Skills Mismatch and Opportunity Gaps: An Analysis of Skills Development and Equity in the New Jersey Labor Market

Practicum Report

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Executive Summary

The current period of economic instability resulting from the COVID-19 pandemic has devastated the New Jersey economy and labor market, with negative impacts felt more harshly by women and minority groups. With millions forced from their primary field of employment, workers may find themselves working in industries improperly matched to their educational qualifications. Evidence suggests that this discrepancy between the supply and demand of labor persists following recessions. Identifying patterns in skills development following the previous recession, the Great Recession of 2008, may therefore predict how New Jersey's labor market will develop during future economic recovery, and will allow policymakers to determine whether issues of talent development or equity are primarily responsible for continued post-recession inefficiencies in the workforce. Through the use of the New Jersey Education to Earnings Data System (NJEEDS) and State Occupation Projections from the US Department of Labor, this report investigates mismatch between education of the workforce and in-demand fields of employment in New Jersey with an equity lens in order to develop solutions to the issues of supply and demand of labor during and after the COVID-19 recession.

Skills mismatches in the labor market between workers and the available occupations are caused by a variety of factors. These factors include an underskilled labor force, an improperly trained labor force in relation to available jobs, overeducation of the workforce, upskilling by employers, discriminatory hiring practices by employers towards underrepresented groups and macroeconomic factors. Skills mismatches have further been shown to have a negative impact on wages. Skills development and targeted training programs may be solutions to this issue, though employer behaviors during and following recessions indicate that education requirements for occupations are often changed as a result of macroeconomic forces. Further, evidence of

discrimination against women and minority groups, even amongst individuals with similar skills requirements, suggests that skills development and training may need to be paired with policies aimed at encouraging greater equity in employer hiring practices in order to truly be effective.

Our analysis utilized the statewide longitudinal data system, NJEEDS, in order to test two hypotheses. Our first hypothesis was that there was a significant amount of mismatch in New Jersey following the Great Recession between the collegiate field of study of graduates and the occupational industry in which these graduates ultimately find employment. We additionally expected to find a mismatch between popular fields of study and growing fields of employment, as identified by the New Jersey Department of Labor (NJDOL), with majors leading to non-growth occupations being overrepresented. Our second hypothesis was that employer behavior, namely discrimination in the hiring of women and minority groups, creates a further opportunity gap in which workers from these groups have less access to high paying positions despite their qualifications or occupation. If this was the case we expected to see lower overall weekly wages among these groups, even when controlling for factors such as collegiate field of study, occupational industry and occupation location. Our analysis utilized NJEEDS to link together race, gender, collegiate field of study, and occupational industry for all graduates of four year degree programs in New Jersey from 2010-2019 in order to test our hypotheses, while also pulling in data from NJDOL regarding 2018 employment and 2018-2028 growth projections.

Our first hypothesis received some support. Analysis of the top 5 occupational industries for graduates of each collegiate field of study showed that 16.29% of these graduates worked in industries that did not match their field of study. The average penalty for working in a mismatched field in the occupations we analyzed was 8% less than the average wage for that field of study. Of the most popular majors in the state, Education, Psychology and Social

Sciences showed a degree of mismatch amongst top occupations. 8% of Education majors worked in mismatched fields, 15% of Psychology majors worked in mismatched fields and 37% of Social Sciences majors worked in mismatched fields. Analysis of degree attainment between the years 2015 and 2018 across all degree programs also indicates an overrepresentation of STEM majors in relation to available jobs and projected growth fields.

Our second hypothesis was supported, with regression analyses revealing that race and gender remain an influence on weekly wages, and that this difference remains even after controlling for differences in occupation, differences in field of study, citizenship status, graduation year and location of employment. Thus, the impact of education and occupational industry, which would have indicated a potential underdevelopment of skills amongst protected groups, was not as significant as other studies have suggested. When analyzing jobs within the state worked by New Jersey residents in our final model, Black individuals earned $103.52 less, Hispanic individuals earned $79.90 less, Asian individuals earned $7.69 more, and Multiracial individuals earned $70.79 less in average weekly wages than White individuals. Women further earned $91.82 less than men in average weekly wages. For Multiracial and female residents only, these differences reduced notably in the third regression model, indicating that at least some of the variation in wages is due to collegiate field of study and occupational location.

Our analyses indicate that efforts can be made at the state level to encourage individuals to enter degree programs with clearer occupational paths post-graduation, and that certain degree fields, such as STEM and the social sciences, are at risk of becoming oversaturated. Further, given the role that race and gender play in differences in weekly wages even when controlling for education and occupation, state initiatives need to focus on encouraging equity in hiring practices, as a skills gap or mismatch does not appear to entirely mitigate these wage differences

for underrepresented groups. Given the high wages of certain occupations that do not require a college degree, state policy may also see fit to target the development of non degree training programs for fields such as manufacturing. In an effort to identify high wage fields and industries in New Jersey for residents and stakeholders, and to provide context for future research into this issue, several dashboards have been made accompanying this report which analyze the counts and wages of workers across all majors and occupational industries in the state by county.

Introduction

The COVID-19 pandemic has created widespread negative impacts in the U.S. and world economies, with the labor market, for both employers and workers, experiencing an unprecedented level of stress. Record unemployment rates have emerged as a result of necessary social distancing policies and quarantines, and several industries, such as food services and retail, have been damaged disproportionately (Handwerker et al. 2020). With millions of workers forced out of their primary field of employment (Holzer 2021), and employers changing their hiring behaviors to adapt to labor demand and financial pressures (Campello, Kankanhalli and Muthukrishnan 2020), labor market conditions are likely to create a notable mismatch between the educational qualifications of the labor force and the jobs available. Although much of this mismatch may be tied to the recession, evidence suggests that issues regarding mismatch between the supply and demand of labor persist following times of economic crisis (Modestino, Shoag, & Balance 2016). Identifying patterns in these skills or education mismatches following the previous recession, the Great Recession of 2008, may therefore predict how New Jersey's labor market will look during future economic recovery, and will allow policymakers to determine whether addressing issues of talent development or equity will better resolve post-recession inefficiencies in the workforce.

Research indicates that a discrepancy between the supply and demand of labor existed in New Jersey even prior to the pandemic, though the potential causes of this mismatch are varied, and could include a gap in skills of the workforce, employer hiring behaviors, issues of race and gender, or a number of other complex factors. A report by the John J. Heldrich Center for Workforce Development investigating the issue of a perceived undersupply in skilled workers found that both an undersupply and oversupply of labor were issues depending on occupational

field and region (Holcomb, Heidkamp, Krepcio and Mabe 2017). While some occupations, such as medical assistants, were projected to be vastly oversupplied in relation to available openings, other fields, such as teacher assistants, were predicted to be vastly undersupplied. These findings indicate that the picture of the supply and demand discrepancy in New Jersey is more complex than an overall shortage of qualified individuals. Further, there is a well documented history of discimination and occupational segregation that suggests a simplistic lack of skills is not the primary issue for New Jersey's increasingly diverse workforce (Johnson, Bashay and Bergson-Shilock 2019). Any analysis of this issue must therefore also consider work protections for underrepresented groups as a solution in addition to skills development initiatives. If gender and race impact field of employment and earnings more than a person's education or training, a serious focus on equity and diversity is warranted at the state level.

In order to provide a complete analysis of issues of supply and demand in the New Jersey labor market, our research analyzes mismatches in the labor market between the majors of New Jersey's graduates and the occupational industries in which they ultimately find work, while also taking into account differences in wages based on race and gender when controlling for these factors. In the wake of the COVID-19 pandemic, there is also an increased urgency to identify the various education and training pathways available to individuals that will place them in in-demand fields. With many industries, such as the service and retail industries, facing devastating negative impacts, identifying alternative career pathways for individuals employed in these fields could aid recovery efforts by helping reconnect them with steady work. Through the use of the New Jersey Education to Earnings Data System (NJEEDS), this report investigates instances of potential mismatch between education and field of employment in New Jersey with

an equity lens in order to develop solutions to the issues of supply and demand of labor during and after the COVID-19 recession.

Skills Mismatches In the US and New Jersey Labor Market

A "mismatch" between supply and demand in the labor market suggests that there is an issue with either the qualifications held by the labor force or the hiring behaviors of employers, resulting in misalignment between these two groups. Understanding the impact of a skills mismatch during and after a recession requires an understanding of how mismatch is conceptualized in previous literature, how mismatches play out in the labor market, and how mismatches are affected by macroeconomic forces.

The term "skills mismatch" has been utilized in a number of different ways throughout the academic literature, with each definition having different implications for where the cause of the mismatch lies. Oftentimes, terms such as "skills," "education," and "qualifications" are used interchangeably, as are the terms "mismatch" and "gap." McGuinness, Pouliakas, & Redmond (2018) take both "skills mismatches" and "skills gaps" to encompass a variety of labor market conditions, including overeducation of the workforce, under-education of the workforce, hard-to-fill vacancies, and skill obsolescence in the labor market. Other researchers differentiate between skills gaps and mismatches more clearly. Cappelli (2015) asserts that a skills gap illustrates that individuals are not meeting a basic level of employability, usually judged by educational level, while a skills mismatch also includes the possibility that workers are not necessarily underqualified, but have the wrong skills for the available positions or are in fact overqualified. Robst (2007a) echoes this definition of mismatch, defining the concept as a misalignment between a person's field of study or major and their occupation. Still others delineate a skills mismatch from an education mismatch, defining the latter as referring only to

educational qualifications, though making this distinction is often difficult due to the lack of data regarding individual workplace related skills (Desjardins and Rubenson 2011).

For the purposes of this report, we will focus primarily on the broader concept of skills mismatch, and will refer to the term as a general differentiation between the skills or qualifications held by the labor supply and the skills or qualifications required by employers to fill the available positions, utilizing education and major as our primary measure of skills. Utilizing the conceptualizations suggested by Cappelli (2015) and Robst (2007), a mismatch may be the result of a lack of skills or education by the supply of labor, an inconsistency between the skills held by the workforce and the positions available, an overqualified workforce, or hiring behaviors on the part of employers that limit the admission of qualified candidates. Skills mismatches are therefore observable as either an oversupply or undersupply of labor in certain fields. A skills gap, referring only to a lack of skilled employees in regards to the available positions, is therefore a potential explanation for a mismatch but does not take into account other explanations for the discrepancy between the supply and demand of labor, and therefore will not be used interchangeably with the term. While we will use the term "skills" when talking about the qualifications of individuals in the workforce, we will primarily be discussing their educational qualifications, thus encompassing the definition of "education mismatch" as well. While early exploratory research, much of it proprietary, has begun to explore the role of work skills as distinct from education, the scope of this data is still limited and thus will not be a primary focus of our analysis.

As previously noted, the existence of a skills gap is one potential explanation for the mismatch in New Jersey and one often suggested by business interests. When a skills gap exists, individuals are not attaining the degrees or credentials that the market deems valuable or are

taking part in degree programs that do not adequately prepare them for the fields associated with their program of study (Cappelli 2015). While data detailing the impacts of the pandemic is still forthcoming, information from the BLS JOLTS survey prior to the pandemic illustrates that job vacancies in the United States exceeded the number of new hires as of 2014, indicating a lack of qualified labor for the available jobs (Holcomb, Heidkamp, Krepcio and Mabe 2017). Surveys of employers have also supported this claim, with Fortune 1000 STEM recruiters and organizations such as the New Jersey Chamber of Commerce self-reporting a lack of qualified candidates for available positions (Holcomb, Heidkamp, Krepcio and Mabe 2017; Bayer Corporation 2014). These results indicate that a skills gap may be a primary cause of mismatch and a pressing issue for labor in New Jersey and the wider United States.

