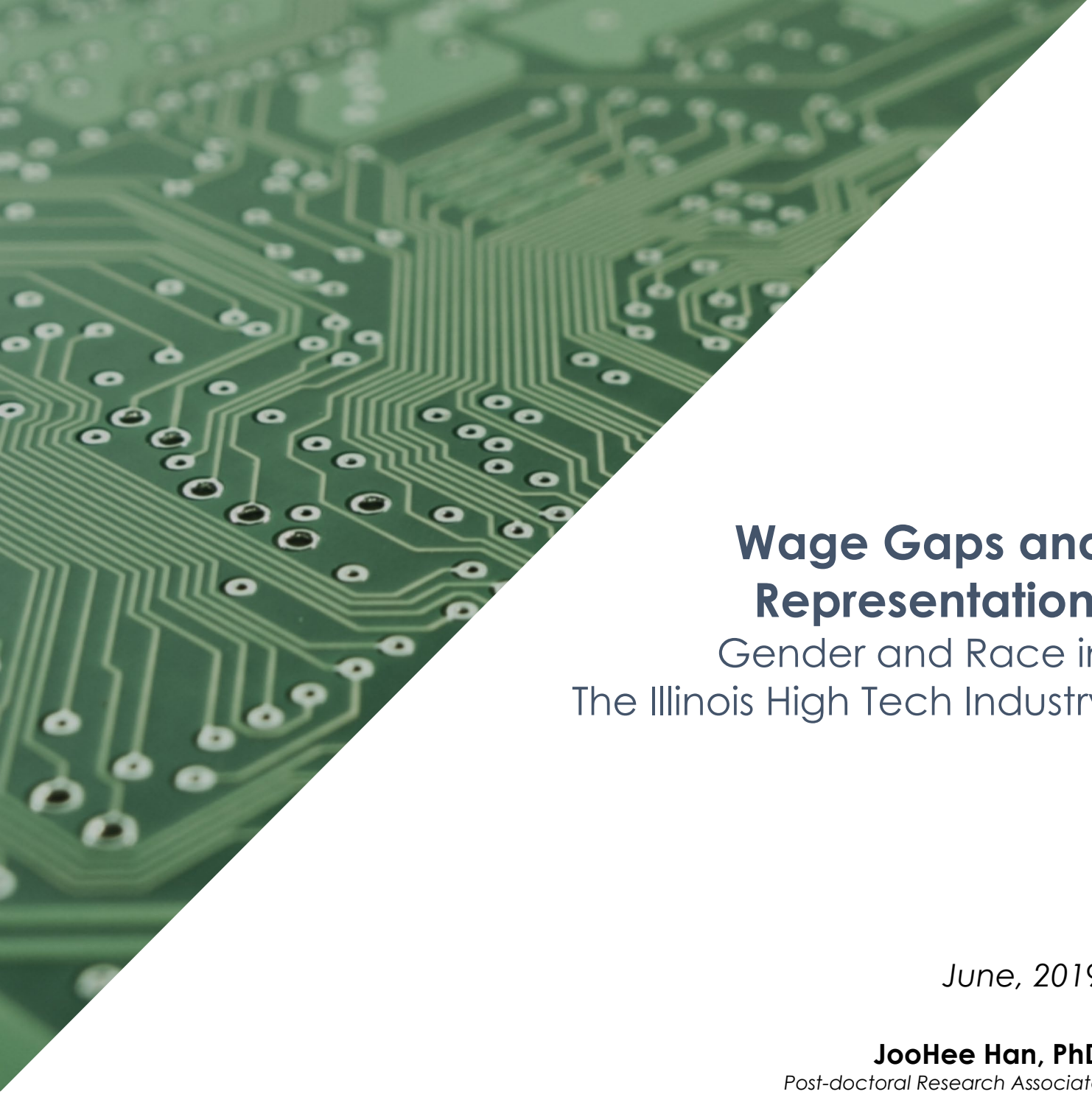

Wage Gaps and Representation:
Gender and Race in The Illinois High Tech Industry

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JooHee Han, PhD
Post-doctoral Research Associate
Labor Education Program
Project for Middle Class Renewal
University of Illinois at Urbana-Champaign

ILLINOIS LABOR & EMPLOYMENT RELATIONS
PROJECT FOR MIDDLE CLASS RENEWAL

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The Project for Middle Class Renewal's mission is to investigate the working conditions of workers in today's economy and elevate public discourse on issues affecting workers with research, analysis and education in order to develop and propose public policies that will reduce poverty, provide forms of representation to all workers, prevent gender, race, and LGBTQ+ discrimination, create more stable forms of employment, and promote middle-class paying jobs. Each year, the Project will be dedicated to a number of critical research studies and education forums on contemporary public policies and practices impacting labor and workplace issues. The report that follows, along with all other PMCR reports, may be found at **go.illinois.edu/pmcr**

EXECUTIVE SUMMARY

The gender and race gaps in pay and employment in the tech industry has been highlighted nationally in recent years, which has sparked diversity debates on employment discrimination. Employment diversity is not an issue limited just to Silicon Valley. Chicago is the 8th largest tech market in the U.S. The city is one of the fastest growing markets for venture capital investments. As a first step to increasing the diversity of Illinois' tech workforce, this report examines employment and wages across gender and race groups in three core tech occupations: executives, managers, and professionals. Analyses of data from the American Community Survey between 2008 and 2017 reveal:

- The workforce in Illinois' tech industries is predominantly male and white, particularly in upper core tech occupational ranks (executives, managers, and professionals). White employees comprise 88%, 76%, and 68% of all executives, managers, and professionals respectively. Only 25% of executives, 40% of managers, and 27% of professionals are women.
- In the last decade, the workforce diversity has not changed except for two groups: an increasing proportion of women - mostly white - hold managerial positions and an increasing proportion of non-white employees, mostly male, hold professional occupations.
- Despite such changes the gender pay gap exists in all three core occupations and the race pay gap is clearly evident among executives. Female executives earn 38.5% less than male executives, female managers earn 23.7% less than male managers, and female professionals earn 15.5% less than male professionals.
- Combined together, women and minorities are not only underrepresented in tech but they are also paid less than white men.
- Female tech managers in Illinois earn only 58% of what women tech managers earn nationally.
- Underrepresentation of women in tech and the gender pay gap are also associated with long work hours. On average, men work two to three more hours per week than women. The demanding work hours in the tech industry likely push women out of the industry.

The stagnant gender pay gaps and underrepresentation of women and minorities suggest that the gaps will likely persist in the future unless there are strong interventions. Based on studies, firm adoption of "count and compare" practices should be required to monitor gender-race diversity hiring and pay equity.

