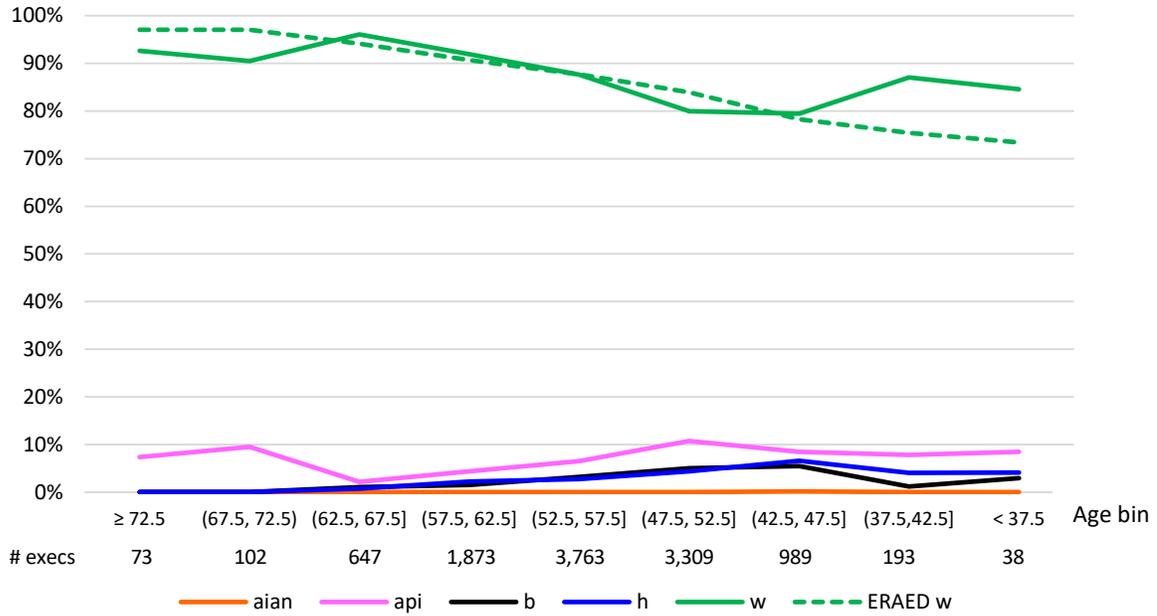
Executive group	Benchmark that executive VRAEDs are calibrated against	Executive race or ethnicity										Dissimilar inferences fraction
		American Indian / Alaska Native		Asian / Pacific Islander		Black		Hispanic		White		
		RS	SP	RS	SP	RS	SP	RS	SP	RS	SP	
All execs	US population BA-qualified ERAED	Same	Same	Same	Same	Same	Opposite	Different	Opposite	Same	Opposite	40%
SEVP + EVP	US population BA-qualified ERAED	Different	Same	Same	Same	Different	Opposite	Different	Different	Different	Different	70%
SVP	US population BA-qualified ERAED	Different	Same	Same	Same	Different	Different	Opposite	Different	Different	Opposite	70%
VP	US population BA-qualified ERAED	Different	Same	Same	Same	Different	Different	Different	Different	Different	Different	70%
CEO	US population BA-qualified ERAED	Different	Different	Same	Same	Same	Same	Different	Different	Same	Different	50%
CFO	US population BA-qualified ERAED	Different	Different	Same	Same	Same	Same	Different	Different	Same	Same	40%
GC	US population BA-qualified ERAED	Same	Different	Same	Same	Different	Opposite	Different	Different	Same	Different	60%
COO	US population BA-qualified ERAED	Same	Same	Same	Same	Different	Different	Different	Different	Different	Different	60%
CHRO	US population BA-qualified ERAED	Same	Same	Different	Same	Same	Different	Different	Different	Different	Opposite	60%
CIO	US population BA-qualified ERAED	Same	Same	Same	Same	Different	Different	Different	Different	Different	Different	60%
CTO	US population BA-qualified ERAED	Same	Same	Same	Same	Different	Different	Different	Different	Different	Opposite	60%
Dissimilar inferences fraction		36%		5%		68%		100%		72%		58%

Color key:		Fractions:
Same	$= Z_{ijk}[USPopRAED] \geq 1.96$ and $Z_{ijk}[ERAED] \geq 1.96$, or $Z_{ijk}[USPopRAED] \leq -1.96$ and $Z_{ijk}[ERAED] \leq -1.96$, or $-1.96 < Z_{ijk}[USPopRAED] < 1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$	42%
Different	$= Z_{ijk}[USPopRAED] \geq 1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$, or when $Z_{ijk}[USPopRAED] \leq -1.96$ and $-1.96 < Z_{ijk}[ERAED] < 1.96$	50%
Opposite	$= Z_{ijk}[USPopRAED] \geq 1.96$ and $Z_{ijk}[ERAED] \leq -1.96$, or $Z_{ijk}[USPopRAED] \leq -1.96$ and $Z_{ijk}[ERAED] \geq 1.96$.	8%

Figure 3

Panel A shows VIAF-based racial/ethnic densities (VRAEDs) of all executives in union of the random sample (RS) of US publicly traded firms and S&P 500® firms (SP) at 12/31/19, and the ERAED for White executives, by executive age in 5-year bins. ERAEDs are the expected TBQ-based labor supply densities derived from the RAEDs of seniors graduating from the top 100 US colleges & universities (per Ashkenas, Park and Pearce 2017) matched to the same year that each executive graduated. VRAEDs – ERAEDs are shown in panel B.

Panel A: VRAEDs of all RS + SP executives, and ERAEDs for White executives, by executive age in 5-year bins



Panel B: VRAEDs – ERAEDs of all RS + SP executives, by executive age in 5-year bins