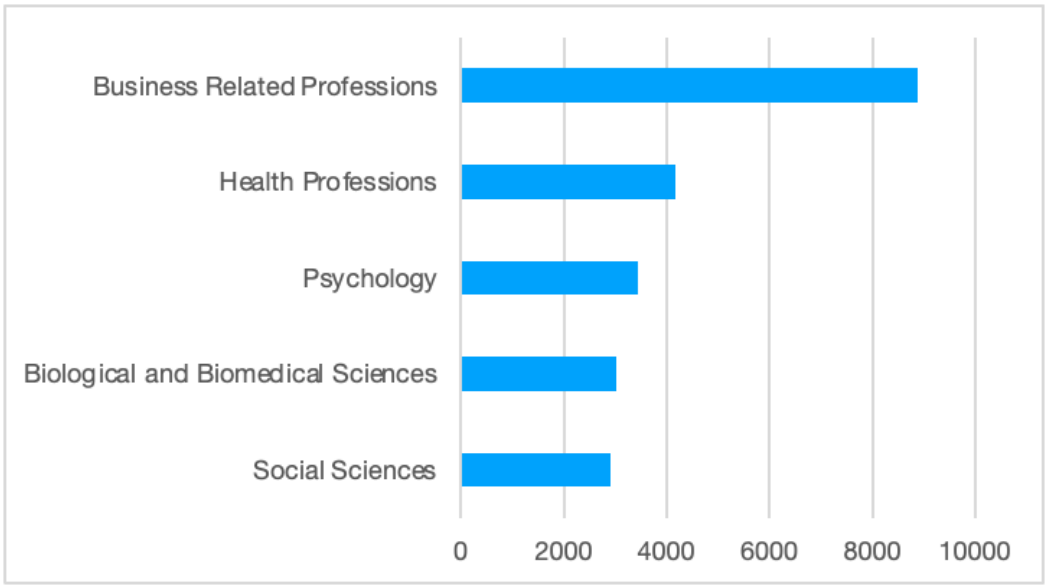
The existence of a skills gap, however, has been highly contested within the research community, with some researchers indicating that the idea is not supported by the labor market data, and is more so reflective of interviews with employers who frame the issue with their own interests in mind. A review of the skills gap literature by Cappelli (2015) indicates that despite a number of reports created by the National Center on Education and the Economy, the US Secretary of Labor, the US Chamber of Commerce, and numerous researchers predicting a shortfall in labor by the late 2010's, this predicted labor crisis did not materialize within the specified time frame. While a shortfall of labor would indicate a surplus of available jobs, even graduates of specialized programs such as engineering and IT have reported difficulty finding work (Salzman, Kuehn and Lowell 2013) within the past decade. The same study reports that approximately half of engineering graduates in the same time period did not take jobs within the engineering field, with 30% of those not taking jobs reporting the reason as a lack of available positions. Further, despite frequent employer claims of difficulty in filling jobs, research

indicates that the reasons for this difficulty are primarily reported to be workplace attitudes, insufficiently attractive pay and lack of experience, with one survey indicating that only one third of employers reported an actual lack of education or "hard skills" as the reason for unfilled positions (Manpower 2013). An international overview of OECD countries also indicates that more than 50% of individuals believe that their current job could be done by a person with fewer qualifications than listed as required by the employer (Cappelli 2015).

Although a skills gap as defined above may not entirely explain labor market discrepancies, there is evidence of a skills mismatch in New Jersey, though the extent of this mismatch varies depending on region and occupation. According to a 2016 analysis by the Heldrich Center, various occupations are expected to be undersupplied in the coming years, including teacher assistants, preschool teachers and computer support specialists (Holcomb, Heidkamp, Krepcio and Mabe 2017). Other occupations, such as medical assistants and electricians are alternatively expected to be oversupplied. Further, these results do not hold across all counties, with some areas experiencing oversupply in certain occupations, and others undersupply in the same occupations. Data from the Integrated Postsecondary Education Data System (IPEDS) from the 2018-2019 school year indicates that across all degrees in New Jersey, the greatest number of degrees achieved were in the Health Related professions, followed by Business, Management, Marketing and Related Support Services; Liberal Arts and Sciences, General Studies and Humanities; Education; and Computer and Information Sciences and Support Services (Integrated Postsecondary Education Data System 2021). Majors for first time graduates of Bachelor's programs specifically in New Jersey are somewhat different, consisting firstly of Business related professions, followed by Health related professions, Psychology, Biology and Biomedical Sciences and Social Sciences. These majors match somewhat to

in-demand occupations in New Jersey, with occupations topping this list including registered nurses and software developers (New Jersey Department of Labor and Workforce Development 2021a). Many in-demand jobs, however, do not require a post-secondary degree, with the next three occupations on the list being freight, stock and material movers; retail salespersons; and sales representatives. College graduates overqualified for in-demand fields can also lead to mismatch in the labor market.

Figure 1: **First Time Bachelor's Degrees Earned by Graduates of 2018-2019 School Year in New Jersey**



Source: Integrated PostSecondary Education Data System, 2021

Evidence suggests that these skills mismatches within the state have the potential to cause significant wage losses for mismatched workers. Robst (2007a) notes that mismatches between a person's college major and their occupational field can lead to wage penalties of over 20%. Robst (2007a) further observes that STEM and business majors had lower levels of educational mismatches than those in more general fields of study such as liberal arts or the social sciences, though the specificity of the skills learned in STEM and business majors meant that when

mismatches were present, these workers suffered a comparative reduction in wages, referred to as a wage penalty. In particular, workers who majored in business management, engineering, the health professions, computer science or law suffered particularly high wage penalties for working outside of the field they were trained in. While these findings imply the presence of a tradeoff between having transferable skills and specific skills, further research has indicated that the wage penalties for specific majors may be less pronounced than originally indicated (Eymann and Schweri 2015). As such, there may be a distinct advantage to promoting specialized training and reducing mismatches between majors and occupations.

Skills mismatches and skills gaps are also tightly connected to macroeconomic issues and therefore, researchers seeking to understand issues of mismatch must also take into account the overall effects of recessions on the supply and demand of labor. In the years following the Great Recession, 99% of new jobs were filled by college graduates, despite those with a high school diploma or less losing 5.6 million of the 7.2 million jobs lost during the recession (Carnevale, Jayasundera and Gulish 2016). While the overall impact of the current pandemic is still impossible to fully measure, data indicates that low-skilled laborers and those with less than a Bachelor's degree are facing worse outcomes and slower recovery than those that do (Perry, Aronson and Pescosolido 2021; Saenz and Sparks 2020). Job loss has been highly concentrated in low skill employment areas, such as the food and service industry and the retail industry. Further, a study examining pandemic impacts in Indiana found that those with less than a Bachelor's degree were shown to have greater food insecurity than those with a Bachelor's degree (Perry, Aronson and Pescosolido 2021). Taken on the surface, these findings could indicate that skills development would lead to greater overall security for individuals with higher education; however, employers have often increased requirements for jobs in times of recession

in response to the increased labor supply, implying that skill development itself may not be the chief issue in times of economic crisis.

Employer behavior during and after recessions complicates the issue of skills mismatch, as employers often alter requirements for positions based not on the skills needed for the job, but in response to an oversupply of labor during periods of high unemployment. The impact of recessions upon the U.S. labor market can be best characterized by the relationship between the unemployment rate and the job vacancy rate, an expression of vacant jobs in proportion to the labor market. This relationship, known as the Beveridge curve, and its shifts in response to the economy illuminate how employer behavior and skills requirements change during recessions (Modestino, Shoag, & Balance 2016). In these times of economic crisis, employers often raise the educational requirements for available positions, an action referred to as "upskilling." Modestino, Shoag, & Balance (2016) therefore characterize changing skills requirements as a strategic and opportunistic response by employers, undercutting the idea that advanced training is the only solution to skills mismatches following recessions.

Modestino (2019) further discusses the changing trends in employer behavior during the recession through an analysis of educational requirements by employers. An analysis of 83 million online job postings across all U.S. industries found that between 2007 and 2014, the share of job vacancies requiring Bachelor's degrees or higher rose by more than 10%. Additionally, a 2013 survey found that nearly one-third of employers had increased their educational requirements over this five year period while hiring more college educated workers for positions previously held by high school graduates (Modestino 2019). Upskilling trends continued within the same occupations or job titles, indicating deliberate changes in hiring behavior by employers. Evidence indicating that employee-employer friction from skills

mismatches may not solely derive from educational credentials is highlighted by the fact that the share of job postings requiring five or more years of experience rose by 7% from 2007 to 2010 (Modestino & Shoag 2018). Other skills requirements for jobs, such as more years of experience or employment related soft skills, were also raised in unison with education requirements.

Following the supply and demand of certain educational qualifications during post-recession recoveries also provides additional details about how skills mismatches arise, with studies of the employment landscape following the Great Recession indicating that recovery is often substantially different for individuals with greater qualifications than those without. The recovery following the economic recession exhibited an opposite trend as the recession itself did in regard to labor. While educational requirements had increased during the recession, these requirements decreased during its recovery, supporting the idea that mismatches during recessions are driven by employer behavior (Modestino, Shoag, & Balance 2016). Furthermore, while college-educated employees are paid more than less educated workers, this difference decreases during times of recession, indicating a pathway for employers to recruit workers with more education at lower cost to firms (Modestino & Shoag 2018). Modestino (2019) describes how the trend of increasing requirements saw a reversal from 2010 to 2014 when the number of postings requiring a Bachelor's degree and five or more years of experience saw a steady decrease. For example, 15% of physician assistant jobs required a Bachelor's degree or more in 2007, which jumped to 35% in 2010. As of 2017, this number had fallen to just 12%. Further, during economic recoveries high skilled workers were able to return to jobs that better suited their skills while low skilled workers were unable to do so. This inability of lower skilled workers to return to their previous jobs resulted in largely permanent mismatches or unemployment as manual jobs remained in demand while their previous "routine" or "middle

skills" jobs did not (Zago 2021). Their lack of skills also resulted in continued difficulties in job searches where their sector of employment experienced credential inflation in job requirements.

New Jersey's population is highly educated, insulating them from some of the macroeconomic factors that cause unemployment, but may in fact be overeducated for newly in-demand positions in the state. Over 40 percent of New Jersey residents have a Bachelor's degree or higher, compared to the 33 percent average of the wider United States (New Jersey Department of Labor and Workforce Development 2020). Those with a Bachelor's degree or higher have lower rates of unemployment than any other education group at 3.3%, compared to some college or an Associate's degree at 5.5%, high school diplomas at 7.1% and less than a high school diploma at 8.3%. New Jersey's Department of Labor also reports that 1.6 million jobs will be affected by automation in the coming years, with individuals having less skills being more susceptible to having their job replaced, indicating a need for skills development (New Jersey Department of Labor and Workforce Development 2020). Despite this, many of the in demand occupations in New Jersey do not require an advanced degree, and the Bureau of Labor Statistics reports that New Jersey's population is in fact over-educated for these positions. These statistics highlight the potential benefit of targeted training programs corresponding to employer needs, and bely the claim that the state has an overall skills gap.

These findings create a complicated picture of the causes and effects of skills mismatches in the labor market. Although those with advanced degrees have distinct advantages during both periods of recession and recovery, targeting skills development may not be warranted when hiring behaviors play such a large role in skills mismatches during these periods, and when so many in-demand fields do not require advanced credentials. This is complicated further by the context of the current recession, which has impacted certain fields disproportionately, meaning

that many workers are looking for work with degrees that have no clear industry match. This issue, however, must also be analyzed through an equity lens, as factors such as race and gender have also been shown to have an impact on the hiring behavior of employers, and thus may also be affecting skills mismatch in the labor market. Inequity in both academic achievement and hiring on the basis of race or gender may illustrate an opportunity gap instead of a skills gap, and would require a set of different solutions that target discimination in hiring behaviors and educational access.

The Skills Mismatch in the Context of Race and Gender

An analysis of labor issues regarding underemployment and unemployment in New Jersey would be incomplete without also taking into account race and gender disparities in the workforce. While discrimination in education and hiring practices may contribute to a skills gap, evidence suggests that even when controlling for these factors, women and minority groups may still make less than their White, male counterparts, which would suggest a focus on targeted skills development may not be warranted.

Women in the United States continue to face barriers to economic equality, with issues such as unequal pay, occupational segregation, inflexible work policies and lack of support for mothers contributing to continued differences in career mobility. A report by the Center for American Progress analyzing US Census Data indicates that prior to the COVID-19 recession, women still only earned 82 cents for every dollar earned by men (Bleiweis 2020). This gap in wages was even worse for minority women, with Hispanic/Latino women earning only 54 cents per every dollar earned by a man, Black women earning 62 cents and Native American/Alaska Native women earning only 57 cents. Some of the issues leading to this disparity include discrimination against women workers, loss of work hours and experience due to absences

related to mothering, and the gendering of fields of work. Despite advances in recent years, women still dominate traditionally female led fields like preschool teaching and cosmetology, and have a hard time breaking into fields such as carpentry and the trades (Hegewisch and Hartmann 2014). Women also typically find themselves concentrated in jobs with less authority, less mobility and lower overall wages (Reskin and Bielby 2005). In regards to education, women experience mismatch at similar rates to men, but report that the reason for working in a mismatched career field is more likely due to factors like location and family concerns as opposed to men, who report working in a mismatched field more often due to pay or promotional opportunities (Robst 2007b).