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1. INTRODUCTION

The gender gaps in pay and employment in tech have been highlighted nationally in recent years. Ellen Pao's lawsuit against Kleiner Perkins Caufield & Byers, a famous Silicon Valley venture capital firm, triggered debates on gender discrimination in the tech industry.[1] In 2017, Google fired a senior software engineer who posted a memo in the company's internal forum, where he insisted that the reason why fewer women work in tech is related to biological causes.[2] Afterward, Google pledged to increase diversity in the firm and several other Silicon Valley tech firms including Facebook voluntarily released reports on employee diversity. Despite the tech giants' efforts to move toward a more diverse workforce, transparency on diversity hires has been inadequate. REVEAL, a media specializing on tech industries, requested information from the 211 biggest San Francisco Bay Area-based tech companies for their Federal mandatory EEO-1 reports, which contains the detailed number of employees by race, gender, and occupation. But only twenty-three firms including Intel, Twitter, AirBnB, Uber, and Apple provided their reports.[3]

Diversity problems in tech are not limited to Silicon Valley. Chicago is the 8th largest tech market in the U.S. (U. S. Government Accountability Office 2017). In addition, Chicago is one of fastest growing markets for venture capital investments. However, gender and race employment diversity in the Illinois tech industry appears limited. The underrepresentation of women in tech companies in Chicago is particularly severe in leadership positions: currently 26% of 1,100 tech Vice Presidents are women and only 6% of CEOs are female among 300 companies.[4]

To increase diversity in the Illinois tech sector, many organizations have been formed and initiatives have been implemented. Currently in Illinois, there are 34 organizations that work for improving gender or racial diversity in tech.[5] Illinois Technology Association (ITA), for example, started a program called "Women Influence Chicago," which provides benchmarking and education for women in tech. In addition, efforts have been made to increase the number of women who enter tech fields. The University of Illinois received a $1.2 million grant from the National Science Foundation for a project aiming to attract more women, minority, and low-income students into college STEM (Science, Technology, Engineering and Mathematics) majors.[6]

In order to achieve effective outcomes from diversity-enhancement programs, the first step is to clearly understand the current status of diversity and inequality across race/gender groups in the tech workforce. Although a few earlier studies examined diversity among Illinois tech workers, they are mostly limited to leadership positions, and analyzed only in select companies, and mostly by gender. For example, ITA's recent report analyzes female representation among Vice Presidents, Senior Vice Presidents, and C-Suites occupants, including CEOs. The report did not extend to professionals and mid-level managers,

[1] https://www.nytimes.com/2015/03/28/technology/ellen-pao-kleiner-perkins-case-decision.html

[2] https://www.vox.com/identities/2017/8/8/16106728/google-fired-engineer-anti-diversity-memo

[3] https://www.revealnews.org/article/hidden-figures-how-silicon-valley-keeps-diversity-data-secret/

[4] https://cdn.ymaws.com/www.illinoistech.org/resource/resmgr/docs/wic/women_influence_chicago_benc.pdf

[5] https://venturebeat.com/2017/12/12/how-34-illinois-tech-organizations-are-working-to-close-the-diversity-gap/

[6] http://www.news-gazette.com/news/local/2019-03-27/ui-getting-12-million-nsf-project-aims-spread-stem.html

who constitute the majority of the tech workforce. In addition, detailed analyses on income differences and work hours among Illinois tech workers are even scarcer. A report published by a recruiting HR company analyzed tech workers' salaries and reveals that the magnitudes of the gender pay gap vary by tech markets but it did not include Chicago in their analyses.[7]

After a brief discussion of some employment diversity literature and a methodological description, the current report is divided into sections. First, the study examines data from the American Community Survey to determine the state of diversity in the Illinois tech industry. It also includes how much gender and race diversity has changed over time in core occupations. Next, the report examines the hourly wage differences across race and gender in core Illinois tech occupational groups and offers comparisons to national level data. A following section examines the comparative impact of work hours and gender on pay differentials. Finally, the report concludes with a few policy suggestions for increasing employment diversity in the tech industry.

2. DIVERSITY IN TECH

2.1. Why Workplace Diversity Matters

Workplace diversity has been an important issue for a long time for both employers and employees. For employers, diversity is associated with corporate performance. A report published by McKinsey (Hunt, Layton, and Prince 2015) reveals that firms with more gender and race/ethnicity diversity in leadership positions are more likely to perform better financially. The authors further explain that diversity increases employee satisfaction, improves decision-making through innovation and creativity from diverse ideas, and helps firms build better images. Because innovation and creativity are particularly crucial to success in the tech industry, securing diversity should be an essential part of a firm's human resource practices.

For employees, lack of diversity may imply workplace discrimination toward women and minorities in hiring, promotion, and retention. Glass-ceilings for women and minorities, and channeling women and minority into less privileged occupations are often pointed to as causes of underrepresentation in many workplaces (McKinsey & Company 2018). In addition, workplace diversity is influenced by structural causes such as the aggregate labor supply. The gendered pipeline of college students who are STEM majors interested in, for example, computer science has been identified as a cause for the lack of diversity in tech (Myers 2018).

2.2. Gender/Race Diversity and Pay Gaps in Tech Industry

Studies have pointed to two major causes of the underrepresentation of women and minorities, and for the existence of pay gaps: (1) the lack of women entering tech fields and (2) workplace discrimination in hiring, promotion and compensation. Mann and DiPrete (2013) show that the supply of female labor into traditionally female occupations starts in college. As women take a more diverse set of courses relative to men who take more STEM-related courses, women tend more to choose non-STEM post-college careers in law and medicine. However, an EEOC (U.S. Equal Employment Opportunity Commission) report (2016) found that the female labor supply is not the primary cause of underrepresentation of women in tech firms. The number of women and minorities who major in STEM has increased considerably in recent years

[7] https://hired.com/page/wage-inequality-report/

and a traditional formal bachelor's degree is not required in about half of the STEM jobs.

Nonetheless, women who chose to work in tech face discrimination, which often results in a gender pay gap. Within tech occupations, women are channeled into fields that women are socially expected to fill. Cech (2013) finds that there exists a profession-specific gender norm in tech. Men are expected to work in core tech fields, while and social communication positions are reserved for women. As a consequence, women that work in core technical fields, often get less compensation than men in the same field.

Differential rewards incentivize women to leave the industry. Glass et al. (2013) argue that the lower job rewards for women in STEM fields, rather than family-related factors, is the more critical cause of higher attrition of women in tech. Similarly, Prokos and Padavic (2005) insist that discrimination is the key determinant of the gender pay gap in workers in science and engineering. As a consequence, about 50% of qualified women in tech firms reportedly leave their job (Hewlett, Luce, and Servon 2008) due to unequal treatment.

