



The Value of Sub-baccalaureate Credentials in Manufacturing for New Jersey

Coleridge Initiative

Applied Data Analytics - NJ 2021

Team 5: Donna Camillone,
Jan Kiehne, Rocio
Rodriguez-Lema, Pritesh
Sheth & Pauline Zaldonis

Team Leaders: Benjamin
Feder & Jimmy Green

**New Jersey Education to Earnings Data System
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Motivation: Getting Back to Work



We are coming out of the pandemic, but there are millions of individuals who have been under or unemployed who need to get back to work.

In February of this year,

New Jersey the Dept of Labor & Workforce counted over 2M UI claims.

According to the World Population Review based on current Census Data, there are about 5.5M working age adults in NJ which means that approximately 36% of the adult population in NJ claimed to be unemployed during the pandemic.

During this time, many industries and jobs contracted (for example in hospitality, food service and retail), so individuals may not be able to return to their prior job or industry.

There is a need for training to move people into new occupations and get people back to work. We wondered how might it be possible to support a swift return to work?

Motivation: Getting Back to Work Swiftly

In 2020, the Georgetown University Center on Education and the Workforce completed an analysis called "The Overlooked Value of Certificates and Associate's Degrees".



The Georgetown University study reveals that sub-baccalaureate credentials, credentials below the BA level such as certificates and associate degrees, can provide significant value to students in a shortened timeline.

- These credentials are typically workforce and career aligned, meaning students can move directly into an occupation
- They don't take as long to complete and usually are at a lower cost, so individuals can retool and get to work faster.

We asked ourselves whether short term programs could provide opportunity in NJ. (see Literature review)

Motivation: Manufacturing

SENATE, No. 3216 STATE OF NEW JERSEY 219th LEGISLATURE

INTRODUCED DECEMBER 7, 2020

- **Important Industry:** “The manufacturing industry cluster contributed **\$50.5 billion** to the Gross Domestic Product in 2019 or about 9.1 percent of all output”
- **Employment Opportunity:** “There were nearly **9,000 establishments** in New Jersey that employed nearly **250,000 people** in the manufacturing sector in 2019.
- **Need to replace aging workforce:** “The profile of the average New Jersey resident worker is generally **older than average** and male.”

Quotes are public information from “New Jersey’s Manufacturing Industry Cluster” by NJ Bureau of Labor Market Information, Winter 2020-21. We decided to hone in on this question and look at the value of these sub-baccalaureate credentials in the Manufacturing industry.

We decided to hone in on this question and look at the value of these sub-baccalaureate credentials in the Manufacturing industry. We chose manufacturing because this industry has a history of valuing short-term credentials. We understood that New Jersey has a desire to develop manufacturing careers within the state. In December 2020 New Jersey proposed NJ Senate bill 3216 to promote manufacturing career pathways. We do not know, at this time, if the bill will be brought to a vote, however, it is an indication that there is a desire to sustain and enhance manufacturing in New Jersey.

While manufacturing is declining as an industry nationwide, it is still an enormous industry in New Jersey. Manufacturing accounts for \$50.5 billion dollars or 9.1% of New Jersey’s Gross Daily Product (GDP) and employs nearly a quarter million New Jersey workers.

Manufacturing is an industry where there is opportunity nationwide. New Jersey Legislators, as well as thousands of manufacturing employers, are studying the manufacturing industry for trends and future growth, while also looking for succession planning for the currently aging workforce.


Research Question:

As a team, we began to look at the literature surrounding the manufacturing industry and the credential programs available. We formulated the following research question to be answered by conducting data analysis on our available data. We present our data analysis findings and policy implications.

What are the employment outcomes and earnings for graduates of short-term occupational degrees, certificate and associate programs in Manufacturing in New Jersey?

Approach: The Cohort

Initially we defined our cohort to look at graduates from the 2012-2013 academic year. We found that the number of graduates within the manufacturing programs was not a significant representation. We expanded our data analysis to include the 2012-2013 academic year through the 2017-2018 academic year. Our data analysis looked at the NJ OSHE Completions



Approach: The Cohort

- All **graduates** (degree levels such as **certificates, associates, bachelors, masters etc.**) from academic years 2012-13 through 2017-18 of programs that align with manufacturing.
 - Alignment with manufacturing is based on 78 CIP codes identified by Advance CTE which created the Perkins IV CIP-SOC crosswalks for reporting on National Career Clusters.

data. We filtered the Completions data to identify the completers of manufacturing programs using the 78 CIP codes identified by the Advance CTE identified in the Perkins IV CIP-SOC crosswalk for reporting National Career Clusters. The CIP codes included were both Production and Maintenance related codes. We did not include the Enrollments data in our research.

