

# Center for Employment Equity

University of Massachusetts Amherst

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## Is Tech Sector Diversity Improving?

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Employment Equity

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The Tech industry is one of the fastest growing sectors in the American economy.<sup>1</sup> This expanding sector also produces high-paying jobs. The median annual wage of all workers in the Tech sector of the U.S. economy is about twice that in non-Tech industries and professional workers' median annual wage is up to 48% higher in Tech than in non-Tech firms.<sup>2</sup> Tech firms are also among the leader firms in the profit race among US corporations.<sup>3</sup>

But all is not rosy in Tech. It is well known that access to these high-paying jobs is not equally distributed. Most of these good jobs go to White and Asian men. Other minorities and women of all backgrounds continue to constitute relatively small fractions of the Tech workforce despite substantial pressure to diversify and rapid job expansion.<sup>4</sup> The same can be said of the venture capital firms propelling future expansion.<sup>5</sup> In addition, Black and Hispanic employees are rare and generally not fully incorporated into workplace professional cultures, while Asian men and women face sustained barriers to leadership positions.<sup>6</sup> The Tech sector has a diversity problem, one that the recent protests for racial justice have highlighted once again.<sup>7</sup>

This mismatch between good jobs and profitable firms and the diversity of the rest of the US has produced substantial pressure on Tech firms to diversify their workforces. The pressure for increased diversity has been most intense around gender, with issues of both hostile workplace climates and a leaky, high turnover, employment pipeline as the most often cited sources of low levels of women's employment.<sup>8</sup>

Advocacy for racial diversity in Tech has widened to include other groups. While Asian employees are widespread in professional-technical roles, some commenters have noted lower

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<sup>1</sup> GAO. 2017. Diversity in the Technology Sector. Report to the Ranking Member, Committee on Education and the Workforce, House of Representatives.

<sup>2</sup> Roberts, Brian and Michael Wolf. 2018. "High-Tech industries: an analysis of employment, wages, and output." Bureau of Labor Statistics. Beyond the Numbers: Employment & Unemployment 7(7). Retrieved 4/18/2019. <https://www.bls.gov/opub/btn/volume-7/high-Tech-industries-an-analysis-of-employment-wages-and-output.htm>

<sup>3</sup> <https://www.theatlantic.com/business/archive/2017/10/why-does-the-stock-market-keep-going-up/543249/>

<sup>4</sup> The notoriety of the Tech industry has led to investigations by both the U.S. Equal Employment Opportunity Commission (U.S. Equal Employment Opportunity Commission. 2016. *Diversity in High Tech*) and the Federal Governmental Accountability Office (United States Government Accountability Office. 2017. Report to the Ranking Member, Committee on Education and the Workforce, House of Representatives: Diversity in the Technology Sector: Federal Agencies Could Improve Oversight of Equal Employment Opportunity Requirements. November 2017 GAO-18-69).

<sup>5</sup> <https://Techcrunch.com/2019/02/12/investors-are-still-failing-to-back-founders-from-diverse-backgrounds/>

<sup>6</sup> Alegria, Sharla N. 2020. "What do we mean by broadening participation? Race, inequality, and diversity in Tech work." *Sociology Compass*. DOI: 10.1111/soc4.12793

<sup>7</sup> <https://searchcio.techtarget.com/feature/Techs-racial-diversity-problem-meets-its-day-of-reckoning>

<sup>8</sup> Scott, Allison, Freada Klein, and Uriridiakoghene Onovakpuri. 2017. "Tech Leavers Study." Kapor Center for Social Impact.

rates of representation in managerial and especially executive jobs.<sup>9</sup> Black and Hispanic employees are rare in all of the core roles in Tech.<sup>10</sup>

Many Tech firms seem to have embraced easy, but typically ineffective solutions to their diversity problems, such as bias training and appointing a chief diversity officer.<sup>11</sup> Many Tech firms also attempt to reduce the pressure for diversity by forcing employees who report discrimination to give up their legal rights and submit to firm controlled arbitration. This suggests to us that many of these firms are only reluctantly recognizing the problem of equity and inclusion in their workforces.<sup>12</sup>

Prior research has concluded that more racially and gender diverse firms tend to be more innovative and financially successful than less diverse firms.<sup>13 14 15</sup> This may be particularly true in Tech where innovation and creativity are central to firm success. It may be the case that the old boys network in Tech is actually slowing innovation.

Still there is evidence that some firms are doing better than others, even in Silicon Valley.<sup>16</sup> At the *Center for Employment Equity* we think that the Tech sector can do better. In fact, as we show in this report there already are firms that are successful at integrating their workforces along both gender and race/ethnic lines. To us this suggests that there could be more. In this report we try to discover which firms are diversifying their labor forces more quickly. We also link firm diversity trajectories to firm expansion and to managerial and executive diversity. While we discover that indeed some firms are diversifying rapidly, we found an equal number moving in the other direction – toward more white male dominated employment. The vast majority of firms, however, display little change in their labor forces. Those firms that are rapidly becoming

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<sup>9</sup> Gee, Buck and Denise Peck. 2016. “The Illusion of Asian Success: Scant Progress for Minorities Cracking the Glass Ceiling, 2007-2015.”

<https://c.ymcdn.com/sites/www.ascendleadership.org/resource/resmgr/research/TheIllusionofAsianSuccess.pdf>

<sup>10</sup> GAO. 2017. Ibid.

<sup>11</sup> TechCrunch. 2019. “The Future of Diversity and Inclusion in Tech.”

<https://Techcrunch.com/2019/06/17/the-future-of-diversity-and-inclusion-in-Tech/>

<sup>12</sup> Recently, two indirectly employed Tesla workers, not under employee contract of arbitration, were able to file a discrimination lawsuit. Bloomberg. 2018. “Tesla Workers Claim Racial Bias and Abuse at Electric Car Factory.” <https://www.bloomberg.com/news/features/2018-04-12/tesla-workers-claim-racial-bias-and-abuse-at-electric-car-factory>

<sup>13</sup> Hunt, Vivian, Dennis Layton, and Sara Prince. 2015. “Diversity Matters.” McKinsey & Company. <https://www.mckinsey.com/~media/mckinsey/business%20functions/organization/our%20insights/why%20diversity%20matters/diversity>

<sup>14</sup> Herring, Cedric. 2009. “Does Diversity Pay?: Race, Gender, and the Business Case for Diversity.” *American Sociological Review* 74:208-224

<sup>15</sup> Pager, Devah. 2016. “Are Firms That Discriminate More Likely to Go Out of Business?” *Sociological Sciences* 3:849-859.

<sup>16</sup> Tomaskovic-Devey, Donald and JooHee Han. 2018. “Is Silicon Valley Tech Diversity Possible Now?” Center for Employment Equity, University of Massachusetts Amherst.

more diverse in their professional-technical labor forces also tend to be growing more rapidly and to have first installed more diverse executive and managerial leadership.

At the *Center for Employment Equity* we believe that the first step for public accountability is the “count and compare” strategy.<sup>17</sup> If diversity in Tech is possible now, and we believe it is, then we expect to see firm variation in both the levels and trends in diversity. The rest of this report explores this possibility. Here is what we found.