Despite stronger pay protection laws in recent years, this gender pay gap still persists in New Jersey. According to the 2019 American Community Survey, women in New Jersey make approximately 80% of the wages that men make, ranking New Jersey 21st in the United States in terms of gender pay equity. The American Association of University Women (2020) notes that New Jersey lacks laws prohibiting job tracking based on sex, making salary ranges available for viewing, requiring employers to keep track of wages and sponsoring state education and training programs aimed at the reduction of gender pay inequities. In 2018, Governor Murphy enacted the Diane B. Allen Equal Pay Act to strengthen equal pay protections further than those under the federal regulation (Apter 2020). In addition to mandating equal pay for individuals in the same occupation regardless of race, gender, sexuality, religion or class, the act also uses the "substantially similar" standard for work as opposed to the "equal work" standard used by the federal government when determining whether discrimination in pay is present between individuals in the same occupation. Regardless, the continued persistence of the pay gap points

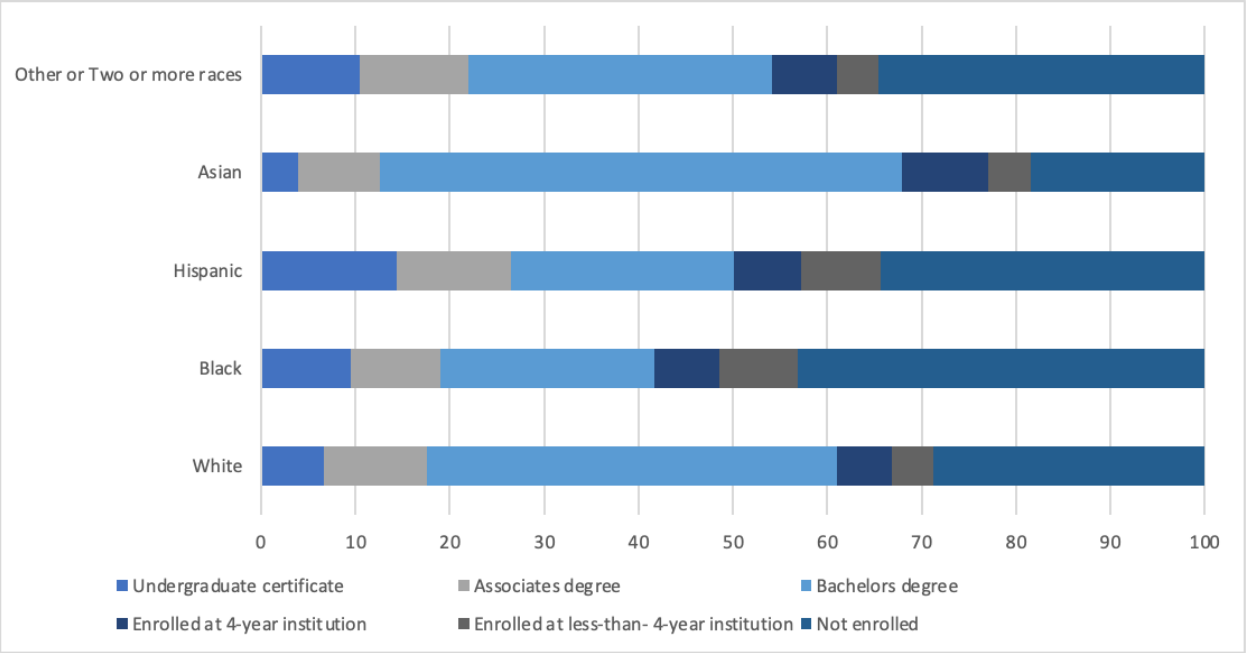
to other issues, such as occupational segregation and family leave policies, as continuing to affect workplace equity for women.

Despite their growing presence in the labor market, racial minority groups also experience significant wage gaps when compared to White workers in the United States. The Center for American Progress projects that by 2030, 83 million new jobs and replacement positions will be available, and that 54 percent of workers will be people of color (Vuong 2013). Much of this growth will be among those with less than a Bachelor's degree, with the Economic Policy Institute reporting that by 2032, the majority of the working class will be people of color (Wilson 2016). Unfortunately, this emerging diverse working class will inherit issues of wage stagnation that have plagued workers without a Bachelor's degree for decades. Further, wage growth for people of color has been slower than for White workers, and the ratio of Black and Latino men's wages to White men's wages has remained nearly the same since 1979 (Wilson 2016). The source of these disparities are plentiful, and no one explanation accounts for the entirety of the wage gap between people of color and White workers. Some of these reasons include discimination in hiring practices, the ongoing racial wealth gap, geographic segregation, lack of resources such as healthcare and internet, and occupational segregation (Johnson, Bashay and Bergson-Shilcock 2019).

Research and public data analyzing the education and training of Black and Latino workers provides some support for the idea that a skills mismatch may be preventing these groups from achieving the same success in the workplace as their White peers. According to the National Center for Education Statistics (NCES) Beginning Postsecondary Longitudinal Study (BPS: 12/17), first time Black and Latino students pursuing a postsecondary degree lagged behind their White peers in attainment of Bachelor's degrees, with 22.7% of Black students and

23.6% of Latino students achieving this degree compared to 43.4% of White students after 6 years (Pretlow, Jackson and Bryan 2020). While Black and Latino students outpace White students in certificate attainment, and Latino students earn slightly more Associate's degrees than White students, these statistics still exhibit a notable achievement gap between racial groups.

Figure 2: **Percentage Distribution of 2011-12 First Time US Postsecondary Students 6-year Attainment Status by Race/Ethnicity: 2012-17**

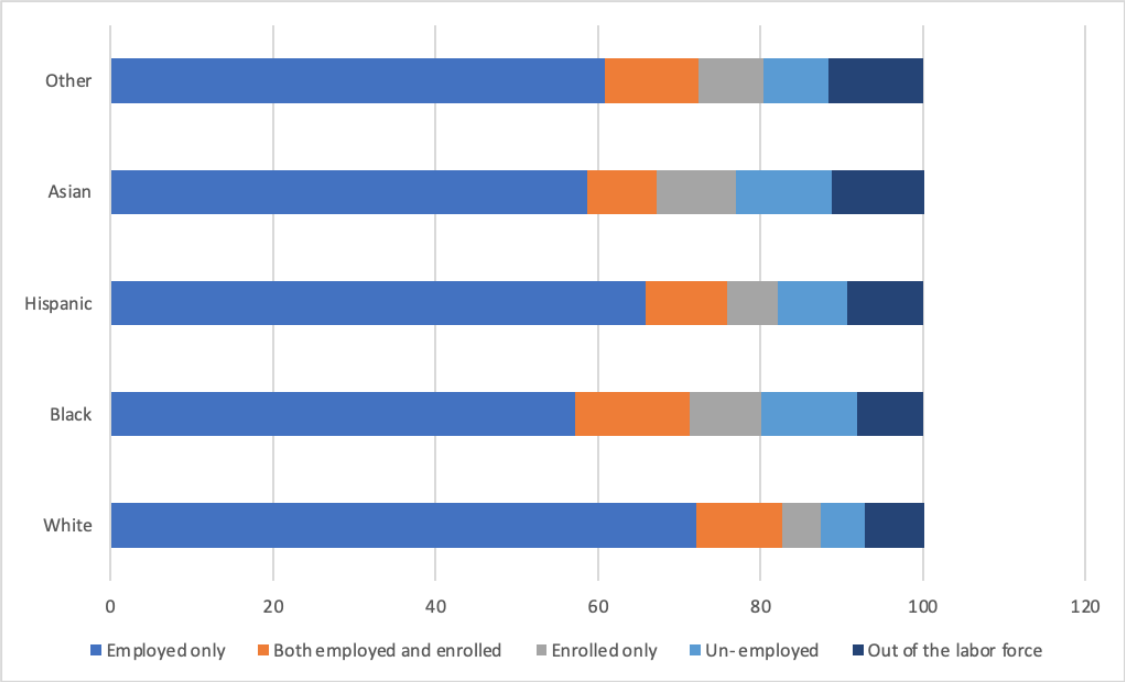


Source: National Center for Education Statistics, BPS 12:17

Critics of the importance of the skills mismatch in racial inequality in the workforce point to the persistence of discrimination across all skill areas of the labor force. For example, Black workers have historically been excluded from the construction industry in large cities, a labor sector that should not be affected by the skills mismatch due to the low educational barrier for entry (Waldinger and Bailey 1991). In fields such as construction, the new hires are often made through informal networks, leading to a largely homogenous group of White workers even when

skill requirements are low. Looking at the NCES Baccalaureate and Beyond (B&B) study for graduates of the 2007-2008 school year further shows that even for graduates of Bachelor's degree programs, Black and Latino students still fall behind White students in terms of employment prospects. As of 2012, unemployment rates for Black and Latino graduates of the 2007-2008 school year were 11.8% and 8.5% respectively compared to 5.5% for White students (Cataldi, Siegel, Shepard and Cooney 2014). Both low and high skill employees therefore face barriers to employment that cannot be explained by a simple skills gap, though this gap may still be attributed to a more complex skills mismatch, as the same survey reports gaps in employability between different degrees, namely STEM and non-STEM degrees, with unemployment rates of 5% vs. 7.1%, respectively.

Figure 3: **Percentage Distribution of 2007–08 Bachelor's Degree Recipients' Employment and Postsecondary Enrollment Status, by Race/Ethnicity: 2012**



Source: National Center for Education Statistics, B&B 2012

Notably, the coronavirus pandemic has impacted women and minority groups far greater than it has White men. In regards to gender, this impact is noticeably different from the Great Recession of 2008, in which the losses in male-dominated career fields led to an increase in women in the workforce. Compared to a loss of 9 million jobs from February to May for men in 2020, women lost 11.5 million jobs and 865,000 women dropped out of the labor market, more than 4 times the number of men (Mason 2020). As in the case of women, individuals belonging to minority populations have also felt the impact of the coronavirus more harshly than White individuals. Even when controlling for the fact that White individuals have higher levels of education, that Latinx individuals are typically younger and that minority workers are employed in more vulnerable low wage jobs, unemployment rates have remained higher for minority populations than for White workers (Saenz and Sparks 2020). A study of economic precarity in Indiana found that Black individuals were significantly more likely to experience economic insecurity than White individuals, with researchers further noting that patterns of inequality during the pandemic reflect the same patterns seen in previous disasters such as Hurricane Katrina and the Great Recession (Perry, Aronson and Pescosolido 2021).

In New Jersey, women and minority populations have also been affected disproportionately worse during the pandemic than their White, male peers, and identifying alternative career pathways for individuals working in these fields could also help them regain lost wages. The Economic Policy Institute reported that in the first quarter of 2020, the unemployment rate in New Jersey was 3.8%. Black individuals had the highest rate (6.9%), followed by individuals who identify as Hispanic (4.6%), Asian (4.5%), and White (2.6%) (Williams 2020). This trend continued into the second quarter of 2020 when unemployment rates surged to 16.1% during the onset of the pandemic. Hispanic unemployment now saw the highest

rate (23.3%), followed by Black (18.3%), Asian (16.2%), and White (13%). The disparity of outcomes between these groups, whether caused by gaps in skill or employer behaviors, highlights a need for policy innovations that address inequality across racial groups.

These disparities, both prior to and during the pandemic, either indicate that there is a skills gap between underrepresented groups and the rest of the population, suggesting an educational disparity, or indicate that there is a discrepancy in the hiring behavior of employers when considering these underrepresented groups and the rest of the population, suggesting discrimination and occupational segregation on the part of employers. While it is possible that both of these explanations account for some of the differences in wages and hiring outcomes, each requires substantially different policy initiatives, and further analysis into which cause is more prevalent may help policymakers in charting solutions towards a more equitable workforce post-recession. Before turning to the analysis of data from NJEEDS to determine the prevalence of skills mismatches and occupational segregation, we will first review some of the previous policy actions taken by New Jersey and other states to develop skills, combat mismatch and promote equity in the workforce.

Workforce and Education Policy Initiatives at the State Level

A number of approaches have been taken at the state level to address the mismatch between labor supply and employer demand. Some of the primary focuses of these initiatives have been targeted skills development, expansion of educational access and funding, integration of soft skills into curricula, diversity and inclusion strategies, efforts to better understand employer needs, and job creation programs.

New Jersey has been at the forefront of addressing present skills gaps and bridging them through a variety of different policies and efforts. One of these approaches has been through the

actions of the New Jersey Community College Consortium for Workforce & Economic Development, which has provided various training programs across skill levels and industries in the state. Since 2004, the Consortium has been able to train nearly 190,000 workers at over 7,900 companies in New Jersey, all through 19 community colleges (NJBIA 2018) with the aid of a grant from the New Jersey Department of Labor and Workforce Development. Through a partnership with the New Jersey Business and Industry Association, the Consortium helped create the NJBIA Basic Skills Workforce Training Program. This program provides grant-funded training to improve computer skills, communication skills, English as a Second Language (ESL) education, and other useful workplace training. This training program has also provided employers the ability to send their employees to a community college location in order to further their education. The Consortium continues to work to close the skills gap through continued partnerships with the NJDOL, NJBIA, and community colleges, providing needed skills to improve the state's manufacturing sector in particular.