It may be significant to do additional research that would include a customized selection of CIP codes based on the types of manufacturing careers New Jersey would like to promote within the state.

Once we had our cohort and the full set of completers within our academic years, we went on the link the cohort with the New Jersey Department of Labor and Workforce Development employer and wage data. With this information we could analyze the data to look at earnings potential for our cohort compared to all completers.

We did include some relevant demographic data for our cohort to provide some high-level findings, as well as, set the stage for future research.

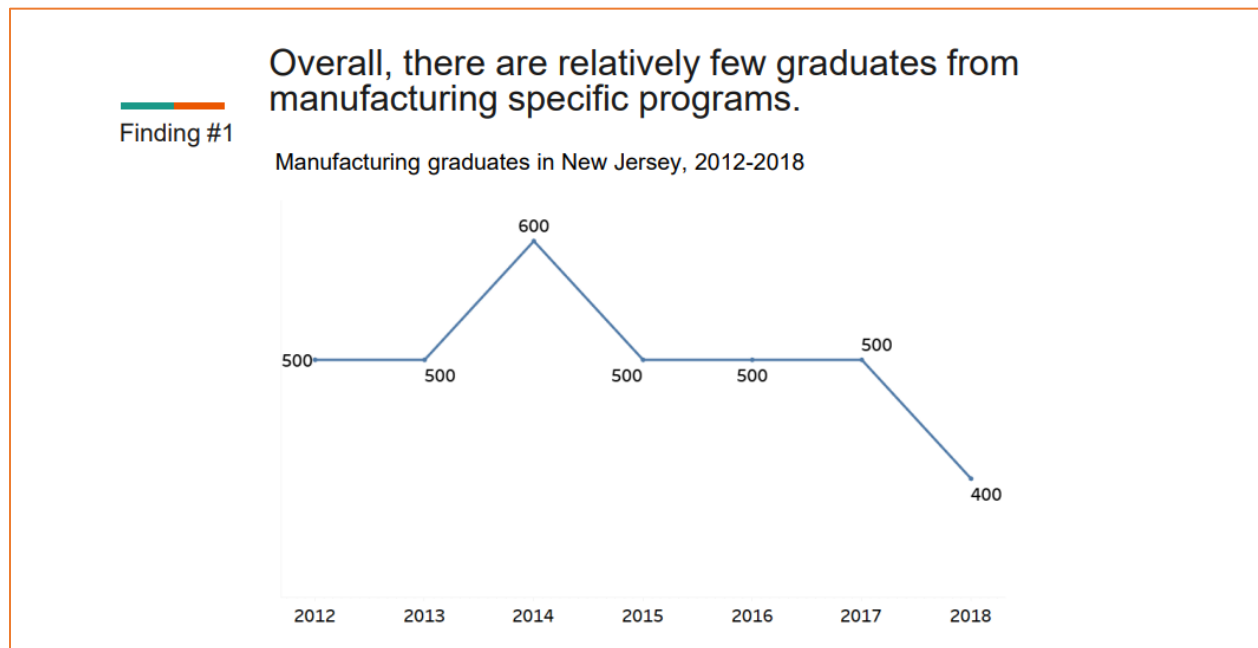
Data sets included:

- NJ OSHE data for graduates (Enrollments and Completions)
- NJ Dept of Labor and Workforce Development (Employers and Wage)
- Advance Career Technical Education (CTE) public data for manufacturing related CIP Codes
- Map graduates data with wage data to understand the employment and earnings

Variables & metrics:

- NAICS code gives us industry
- Award type provides level of credential earned
- Major provides the type of education program studied
- Race and Gender gives us demographic data
- Wage, quarter, year provides information about employment so we can calculate metrics such as quarterly median wages and percent employed after one year

Finding #1:



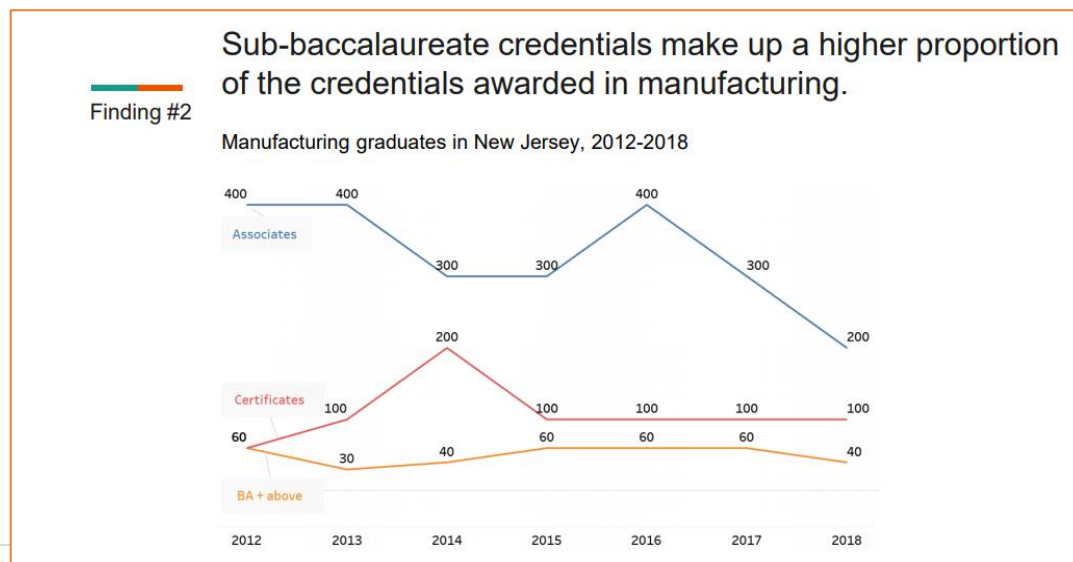
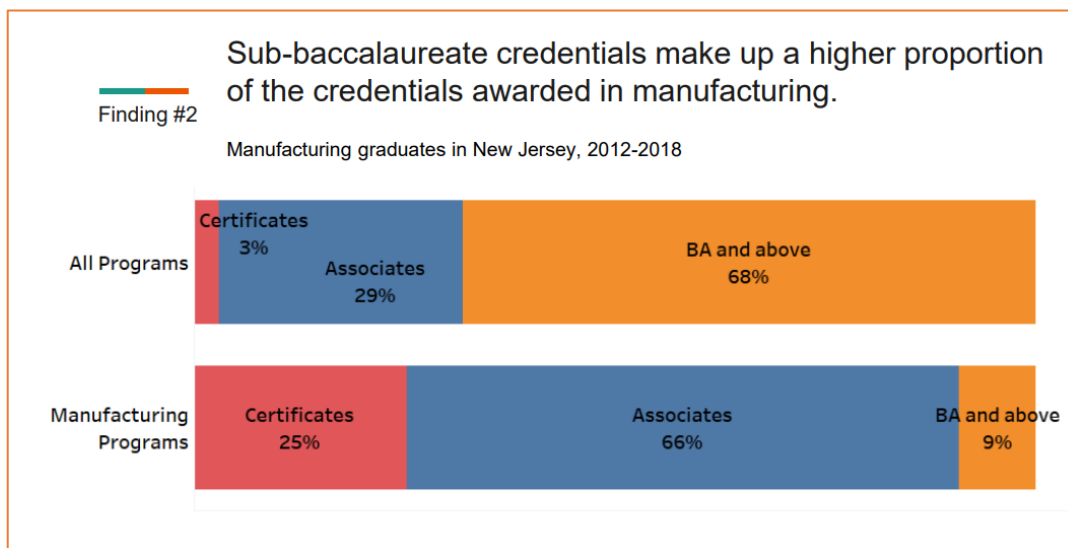
We discovered that manufacturing graduates, based on the 78 CIP codes, represent a very small (~0.5%) proportion of graduates when compared to total graduates in all programs. This raised a number of questions that need to be explored such as, is there a lack of demand for manufacturing graduates, is there a lack of interest in the programs, or is there a lack of awareness of the value of the credentials?

Manufacturing is important to US Economy, as well as, New Jersey's economy. Awareness should be created for the manufacturing related programs at many levels, through guidance in the secondary school level, point of enrollment into the post-secondary institutions and through re-employment development programs.