### Executive Summary

- There have been slow increases in racial, ethnic and gender diversity in the U.S. Tech sector, but this trend lags far behind shifts in the workforce more generally. Much of this employment shift has been toward Asian men and women in technical and managerial jobs, but toward Asian men and white women in executive positions. In professional-technical jobs white women’s employment is declining. In managerial jobs white women’s employment is stable.
- When we examine diversity trends at the firm level, we find that most Tech firms display this pattern of slowly increasing diversity, but that there are also significant clusters of firms that are rapidly becoming either more or less diverse.
- We also find two subsets of firms that are rapidly becoming more and less diverse in their employment composition.
- For both executive and professional jobs, rapid increases in diversity and rapid firm growth are complementary. Diversity is good for business, or perhaps good business practices produce diversity?
- For managerial jobs, however, it cuts both ways. Rapid growth in diversity among managers is associated in some firms with strong expansion in the diversity of the professional-technical workforce, but in others with strong declines. In some firms managerial diversity trickles down to change chilly climates. In others, increased managerial diversity appears to produce backlash and retrenchment.
- Although most evidence points toward token, rather than pipeline driven, diversity expansion among executives, we do find that in those relative rare firms with dramatically increasing executive and managerial diversity that they tend also to generate increasing professional-technical diversity, particularly among women and non-Asian minorities.

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<sup>17</sup> Tomaskovic-Devey. 2018. “Count and Compare: One Strategy for Reducing Discrimination.” Center for Employment Equity of University of Massachusetts Amherst.  
[https://www.umass.edu/employmentequity/sites/default/files/CEE\\_countandcompare.pdf](https://www.umass.edu/employmentequity/sites/default/files/CEE_countandcompare.pdf)

- Some firms have figured out how to thrive economically while becoming rapidly more diverse in their employment profile. These firms hold lessons and opportunities for the majority of Tech firms with public commitments to diversity but sluggish track records, as well as for the investor community looking for both product and equity innovation.

## Methods

We observe Tech firms based on the fifty-five 6-digit industry codes (NAICS) identified as Tech-related by the U.S. Government Accountability Office (GAO) and four additional industries that we discovered to be prevalent among the largest Silicon Valley Tech firms.<sup>18</sup> In the same report the GAO identified the 10 largest Tech labor markets: San Francisco, New York, Washington DC, Los Angeles, Seattle, Boston, Dallas, Chicago, Atlanta, and Philadelphia. We focus on these ten cities and their surrounding metropolitan areas, these are basically the beating heart cities of the U.S. Tech sector.

Using workplace level data from the U.S. Equal Employment Opportunity Commission, we treat all establishments in the same firm within the same local labor market as a local Tech employer. In 2016, there were 6,163 Tech firms employing 2,582,342 workers in these ten labor markets. The EEOC mandates reporting from all US firms with more than 50 employees if federal contractors and 100 if not. Using these data we miss the smallest start-up firms, but are able to observe employment shifts at the workplace level.<sup>19</sup> Seventy-one percent of EEOC reporting Tech firms are federal contractors and so are legally mandated to practice affirmative action in hiring and promotion.

## National Tech Employment Diversity Levels and Trends

We focus our analyses on professional, managerial and executive jobs. Professional occupations are the core technical production occupations in the Tech industry workforce, and include data scientists, computer engineers, programmers and systems analysts among many more specialized roles. Most of these professionals have specializations in science, technology, engineering and mathematics (STEM) occupations.<sup>20</sup> Managers implement policy and coordinate tasks. Executives are the leadership ranks responsible for both firm's diversity and financial returns.

Labor supply and pipeline explanations about Tech diversity suggest that expanding diversity in professional jobs could increase diversity in higher-ranking manager and executive occupations. On the other hand, accounts of tokenism suggests that diversity in leadership may be merely symbolic and diversity in core production occupations does not change even with expansion of

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<sup>18</sup> GAO. 2017. Ibid. The list of Tech industries is in the Appendix A. For more details, see Tomaskovic-Devey, Donald and JooHee Han. 2018. Ibid. Appendix 4.

<sup>19</sup> We exclude establishments that reported to the EEOC but had fewer than 50 employees because reporting of these smaller establishments are not mandatory and thus the EEOC data is not representative of smaller workplaces.

<sup>20</sup> U.S. Equal Employment Opportunity Commission. 2016. Ibid.

diversity at the executive level because political pressures are often limited to visible top positions. Of course, even symbolic diversity at the top may trickle down to practical workplace diversity, if executives and managers put efforts into diversifying subordinate workforces. In this report we search for pipeline, token, and trickle down diversity profiles.

Table 1 displays Tech sector demographic diversity shifts from 2008 to 2016 for professional, manager, and executive roles in the top ten Tech labor markets. Our focus is primarily on change, but there are some obviously stable comparisons. White men are the largest group by far and their dominance grows with rank in the organization. White women and Asian men are the next two largest groups, both decline in representation as we move from professional to managerial to executive positions, but this underrepresentation at the top is stronger for Asian men. Other groups – Asian women, Black men and women, Hispanic men and women -follow this same pattern of increased exclusion at the top, although their absolute numbers are much, much smaller. Given their representation at 7% of all professional Tech jobs Asian women are particularly absent in executive roles (2%).

White men are the largest group among professionals and constitute absolute majorities of executives and managers, but their proportional dominance has declined by 4.0%, 5.4%, and 5.9%, in professional, manager, and executive jobs respectively. The average Tech firm diversified their workforce away from white men between 2008 and 2016 and did so faster for higher ranked jobs. More diversity in top jobs probably reflects in part the general political pressure on these firms to demonstrate progress on diversity. Ellen Berrey in her close study of diversity initiatives finds that some firms value executive diversity primarily to avoid the embarrassment of all male or all white executive photos.<sup>21</sup> Token integration may be going on here, at least in some firms, particularly among those large visible firms that receive the most pressure to diversify.<sup>22</sup>

**Table 1. Percent of Each Demographic Group in Executive, Managerial, and Professional Occupations in Tech Industry in the 10 Largest Tech Markets.**

| Occupation<br>Demographic<br>Group | Professionals |      |      | Managers |      |      | Executives |      |      |
|------------------------------------|---------------|------|------|----------|------|------|------------|------|------|
|                                    | 2008          | 2016 | % Δ  | 2008     | 2016 | % Δ  | 2008       | 2016 | % Δ  |
| White Men                          | 47.4          | 43.4 | -4.0 | 56.2     | 50.8 | -5.4 | 71.6       | 65.8 | -5.9 |
| White Women                        | 20.8          | 19.9 | -0.8 | 22.3     | 22.2 | 0.0  | 14.1       | 15.6 | 1.5  |
| Asian Men                          | 13.1          | 14.1 | 1.0  | 8.4      | 10.3 | 2.0  | 7.8        | 9.8  | 2.0  |
| Asian Women                        | 6.0           | 7.1  | 1.2  | 2.8      | 4.3  | 1.5  | 1.4        | 2.2  | 0.8  |
| Black Men                          | 3.6           | 3.7  | 0.1  | 2.8      | 2.6  | -0.2 | 1.5        | 1.5  | 0.0  |

<sup>21</sup> Ellen Berrey. *The enigma of diversity: The language of race and the limits of racial justice*. University of Chicago Press, 2015).

<sup>22</sup> Previous research has found that large visible firms tend to integrate jobs more quickly than others in the same industry, see McTague, Tricia, Kevin Stainback, and Donald Tomaskovic-Devey. 2009. "Organizational Response to Institutional Pressures for Equal Employment Opportunity since the Civil Rights Act of 1964." *Social Forces*. 87:1499-1527.

|                |     |     |      |     |     |      |     |     |     |
|----------------|-----|-----|------|-----|-----|------|-----|-----|-----|
| Black Women    | 3.2 | 2.8 | -0.3 | 2.2 | 2.2 | -0.1 | 0.7 | 0.7 | 0.0 |
| Hispanic Men   | 2.9 | 4.1 | 1.1  | 2.9 | 3.7 | 0.7  | 1.8 | 2.2 | 0.4 |
| Hispanic Women | 1.6 | 2.2 | 0.5  | 1.3 | 1.9 | 0.6  | 0.4 | 0.8 | 0.4 |

Shockingly, in the professional occupations white women’s representation actually declined slightly (-0.8%).<sup>23</sup> Thus, on average white women did not benefit from the social and political pressure for diversity on the Tech sector. In contrast, among the core professional jobs Asian male, Asian female, Black male, Hispanic male, and Hispanic female representation all increased slightly. Black women, like white women, declined as a proportion of professional workers in Tech firms.