The tech industry is also less racially diverse than other industries. Except for Asians, all other non-white racial groups' proportions are considerably lower in tech than in all private industries. According to the EEOC (2016), the proportion of black employees in tech is only 7.4%, while it is 14.4% in private industries. The Hispanic employee proportion in tech is only 8%, while it is 13.9% of all private sector workforces. The tech workforce is mostly white constituting 68.5% of all employees (compared to 63.5% of all private sector workers). While Asian employees have higher representations in tech than in all private industries, their access to leadership positions is limited. Gee and Peck (2016: 3) created a "pipeline" metric of the Executive Parity Index (EPI) by calculating "a ratio of the percentage representation of a company's Executive workforce relative to that company's percentage representation of its entry-level Professional workforce." The authors find that the EPI of Asian men in Silicon Valley tech firms is much lower than those of white men and women, similar to black men, and lower than Hispanic men, suggesting that Asian progress in the industry may be illusory.

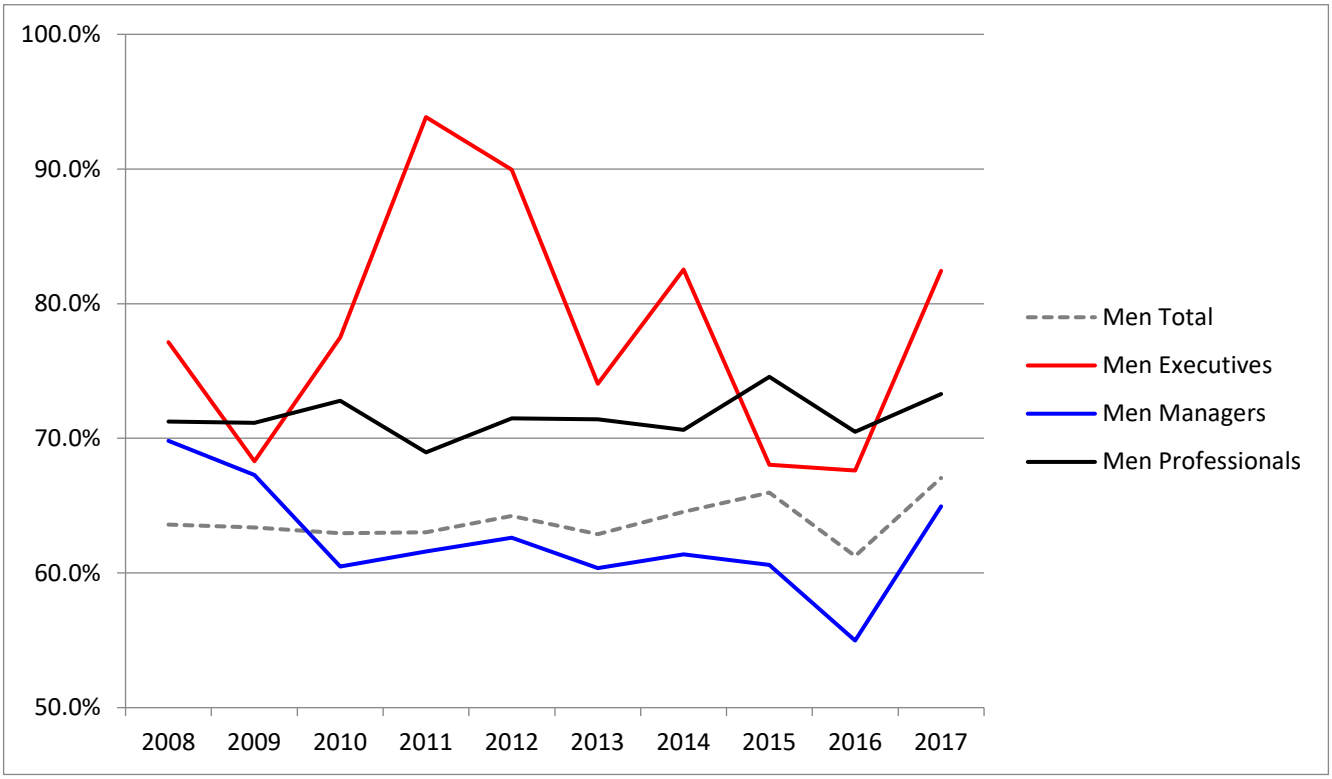
3. DATA AND METHODOLOGY

To examine the diversity of the current Illinois tech workforce and how diversity has changed over time, annual data from the American Community Survey from 2008 to 2017 was analyzed. Because the sample size is small, particularly for those who work in executive and managerial occupations, an analysis of 5-year cumulative data of 2012-2016 for gender/race subgroup was also conducted. The sample is limited to those who resided in Illinois and worked in tech industries and all analyses are adjusted by sampling weights.

Currently, there is no clear definition of the tech industry. For example, EEOC (2016: 1) defines "high tech industry," or the "high tech sector," as industries that employ a high concentration of employees in science, technology, engineering and mathematics (STEM) occupations and the production of goods and services advancing the use of electronic and computer-based production methods." Because various researchers define tech in slightly different ways the industries in this report are defined by 3 and 4 digit NAICS (North American Industry Classification System) codes based on earlier studies (EEOC 2016; Robert and Wolf 2018). A list is provided in Appendix Table A1.

This report focuses on executives, managers, and professionals because these occupations likely reflect the attributes of tech industry-specific workforces that provide the highest financial rewards, authority and prestige. In addition, these occupations constitute the majority of the tech workforce. Employees in professional occupations such as computer programmers, software developers, web developers, and database administrators comprise 43.5% of all

Figure 1: Male Proportions (%) in Illinois Tech Industry Workforce by Occupation between 2008 and 2017



employees and the proportions of executives and managers are higher in tech industries than in other industries (EEOC 2016). Most managers are those promoted from professionals in the same industry. The detail ACS occupations are grouped into ten EEO-1 occupational categories to increase the sample size in each occupational group. Alternatively, pay gaps in selected detailed Standard Occupational Classification (SOC) groups were analyzed.[8]