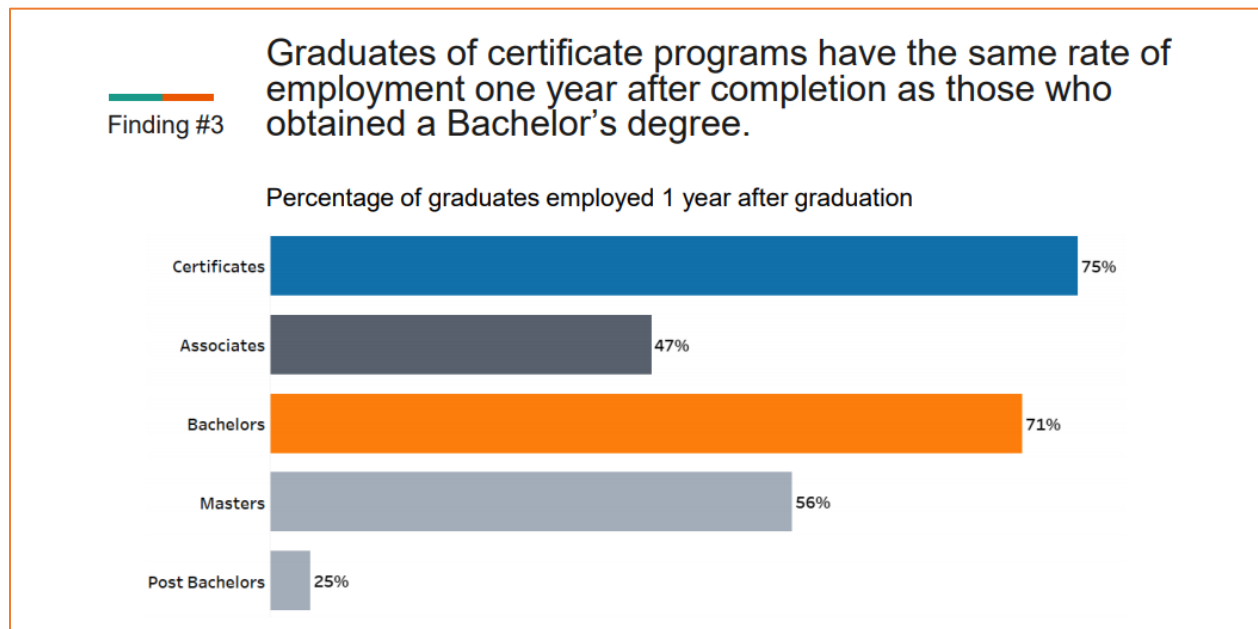
Finding #2:

While the total number of graduates in manufacturing related programs is less than 1% of total graduates, we took a deeper dive into the credentials sought by the graduates. We found that associates and certificate level graduates in manufacturing related programs form a significantly large part of population (~90%) when compared to bachelors and above degree levels (~10%).

Possibly the wage and employment for manufacturing programs have better returns? We can substantiate it only by finding the employment outcome and earnings. We explored this further in our data analysis.



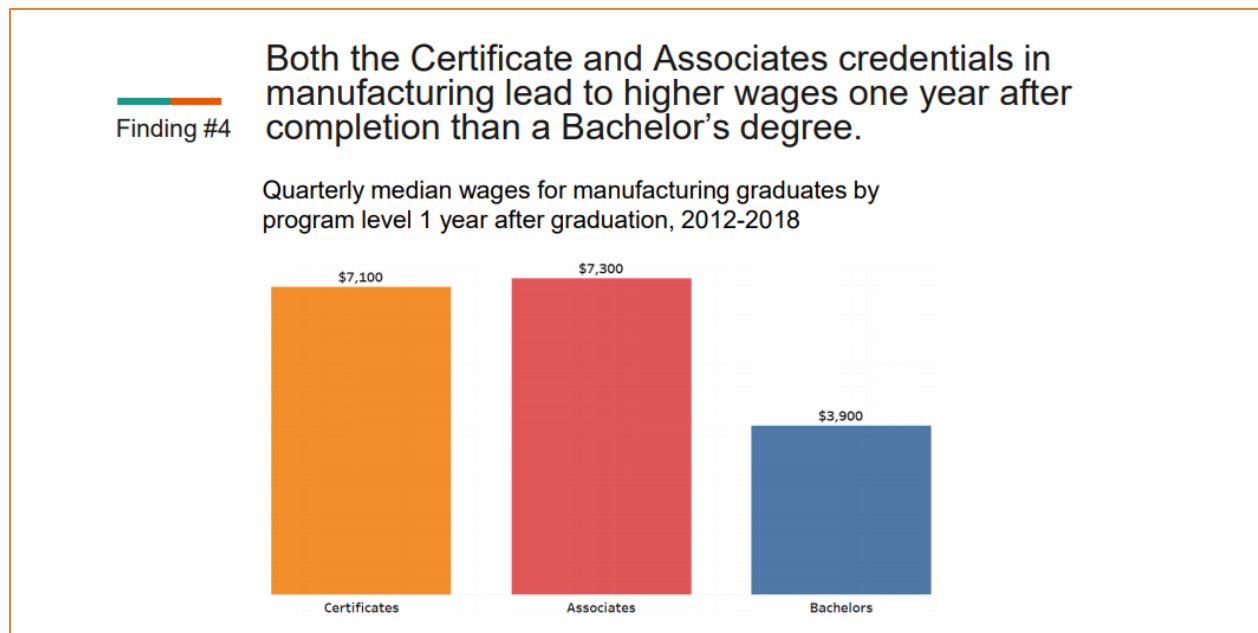
Finding #3:



Next, we looked to see the employment outcomes one year out after graduation for our cohort. The bar chart clearly shows that the percent of manufacturing graduates with Associates & Certificates level courses have equivalent rate of employment when compared to the percent of manufacturing graduates across all completion levels. We did observe that the graduates earning an Associates degree had a smaller percent of employment one year out from graduation. There are a few factors that might cause the data to reflect this difference, for example additional data analysis might look to link these graduates back to the enrollment data to determine the number of graduates in this category went on to enroll in a four+ year program to seek a higher level degree.

This finding leads to an exploration of the about earning/wages for sub-bachelors and post-bachelor's degree. We explored merits about the value of Sub-baccalaureate degrees in manufacturing from an employment earnings perspective.

Finding #4:



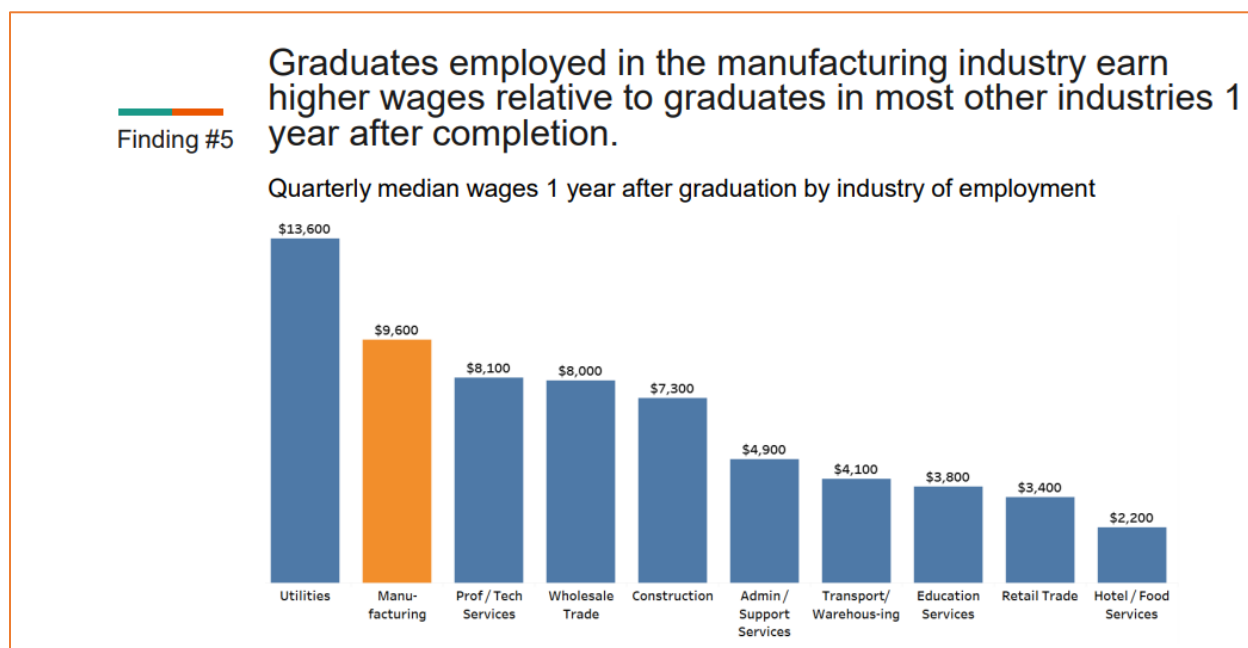
Previously, we found that graduates of certificate programs have similar levels of employment one year after graduating as those completing bachelor's degrees in manufacturing.

Our next finding is that both certificate and associate degree holders in manufacturing out-earn those with a Bachelor's in manufacturing, with significantly higher quarterly median wages.

The bar chart on this slide illustrates the difference in median quarterly wages one-year post-graduation by award level for graduates of manufacturing programs. You can see here that the shorter-term manufacturing programs actually lead to a higher wage than the bachelor's degrees in manufacturing one year after graduation, further illustrating the value of the sub-baccalaureate degrees.