In managerial occupations, both Asian men and Asian women’s representation increased. Hispanic men and women’s managerial access increased marginally, while Black men and Black women’s representation declined. White women’s managerial representation was stable, growing at the same rate as the sector overall. Increased Tech diversity at the managerial level seems to be primarily among Asian employees.

In the executive ranks, Asian men’s representation increased the most, by 2.0%, followed by White women at 1.5% growth. There were slight gains for Hispanic men and women, but no net change for African American men and women. Thus, it was mostly White women and Asian men who moved into the executive suites.

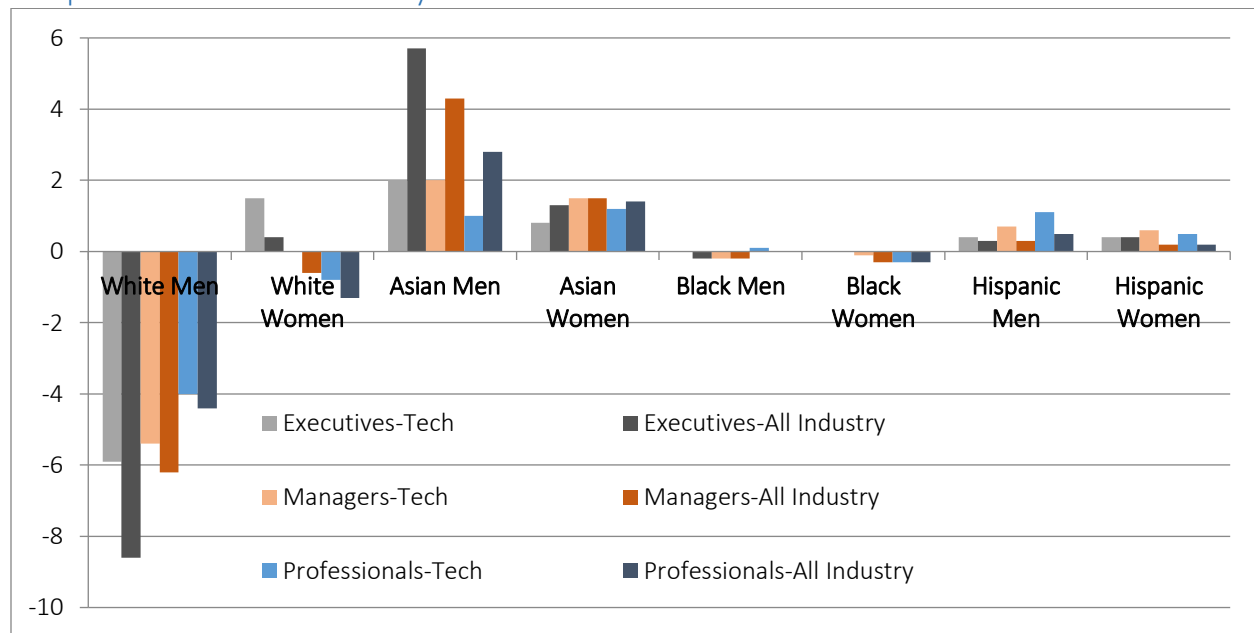
White women’s gains were limited to the executive ranks. To the extent that the political pressure on Tech has been focused on women in general and White women in particular, promotion into executive ranks, rather than a more general increase in gender diversity in the much more numerous professional and managerial jobs has been the result. Some white women’s movement into the C-suite presumably reflects firm’s response to political pressures on Tech to diversify its labor force. But the observed pattern is one of diversifying only the visible executive labor force. This strongly fits a pattern of symbolic or token diversity management. At the same time there may be a forward looking expectation both in the C-suite and below that this gender integration will eventually trickle down to change hiring and turnover patterns elsewhere in the firm.<sup>24</sup>

<sup>23</sup> This pattern of declining representation was also observed in earlier research, see Sharla N. Alegria and Enobong H, Branch. 2015. Causes and consequences of inequality in the STEM: Diversity and its discontents. *International Journal of Gender, Science and Technology*, 7(3), 321–342.

<sup>24</sup> More women executives have been found to be associated with lower gender wage gaps (Flabbi, Luca, Mario Macis, Andrea Moro, and Fabiano Schivardi. "Do female executives make a difference? The impact of female leadership on gender gaps and firm performance." *The Economic Journal* 129, no. 622 (2019): 2390-2423), increased gender diversity (Kurtulus, Fidan Ana, and Donald Tomaskovic-Devey. "Do female top managers help women to advance? A panel study using EEO-1 records." *The ANNALS of the American Academy of Political and Social Science* 639, no. 1 (2012): 173-197), and more support for diversity policies (Dobbin, Frank, Soohan Kim, and Alexandra Kalev. "You can’t always get what you need: Organizational determinants of diversity programs." *American Sociological Review* 76, no. 3 (2011): 386-411).

Figure 1 presents the percent changes in the representations of each demographic group in the EEOC reporting Tech firms and among all EEOC reporting firms across all industries. White male representation declined in executive, managerial, and professional jobs in Tech, but at a markedly slower pace (5.9%, 5.4%, and 4.0% respectively) than the national economy more generally (8.6%, 6.2%, and 4.4% respectively). The same patterns are observed for white women in all job levels. Asian advancements in their representation in Tech are also slower than the national trends for all occupations and industries. Conversely, Hispanic representations in Tech increased faster than the national rate. Given this comparison to the national labor force, Tech is conspicuous for its lack of integration, with the singular exception of its Hispanic labor force. Of course, this increased Hispanic representation is from a very low base of 3% or less of professional, managerial and executive jobs for both Hispanic men and women in 2008.

Figure 1. Percent Changes of Each Demographic Group in Executives, Managerial, and Professional Occupations National Level in all industries (including Tech) in all markets, in comparison to the Tech Industry.



The meager progress we observe in Tech sector employment diversity seems to largely reflect demographic shifts in the population at large, rather than particular success in diversifying the overall Tech sector workforce.

Despite the move toward a more diverse workforce, Tech firms remain predominantly white male relative to other industries and are becoming more inclusive at a slower pace than the rest of the US economy. The one exception seems to be in executive jobs, where white women are moving more rapidly into executive jobs in Tech than they are into executive jobs elsewhere, as well as more rapidly into top jobs than their presence within the Tech sector pipeline of professionals and managers.



## Firm Level Diversity Trajectories

These depressing results do not mean that all individual firms have stalled diversity profiles. At the *Center for Employment Equity* we have previously documented in our 2018 report [Is Silicon Valley Tech Diversity Possible Now?](#) a great deal of firm level variation in employment diversity in the San Francisco region. We suspect that this variable integration pattern is true in all of the major Tech markets.

In our earlier report we demonstrated that some Silicon Valley Tech firms did better than others. Some were much better than average, while others were considerably worse. In this report, focusing on change in diversity, we employ an statistical approach, latent trajectory analyses, to identify groups of firms with different trends in diversity. The logic of our estimation is to classify firms in terms of shared trajectories of inclusion and exclusion. The basic approach is a form of machine learning in which we use a clustering algorithm to identify both multiple trajectories and classify individual firms into the trajectories that most resemble their employment dynamic. We describe this approach in more depth in Appendix B.