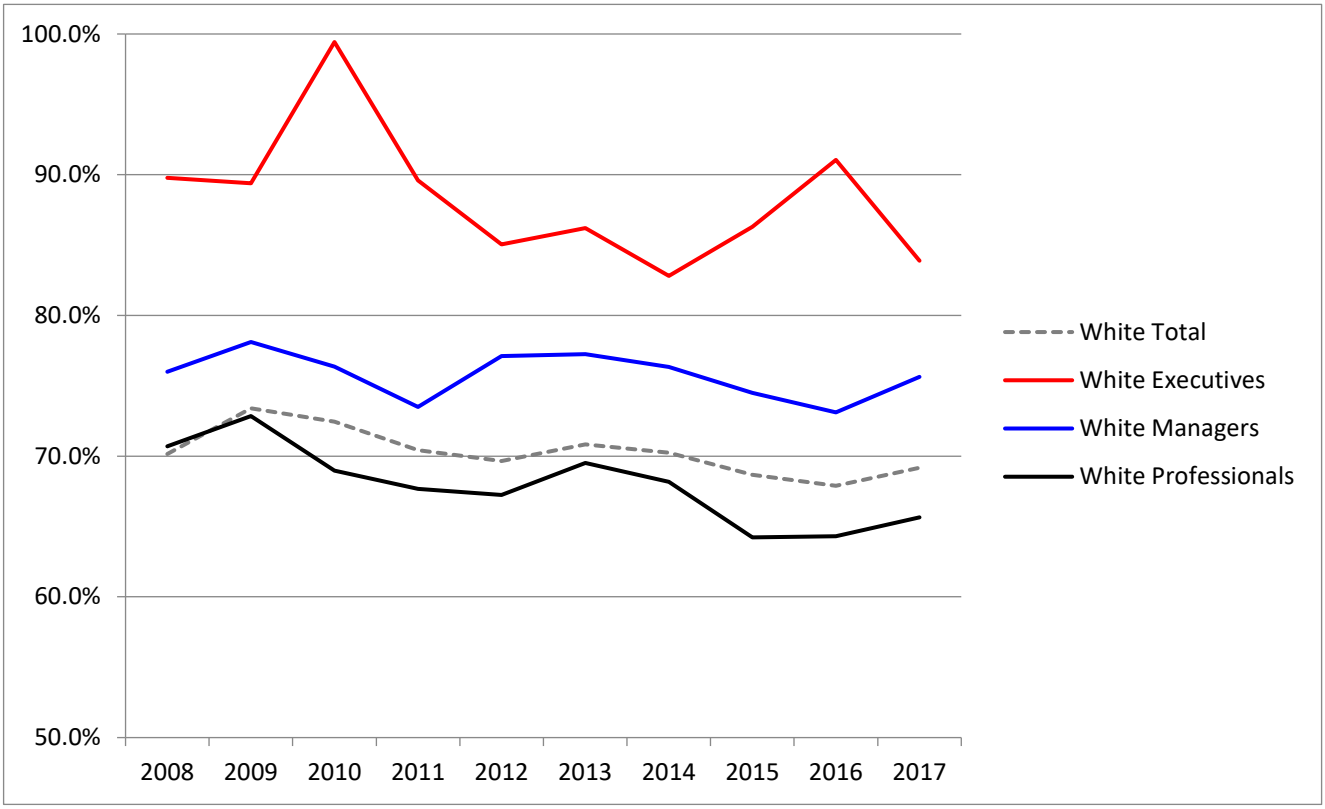
The hourly wage is calculated by dividing the annual income from work by the usual hours worked per week and the weeks worked. To reduce bias from extreme numbers, median wages instead of mean wages are used. All hourly wages adjusted to either 2017 dollars or 2016 dollars depending on dataset by the Current Price Index (CPI) provided by the Bureau of Labor Statistics.

4. ILLINOIS WORKFORCE DIVERSITY

The Illinois tech industry workforce is predominantly male. There is less gender diversity in higher occupational ranks and it has not changed much in the last decade. **Fig 1** shows the male proportions of the workforce in Illinois' tech industry by occupation between 2008 and 2017. The majority of all workers in all occupational ranks, including other support/clerical workers are men (grey dash line). The proportion has been stable at around 70% or above over time. In the executives rank, however, the male proportion is much higher (red line). It spiked to more than 90% in 2011, then fluctuated and slightly declined afterward. The fluctuation is likely due to the relatively small number of

[8] The Standard Occupational Classification is a federal statistical standard used by federal agencies to classify workers into occupational categories.

Figure 2: White Proportions (%) in Illinois Tech Industry Workforce by Occupation between 2008 and 2017



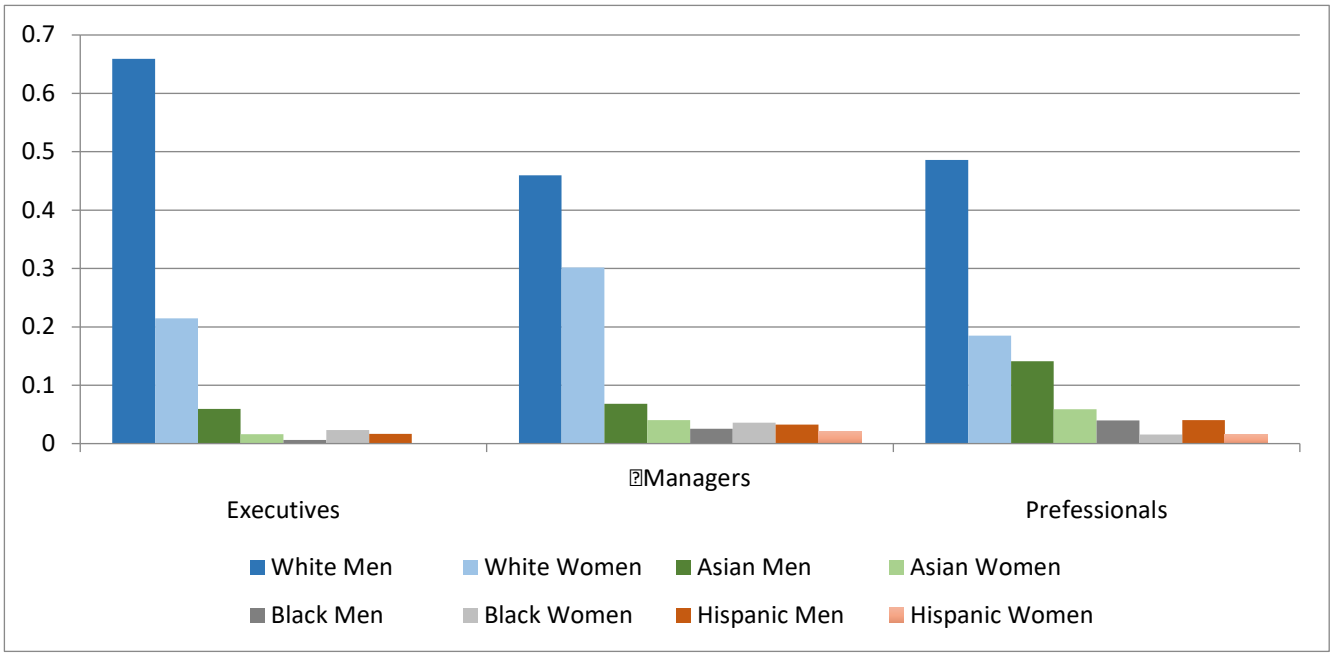
executives in the sample. The second highest male proportion is observed among professionals (black line), which remain stable at 70% or above. Managers (blue line) are the only group where the male proportion is lower than that of total employees and has declined to 55% in 2016 from 70% in 2008.

In terms of race, the Illinois tech workforce is dominated by white employees. **Fig 2** presents the proportion of white employees in the Illinois tech industry workforce by occupation between 2008 and 2017. The overall proportion of white employees (grey dash line) has steadily hovered around 70%. However, white employee representation is extremely high among executives (red line). Although it has declined since its near 100% peak in 2010, it has never dropped below 80%. The white employee representation among managers (blue line) is constant at around 75% over time. On the other hand, the white proportion of employees in professional occupations (black line) has been declining slightly from higher than 70% to about 65% in 2017.