Finding #5:

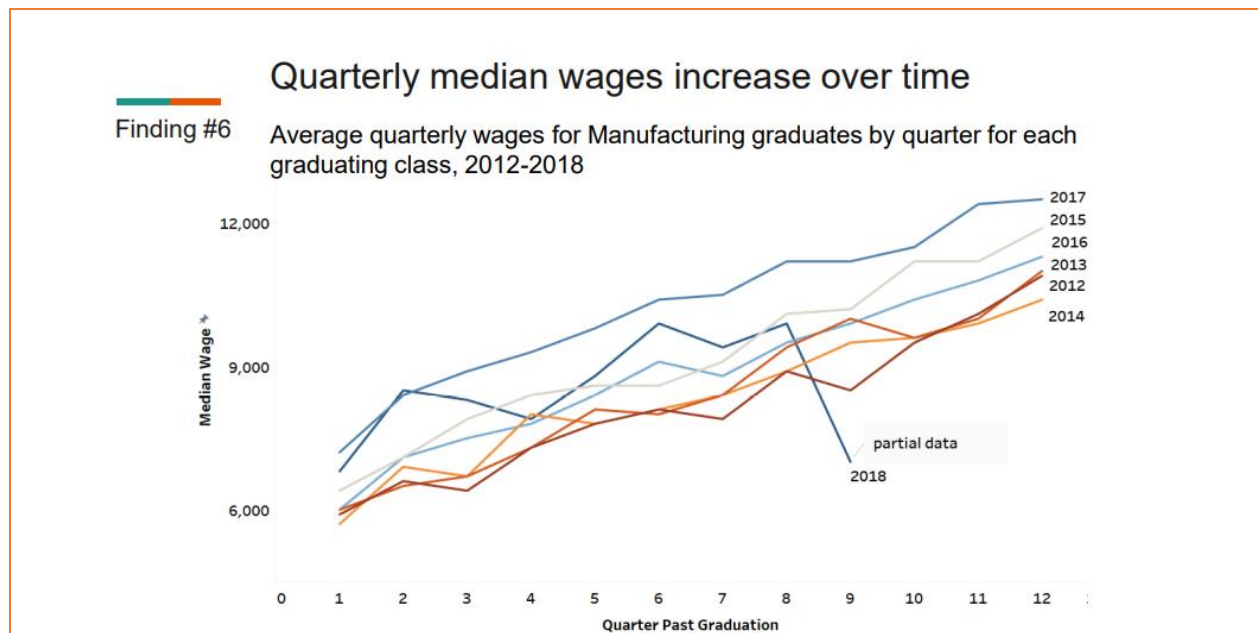
Digging deeper into the data on earnings for completers of short-term credentials in manufacturing, we can see here that graduates of 100- and 200-level programs (certificate and associates) in manufacturing who gain employment in the manufacturing industry earn the highest quarterly median wage compared to other industries.



However, we did find that not all manufacturing graduates get a job in the manufacturing industry based on the NAICS codes. We found that less than a quarter of manufacturing graduates who gained employment one year after graduation obtained a job in the manufacturing industry. Those who did get a job in manufacturing typically earned higher wages relative to graduates in other industries. We not able to conclude why the majority of manufacturing grads did not get a job in the manufacturing sector.

It could be due to a lack of demand for manufacturing program graduates at the time, a misalignment of program curriculum and employer needs, or it could be that graduates found jobs in fields relating to manufacturing in other industries (such as construction or utilities). Additionally, certificate programs in manufacturing skills may lead more to self-employment opportunities or other career paths not included in the wage data. This merits further research.

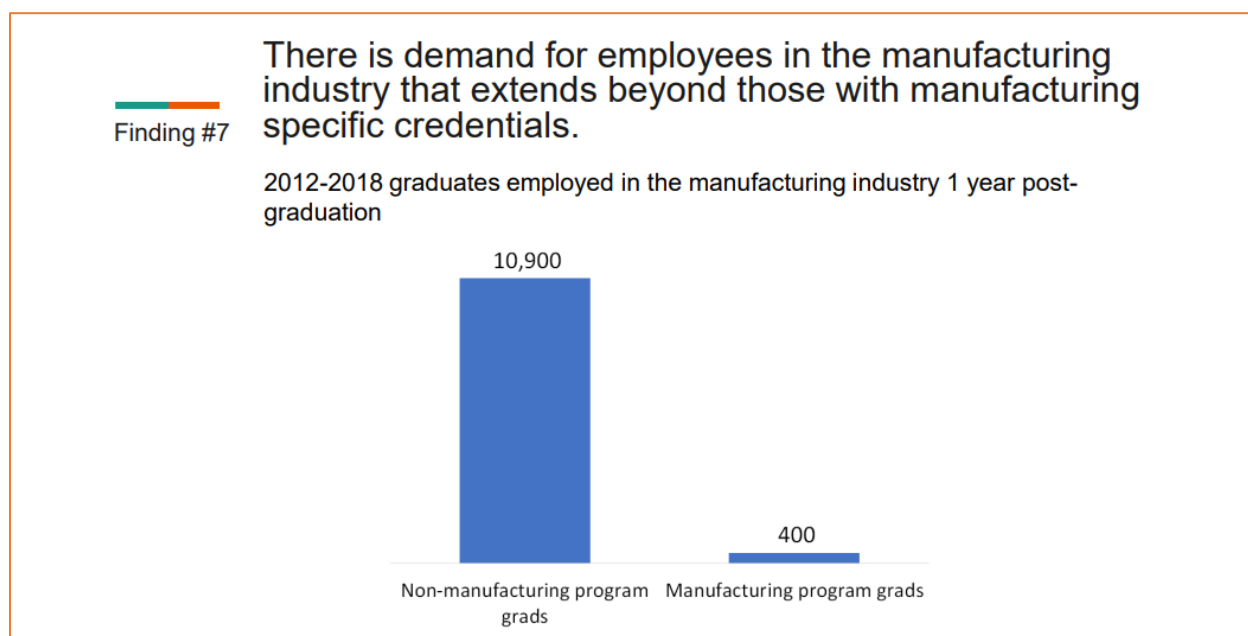
Finding #6:



Regardless of the industry of employment, we see here that quarterly median wages for graduates of manufacturing programs increases over time after graduation. For each graduating class, you can see a steady increase in wages over time. Because the most recent wage data we have access to is from the second quarter of 2020, our wage data is incomplete in the later quarters for some 2017 and 2018 graduates. Despite the incomplete data for later graduating years, we can see that wages do increase after graduation for completers of short-term manufacturing programs.

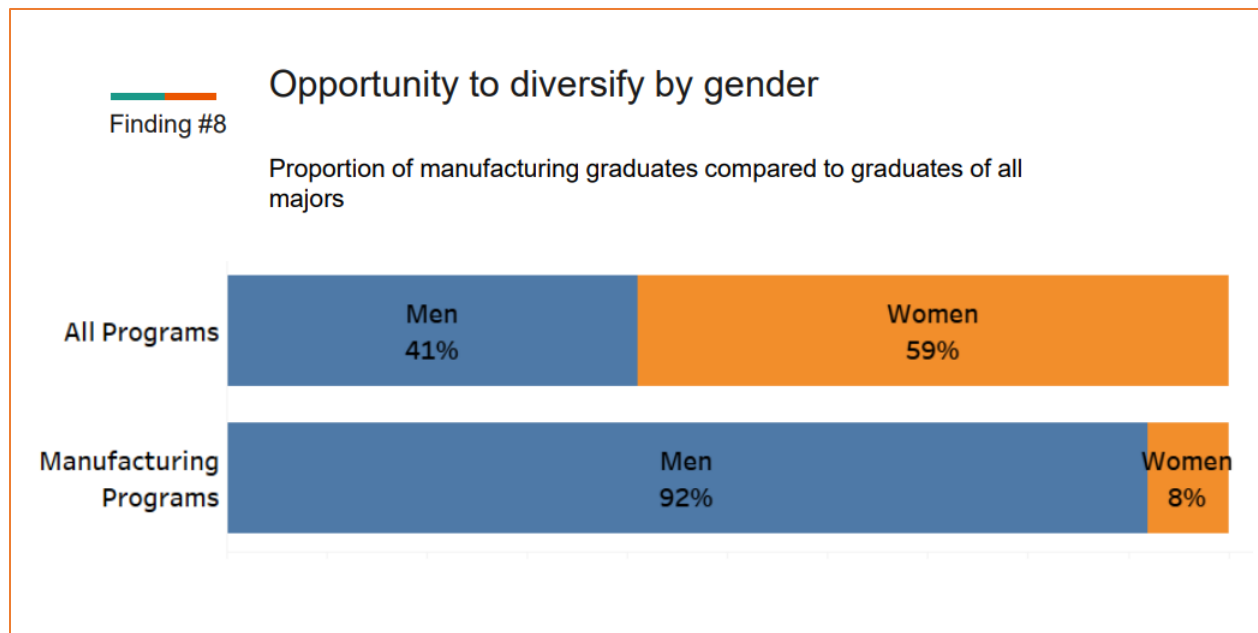
Finding #7:

So far we have been looking at the employment outcomes for graduates of manufacturing programs, but we also wanted to look at graduates of other majors who are employed in the manufacturing industry to better understand what other majors were valued in the manufacturing industry. We found that a small proportion of those employed in the manufacturing industry in New Jersey graduated from a manufacturing program, as identified by the CIP codes we used in our analysis.