Given their small numbers in order to estimate firm level trajectories we combined counts of Hispanic and Black men, as well as Hispanic and Black women into two groups. We then estimated firm latent trajectories separately for executives, managers and professionals across all firms in the ten largest Tech labor markets. In a companion report we compare Tech firm trajectory patterns across these major labor markets, identifying the labor markets where each pattern predominates.<sup>25</sup>

For professional jobs we found five major trajectory patterns: 1. *slow growth in diversity*, 2. *Asian male decline*, 3. *female decline*, 4. *female advancement*, and 5. *Asian advancement*. For both executive and managerial jobs we discovered only three patterns of firm level trends: 1. *slow growth in diversity*, 2. *rapidly increasing diversity across multiple groups*, and 3. *rapidly decreasing diversity across multiple groups*. It is not surprising to find more dynamic trends in professional occupations than executive and managerial jobs considering professionals' much larger employment size as well as that they are less visible internally as role models and externally as the face of the firm than managers and executives.

The common finding from across all three occupational trajectory analyses is that in the vast majority of firms there is a pattern of slight decline in white males as a share of all employees and small increases in other groups. Most Tech sector firms are slowly becoming slightly more diverse, although as we pointed out above this is at a considerably slower rate than firms in other industries.

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<sup>25</sup> JooHee Han and Donald Tomaskovic-Devey. 2020. "Searching for Diversity in the 10 Largest U.S. Tech Markets." Center for Employment Equity, University of Massachusetts Amherst.

But there are also significant clusters of firms with dramatic patterns of either increased employment diversity or large gains in white male employment at the expense of other groups.

### Firm Diversity Trajectories among Professional Employees

Among professionals we discovered five firm diversity trajectories. Among these the most common pattern is a slow decline in white – both male and female – employment and small increases in minority employment. Next most common are two distinct types of firms where there seem to be tradeoffs between white men and all women. Some firms are moving toward more white male employment and others toward more female workforces. The final, and least common pattern is a trade-off between Asian employment and all other groups. Again this pattern happens in both directions, some firms see Asian growth at the expense of all other groups, others see the reverse pattern.

Table 2 summarizes for professional employees the average percent changes of each demographic group in each trajectory type. The most common diversity trajectory, which is shared by 81.7% of firms, is a slow decline in white male and white female representation, no change for black and Hispanic women, and slow growth for Asian men and women and for other minority men.

Table 2. Five Types of Firms, Classified in terms of Diversity Change between 2008 and 2016 in Professional Jobs. Cells are the average percent changes of each demographic group.

| Firm Trajectories    | Asian Male Decline | White Male Growth & Female Decline | Slow Growth in Minority Diversity | Female Advancement & White Male Decline | Asian Advancement |
|----------------------|--------------------|------------------------------------|-----------------------------------|---|-------------------|
| White Men            | 11.3*              | 21.8*                              | -2.2*                             | -23.2*                                  | -24.4*            |
| White Women          | 6.7*               | -8.7*                              | -0.8*                             | 11.5*                                   | -9.7              |
| Asian Men            | -31.2*             | -0.6                               | 1.3*                              | -0.5                                    | 27.6*             |
| Asian Women          | 2.2                | -1.9*                              | 0.8*                              | 2.5*                                    | 9.1*              |
| Black/Hispanic Men   | 3.5*               | -4.7                               | 0.3*                              | 2.6                                     | -3.0*             |
| Black/Hispanic Women | 3.7*               | -5.6*                              | 0.0                               | 4.9                                     | -1.4              |
| N                    | 211                | 534                                | 6,796                             | 614                                     | 168               |
| %                    | 2.5                | 6.4                                | 81.7                              | 7.4                                     | 2.0               |

\* signifies that this change is statistically significant at or below a probability of .05.

The second most frequent pattern, present among 7.4% of firms, is a strong decline in white men, with rapid growth in female, especially white female, employment. The reverse pattern, quickly rising white male employment with strong declines in female employment, occurs in almost as many firms (6.4%).

The final two patterns more strongly implicate Asian employment. In the first, which we label Asian Advancement, includes only 2% of firms. In these firms white employment declines sharply, especially among men, Black and Hispanic men decline as well, and Asian men and

women’s employment grows rapidly. In the final 2.5% of firms white men and white women’s employment surges, Asian men drops, but Black and Hispanic diversity also grows quite strongly.

In most discussions of Tech sector diversity the implied trade-off is between male and female employment. That is not what is actually happening. Rather for the vast majority of firms slowly rising ethnic diversity and declining white employment is the dominant pattern.

Gender trade-offs occur as well, but here the dominant pattern is a trade-off between white male employment and all women. But it goes both ways: in some firms this means fewer white men over time, while in others the pattern is toward fewer women. Finally in another subset of firms the competition for changing employment hinges on Asian advancement. A small minority of firms display rising Asian employment at the expense of all other groups. A slightly larger set of firms show the opposite pattern in which Asian employment declines in the face of rising employment of all other groups, particularly of white men and white women.

### Firm Diversity Trajectories among Managers

Diversity trends in managerial occupations are less complex. Table 3 summarizes the average percent change for each demographic group in the three trajectory types we discovered in our statistical analysis of managerial diversity shifts.

The majority of firms (77.3%) became more diverse in their managerial employment, but the changes are quite small. In these firms the white male share of managers declined by 3.5% on average between 2008 and 2016, while all the other groups’ share increased slightly. Among managers in most firms white, Black, and Hispanic women saw no statistically significant gains. The stronger gains were for Asian men and Asian women, with a very weak pattern of growth in Black and Hispanic male managers.

Almost 10% of firms (9.7%) achieved strong increases in managerial diversity. White males as a proportion of managers declined by a third in these firms, while other groups’ proportion increased. White women showed the most dramatic gains (9.0%) and Asian women the smallest (2.5%), but for these firms there was rapid growth in diversity across all groups, at the expense of white men.

Table 3. Three Types of Firms, Classified in terms of Diversity Change between 2008 and 2016 in Managerial Jobs. Cells are the average percent changes of each demographic group.

| Firm Trajectories    | Strongly Decreasing Diversity | Slow Growth in Diversity | Rapidly Increasing Diversity |
|----------------------|-------------------------------|--------------------------|------------------------------|
| White Men            | 24.2*                         | -3.5*                    | -36.9*                       |
| White Women          | -12.7*                        | -0.2                     | 9.0*                         |
| Asian Men            | -3.9*                         | 1.9*                     | 6.3*                         |
| Asian Women          | -1.9*                         | 1.0*                     | 2.5*                         |
| Black/Hispanic Men   | -4.3*                         | 0.2*                     | 6.9*                         |
| Black/Hispanic Women | -2.0                          | 0.0                      | 3.7*                         |

|   |       |       |     |
|---|-------|-------|-----|
| N | 1,081 | 6,435 | 807 |
| % | 13.0  | 77.3  | 9.7 |

\* signifies that this change is statistically significant at or below a probability of .05.

Conversely, in the third set of firms we observe strongly decreased diversity. The white male share of managerial jobs increased on average by 24.2%. All other groups declined and white women declined the most dramatically. This pattern of strongly declining diversity and growing white male managerial employment occurred in 13% of firms.

In most Tech sector firms managerial composition is slowly moving away from white men and toward Asian men and women. The second most common pattern is a strong swing toward increased white male management at the expense of all other groups. In slightly less than 10% of firms we observe a clear pattern of increased managerial diversity. These firms show that increased managerial diversity is possible, but also that it is far from common.