Governor Phil Murphy has continued to introduce new initiatives to develop New Jersey's workforce and education policy. In 2018, Governor Murphy announced the creation of the New Jersey Apprenticeship Network which would provide a path for state residents to enter high skill careers through paid apprenticeships (Baglivo 2019). A reported $10 million was set aside in the state budget for the network and an additional $2.8 million was awarded in grants to seven New Jersey businesses and higher education institutions for training programs to employ new apprentices. Such efforts highlight the dual role of incorporating both businesses behavior and investment in education into workforce development strategies.

New Jersey has also taken several steps to expand access to training and education for low income and underskilled workers. One area in which New Jersey has expanded educational

opportunity has been in the expansion of grants and financial aid, such as the planned expansion of the Educational Opportunity Fund and the New Jersey Community College Opportunity Grant (State of New Jersey OSHE 2019). New Jersey has set a "65 by 25" goal, in which 65% of working age individuals are expected to have a degree or valued credential by 2025. Preparing youth for higher education has also been a key initiative in New Jersey, with some strategies including dual enrollment programs, Governor's schools, College Bound, "P-Tech" programs providing STEM based Associate's degrees to high school students, and vocational technical schools (State of New Jersey OSHE 2019). Initial development has also begun on a program that will make education at public universities free for students, known as the Garden State Guarantee. This program aims to provide outcomes based funding to institutions in order to allow them to provide two years of free college to individuals with an adjusted gross income less $65,000, stabilize tuition rates for all four years of a student's education and provide sliding scale fees for those above the income threshold.

More career focused training can be found through New Jersey's network of One Stop Career Centers, which provide a variety of training, employment readiness and educational resources to job seekers. New Jersey's Employer Partnership on-the-job (OJT) training program subsidizes employers who provide participants with paid work and training in a skilled occupation (New Jersey Department of Labor and Workforce Development 2021c) The New Jersey Apprenticeship Network (NJAN) provides registered apprenticeship options to career seekers in areas such as construction trades, advanced manufacturing and healthcare. Governor Murphy additionally launched the NJ Jobs initiative prior the pandemic, an online portal linking employers to job seekers. Since the onset of the coronavirus pandemic, the governor has

augmented this initiative with a COVID-19 Jobs and Hiring Portal as well (New Jersey COVID-19 Information Hub 2021).

NJDOL and NJDOE have also worked jointly to establish the New Jersey Career Assistance Navigator (NJCAN), an online website that provides New Jersey job seekers to explore interests, learn about different occupational fields and examine outcomes for different career paths in the state. Some tools available to New Jersey residents through NJCAN include the interest profiler and occupation sort, which both give residents a list of questions to answer related to their work preferences and use that information to give them a list of careers matching those preferences (NJCAN 2021). Residents can then look at each occupation's training requirements, predicted job growth, average salary and other job-related information in order to inform their career decision making. Residents can also access the New Jersey Training Opportunities (NJTOPPS) website, which hosts the Eligible Training Provider List (ETPL) and Consumer Report Card (CRC). The ETPL is a list of all training providers in the state that are eligible for public funding, and the CRC provides evaluations of each of these providers, allowing users to see outcomes for enrollees in these programs, including salary and employment (New Jersey Department of Labor and Workforce Development 2021d).

Some schools in New Jersey also take part in the Job's For America's Graduates program, or JAG. Managed by the Chamber of Commerce, JAG delivers employment skills training, promotes academic success, and provides leadership and civic engagement opportunities (NJCC 2021). Business volunteers also speak with students in this program, provide mentoring and internship opportunities, and judge student competitions. This program is currently offered in select schools with low graduation levels, including Carteret High School, New Brunswick Adult Learning Center and four schools in the Newark school district.

New Jersey provides a number of Labor and Workforce Development Assistance Programs to encourage employers to take part in developing the workforce. One of these programs is UPSKILL, which matches up to 50% of training costs incurred by NJ employers in the process of training workers for middle and high skill positions (New Jersey Department of Labor and Workforce Development 2021e). These costs can include tuition for approved training programs, textbooks/software, and examination fees. Businesses may also contact One Stop Career Centers to participate in the Opportunity Partnership program, a grant program for training providers that provide credentials to displaced workers allowing them to find employment in in-demand fields. On the Job Training grants are also available to businesses that provide 26 weeks of training to unemployed individuals or individuals receiving public assistance, up to $10,000 for full time positions (New Jersey Department of Labor and Workforce Development 2021e). Grants are also available for nonprofits who provide employment to income eligible, unemployed individuals over the age of 55, and a tax credit is also available to employers who hire veterans and other residents with identified employment barriers.

NJDOL also has infrastructure in place for encouraging employers to provide training for key industries in New Jersey. Employers can be reimbursed 50% of wages for high school or college interns who are given assignments associated with identified industries such as manufacturing, healthcare and life sciences (New Jersey Department of Labor and Workforce Development 2021e). The reimbursement cap is greater for STEM positions ($3500 instead of $1500). A federal bonding program is also available to employers who take on “hard-to-place” job candidates, such as those with poor credit histories, criminal histories or substance abuse

concerns. Further, the GAINS program provides grants to businesses that provide apprenticeship programs in identified high growth industries such as advanced manufacturing and life sciences.

New Jersey has further initiated several programs aimed at promoting equity in the workforce. One approach New Jersey has taken towards skills gaps and equity has been through the establishment of the Workplace Development Partnership (WPD) under the Department of Labor and Workforce Development. The central aim of this department has been to provide income security to the unemployed or those unable to work as well as to "equitably enforce New Jersey's labor laws and standards" (Heldrich Center 2008). The WPD program has been key in New Jersey's efforts to train workers and job seekers including underrepresented groups. An analysis of this program found that both employees and employers benefitted from such workplace development actions. Small manufacturing companies cited the WPD program as vital in providing improved training to their employees, which positively affected the company's ability to retain customers and secure new ones (Heldrich Center 2008). Other equity based programs have focused on issues of occupational segregation. The NJ BUILD grant provides funding for pre-apprenticeship training, workforce training and field-specific entry-level skills training for businesses employing women and minority groups in the field of construction (New Jersey Department of Labor and Workforce Development 2021e). The Youth Transition to Work Program also facilitates transitions into apprenticeable occupations for high school Seniors and Juniors.

New Jersey has also established an Office of Diversity and Inclusion within the Department of the Treasury aimed at creating a more diverse array of leadership in New Jersey's businesses. Some resources offered by the office include diversity and inclusion training for employers, collaboration with Cabinet members to identify diverse talent from the workforce and

the development of a statewide diversity and inclusion plan (New Jersey Office of Diversity and Inclusion 2021). The Office of Diversity Inclusion also collaborates with other organizations to host networking events for minority, women and veteran owned businesses.

These policies illustrate the variety of approaches available for tackling unemployment and labor mismatch issues at the state level. Education initiatives, career-development programs, and equity task forces can aid in tackling disparities in skills and hiring; however, a targeted analysis can better identify whether skills gaps or opportunity gaps are more the cause of these disparities, and can provide policymakers with a clearer path regarding which initiatives deserve the most resources.

Empirical Analysis of the NJEEDS Data System

The above literature review suggests a mismatch between the skills of labor and available employment opportunities in New Jersey, as well differing causes for why this mismatch exists. While evidence suggests a discrepancy in the state between the supply and demand of labor, and there is a need to identify alternate fields of employment for displaced workers in the wake of the pandemic, research is necessary to understand the degree to which inadequately skills workers, hiring behavior by employers, and discimination in education and the workforce contribute to this discrepancy. If improper skills development is a significant cause of mismatch, we expect to see an overrepresentation of majors with a high degree of mismatch, along with a high rate of overall mismatch among top occupations by field of study across the state. We further would expect to see a mismatch between degrees attained by New Jersey graduates, and growth occupations in the state. If discriminatory employer behavior is a significant cause of labor market discrepancies, we would additionally expect to see factors such as race and gender impacting wages, even after controlling for collegiate field of study and occupational industry.

While this second hypothesis is not strictly a competing hypothesis, it would suggest that for women and minority groups, skills development alone is not sufficient to aid in improving labor market outcomes for New Jersey's workforce. While this analysis will allow for a greater understanding of the extent and causes of labor supply and demand discrepancies, it will also allow for the identification of high paying career alternatives for individuals in fields adversely affected by the pandemic.

Our research tested two hypotheses. The first hypothesis was that a skills mismatch exists in New Jersey between the most prevalent fields of study of graduates and the occupational industries in which these individuals find work. We further expect to see a mismatch between these majors and growth occupations in the state. Our second hypothesis was that employer behavior and other factors, namely discrimination in the hiring of women and minority groups, create an opportunity gap in New Jersey even when these groups have similar skills and occupations to their White, male counterparts. If this is the case, we expect to see lower wages for women and minority groups, even when controlling for factors such as collegiate field of study, occupational industry and location of occupation.

Methods and Analysis Strategy

Analyses conducted for this report utilized the New Jersey Education to Earnings Data System (NJEEDS), New Jersey's state longitudinal data system, which is administered and housed by the John J. Heldrich Center for Workforce Development at Rutgers Edward J. Bloustein School for Planning and Public Policy. The data system is the result of a joint initiative between the New Jersey Office of the Secretary of Higher Education (OSHE), the New Jersey Department of Labor (NJDOL), the New Jersey Department of Education (NJDOE), the New Jersey Higher Education Student Assistance Authority (HESAA) and the Heldrich Center. The

data system contains a large quantity of data regarding the educational and workforce outcomes of all New Jersey residents, including vocational rehabilitation data, demographic data, post-secondary completion data and wage data. Our study therefore is not a sample, and instead looks at the entire population of graduates fitting the parameters we established. Growth occupations were identified utilizing publicly available growth projections data from NJDOL.

Our analysis utilized three sources from the NJEEDS database; OSHE completions data, unemployment insurance (UI) wage data and UI employer data. OSHE completions data provided us with the award type, field of study (measured as a 2 digit Classification of Instructional Program or "CIP" code), race, gender, citizenship status and graduation year of post-secondary graduates in New Jersey. UI wage data provided the weekly wages earned by New Jersey workers and a Federal Employer Identification Number (FEIN) that allowed the data to then be linked to UI employer data within the system. UI employer data then allowed us to obtain the 4-digit North American Industry Classification System (NAICS) codes for occupations held by New Jersey workers, an identifier of the industry in which they obtain employment, as well as the county in which they were employed. Linking these data sources therefore provides a complete profile of gender, race, citizenship status, post-secondary course of study, graduation year, wages, occupational industry and occupation location at the county level for all graduates of post-secondary institutions in New Jersey. Further, as our research question concerns discrepancies between the supply and demand of labor during economic recoveries, we targeted data following the Great Recession, from the years 2010 to 2019.

Several analyses were conducted to test this report's hypotheses. Firstly, a descriptive analysis was conducted examining the prevalence of skills mismatch between the collegiate field of study and occupational industry of college graduates in New Jersey from the years 2010 to

2019. For each college major in New Jersey, we compiled the 5 occupational industries in which graduates of those programs found the most employment. We then classified each occupational industry as either a match or mismatch, utilizing the CIP-SOC crosswalk (National Center for Education Statistics, 2021) in order to identify occupations considered to be a match for each major by the National Center for Education Statistics (NCES). Due to the fact that there is no crosswalk between CIP and NAICS codes, and we did not have access to SOC codes for residents within NJEEDS, which indicate specific occupations as opposed to wider industries, some discretion by the researchers was used in matching appropriate CIP codes to NAICS classifications. After classifying occupational industries as either matches or mismatches, mismatch penalties were calculated by comparing average wages earned for a particular CIP/NAICS pairing to the average wage of the entire major. In order to narrow down the quantity of data for analysis, this part of our analysis focused solely on graduates of programs at the Bachelor's degree level or higher. Occupational data from individuals who worked less than 12 weeks in any given occupation was excluded from analysis, and weekly wages were excluded prior to an individual earning their degree.

For the five most prevalent majors obtained by college graduates of Bachelor's level or greater programs in New Jersey identified in NJEEDS for the years examined (Education; Business, Management, Marketing and Related Services; Health Professions and Related Programs; Psychology; Social Sciences), the CIP-SOC crosswalk was also used to connect the major to SOC codes considered appropriate occupational matches. For each occupational match, we analyzed publicly available growth projections data from the NJDOL, looking at openings in 2018 as well as the number of jobs projected to be created by 2028 and the growth rate between 2018 and 2028. We also analyzed the growth projections and 2018 employment for the top five

majors obtained across all degree and certificate programs for the years 2015-2018 in order to provide a more complete descriptive analysis. These majors were Health Professions and Related Programs; Business, Management, Marketing and Related Support Services; Liberal Arts and Sciences, General Education and Humanities; Education; and Engineering. This information was also pulled from OSHE Completions data, but utilized IPEDS to access the data publicly instead of NJEEDS due to access and time restrictions.