In sum, tech executives are predominantly white and male, although their representations have slightly declined. An increasing proportion of women hold managerial occupations. However non-white female representation has not increased. Additionally, professional occupations are predominantly held by men (never below 70% except in 2011) although these occupations have become a bit more racially diverse.

Fig 3 more clearly shows the gender-race group compositions in each occupation. It is based on 2012-2016 cumulative data, which thus can be interpreted as the 5-year averages. Executives are predominantly white men (65%) while white female representation is only 20%. The next largest gender-race group is Asian men (5%). Other minority groups (Asian women, Black and Hispanic men and women) are extremely rare in executive positions.

Figure 3: Race/Gender Composition of Workforce in Illinois Tech Industry in Executives, Managerial, and Professional Ranks (2012-2016 Average)



While white-male managers make up a plurality (45%), white female managers account for roughly 30% of the total number of managerial employees. Gender parity in managerial occupations is stronger among other racial groups than in executive and professional occupations. However, among professional classifications racial diversity is limited only to men. A very small proportion of professionals employees are Black and Hispanic Women.

5. PAY GAP

5.1. Gender

As well as workforce diversity, the pay gaps across race and gender are important indicators of inequality in the tech industry. **Fig 4** presents median hourly wages (in 2016 dollars) of Illinois tech workers among executives, managers, and professionals by gender. It reveals that a gender pay gap exist in all three occupational groups but with different magnitudes. The median hourly wage of male executives is $66.3 while it was $40.8 for women. The median hourly wage of male managers is $42.2 while it was $32.2 for women and it is $36.2 and $30.6 for male and female professionals respectively. In short, the gender pay gap is the largest for executives (women earn 61.5% of men), followed by managers (women earn 76.3% of men) and professionals (women earn 84.5% of men).

Figure 4: Median Hourly Wage (2016 dollars) of Illinois Tech Workers by Gender and Occupation (2012-2016 Average)

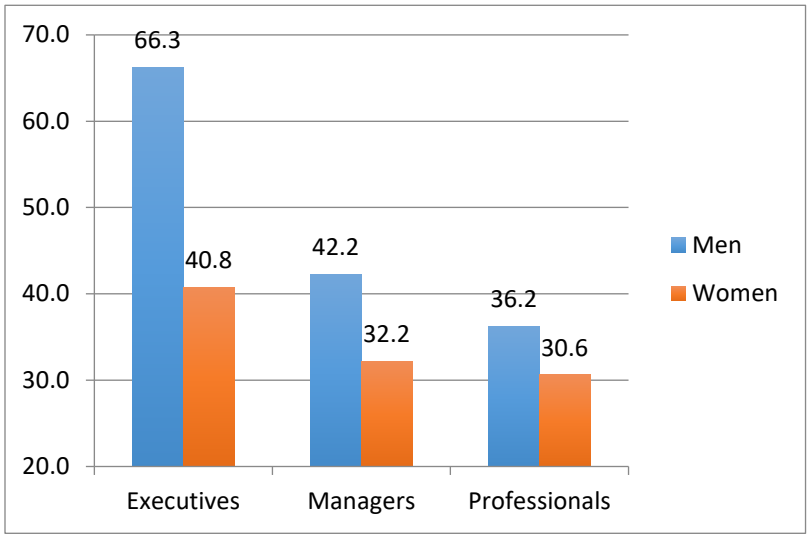


Figure 5: Median Hourly Wage (2017 dollars) of Managers in Illinois Tech Industry by Gender between 2008-2017.

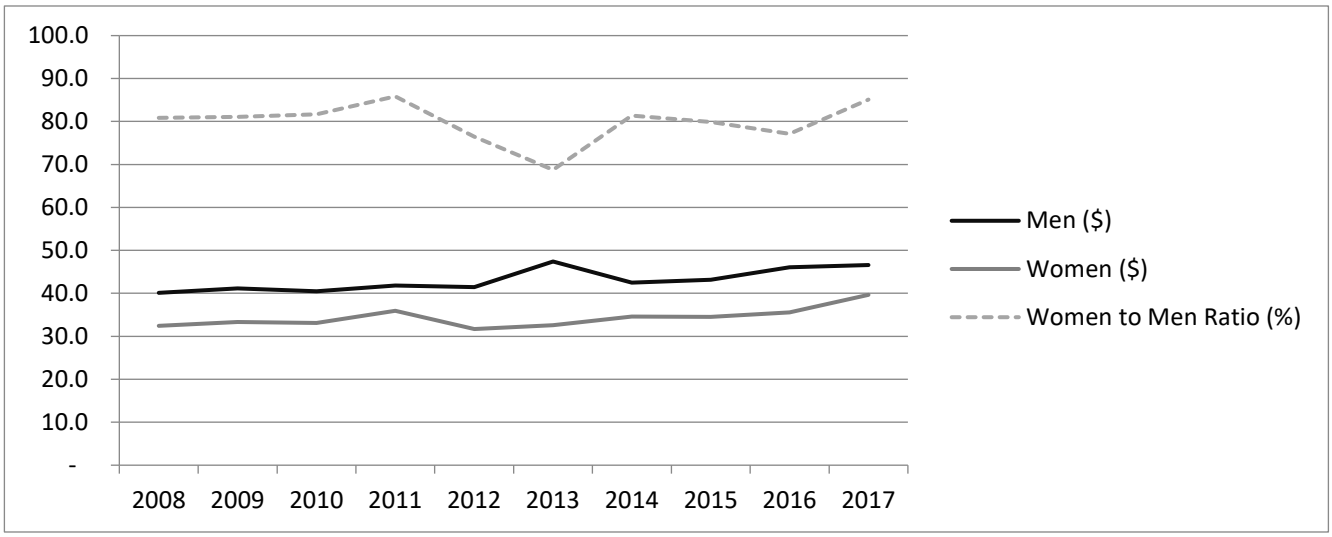
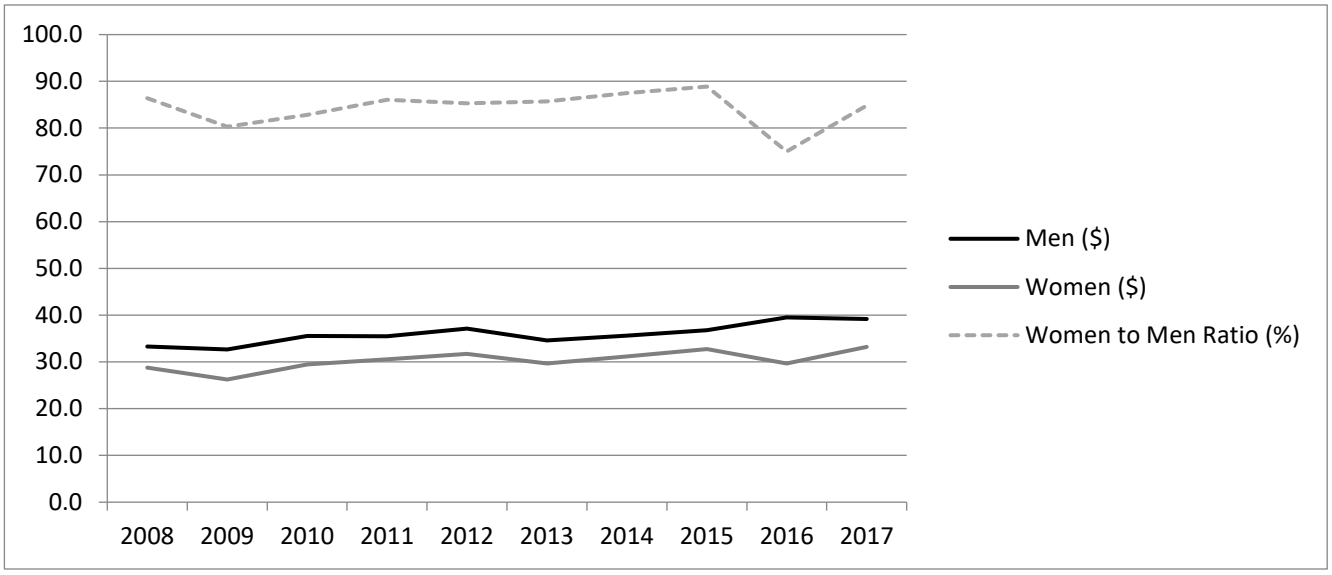