### Firm Diversity Trajectories among Executives

Firm variation in firm trajectories for executive diversity is similar to the pattern we discovered for managers. We again find that most firms show small increases in diversity, and smaller groups of firms display more rapid increases or decreases in executive diversity.

Table 4 describes these three types of executive diversity trajectories. The majority of firms (77.3%) became slightly more diverse in their executive ranks over time. In these firms, the proportion of white male executives declined modestly by 4.0% on average, while that of all other groups increased slightly, on average 1.2% for white women, 1.3% for Asian men, 0.5% for Asian women, while Black and Hispanic men and both increased by 0.2%. All of these changes were statistically significant, signaling a broad if not dramatic increase in executive diversity in three-quarters of U.S. Tech firms.

Table 4. Three Types of Firms, Classified in terms of Diversity Change between 2008 and 2016 in Executive Jobs. Cells are the average percent changes of each demographic group.

| Firm Trajectories    | Strongly Decreasing Diversity | Slow Growth in Diversity | Rapidly Increasing Diversity |
|----------------------|-------------------------------|--------------------------|------------------------------|
| White Men            | 31.6*                         | -4.0*                    | -66.4*                       |
| White Women          | -16.2*                        | 1.2*                     | 4.9                          |
| Asian Men            | -6.6*                         | 1.3*                     | 6.1*                         |
| Asian Women          | -1.8*                         | 0.5*                     | 0.3                          |
| Black/Hispanic Men   | -5.3*                         | 0.2*                     | 1.3                          |
| Black/Hispanic Women | -2.2*                         | 0.2*                     | 0.7                          |
| N                    | 1,166                         | 6,430                    | 727                          |
| %                    | 14.0                          | 77.3                     | 8.7                          |

\* signifies that this change is statistically significant at or below a probability of .05.

Fewer firms, only 8.7%, became dramatically more diverse in their executive ranks. White male executives in these firms declined rapidly (66.4%), while the proportion of all other groups increased briskly. The largest representation growth is found among Asian men (6.1%), followed by white women (4.9%), Black and Hispanic men (1.3%), Black and Hispanic women (0.7%), and Asian women (0.3%). However, only the increase in Asian male representation is statistically significant at  $p < 0.5$ . Nonetheless, these firm's patterns of executive diversity growth strongly suggest that more inclusive Tech firms exist and that further diversity in Tech is possible now.

Conversely, an even larger proportion of firms (14.0%) became increasingly white-male dominated in executive jobs. White male executives increased by 31.6%, on average in these firms, whereas all the other groups' executive proportions declined significantly.

The dominant pattern in executive diversity is toward very weak increases in representation of all groups, and slight declines in the proportion of executives that are white men. Dramatic surges in executive diversity are rare, but do happen, although it is for Asian men that this pattern is most consistent, being both larger and statistically significant. That the other groups have relatively large percentage shifts but are not statistically significant suggests that their integration into executive jobs is quite uneven within this cluster of firms. The most disturbing pattern is that in one of eight firms the executive ranks are becoming increasingly white male, at the expense of all other groups.

The proportion of firms in the slow increase in diversity class are smaller for executive (77.3%) and manager (77.3%) jobs than they are for professional (81.7%) jobs. This suggests that some firms may be responding to the pressure for increased diversity primarily symbolically, by integrating the most publically visible executive ranks. However, because diversity in both leadership positions are associated with increased diversity in professional jobs, we suspect that changes in the leadership positions, even if motivated for merely symbolic reasons, can lead to more diverse workforce in professional positions in the future.<sup>26</sup>

### Job Growth and Diversity Trajectories

We wondered if diversity trajectories were associated with the rate of employment growth in Tech sector firms. We know that this sector has seen very high levels of employment growth, but not all firms grow at the same rate. Some actually shrink and some do not survive.

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<sup>26</sup> There is a great deal of research showing that leadership diversity can promote increased diversity elsewhere in firms (see for examples Sheryl Skaggs, Kevin Stainback, and Phyllis Duncan. "Shaking things up or business as usual? The influence of female corporate executives and board of directors on women's managerial representation." *Social Science Research* 41, no. 4 (2012): 936-948 and Kurtulus, Fidan Ana, and Donald Tomaskovic-Devey. "Do female top managers help women to advance? A panel study using EEO-1 records." *The ANNALS of the American Academy of Political and Social Science* 639, no. 1 (2012): 173-197).

We did find that firm variations in diversity trends are associated with employment growth and here the news is better than the grim findings so far: firm expansion is particularly beneficial to minority groups.

The average firm has many more technical professionals than managers or executives and we focus on these most plentiful jobs first. Employment growth in the professional ranks is strongly associated with the two increased diversity trajectories. Table 5 summarizes the average number of jobs in firms in the first year and the last year, and the job growth rate in professional jobs for each firm trajectory type. While all five types of firms show positive employment growth, the rates of growth are quite different.

**Table 5. Average Number of Professionals and Professional Job Growth by Professional Firm Trajectory Class**

| Average Number of Jobs | Asian Male Decline | Female Decline | Slow Growth in Diversity | Female Advancement | Asian Advancement |
|------------------------|--------------------|----------------|--------------------------|--------------------|-------------------|
| 1 <sup>st</sup> Year   | 101.5              | 44.6           | 166.5                    | 50.1               | 66.7              |
| Last Year              | 108.4              | 48.6           | 199.2                    | 71.8               | 143.9             |
| Growth Rate            | 6.8                | 8.9            | 19.7                     | 43.4               | 115.8             |

The slow growth in diversity firms are much larger, and growing at an intermediate rate. Employment growth rate is modest at best in the two classes where diversity is shrinking. Firms that are lagging behind the robust sector growth rate are more likely to retreat into more homogeneously Asian or White male employment configurations. Professional job expansion is highest in the firms in the Asian advancement class, followed by in the female advancement class. In rapidly expanding firms, women and Asians are hired into the newly created professional jobs at a higher rate than other groups.

We cannot tell definitively if the link between rapid growth and expanding diversity is because more diverse firms are more productive and so expand at higher rates, as has been argued in previous studies. This certainly may be the case. It could also be that rapidly expanding firms have the slack resources that allow them to be more deliberate in pursuing employment diversity goals. In either case, increased diversity and economic expansion are strongly associated with each other.

**Table 6. Job Growth by Executive Firm Trajectory Class**

| Average Number of Jobs | Strongly Decreasing Diversity | Slow Growth in Diversity | Rapidly Increasing Diversity |
|------------------------|-------------------------------|--------------------------|------------------------------|
| 1 <sup>st</sup> Year   | 5.9                           | 10.7                     | 5.6                          |
| Last Year              | 5.9                           | 12.7                     | 7.4                          |
| Growth Rate            | -0.1                          | 17.9                     | 32.1                         |

Very similar to professional jobs, employment growth in the executive ranks is strongly associated with increased diversity (see Table 6). The number of executive positions was essentially stagnant in the strongly decreasing executive diversity firms. Conversely, the mean number of executives in the slow growth in diversity class increased from 10.7 to 12.7 resulting in almost 18% overall growth. By far the largest job growth (32.1%) among executives is a characteristic of firms in the rapidly increasing diversity class. Growth in the number of executive jobs is associated with increased executive diversity. This pattern suggests that it is the addition of new executive positions that produces the social space for rising executive diversity. The average firm added only 2 executive positions across the period. Thus, rapid growth in executive diversity is about the addition of only one or two new, more diverse, executives. In this case, we cannot tell if this is an innovation/productivity contribution from executive diversity, as past research points to, or that the public pressures for increased executive diversity are particularly strong in this class of firms.