To test our second hypothesis, an ordinary least squares regression analysis was conducted analyzing the effects of race/ethnicity, gender, citizenship status,, field of study, occupational industry and occupation location on wages. We ran two series of nested regression analyses, with one including all occupations worked by New Jersey graduates, and the other excluding jobs occupations outside of the state. In order to better understand the complicated interactions between field of study, job availability, workplace county, and wage differences, a dashboard has also been provided as a companion to this report analyzing wages and job counts by county.

Results

Mismatch Analysis

Our first descriptive analysis examined the occupational mismatch of New Jersey graduates. Across all majors, 16.29% of the top 5 occupations worked by graduates were mismatched to their collegiate field of study. Graduates in mismatched fields did suffer a wage penalty, earning 8% less on average than the average wages of other workers who had the same major. For example, 18% of Visual and Performing Arts majors worked in Restaurants and Other Eating Places, which we classified as a mismatch, and earned $380 per week on average, compared to the average across all graduates of that major, which was $670. For the most

prevalent majors in the state, two of the five, Health Related professions and Business Related professions, had no mismatch at all amongst top occupations. Amongst top occupations of the other most popular majors in the state, 8% of Education majors were in mismatched fields, 15% of Psychology majors were in mismatched fields and 37% of Social Sciences majors were in mismatched fields. On average, Education majors suffered a 50% wage penalty for mismatch, Psychology majors suffered a 1% penalty and Social Sciences majors suffered a 29% penalty. As there was no mismatch among top occupations for Health and Business related fields, we were unable to calculate a mismatch penalty for these majors.

Figure 4: **Mismatch Classifications for Education Majors, 2010-2019**

Occupational Industry	Mismatch Status	Percent of Observed Occupations
Elementary and Secondary Schools	No Mismatch	82%
Colleges, Universities and Professional Schools	No Mismatch	5%
Child Day Care Services	No Mismatch	4%
Employment Services	Mismatch	5%
Restaurants and Other Eating Places	Mismatch	3%

Source: NJEEDS

Figure 5: **Mismatch and Average Mismatch Penalty in Top 5 Occupations for Popular Degree Programs, 2010-2019**

Degree Program	Mismatch in Top 5 Occupations	Average Mismatch Penalty
Education	8%	50%
Business, Management, Marketing and Related Services	0%	N/A
Health Professions and Related Programs	0%	N/A
Social Sciences	37%	29%
Psychology	15%	1%

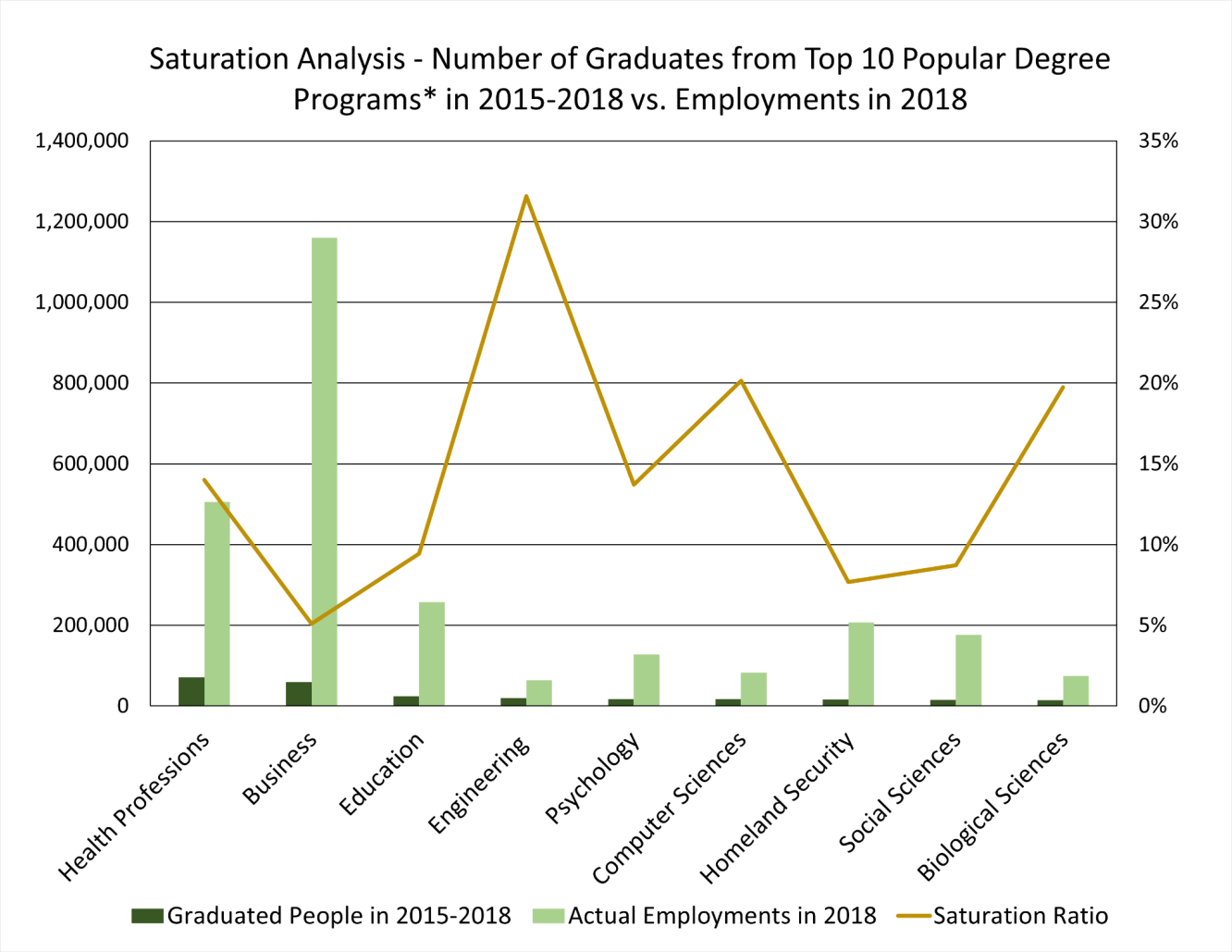
Source: NJEEDS

Our descriptive analysis also utilized New Jersey Department of Labor projections of growth occupations for the years 2018-2028, focusing first on the same top 5 fields of study of New Jersey graduates of Bachelor's or higher degree programs from the years 2010-2019. As of 2018, there were 257,030 positions in Education fields, 1,159,350 positions in Business related fields, 505,850 positions in Health related fields, 127,280 positions in Psychology fields and 175,930 positions in Social Sciences fields in the state. For all occupations that graduates of Education programs are qualified to work in, there is projected to be 21,190 new job openings, with a ten year growth rate of 8%. For Business, Management, Marketing and Related Services graduates, there is projected to be 27,880 new openings, with a growth rate of 2%. Graduates who studied the Health Professions and Related Programs have the greatest number of potential job openings out of these categories with 52,400 new job openings, and an average growth rate of 10%. Finally, graduates of Psychology programs and Social Sciences programs are projected

to have 12,710 and 11,890 new job openings, respectively, with average growth rates of 10% and 7%.

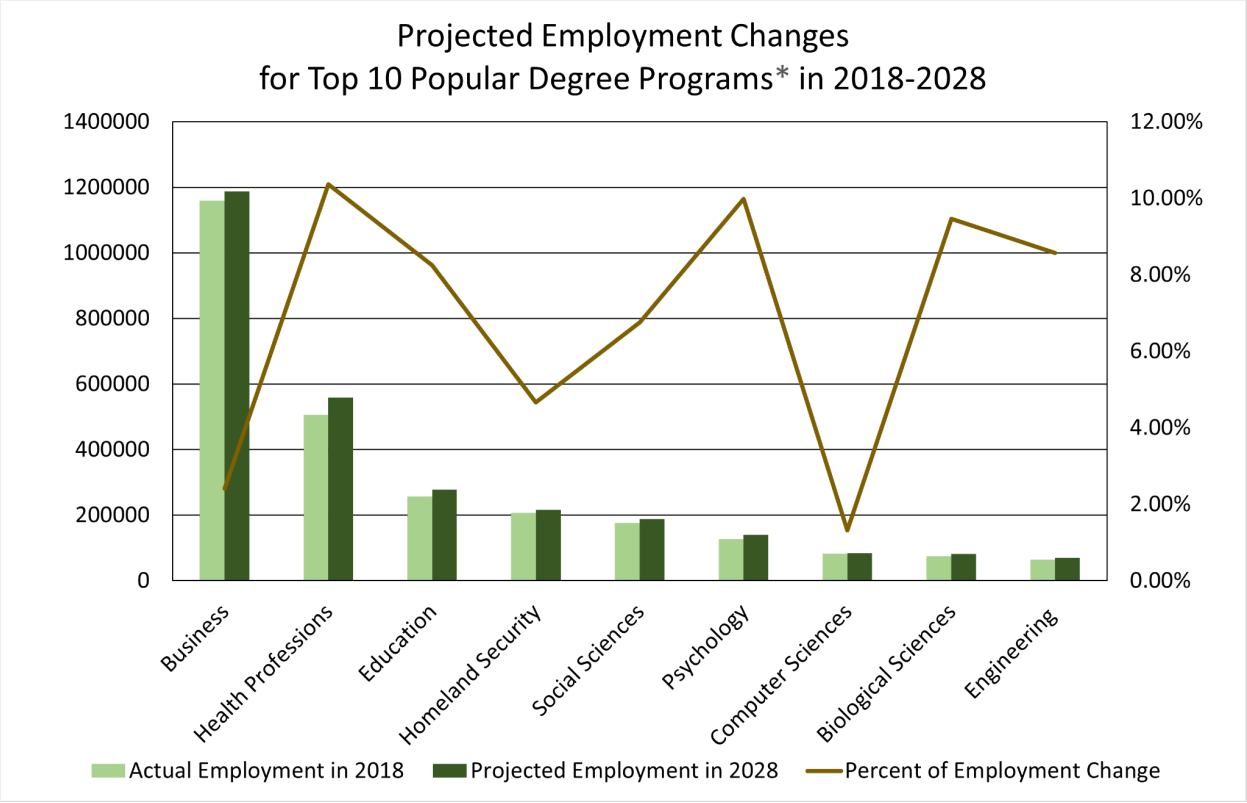
Our analysis also analyzed the top 5 majors achieved by graduates in the state across all degree programs from 2015-2018, including Associate's degrees and certificate programs, utilizing IPEDS data and the NJDOL job projections data. Saturation ratios displayed in Figure 6 were defined as the ratio of people who graduated from 2015-2018 in each field to the actual matched employment occupations available for those fields in 2018. Specifically, the top 5 fields in this portion of the analysis were Health Professions, Business related fields, Liberal Arts and Sciences, Education and Engineering. Across all degree levels between 2015 and 2018, 70,817 graduated from the Health Professions, 58,945 graduated from Business programs, 44,228 graduated from Liberal Arts program, 24,227 graduated from Education programs and 20,143 graduated from Engineering programs. In 2018, 2,700 occupations corresponded to Liberal Arts and Sciences and 63,820 corresponded to Engineering, and there are projected to be 290 and 5,470 new positions available by 2028, respectively. The ten year growth rate for Liberal Arts related positions is 11%, and the growth rate for Engineering is 9% . The projected openings for Liberal Arts and Sciences, however, may not be entirely reliable, as the CIP-SOC crosswalk for this major is matched with very few occupations compared to other degree programs. Complete openings and growth rates for all fields can be found in Appendix A.