Figure 6: Median Hourly Wage (2017 dollars) of Professionals in Illinois Tech Industry by Gender between 2008-2017

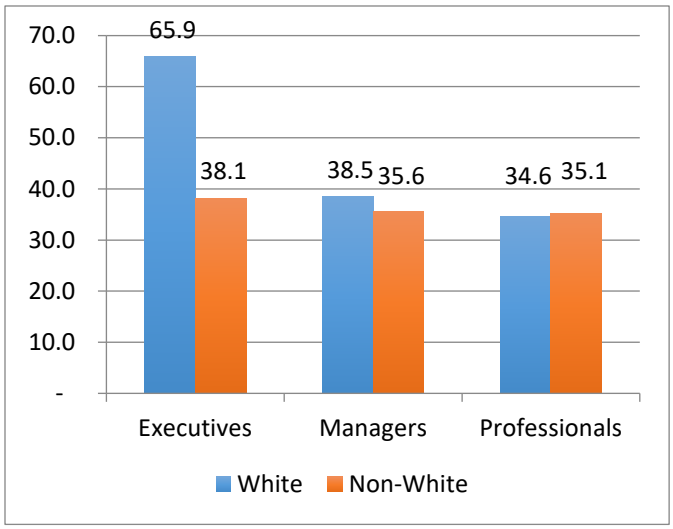


The gender pay gaps do not appear to have improved over time. **Fig 5** presents the median hourly wages of male and female managers (in 2017 dollars) and the female-to-male ratios between 2008 and 2017. Because the wages are adjusted to 2017 dollars based on CPI the figure shows that the real wage increased for both men (black line) and women (gray line) over time. Despite the increase in female managers' wages the ratio of female to male wages (gray dash line) has not changed, having stayed around 80%.

A similar pattern is found among professionals in **Fig 6**. As the median hourly wages of professionals has increased for both men (black line) and women (gray line) the female-to-male ratio (gray dash line) has narrowed from 80% in 2009 to 90% in 2015. The gap, however, increased in the last two assessed years (2016 and 2017). Due to the small sample size of female executives in the annual data it was not possible to examine the gender pay gap among executives. Nonetheless, the same pattern is likely to be observed. Altogether, it suggests that while an increasing number of women work in tech women's pay levels are not comparable to men's.

5.2. Race

Figure 7: Median Hourly Wage (2016 dollars) of Illinois Tech Workers by Race and Occupation (2012-2016 Average)



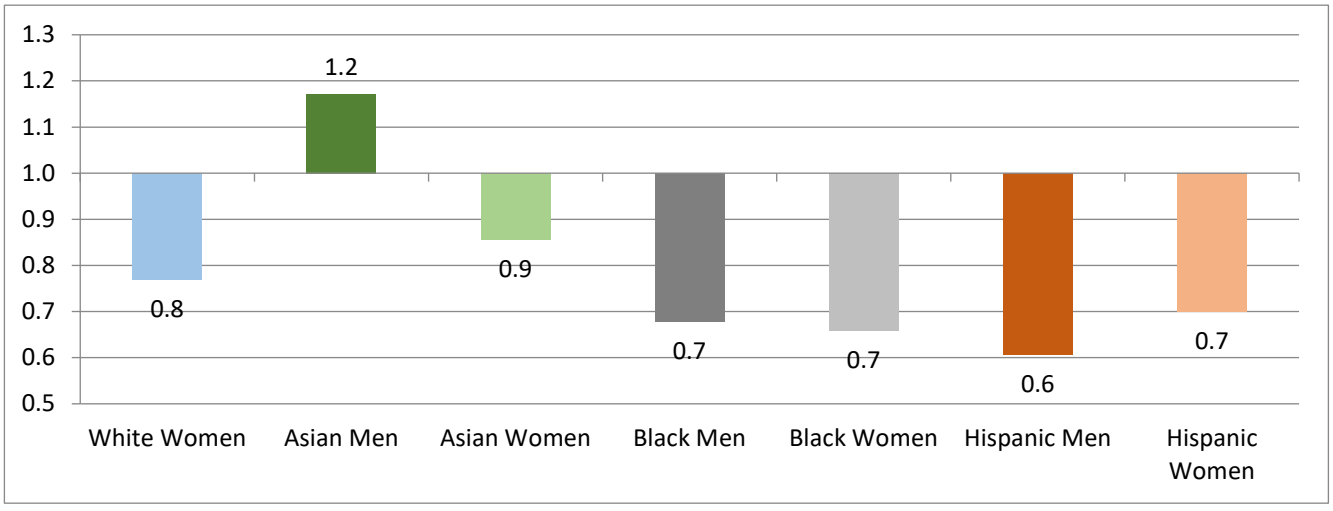
While largely undisturbed pay gaps are observed across gender in the core tech occupations, racial pay gaps appear to be narrowing. **Fig 7** presents median hourly wages for whites and non-whites[9] in executives, managers, and professional classifications. The racial pay gap among executives is sizeable. White executives earn $65.9 per hour compared to non-white executives who earn only $38.1 (57.8% of whites).