In contrast, in managerial jobs the association between job growth and diversity trends is not as simple. The addition of new management jobs is higher in both the strongly decreasing and the rapidly increasing diversity firms (Table 7). This suggests that expanding managerial ranks can go either way – for some firms they are an opportunity to increase managerial diversity in others the opposite occurs.

**Table 7. Job Growth by Managerial Firm Trajectory Class**

| Average Number of Jobs | Strongly Decreasing Diversity | Slow Growth in Diversity | Rapidly Increasing Diversity |
|------------------------|-------------------------------|--------------------------|------------------------------|
| 1 <sup>st</sup> Year   | 12.4                          | 56.5                     | 15.0                         |
| Last Year              | 19.2                          | 66.2                     | 23.0                         |
| Growth Rate            | 55.1                          | 17.2                     | 53.0                         |

In sum, the results suggest that newly created jobs produce opportunity for increased female and minority hiring, which leads to more diverse executive and professional workforces in these firms. For managers, however, it can go either way. Rapid managerial job expansion can lead to either rapid diversity or consolidation of white male dominance. We cannot tell if these patterns are about positive feedback from diversity to expansion or the reverse causal pattern, expansion permits more diverse hires. In either case, it is good news – rapid expansion in the Tech sector is associated with increased diversity – although this can be slow or rapid increase depending on the choices made by the firm.

### Trajectory Consistency across Executive, Managerial, and Professional Jobs

Since the previous analyses treated each trajectory class as occupation specific, we wondered how the professional, managerial, and executive classes are associated at the firm level. While it is certainly possible, that the three occupations move independently of each other, it also seem possible that some firms may show across the board commitments to increased diversity.

Since in the vast majority of firms all three occupations show a pattern of marginally increased diversity, it is not surprising that the most common pattern, in 51.9% of firms, is slow employment diversity growth in all three occupational roles. We can think of these firms as not doing anything in particular to increase or decrease diversity. They are simply doing little other than preserving the status quo. Their slow increase in diversity simply reflects the more general changes in the U.S. Tech sector labor supply. At the same time, about half of all firms show different patterns.

Our strategy is to look at the associations between executive and managerial trajectories and the five professional classes of firm trajectories. These are not strictly speaking causal models, but they are set up to see if increased (decreased) diversity at the executive and managerial levels are plausibly associated with increased (decreased) diversity for the core labor force of technical professionals. We use another statistical approach, multinomial logistic regression, to parse out these associations. A few more words on multinomial logistic regression and a complete table is provided in Appendix C.

Figure 2 reports the results of these analyses as the relative risk ratio, a measure of association, of the five trajectory classes of professional trajectories and the executive and managerial firm trajectory classes in executive and managerial jobs. Slow growth in the diversity class is the implied reference category for both outcome and independent variables. The basic logic of the table is to ask if executive and managerial diversity trajectories are associated with the diversity trajectories among the core technical jobs in the professional occupations. Such associations might represent the impact of executive and managerial decision making, a pipeline effect where diverse professionals later move into managerial and executive jobs, or a more general organizational set of practices that impact diversity in all jobs.

The big finding is that firms with increasing executive and managerial diversity tend to also create increasing professional diversity. Although the Asian increased professional diversity class is not significantly associated with increased executive diversity, the female increased diversity class is strongly associated with both increased managerial and executive diversity. This patterns is stronger for managerial than executive diversity.

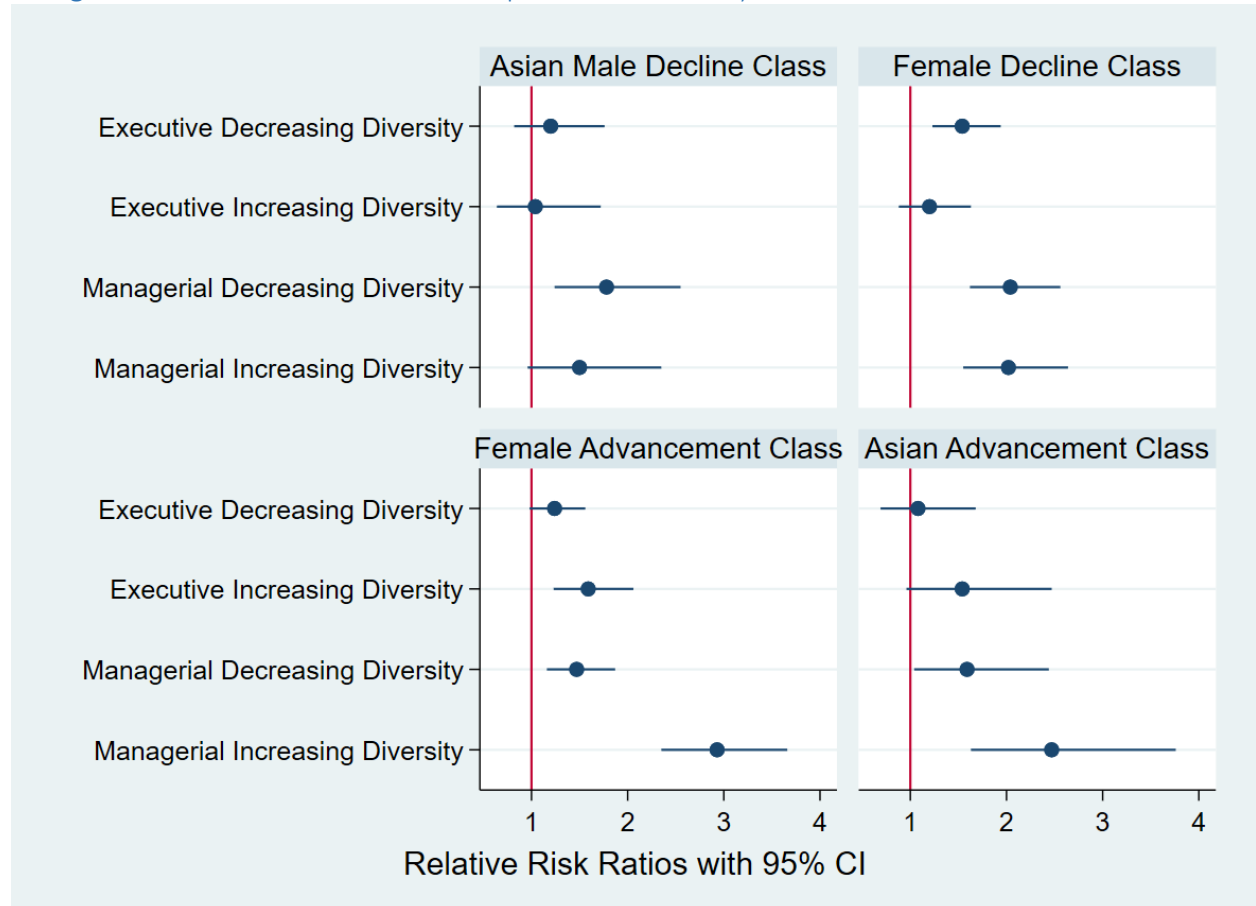
The risk of falling into the Asian advancement class in professional jobs is 147% ( $2.47-1=1.47$ ) higher among the firms with an increasing managerial diversity trajectory than it is in the more numerous firms in the slow growth managerial diversity class. Similarly, firms with strongly increasing managerial diversity have a 193% higher risk of falling into the female professional advancement trajectory. The patterns for the strongly increasing executive diversity firms are similar, but much weaker. This suggests the increased diversity at the level of both management and hiring is more effective than simply adding a new “more diverse” executive at producing strong surges in core professional-technical employment diversity.