***Figure 6*: Employment Saturation Analysis for the Top 10 Degree Programs Across All Degrees, 2015-2018**



Source: IPEDS; New Jersey Department of Labor, 2021

***Figure 7*: Projected Employment Changes for the Top 10 Degree Programs Across All Degrees and Certificates.**



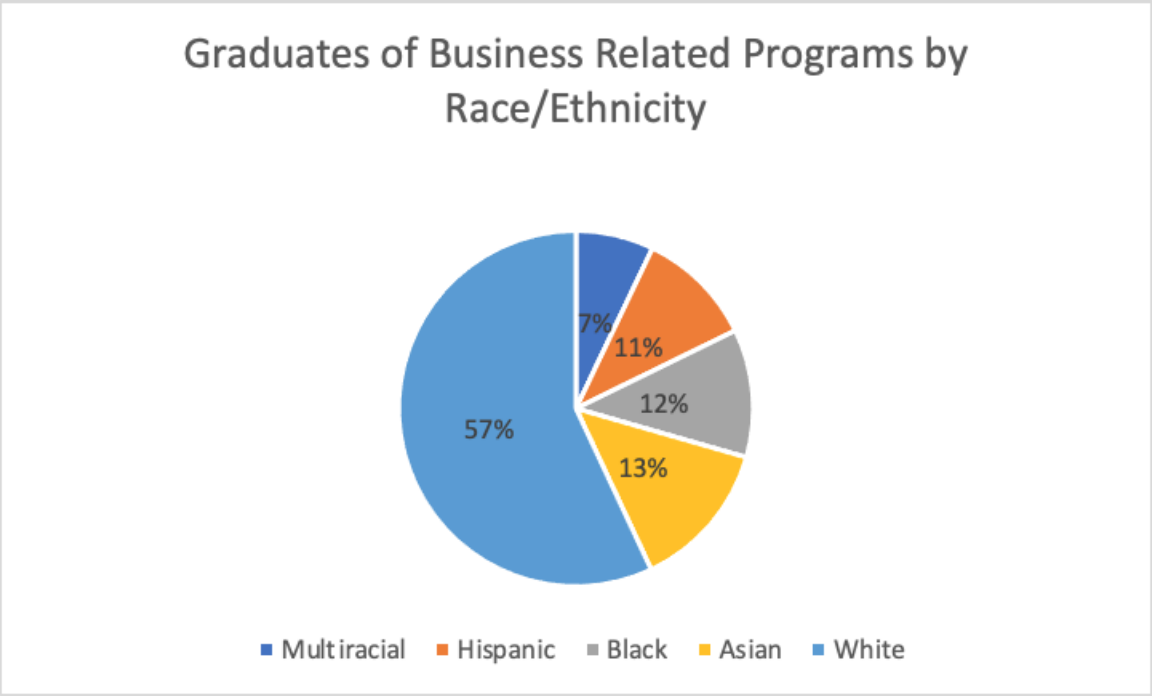
Data Source: IPEDS, New Jersey Department of Labor, 2021

Analysis of Race and Gender

Two series of ordinary least squares regression models were conducted to determine whether race (White, Black, Hispanic, Asian, Pacific Islander, Alaskan, Multiracial), sex, citizenship status (citizen, non-resident alien, resident alien), graduation year, occupational industry (measured in this analysis with 2 digit NAICS codes), collegiate field of study and location of workplace at the county level were significant linear predictors of average weekly wage. Model 1 of the first regression included race and sex. Model 2 added citizenship status, graduation year and occupational industry. Model 3 added in collegiate field of study and occupation location at the county level. The first ordinary least squares regression series

excluded NJ residents whose jobs were located outside of New Jersey, while the second series included these individuals. In order to focus on job availability within the state, only information from the first series is presented below. Full details on both regressions can be observed in Appendices B and C. Due to low counts, analyses for Pacific Islanders and Alaskans are not reported below, but can be found in the full regression models in the Appendices.

Figure 8: Graduates of Business Related Programs by Race/Ethnicity



Source: NJEEDS

As this was a population study and not a sample, coefficients in the regression equaled coefficients in the population, meaning significance tests lose their meaning. We have therefore not reported p-values for variables in our write up, though significance is reported in the regression tables shown in the Appendices and for overall models throughout. In Model 1 of the first regression series, race was a meaningful predictor of wages. Compared to White individuals,

Black individuals earned $89.62 less, Hispanic individuals earned $75.21 less, Asian individuals earned $101.27 more, and Multiracial individuals earned $99.00 less in weekly wages. Being a woman was associated with $101.10 less in weekly wages. Model 1 was significant ($p<.001$) and accounted for 1.1% of the variation in wages.

In Model 2, after adding in citizenship status, award year and occupational industry, Black individuals earned $97.54 less, Hispanic individuals earned $79.85 less, Asian individuals earned $81.34 more, and Multiracial individuals earned $98.01 less in weekly wages compared to White individuals. Being a woman remained a predictor of wages, with women earning $102.59 less than men in weekly wages. Citizenship status was a predictor of wages in Model 2, but results may be unreliable due to low counts and thus will not be explored in detail. Graduate year was negatively associated with wages. For every graduate year later than 2010, individuals earned $1.68 less in weekly wages.

For our analyses of wage differences by occupational industry, Educational Services was used as the baseline industry due to it employing the most New Jersey residents out of all occupational industries. The largest positive differences in weekly wage compared to the baseline industry in Model 2 were Utilities, with $444.50 more in weekly wages; Management of Companies and Enterprises, with $360.87 more in weekly wages; and Manufacturing enterprises falling under NAICS Code 32, with $83.21 more in weekly wages. Manufacturing included under NAICS Code 32 includes wood, paper, petroleum, coal, chemical, plastic and other related types of manufacturing. The three occupational industries most negatively associated with wages were Accomodation and Food Services, earning $717.03 less in weekly wages; Arts, Entertainment and Recreation, earning $657.10 less in weekly wages; and Retail Trade falling

under NAICS Code 45, earning $544.04 less in weekly wages. Model 2 was significant ($p<.001$) and accounted for 9.8% of the variation in wages.

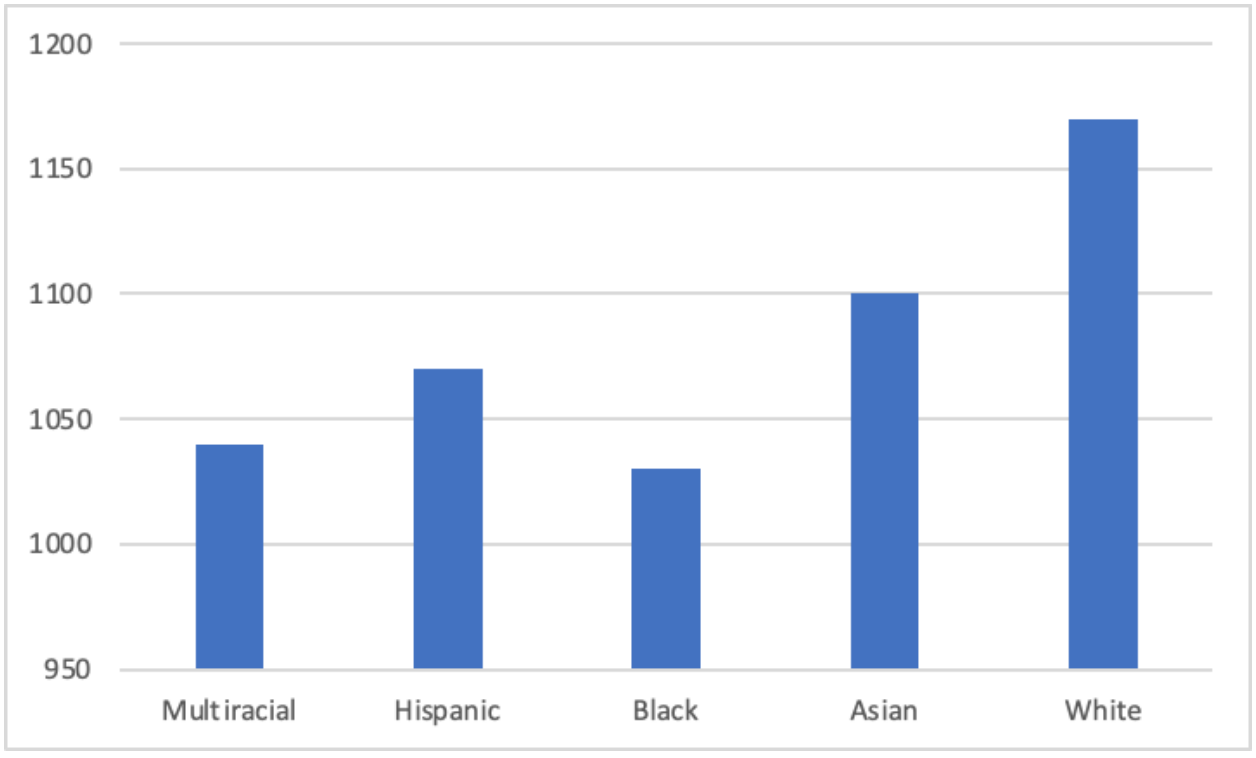
In Model 3, after adding in collegiate field of study and occupation location, Black individuals earned $103.52 less, Hispanic individuals earned $79.90 less, Asian individuals earned $7.69 more and Multiracial individuals earned $70.79 less in weekly wages than White individuals. Women earned $78.60 less than men in weekly wages. Every graduate year later than 2010 was associated with $6.85 less in weekly wages.

The largest positive differences in weekly wage compared to the baseline industry in Model 3 remained Utilities, with $415.22 more in weekly wages; Management of Companies and Enterprises, with $305.03 more in weekly wages; and Manufacturing enterprises falling under NAICS Code 32, with $63.19 more in weekly wages. The three occupational industries most negatively associated with wages were Accomodation and Food Services, earning $644.90 less in weekly wages; Arts, Entertainment and Recreation, earning $594.22 less in weekly wages and Other Services falling under code 81 of the NAICS Code, earning $502.67 less in weekly wages.

CIP code 52, representing Business, Management, Marketing and Related Fields, was used as the baseline for the collegiate field of study variable because it had the largest number of graduates in the years examined. Full results for Model 3 for this variable can be observed in Appendix B. Only five variables had positive differences in weekly wages compared to the baseline variable: Military Technologies, with $319.53 more in weekly wages; Health Professions and Related Programs, with $292.31 more in weekly wages; Legal Professions and Studies, with $210.85 more in weekly wages; Engineering Related Technologies, with $97.93 more in weekly wages; and Engineering, with $97.93 more in weekly wages. Due to the low

number of graduates of studies in Engineering Technologies and Military Technologies programs, these wage differences should be considered unreliable as predictors. Several fields made notably less than the baseline field of study in weekly wages. Some of these fields of study were Communication Technologies and Support Services, with $399.27 less in weekly wages; Visual and Performing Arts, with $387.33 less in weekly wages; and Area, Ethnic and Cultural Studies, with $368.44 less in weekly wages. Looking at the most popular fields of study for Bachelor's degree programs or greater not mentioned above, Education graduates made $35.23 less than the baseline variable; Psychology graduates made $333.45 less; and Social Sciences graduates made $295.37 less.

Figure 9: **Average Weekly Wages for Graduates of Business Related Programs by Race/Ethnicity**



Source: NJEEDS

Full results for the county level analysis in Model 3 can be observed in Appendix B. Jobs located in Bergen County were used as the baseline category. Compared to the baseline, residents who worked in Hudson County, Essex County and Somerset County made the most in weekly wages, making $103.19, $107.28, and $127.40 more in weekly wages, respectively. Residents who worked in Cape May County, Ocean and Warren County made the least in weekly wages, making $144.35, $110.80 and $106.25 less in weekly wages, respectively. Model 3 was significant ($p<.001$) and accounted for 18.2% of the variation in wages ($p<.001$).

Discussion

The results of our analysis provided some support for the central hypotheses in this paper. The first hypothesis was partially supported, as 16.29% of graduates working in the most prevalent fields for their major from the years 2010-2019 worked in a mismatched field. Despite this, wage penalties were fairly low on average, and amongst the 5 most popular degree programs in New Jersey, two had no mismatch whatsoever. Social Science graduates had the highest degree of mismatch amongst top degree fields, and the second to largest mismatch penalty. Based on job growth projections, less positions in Psychology and the Social Sciences will be available comparable to other popular majors. As such, it is likely that graduates from these programs will experience high degrees of skill mismatch over the next several years. Notably, when accounting for all degrees, several STEM majors, such as Engineering and Computer Sciences, had higher saturation in relation to both actual 2018 jobs and projected job growth. Given the frequent efforts by policymakers to promote individuals into STEM programs, this finding suggests graduates of these programs may actually have a more difficult time finding work in the years to come. Overall, our research indicates that skills gaps exist in the New

Jersey workforce, and that these mismatches negatively affect workers, though the extent of this mismatch varies between fields and penalties appear to be modest on average.

Our second hypothesis found fuller support from our series of regression analyses. Weekly wages for Black, Hispanic and Multiracial individuals remained meaningfully lower than White individuals across all models. Women also consistently earned less in weekly wages than men across all models. For Black and Hispanic residents, differences in weekly wages did not change notably after controlling for occupation, and increased slightly after controlling for education and occupational industry, indicating that Black and Hispanic individuals make less than White individuals regardless of educational qualifications, occupational location or occupational industry. This effect was somewhat different for Multiracial individuals and women, whose wage differences from White individuals did decrease somewhat after controlling for field of study and occupation location. When factoring in out of state jobs, occupational industry also reduced wage differences between Multracial individuals and White individuals, and between women and men. Notably, multiracial individuals saw significant decreases in wage differences from White individuals when controlling for occupation, and again when controlling for education and occupation location when including out of state jobs. Asians also saw drastic reductions in their positive wage differences from White individuals when accounting for occupation, educational field of study and occupational location in both model series. These factors nearly eliminated the difference entirely between the wages of White and Asian residents.