But the racial pay gap is reduced to about three dollars among managers. White managers earn $38.5 and non-white managers earn $35.6 (92.5% of whites). And the pay gap disappears among professionals: white professionals earn $34.6 while their non-white counterparts earn $35.1 (101.5% of whites).

5.3. Race and Gender

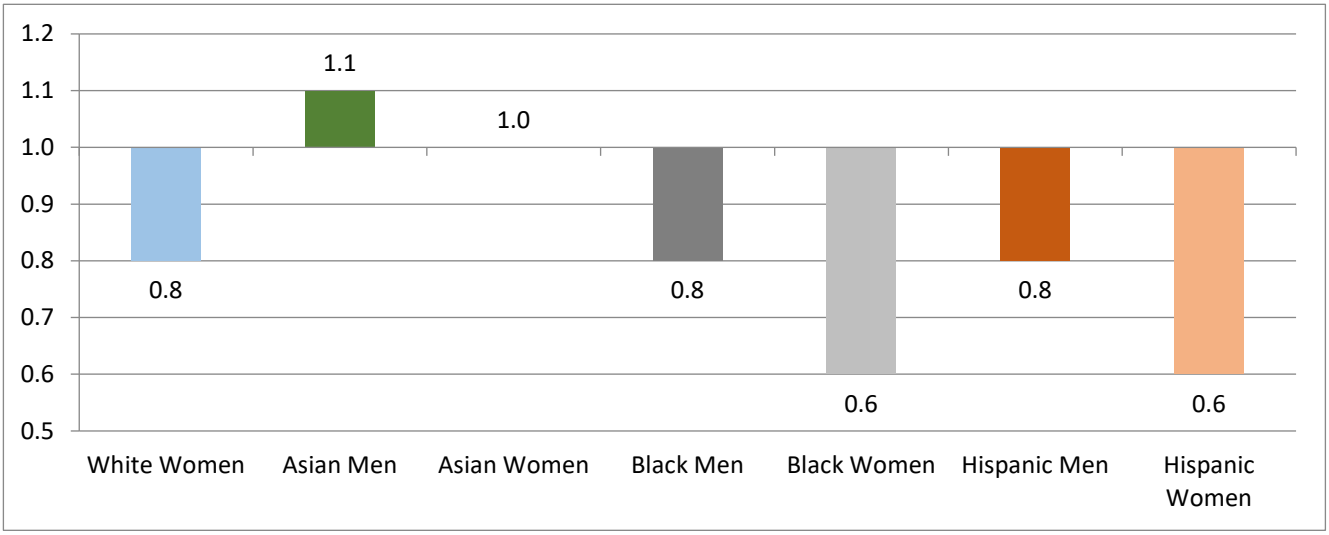
A detailed breakdown by race-gender groups shows that the gender pay gap also varies by race. **Fig 8** and **Fig 9** present the ratios of each race-gender group's median hourly wage to white men's among managers and professionals respectively. In the managerial rank, the gender pay gap is mostly prevalent among white male and Asian employees. Relative to white male managers' median hourly wages ($42.8), white women earn about 78%. But an even larger gender pay gap is observed among Asian managers. Asian men earn approximately 18% more than white male managers, while Asian women earn 16% less than white men. However, both Black

Figure 8: Ratios of Each Race-Gender Group's Median Hourly Wage (2016 dollars) to White Men's among Managers (2012-2016 Average; White Male median hourly wage in 2016 is $42.8)



[9] Due to the small sample size, non-whites are not disaggregated by detailed race categories.

Figure 9: Ratios of Each Race/Gender Group's Median Hourly Wage (2016 dollars) to White Men's among Professionals (2012-2016 Average; White Male median hourly wage in 2016 is $36.2)



and Hispanic men and women earn 30 to 40 percent less than white men.

A similar gender disparity in pay is found among professionals as well but in all race groups. While both Black and Hispanic men earn about 20% less than white men, the gap is 40% for Black and Hispanic women. Asian female professionals earn about the same as white men while white women still earn less than white male professionals.

In addition, the figures reveal that the racial parity in pay among managers and professionals shown in **Fig 7** is not true for all races. While Asian men earn 10% (managers) to 20% (professionals) more than white men, Black and Hispanic male wages are considerably lower than white male employees.

5.4. Wage Gap by Select Occupations in Illinois and in Comparison to National Level

Table 1 summarizes median hourly wages of male and female tech workers in select occupations in Illinois, and comparable national wage medians. The table lists the top ten occupations with the largest share of employees in tech nationally (Roberts and Wolf 2018). The largest gender pay gap in Illinois' tech industry is observed in sales and related occupations with women earning 69% of men, followed by production occupations (72%), and installation, maintenance, and repair occupations (75%). Conversely, women's and men's wages are similar in Healthcare Practitioners and Technical Occupations. In the core tech occupations (i.e., Computer & Mathematical Occupations; Architecture & Engineering Occupations Business & Financial Operations Occupations; Management Occupations), women earn between 77% and 89% of men's wages.

Importantly, the ratio of the median hourly wages of female tech managers in Illinois to the national median is the smallest and most inequitable. For comparison purposes the wages of women in Office and Administrative Support Occupations and Healthcare Practitioners and Technical Occupations in Illinois are similar to the national median.

6. WORK HOURS AND GENDER PAY GAP

Studies suggest that long work hours, particularly in professional occupations, push more women than men out of the profession as women are burdened with more family responsibility, which results in wage penalties for women (Cha and

Table 1: Median Hourly Wages (in 2016 Dollars) of Male and Female Illinois Tech Workers in Detailed Occupations from the Standard Occupational Classification (SOC) System, and the National Median Hourly Wages of Tech Workers

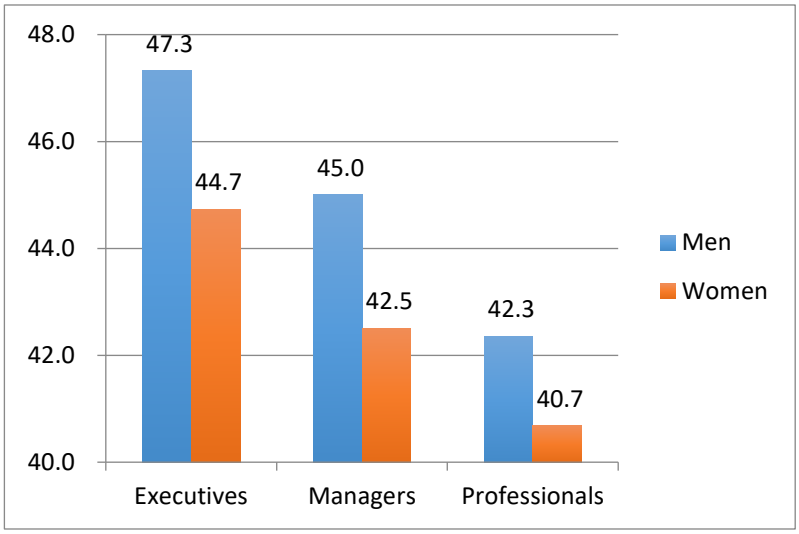
Occupations	Men	Women	Female-to-Male Ratio	National*	Illinois Female to National Median Ratio
41. Sales and Related Occupations	41.4	28.6	0.69	31.1	0.92
51. Production Occupations	20.0	14.5	0.72	19.7	0.74
49. Installation, Maintenance, and Repair Occupations	27.3	20.4	0.75	28.5	0.72
11. Management Occupations	47.6	36.8	0.77	63.2	0.58
13. Business & Financial Operations Occupations	35.6	28.2	0.79	36.8	0.77
17. Architecture & Engineering Occupations	33.6	27.3	0.81	39.4	0.69
15. Computer & Mathematical Occupations	37.1	33.1	0.89	43	0.77
43. Office and Administrative Support Occupations	22.2	20	0.9	19.5	1.03
19. Life, Physical, & Social Science Occupations	29.1	26.4	0.91	33.8	0.78
29. Healthcare Practitioners and Technical Occupations	35.1	35.6	1.02	36.2	0.98