The reverse pattern holds for the two decreased professional diversity groups of firms. Rapid increases in white male managers is associated with both the decreasing Asian and decreasing



female professional diversity firm trajectories. Decreasing executive diversity is associated with decreasing female and increasing white male professional workforces.

Figure 2. Relative Risk of Latent Classes in Professional Jobs from Multinomial Logistic Regression on Latent Classes in Executive and Managerial Jobs (Slow Growth in Diversity Class is Reference Categories for both Outcome and Independent Variables)



\* Statistically significant at or below a probability of .05.

The group of firms with decreasing executive diversity have a 54% higher likelihood of also producing strong diversity declines in professional jobs. Similarly, firms with increasingly white male managerial workforces have a 104% higher risk of also having fewer women and more white men in professional jobs and a 78% higher risk of declining Asian employment.

Inconsistently, the decreasing female diversity class is also significantly associated with firms in the increased managerial diversity class. This might represent firms that disproportionately

promote women from professional to managerial jobs<sup>27</sup> or backlash against managerial diversity.<sup>28</sup>

### Conclusions and Implications

The Tech sector is slowly moving away from its white male profile. Nationally white male dominance in all professional-technical, managerial and even executive positions has declined slightly and most of the other race/gender groups, with the exception of white women in professional and manager jobs, have made slow gains in employment over time. These gains are, however, weaker than the demographic shifts in the labor market more generally. At the sector level Tech continues to have a diversity problem and change is slow.

All firms, however, are not moving in the same direction. While the majority of Tech firms became slowly more diverse, a fraction of firms changed their employment profile more radically. Some firms dramatically expanded their female and minority labor forces, others became significantly more white male dominated. These bifurcated firm diversity trends are present in all three core occupational groups, but we find more complexity in professional occupations than among managers and executives.

About half of all firms showed the sector level pattern of very slow growth in diversity in their professional, managerial and executive workforces. These status quo firms do not show any evidence of successful efforts to increase employment diversity, nor do they show signs of backlashes against diversifying their labor force. What they do show is inertia in their staffing profiles.<sup>29</sup>

But change is possible and to some extent predictable. Firms that became rapidly more diverse in their executive and managerial ranks, also did so for their professional workforces. Likewise, in firms where executive and managerial jobs became less diverse and more white male dominant, the much more numerous professional workforces became less gender integrated and more white male. This suggests that leadership matters, perhaps a great deal. Although with these data we cannot see exactly what it was that these diversity champion firms changed, we can assume that something in leadership, organizational culture or human resource practices favored increased diversity.

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<sup>27</sup> Research shows that white women, but not other women, in Tech firms tend to benefit from a glass escalator into managerial jobs (see Alegria, Sharla. "Escalator or Step Stool? Gendered Labor and Token Processes in Tech Work." *Gender & Society* 33, no. 5 (2019): 722-745).

<sup>28</sup> This backlash pattern has been demonstrated in large German firms, which like the U.S. Tech sector are heavily male dominated (see Abendroth, Anja-Kristin, Silvia Melzer, Alexandra Kalev, and Donald Tomaskovic-Devey. "Women at work: Women's access to power and the gender earnings gap." *ILR Review* 70, no. 1 (2017): 190-222.)

<sup>29</sup> The EEOC data we draw on are yearly one-time employment counts. Thus, we cannot comment on whether status quo firms fail to recruit, hire or retain women and minority employees.

That these same rapidly diversifying firms also tended to be the firms with the highest rate of growth, means that firm economic success and employment diversity expansion are compatible. There is no evidence that diversity comes at the expense of innovation. In fact, the evidence points in the opposite direction. Firms that diversify their workforces also grow substantially faster than other firms in this already dynamic sector of the economy. This may be a reflection of the well-known process that more diverse workforces are more creative and innovative. The causal direction may also be the other way around, successful firms may work harder to create equal opportunity workforces. Or there might be some third factor like corporate culture and managerial efficiency producing both outcomes. In any case, it is the case that expanding demographic diversity in Tech firms is compatible with innovation and rapid firm growth. It may even produce it.

Of course, the causal pressures may differ for executive and professional labor markets. The diversity trajectories for professional jobs probably mostly reflect available labor supply and corporate recruitment and retention commitment and competency. Executive diversity is likely to be more responsive to political pressures from diversity advocates within and outside the firm. Since managers are most often promoted from professional positions, both radically increasing and decreasing diversity in managerial positions is likely to be found in some synergy between technical-professional labor force composition and leadership cultures. Our finding that rapidly rising diversity among managers is consistent with both rapid increased and decreases in professional diversity, suggests that these cultures can become either productive or destructive of inclusive human resource practices. Corporate commitment to diversity is clearly possible, but so are backlashes and retrenchment.<sup>30</sup> The mobilization at Google to protest diversity initiatives is well known in the Tech world, and no doubt occurs elsewhere as well.<sup>31</sup>

It is likely that the expansion of executive diversity may begin as a symbolic response to political pressures. For example, in 2018 California passed a bill that mandates at least one female board director in publically traded companies and a Silicon Valley Tech firm, in response, invited a female board member from a Canadian Tech firm.<sup>32</sup> More visible firms may be under more pressure to display executive diversity in leadership photographs.<sup>33</sup> At the same time we find evidence that expansion of executive, and especially managerial, diversity, may trickle down and change the composition of the professional-technical labor force.

We are optimistic to find that some firms became diverse at a fast pace, that these positive trajectories were consistent with rapid firm growth, and that leadership – particularly middle

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<sup>30</sup> Systematic research has also documented backlashes when women enter managerial roles. See for example Anja-Kristin Abendroth, Silvia Melzer, Alexandra Kalev, and Donald Tomaskovic-Devey. "Women at work: Women's access to power and the gender earnings gap." *ILR Review* 70, no. 1 (2017): 190-222.

<sup>31</sup> James Damore (2017). "Google's ideological echo chamber". Retrieved from

<https://assets.documentcloud.org/documents/3914586/Googles-Ideological-Echo-Chamber.pdf>

<sup>32</sup> <https://www.npr.org/2020/03/05/811192459/a-push-to-get-more-women-on-corporate-boards-gains-momentum>

<sup>33</sup> Berrey, Ellen. (2015). Ibid.

management diversity, may be propelling this process. Less optimistically, about half of firms seem to be stuck in the status quo, and a sizable minority displays less diverse, more white male dominant employment profiles over time. At the sector level, Tech has a diversity problem. At the firm level, some Tech firms have figured out how to solve that problem and thrive.

At the Center for Employment Equity we strongly believe in the count and compare approach to diversity. This report clearly identifies that some firms have figured out how to diversify their labor forces. Diversity in Tech is possible now. For the large group of status quo firms this is good news. It is time for those firms to look inside themselves at their hiring, retention and promotion practices and to figure out what it is they are failing to do or doing wrong. For investors and larger Tech sector firms in the acquisition business, the compatibility of diversity and firm growth presents an investment opportunity, as well as potential lessons on how to diversify while innovating that they might adopt more generally. Investors may also want to identify and avoid firms that are rapidly becoming more white and male, in the same way they would shy away from failing firms.