Taken together, these findings provide some support for the idea that there is a skills mismatch resulting from an inadequately trained workforce, with individuals graduating with degrees in the social sciences and STEM fields at risk of oversaturation in the New Jersey job market. Deemphasizing these fields of study, promoting fields of study with better employment

outcomes and communicating more with employers to assess the skills they consider valuable may be necessary to avoid supply and demand issues in the labor market. Further, observed differences in earnings based on gender and race, even when controlling for occupation and education, suggest that other factors may be negatively affecting the potential of the workforce as well. While numerous potential causes for this racial and gender wage discrepancy exist, our review of the literature suggests discrimination may be a chief cause. Developing the skills of these underrepresented groups, and channeling them into majors with clear occupational matches, may provide some benefit based on our analysis incorporating out of state jobs, but addressing employer behavior may also be necessary in order to reduce workplace inequity. These findings are consistent with data from the B&B 08:12 study, which shows education does not necessarily serve as an equalizer, as Black and Hispanic individuals with Bachelor's degrees have higher unemployment rates than White individuals with Bachelor's degrees (Cataldi, Siegel, Shepard and Cooney 2014). Our analysis suggests that these differences in labor market outcomes are also not explained entirely by differences in field of study amongst four year degree attainers, occupational industry or occupational location.

Policy Recommendations

Based on our findings, inefficiencies in the labor market appear to result from a combination of skills gaps and mismatched training of the workforce, discrimination in compensation, and a degree of occupational and educational segregation amongst certain underrepresented groups. We propose the following policy recommendations to address each of the identified issues.

Policy Recommendation #1: Invest In Targeted Training Programs

Investment in targeted training programs may be beneficial in addressing general mismatch between skills attained through college and skills required by growth occupations in the state. Increased communication between colleges and state businesses may allow for the development of more targeted training programs that better prepare students for available jobs. Expanding and better promoting New Jersey's Opportunity Partnership program, which encourages partnerships between businesses and colleges to develop targeted curriculum for in-demand fields, could aid in fulfilling this need. Colleges across the state of New Jersey may also implement stronger measures for career development for all students, specifically those nearing graduation. Career guidance should be implemented as part of the educational curriculum in colleges and universities rather than simply being an option for students. Ideally, industry representatives and employers would have some stake in formulating this training to ensure that graduates would be more desirable candidates for employment. Expanding grants to employers, such as in New Jersey's GAINS program, that provide apprenticeships in in-demand fields could also strengthen connections between students and employers. A comprehensive study on the minimum training qualifications, desired skills and views on providing training of employers may also allow for greater understanding of employer need, and the potential role of colleges in providing career guidance.

Our regression analyses identifies certain fields and majors in which the state may consider focusing its training efforts in order to guide students into higher paying fields with considerable growth. Business and health related majors and occupations consistently promise higher wage and job prospects, and developing internship and training opportunities for youth may encourage them to enter these fields of study when they reach college age. Further, certain

fields such as advanced manufacturing promise high wages but do not require a four year college degree (New Jersey Department of Labor and Workforce Development. 2021a). Encouraging training programs for these jobs, potentially through credential or "middle skill" training programs, and creating partnerships with businesses that provide positions in these fields may also be beneficial to New Jersey workers. Making these programs accessible, such as through the offering of stackable credentials and flexible training models, may further increase access for low income individuals (Ganzglass 2014).

Expanding apprenticeship programs with close ties to public education may also allow for a clearer occupational path for New Jersey's workers. In countries like Switzerland, apprenticeship programs are fully integrated into the public education system, granting students the ability to begin such programs while receiving counseling and advising (Educa 2021). Such an approach provides the benefit of the government covering the costs of training through cooperation with institutions of higher learning. The Apprenticeship 2000 initiative in North Carolina provides a similar benefit to high school students, who receive training for technical careers in fields such as mechatronics. Partner companies affiliated with Apprenticeship 2000 recruit students who have undergone the rigorous training programs that fit the individual needs for different companies (Apprenticeship 2000). Pursuing any policy to address the changing needs of the labor market and high incidence of skills mismatches ultimately requires cooperation between employers, institutions of higher learning, and state and local governments to ensure that prospective employees are receiving the most useful education and training demanded.

Policy Recommendation #2: Expand Protections for Underrepresented Groups in the Workplace

Given the wage differences by wage and gender even when controlling for education and occupation, wage transparency laws may help ensure that workers can monitor pay discimination. New Jersey is already fairly progressive in its pay transparency and equal pay legislation. Employers in New Jersey are prohibited from retaliating against employees who discuss their compensation with other employees (US Department of Labor 2021). Further, the Diane B. Allen Equal Pay Act imposes strict penalties for discrimination in compensation towards protected classes such as women and minority groups, and uses "substantially similar" work as a basis of comparison instead of "equal" work (Apter 2020). New Jersey also prohibits employers from inquiring about previous salaries when interviewing new employees, as these inquiries often perpetuate previous differences in compensation. Employers contracting with the state must also disclose information regarding the compensation of their employees by race and gender, and the salaries of all public employees are transparent to the public.

New Jersey can make additional efforts to ensure pay transparency and protect women and minority workers. Several states, such as Alaska and Illinois, collect pay information from companies and then report information on these salary discrepancies to the public (Cohgan and Hinkley 2018). Given the available information on employers in NJEEDS, the state could use existing UI Wage and Employer data to produce these reports without requiring additional effort on the part of employers. Making industry wages by race and gender transparent to the public would allow employees to better identify instances of discrimination. Several larger corporations have already taken the initiative to audit their wage gaps internally with promising results, and encouraging businesses in New Jersey to conduct these audits through equity based coalitions and partnerships could also lead to reductions in the pay gap (Cohgan and Hinkley 2018). At a

more basic level, New Jersey's Office of Diversity and Inclusion should continue to expand training opportunities for New Jersey businesses regarding the development of internal equity policies.

For women specifically, efforts can also be made to reduce inequities in the workplace due to mothering. Women often suffer a "motherhood penalty" in the workplace, being discriminated against for their dual roles as parent and worker, losing wages due to time taken from work and losing opportunities for advancement due to time spent caring for children (Gough and Noonan 2013). One solution to this issue is to expand family leave policies, which disproportionately benefit women. New Jersey's Paid Family Leave Insurance currently allows individuals to take time off to care for newborns and family members suffering from medical emergencies. Employees pay into this program, and can take up to 12 consecutive weeks paid time off from work in a 12 month period, or 56 individual days, earning 85% of their salary. Research conducted by the Rutgers Center for Women and Work indicates that women who report taking paid leave are more likely to be working 9 to 12 months after childbirth than those who take no leave and women who report leaves of more than 30 days are 54% more likely to report higher wages in the year following childbirth than those who take no leave (Houser and Vartanian 2012). Further, a study of California's paid family leave policy indicated that participation was affected by lack of knowledge about the program, particularly by low wage and Latino workers (Appelbaum and Milkman 2011). Expanding eligibility for New Jersey's Paid Family Leave policy and making greater public awareness efforts to encourage usage of the program may therefore help reduce the pay gap between men and women. Expanding childcare subsidies may also reduce the motherhood penalty by allowing women to more quickly return to work after absences.

Combating pay gaps may also mean confronting negative stereotypes held by employers regarding underrepresented groups. In addition to the data reported in our study, evidence suggests that behaviors and employment qualifications are interpreted differently based on gender and race. While assertiveness in communication is rewarded for men, it is often received less favorably by women (Hippel, Wiryakusuma, Bowden and Shochet 2011), limiting their effectiveness in areas that can impact the pay gap, such as salary negotiations. Other studies indicate that individuals with "Black sounding" names were less likely to be hired than those with White sounding names (Watson, Appiah and Thornton 2011). Much of the pay gap between White and minority individuals may still be unexplained, but the role of discimination cannot be understated. Pay transparency and other accommodations can only go so far when these attitudes persist in the workplace.

Restructuring these perceptions requires deliberate efforts to introduce women and minority individuals into leadership positions in businesses across the state. Recently, California passed a law requiring publicly traded businesses to have at least one woman on their board by 2021, with a monetary penalty put in place for businesses that do not (Wamsley 2018). European countries have utilized this model as early as 2008, with Norway requiring 40% of the directors of publicly traded companies to be women (Wamsley 2018). Policies like these could be introduced and expanded to include other underrepresented groups in leadership positions throughout the state. Ensuring the participation of these groups in leadership positions would increase diversity overall and help reduce differences in the wage gap by changing workplace cultures from the top down.

Policy Recommendation #3: Introduce Nontraditional Training Programs to Reduce Occupational Segregation

Finally, although pay discrepancies persist when controlling for occupational and educational factors, our second regression series indicates that part of the variation of wages for Multiracial individuals and women is accounted for by occupational industry, collegiate field of study and location of occupation. Research indicates that women and individuals belonging to minority groups are often segregated into lower paying positions, with individuals from these groups less likely to break into high paying occupations such as STEM fields, construction and the trades (Hegewisch and Hartmann 2014). As such, one potential solution to this issue is to create training programs aimed at introducing individuals into "nontraditional occupations." At the federal level, the Women in Apprenticeships in Nontraditional Occupations Program (WANTO) provides grants to employers to train and accommodate women employees in fields that women do not typically find employees (Mastracci 2005). This model could be expanded to also target individuals from minority groups who are excluded from high paying fields, channeling them into positions that give them greater economic mobility.

Limitations and Future Directions

Despite the richness of data, this project had a number of limitations. Due to the limited time frame with which the research team had access to the data system, certain aspects of the research project had to be altered as the research progressed. The following is a complete list of limitations regarding our descriptive and regression analyses.

First, the data reviewed was aggregated on a job level and not on an individual level. In other words, we used the NAICS data as one of the independent variables in the regression and it is a data of job counts rather than individual count. For example, if an employer reports an

individual working in his company every year for 10 years, in total we will have 10 counts for this person in this company. Second, based on the data, we were not able to identify the job status of individuals. Employers do not report whether a certain individual is working part-time or full-time, which could have a significant impact on the wages. Accounting for job status would be quite useful for future analysis.

The last limitation is that in the regression analysis, our team didn't use weight to take into account multiple observations for one participant. That is to say that the analysis didn't take into account that the observations for each NJ resident may not be independent; one resident may have multiple records of different wages in the dataset. Once again, for future analysis, adding the cluster function, which attaches weights to observations, would be very useful for ensuring the accuracy of the results.

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Appendix A: Graduates of All Degree Programs from 2015-2018, Actual 2018 Positions in Corresponding Occupations and 2018-2028 Growth Projections

IndustryName	Total Graduates 2015-2018	Actual Employment 2018	Projected Employment 2028	Change	Growth Rate
Military Technologies and Applied Sciences	230	10600	10790	190	2%
Science Technologies/Technicians	256	10320	10480	160	2%
Transportation and Materials Moving	458	138070	151360	13290	10%
Library Science	474	44430	47670	3240	7%
Precision Production	550	33290	34540	1250	4%
Philosophy and Religious Studies	820	7550	8350	800	11%
Area, Ethnic, Cultural, Gender, and Group Studies	829	1060	1150	90	8%
Agriculture, Agriculture Operations and Related Sciences	953	329650	350440	20790	6%
Communications Technologies/Technicians and Support Services	1144	21860	18790	-3070	-14%
Natural Resources and Conservation	1230	103500	109300	5800	6%
Architecture and Related Services	1267	29060	30250	1190	4%
Family and Consumer Sciences/Human Sciences	2019	256690	276990	20300	8%
Foreign Languages, Literatures, and Linguistics	2473	37950	39780	1830	5%
Construction Trades	2616	145960	156410	10450	7%

Parks, Recreation, Leisure and Fitness Studies	3518	128000	141050	13050	10%
History	3769	78430	83460	5030	6%
Legal Professions and Studies	3840	50620	51400	780	2%
Physical Sciences	4409	63370	66820	3450	5%
Mathematics and Statistics	4596	75600	81160	5560	7%
Mechanic and Repair Technologies/Technicians	5591	105690	109200	3510	3%
English Language and Literature/Letters	5660	45420	46670	1250	3%
Engineering Technologies and Engineering-related Fields	5825	109150	113500	4350	4%
Theology and Religious Vocations	7041	58150	62710	4560	8%
Multi/Interdisciplinary Studies	7571	302320	330880	28560	9%
Communication, Journalism, and Related Programs	9831	82680	86780	4100	5%
Visual and Performing Arts	11049	114750	118900	4150	4%
Public Administration and Social Service Professions	11700	185610	203820	18210	10%
Personal and Culinary Services	11934	146700	168940	22240	15%
Biological and Biomedical Sciences	14727	74610	81670	7060	9%
Social Sciences	15322	175930	187820	11890	7%
Homeland Security, Law Enforcement, Firefighting, and Related Protective Service	15878	206770	216400	9630	5%
Computer and Information Sciences and Support Services	16629	82600	83690	1090	1%
Psychology	17445	127280	139990	12710	10%
Engineering	20143	63820	69290	5470	9%