**Source: Calculated from the annual median wages in Roberts and Wolf (2018), Table 2.*

Weeden 2014; Goldin and Katz 2016). That is, relative to jobs that demand shorter work hours, jobs that demand longer work hours pay higher hourly wages, where women struggle to stay in the occupations. The same mechanism likely applies to Illinois' tech industry. **Fig 10** summarizes the average weekly work hours for men and women in each occupation. While male executives work 47.3 hours a week on average female executives work 44.7 hours a week. Male managers work, on average, 45 hours a week and female managers work 42.5 hours. Among professionals the gap is smaller to 1.6 hours as men work 42.3 hours and women work 40.7 hours a week.

While work hours are different for men and women, the effect of work hours on wages appears weak, whereas the effect of being female is strong. To determine the effect of work hours and gender on earnings, Ordinary Least Square regressions controlling for race, gender, year of education, and occupation were run. The coefficient was 0.22, meaning that hourly wages increased by 22 cents for every one additional hour worked. Therefore, a roughly three hour difference on average work hours for male and female executives and managers yields a 66 cent difference on hourly wage.[10] However, the coefficient of gender in the same model is -3.96. This much larger disparity suggests that being female lowers hourly wages by $4.

Figure 10: Mean Work Hours Per Week of Illinois Tech Workers by Gender and Occupation (2012-2016 Average)



[10] Assuming that race, gender, year of education, and occupation are the same for men and women.

7. CONCLUSION AND POLICY SUGGESTIONS

The Illinois tech industry workforce is predominantly constituted by white males, particularly in upper core tech occupational ranks (executives, managers, and professionals). In addition, the underrepresented groups' wages are lower compared to white men. Although an increasing proportion of women hold managerial positions and non-whites work as professionals, the gender pay gap exists in all three core occupations and the race pay gap is substantial among executives. Additionally, the pay gaps do not appear to have improved over time.

Despite the current predominantly white-male Illinois tech workforce, there are possibilities that diversity may improve. While this report analyzed workforce diversity in the tech sector, firm level analyses show that there exists considerable variation in diversity across firms. Analyzing employee diversity in 177 large Silicon Valley firms, Tomaskovic-Devey and Han (2018) find that diversity varies to some extent by firms. For example, there are 16 firms where Black men are more than 3% of executives. In some firms, more than half of the executives are women while in some other firms, conversely, all executives are men.

Collective efforts are needed to increase diversity in the tech industry. Many policies and practices including diversity training, mentoring and networking, have been implemented at the firm level. However, the effects of such programs have been minimal.

RECOMMENDATIONS

Conversely, according to Kalev, Dobbin and Kelly (2006), the most effective way to increase diversity hires is to make firm hiring practices transparent and to create accountability mechanisms for reducing female and minority underrepresentation.

- After examining various diversity programs, Dobbin and Kalev (2017) found that "diversity task forces" and "diversity managers" are effective tools that yield greater employment diversification. The research suggests that these endeavors make firms more accountable by producing transparent outcomes that can be shared with the entire organization and outside parties.
- Additionally, Steinback and Tomaskovic-Devey (2012) found that the most progress towards racial diversity occurred only until the 1980's when external social and political pressures were placed on firms.
- A consensus has developed that accountability and transparency are necessary to reduce bias and increase diversity in employment. But neither is possible, in the absence of good metrics. Therefore, the first step to increase transparency in diversifying the tech workforce should be firm adoption of "count and compare" practices. According to the Center for Employment Equity at the University of Massachusetts Amherst, firms "need to collect data on themselves" and be required to make the data publically available. Once hiring data reports are parts of the public record "regulators and activists need to rank firms in terms of their employment diversity, pay gaps and discrimination complaints." Such practices allow firms, regulators and stakeholders to diagnose disparities in hiring, promotion, and pay (Tomaksovic-Devey 2018). The focus here is on creating mechanisms for monitoring workplace and workforce diversity.

- The same approach should be used to reduce gender and racial pay gaps. Monitoring and reporting on which group earns more or less in the same occupation will incentivize employers to provide equal treatment of employees regardless of gender and race.[11]

[11] The Trump administration halted a plan that required EEOC to collect pay data by race and gender from large companies. Fortunately, a Federal judge ruled that the order was unconstitutional. See, https://www.washingtonpost.com/dc-md-va/2019/03/05/victory-equal-pay-judge-rules-trump-administration-must-require-companies-report-pay-by-gender-race/?noredirect=on&utm_term=.c2b44c548f51.

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APPENDIX

Table A1. NAICS List of High Tech Industry

NAICS	Industry
211	Oil and gas extraction
2211	Electric power generation, transmission and distribution
3251	Basic chemical manufacturing
3254	Pharmaceutical and medicine manufacturing
3332	Industrial machinery manufacturing
3333	Commercial and service industry machinery manufacturing, including digital camera manufacturing
3341	Computer and peripheral equipment manufacturing, excluding digital camera manufacturing
3342	Communications equipment manufacturing
3343	Audio and video equipment manufacturing
3344	Semiconductor and other electronic component manufacturing
3345	Navigational, measuring, electromedical, and control instruments manufacturing
3346	Manufacturing and reproducing magnetic and optical media
3353	Electrical equipment manufacturing
3364	Aerospace product and parts manufacturing
486	Pipeline transportation
5112	Software publishers
5171	Wired telecommunications carriers
5172	Wireless telecommunications carriers (except satellite)
5174, 5179	Satellite, telecommunications resellers, and all other telecommunications
518	Data processing, hosting, and related services
519	Other information services
5413	Architectural, engineering, and related services
5415	Computer systems design and related services
5416	Management, scientific, and technical consulting services
5417	Scientific research and development services
55	Management of companies and enterprises