## Appendix A. NAICS Codes of Tech Industry

Firms with high proportions of professional-technical workforces are found under the following NAICS codes: 334111 Electronic Computer Manufacturing; 334112 Computer Storage Device Manufacturing; 334118 Computer Terminal and Other Computer Peripheral Equipment Manufacturing; 334210 Telephone Apparatus Manufacturing; 334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing; 334290 Other Communications Equipment Manufacturing; 334310 Audio and Video Equipment Manufacturing; 334412 Bare Printed Circuit Board Manufacturing; 334413 Semiconductor and Related Device Manufacturing; 334416 Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing; 334417 Electronic Connector Manufacturing; 334418 Printed Circuit Assembly (Electronic Assembly) Manufacturing; 334419 Other Electronic Component Manufacturing; 334510 Electromedical and Electrotherapeutic Apparatus Manufacturing; 334511 Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing; 334512 Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use; 334513 Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables; 334514 Totalizing Fluid Meter and Counting Device Manufacturing; 334515 Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals; 334516 Analytical Laboratory Instrument Manufacturing; 334517 Irradiation Apparatus Manufacturing; 334519 Other Measuring and Controlling Device Manufacturing; 334613 Blank Magnetic and Optical Recording Media Manufacturing; 334614 Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing; 336411 Aircraft Manufacturing; 336412 Aircraft Engine and Engine Parts Manufacturing; 336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing; 336414 Guided Missile and Space Vehicle Manufacturing; 336415 Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing; 336419 Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing; 423430 Computer and Computer Peripheral Equipment and Software Merchant Wholesalers; 454111 Electronic Shopping; 541519 Other Computer Related Services; 541990 All Other Professional, Scientific, and Technical Services.

511210 Software Publishers; 517110 Wired Telecommunications Carriers; 517210 Wireless Telecommunications Carriers (except Satellite); 517410 Satellite Telecommunications; 517911 Telecommunications Resellers; 517919 All Other Telecommunications; 518210 Data Processing, Hosting, and Related Services; 519110 News Syndicates; 519130 Internet Publishing and Broadcasting and Web Search Portals; 519190 All Other Information Services; 541310 Architectural Services; 541320 Landscape Architectural Services; 541330 Engineering Services; 541340 Drafting Services; 541350 Building Inspection Services; 541360 Geophysical Surveying and Mapping Services; 541370 Surveying and Mapping (except Geophysical) Services; 541380 Testing Laboratories; 541511 Custom Computer Programming Services; 541512 Computer Systems Design Services; 541513 Computer Facilities Management Services; 541519 Other Computer Related Services; 541711 Research and Development in BioTechnology; 541712 Research and Development in the Physical, Engineering, and Life Sciences (except BioTechnology); 541720 Research and Development in the Social Sciences and Humanities.

## Appendix B. Method for Latent Class Analyses

A latent class analysis is an inductive statistical technique that identifies units, firms in our case, that are similar to each other.

We created firm-year panel data using the EEO1 surveys. For each firm, we calculated each demographic group's percent changes between the first year and the last year in which each firm appeared in the panel between 2008 and 2016. Thus, these firms reported their EEO-1 survey at least twice in the potentially maximum 9 years in the panel although some firms started to appear after 2008 and some dropped out of the panel before 2016. This selection rule results in 8,323 firms, which appeared in the panel for 5.5 years on average (not necessarily consecutively). We collapse African Americans and Hispanics because separate demographic grouping results in too small numbers in each firm, which may cause bias in estimates sensitive to large relative shifts associated with small absolute numbers.

When running these latent class analysis, we did not define maximum iterations, but rather allowed the models to run until they reached maximum likelihoods. We also adjust latent class coefficients by weighting by the employment size in each firm in each occupational rank.

There are no *a priori* limits to the number of classes that might be discovered in a latent class analysis, but there are statistical tests that suggest appropriate numbers of classes. We use the maximum likelihood function to determine the number of latent classes for executive, managerial, and professional employment trajectories to focus on.

## Appendix C. Multinomial Logistic Regression

Multinomial logistic regression is a prediction model that describes the association between a set of predictor variables and a multi-category outcome. Our multi-category outcomes are the five professional-technical workforces trajectory classes discovered in our latent class analysis. The basic logic of a multinomial logistic regression is to contrast the influence of predictor variables on outcomes with some general reference category for both the predictors and outcomes. We take the slow diversity growth, status quo, firm class as this reference. Thus our models ask in comparison to slow growth, status quo firms, how are executive and managerial diversity trajectory classes associated with the rapid increase and decrease in diversity professional-technical firm classes? Table D1 provides the full estimation.

Table D1. Relative Risk Ratios of Latent Classes in Professional Jobs from Multinomial Logistic Regression on Latent Classes in Executive and Managerial Jobs (Slow Growth in Diversity Class is Reference Categories for both Outcome and Independent Variables)

|                                 | RRR  | Std. Err. | z      | P> z     | [95% Conf. Interval] |      |
|---------------------------------|------|-----------|--------|----------|----------------------|------|
| <b>Asian Male Decline Class</b> |      |           |        |          |                      |      |
| Executive Decreasing Diversity  | 1.20 | 0.23      | 0.95   | 0.34     | 0.82                 | 1.76 |
| Executive Increasing Diversity  | 1.04 | 0.26      | 0.17   | 0.86     | 0.64                 | 1.72 |
| Managerial Decreasing Diversity | 1.78 | 0.33      | 3.16   | 0.00     | 1.24                 | 2.55 |
| Managerial Increasing Diversity | 1.50 | 0.34      | 1.76   | 0.08     | 0.96                 | 2.35 |
| Constant                        | 0.03 | 0.00      | -39.99 | 0.00     | 0.02                 | 0.03 |
| <b>Female Decline Class</b>     |      |           |        |          |                      |      |
| Executive Decreasing Diversity  | 1.54 | 0.18      | 3.71   | 0.00     | 1.23                 | 1.94 |
| Executive Increasing Diversity  | 1.20 | 0.19      | 1.15   | 0.25     | 0.88                 | 1.63 |
| Managerial Decreasing Diversity | 2.04 | 0.24      | 6.13   | 0.00     | 1.62                 | 2.56 |
| Managerial Increasing Diversity | 2.02 | 0.27      | 5.21   | 0.00     | 1.55                 | 2.64 |
| Constant                        | 0.06 | 0.00      | -46.33 | 0.00     | 0.05                 | 0.07 |
| <b>Female Advancement Class</b> |      |           |        |          |                      |      |
| Executive Decreasing Diversity  | 1.24 | 0.15      | 1.81   | 0.07     | 0.98                 | 1.56 |
| Executive Increasing Diversity  | 1.59 | 0.21      | 3.52   | 0.00     | 1.23                 | 2.06 |
| Managerial Decreasing Diversity | 1.47 | 0.18      | 3.13   | 0.00     | 1.16                 | 1.87 |
| Managerial Increasing Diversity | 2.93 | 0.33      | 9.56   | 0.00     | 2.35                 | 3.66 |
| Constant                        | 0.07 | 0.00      | -46.98 | 0.00     | 0.06                 | 0.08 |
| <b>Asian Advancement Class</b>  |      |           |        |          |                      |      |
| Executive Decreasing Diversity  | 1.08 | 0.24      | 0.32   | 0.75     | 0.69                 | 1.68 |
| Executive Increasing Diversity  | 1.54 | 0.37      | 1.78   | 0.07     | 0.96                 | 2.47 |
| Managerial Decreasing Diversity | 1.59 | 0.35      | 2.12   | 0.03     | 1.04                 | 2.44 |
| Managerial Increasing Diversity | 2.47 | 0.53      | 4.23   | 0.00     | 1.63                 | 3.76 |
| Constant                        | 0.02 | 0.00      | -37.66 | 0.00     | 0.02                 | 0.02 |
| N                               |      |           |        | 8,323    |                      |      |
| Prob > Chi <sup>2</sup>         |      |           |        | 0.00     |                      |      |
| Log Likelihood                  |      |           |        | -5785.28 |                      |      |
| Pseudo R <sup>2</sup>           |      |           |        | 0.02     |                      |      |