Education	24227	257030	278220	21190	8%
Liberal Arts and Sciences, General Studies and Humanities	44228	2700	2990	290	11%
Business, Management, Marketing, and Related Support Services	58945	1159350	1187230	27880	2%
Health Professions and Related Programs	70817	505850	558250	52400	10%

Appendix B: Multivariate OLS Models Predicting Wage Based on Demographic Characteristics, 2010-2019 NJEEDS, Excluding Jobs Outside of New Jersey

	(1) Model 1	(2) Model 2	(3) Model 3
1. White	0.000	0.000	0.000
2. Black	-89.615***	-97.537***	-103.520***
3. Hispanic	-75.213***	-79.852***	-79.896***
4. Asian	101.266***	81.335***	7.692+
5. Pacific Islander	152.580***	127.900***	43.863+
6. Alaska	82.675*	70.213*	63.129*
7. Multi_Racial	-98.998***	-98.006***	-70.789***
0. male	0.000	0.000	0.000
1. female	-101.013***	-102.587***	-91.820***
1. citizen		0.000	0.000
2. resident alien		126.350***	71.098***
3. non-resident alien		34.095***	-37.380***
awardyearn		-1.681**	-6.849***
61: Educational Services		0.000	0.000
11: Agriculture, Forestry, Fishing and Hunting		-532.293***	-439.783***
21: Mining, Quarrying, and Oil and Gas Extraction		-156.026	-210.495
22: Utilities		444.495***	415.224***
23: Construction		-157.060***	-164.117***
31: Manufacturing		-225.899***	-176.333***
32: Manufacturing		83.208***	63.189***
33: Manufacturing		-12.976	-63.639***
42: Wholesale Trade		-74.663***	-78.751***
44: Retail Trade		-497.653***	-449.717***
45: Retail Trade		-544.035***	-459.325***
48: Transportation and Warehousing		-255.802***	-247.229***
49: Transportation and Warehousing		-308.402***	-268.486***
51: Information		-46.256***	-21.647+
52: Finance and Insurance		49.776***	2.102
53: Real Estate and Rental and Leasing		-233.616***	-230.828***
54: Professional, Scientific, and Technical Services		-31.638***	-62.474***
55: Management of Companies and Enterprises		360.872***	305.034***
56: Administrative and Support and Waste Management		-329.854***	-295.174***
62: Health Care and Social Assistance		-141.293***	-218.642***
71: Arts, Entertainment and Recreation		-657.097***	-594.221***
72: Accommodation and Food Services		-717.026***	-644.898***
81: Other Services (except Public Administration)		-542.034***	-502.667***
92: Public Administration		-12.006+	34.414***
99: Nonclassifiable Establishments		-272.359***	-274.836***
52: BUSINESS, MANAGEMENT, MARKETING, AND RELATED			0.000
01: AGRICULTURE, AGRICULTURE OPERATIONS AND RELATED			-221.011***
3: NATURAL RESOURCES AND CONSERVATION			-326.307***
4: ARCHITECTURE AND RELATED SERVICES			-181.587***
5: AREA, ETHNIC, CULTURAL, GENDER AND GROUP STUDIES			-369.438***
9: COMMUNICATION, JOURNALISM AND RELATED PROGRAMS			-330.695***
10: COMMUNICATIONS TECHNOLOGIES/TECHNICIANS AND SUPPORT			-399.270***
11: COMPUTER AND INFORMATION SCIENCES AND SUPPORT			-10.515
12: PERSONAL AND CULINARY SERVICES			-252.936**
13: EDUCATION			-35.230***
14: ENGINEERING			48.488***
15: ENGINEERING TECHNOLOGIES/TECHNICIANS			97.932***
16: FOREIGN LANGUAGES, LITERATURES, AND LINGUISTIC			-277.432***
19: FAMILY AND CONSUMER SCIENCES/HUMAN SCIENCES			-313.357***
22: LEGAL PROFESSIONS AND STUDIES			210.854***
23: ENGLISH LANGUAGE AND LITERATURE/LETTERS			-332.392***

24: LIBERAL ARTS AND SCIENCES, GENERAL STUDIES			-158.395***
25: LIBRARY SCIENCE			-228.728***
26: BIOLOGICAL AND BIOMEDICAL SCIENCES			-209.844***
27: MATHEMATICS AND STATISTICS			-171.450***
29: MILITARY TECHNOLOGIES			319.528***
30: MULTI/INTERDISCIPLINARY STUDIES			-163.862***
31: PARKS, RECREATION, LEISURE, AND FITNESS STUDIES			-319.761***
38: PHILOSOPHY AND RELIGIOUS STUDIES			-378.340***
39: THEOLOGY AND RELIGIOUS VOCATIONS			-199.458***
40: PHYSICAL SCIENCES			-215.027***
41: SCIENCE TECHNOLOGIES/TECHNICIANS			-111.320*
42: PSYCHOLOGY			-333.454***
43: SECURITY AND PROTECTIVE SERVICES			-308.931***
44: PUBLIC ADMINISTRATION AND SOCIAL SERVICE PROFESSIONS			-182.254***
45: SOCIAL SCIENCES			-295.372***
47: MECHANICAL AND REPAIR TECHNOLOGIES/TECHNICIANS			-24.426
50: VISUAL AND PERFORMING ARTS			-387.328***
51: HEALTH PROFESSIONS AND RELATED CLINICAL SERVICES			292.314***
54: HISTORY			-350.123***
1. Bergen County			0.000
2. Atlantic County			-61.417***
3. Burlington County			-39.576***
4. Camden County			-102.329***
5. Cape May County			-144.346***
6. Cumberland County			-16.971
7. Essex County			107.282***
8. Gloucester County			-100.960***
9. Hudson County			103.192***
10. Hunterdon County			-34.997**
11. Mercer County			80.847***
12. Middlesex County			19.285***
13. Monmouth County			67.690***
14. Morris County			86.425***
15. Ocean County			-110.795***
16. Passaic County			28.370***
17. Salem County			-59.706*
18. Somerset County			127.399***
19. Sussex County			-35.817*
20. Union County			48.156***
21. Warren County			-106.249***
Constant	1080.401***	4602.596***	1.5e+04***
N	2.8e+05	2.8e+05	2.8e+05
r2_a	0.011	0.098	0.182
p	0.000	0.000	0.000

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Appendix C: Multivariate OLS Models Predicting Wage Based on Demographic Characteristics, 2010-2019 NJEEDS, Including Jobs Outside of New Jersey

	(1) Model 1	(2) Model 2	(3) Model 3
1. White	0.000	0.000	0.000
2. Black	-104.779***	-100.413***	-114.973***
3. Hispanic	-84.476***	-82.871***	-85.740***
4. Asian	141.918***	97.642***	20.935***
5. Pacific Islander	207.346***	162.706***	84.594***
6. Alaska	72.969*	54.302*	40.832
7. Multi_Racial	-106.645***	-97.579***	-76.605***
0. male	0.000	0.000	0.000
1. female	-120.585***	-102.990***	-86.187***
1. citizen		0.000	0.000
2. resident alien		95.107***	49.613***
3. non-resident alien		35.138***	-30.995***
awardyearn		-4.694***	-9.498***
61: Educational Services		0.000	0.000
11: Agriculture, Forestry, Fishing and Hunting		-484.215***	-382.006***
21: Mining, Quarrying, and Oil and Gas Extraction		-15.347	-50.968
22: Utilities		488.360***	485.512***
23: Construction		-72.839***	-68.736***
31: Manufacturing		-115.393***	-77.109***
32: Manufacturing		301.799***	283.884***
33: Manufacturing		154.018***	99.406***
42: Wholesale Trade		70.955***	66.301***
44: Retail Trade		-497.035***	-463.087***
45: Retail Trade		-526.511***	-471.173***
48: Transportation and Warehousing		-186.198***	-175.328***
49: Transportation and Warehousing		-240.414***	-234.970***
51: Information		78.854***	81.231***
52: Finance and Insurance		103.675***	57.078***
53: Real Estate and Rental and Leasing		-151.483***	-137.729***
54: Professional, Scientific and Technical Services		89.579***	66.949***
55: Management of Companies and Enterprises		490.091***	431.290***
56: Administrative and Support and Waste Management		-245.533***	-231.808***
62: Health Care and Social Assistance		-101.954***	-164.815***
71: Arts, Entertainment and Recreation		-615.707***	-553.480***
72: Accommodation and Food Services		-656.100***	-594.211***
81: Other Services (except Public Administration)		-453.920***	-405.741***
92: Public Administration		26.235***	92.929***
99: Nonclassifiable Establishments		-180.329***	-186.603***
52: BUSINESS, MANAGEMENT, MARKETING, AND			0.000
01: AGRICULTURE, AGRICULTURE OPERATIONS AND RELATED			-242.669***
3: NATURAL RESOURCES AND CONSERVATION			-348.438***
4: ARCHITECTURE AND RELATED SERVICES			-224.069***
5: AREA, ETHNIC, CULTURAL, GENDER AND GROUP STUDIES			-363.653***
9: COMMUNICATION, JOURNALISM AND RELATED PROGRAMS			-333.311***
10: COMMUNICATIONS TECHNOLOGIES/TECHNICIANS AND SUPPORT			-457.009***
11: COMPUTER AND INFORMATION SCIENCES AND SUPPORT			43.758***
12: PERSONAL AND CULINARY SERVICES			-277.923***
13: EDUCATION			-45.692***
14: ENGINEERING			20.825**
15: ENGINEERING TECHNOLOGIES/TECHNICIANS			89.531***
16: FOREIGN LANGUAGES, LITERATURES AND LINGUISTIC			-294.592***
19: FAMILY AND CONSUMER SCIENCES/HUMAN SCIENCES			-302.503***
22: LEGAL PROFESSIONS AND STUDIES			64.853***
23: ENGLISH LANGUAGE AND LITERATURE/LETTERS			-350.369***

24: LIBERAL ARTS AND SCIENCES, GENERAL STUDIES			-147.645***
25: LIBRARY SCIENCE			-200.934***
26: BIOLOGICAL AND BIOMEDICAL SCIENCES			-243.825***
27: MATHEMATICS AND STATISTICS			-166.843***
29: MILITARY TECHNOLOGIES			312.571***
30: MULTI/INTERDISCIPLINARY STUDIES			-143.029***
31: PARKS, RECREATION, LEISURE AND FITNESS STUDIES			-301.943***
38: PHILOSOPHY AND RELIGIOUS STUDIES			-375.572***
39: THEOLOGY AND RELIGIOUS VOCATIONS			-21.356
40: PHYSICAL SCIENCES			-257.257***
41: SCIENCE TECHNOLOGIES/TECHNICIANS			-187.473***
42: PSYCHOLOGY			-334.200***
43: SECURITY AND PROTECTIVE SERVICES			-320.976***
44: PUBLIC ADMINISTRATION AND SOCIAL SERVICE PROFESSIONS			-161.652***
45: SOCIAL SCIENCES			-293.372***
47: MECHANICAL AND REPAIR TECHNOLOGIES/TECHNICIANS			-44.065
50: VISUAL AND PERFORMING ARTS			-400.841***
51: HEALTH PROFESSIONS AND RELATED CLINICAL SERVICES			275.228***
54: HISTORY			-357.097***
1. Outside NJ			0.000
2. Atlantic County			-138.852***
3. Bergen County			-90.409***
4. Burlington County			-124.525***
5. Camden County			-186.491***
6. Cape May County			-222.609***
7. Cumberland County			-95.882***
8. Essex County			23.636***
9. Gloucester County			-170.524***
10. Hudson County			22.206***
11. Hunterdon County			-111.165***
12. Mercer County			-9.544+
13. Middlesex County			-78.167***
14. Monmouth County			-20.861***
15. Morris County			-15.715**
16. Ocean County			-192.823***
17. Passaic County			-50.505***
18. Salem County			-128.710***
19. Somerset County			23.653***
20. Sussex County			-120.146***
21. Union County			-36.439***
22. Warren County			-195.277***
Constant	1093.076***	1.1e+04***	2.0e+04***
N	4.2e+05	4.2e+05	4.2e+05
r2_a	0.016	0.110	0.180
p	0.000	0.000	0.000

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001