This indicates to us that there is a higher demand for employees than we can see by looking at graduates of manufacturing programs alone. This raised a question for us, if the needs of manufacturing employers could be better met by manufacturing programs that were more specifically tailored to their needs. If so, this type of tailoring could be accomplished through further development of short-term credential programs. Expanded research into this question would include a more detailed look into what types of employment positions the employers hire. Are the positions for administrative or sales work and not specifically manufacturing floor positions?

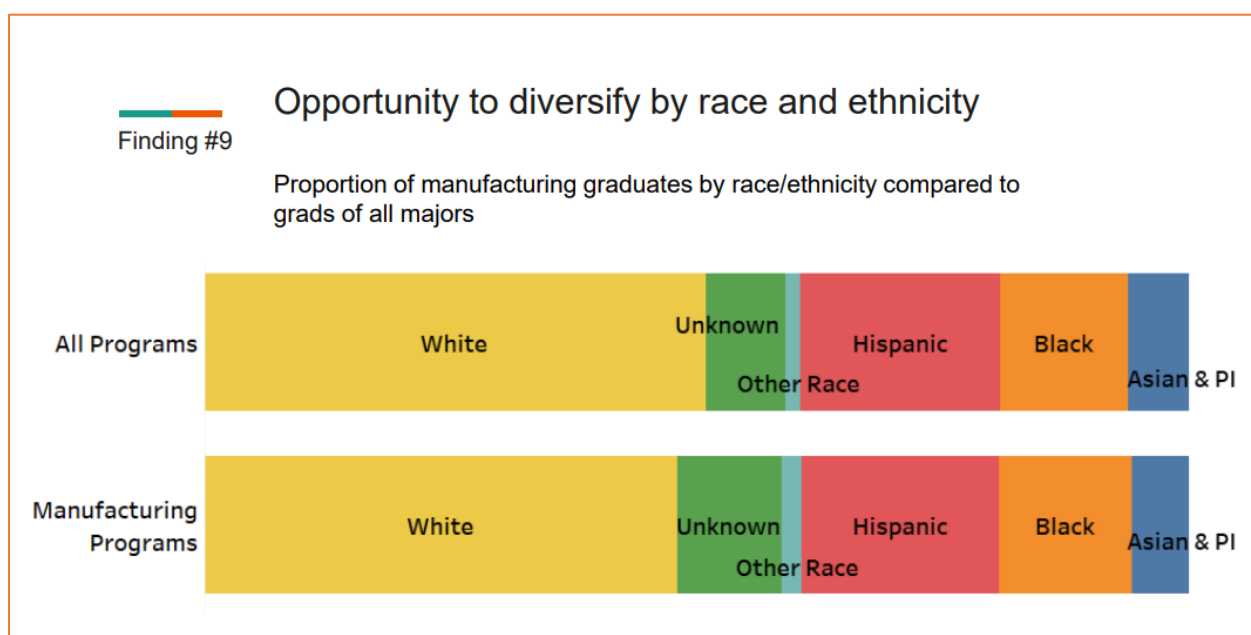
Finding #8:



We also wanted to look at the demographics of those who are completing manufacturing programs in New Jersey. We found that women are greatly underrepresented in manufacturing programs compared to all majors. As we think about how to meet the demand for workers in the manufacturing industry and re-employ displaced workers, we see an opportunity to increase the number of manufacturing graduates by diversifying by gender. Based on the higher earnings findings we uncovered in our research, marketing manufacturing programs to women may improve the wage gap for women.

Finding #9:

We also looked at the breakdown of manufacturing students by race/ethnicity. The racial/ethnic breakdown of manufacturing graduates is similar to the breakdown of other majors, although there are slightly higher proportions of Hispanic and Black graduates in Manufacturing. That said, about half of manufacturing graduates are non-Hispanic white, so there is room to diversify Manufacturing programs, which should lead to a more diverse manufacturing workforce.



Policy Implications:

Question, what opportunities does New Jersey have based on this research? What are the Policy Implications?

As we have pointed out, Manufacturing is one of the top 5 industries in New Jersey and provides opportunity for higher than median wages compared to all industries. However, manufacturing programs represent > 1% (0.6%) of all graduates. How can New Jersey improve this balance between need and job candidates.

Policy Implications

- Given the value of the sub-baccalaureate credential in the manufacturing industry in New Jersey, students and employers would benefit from an **increased investment** in these programs.
- Short term credentials in manufacturing can help individuals **return to the workforce quickly** and bolster the manufacturing sector post-pandemic.
- This investment should include **increased communication** between education program developers and industry leaders to ensure alignment of skills taught to employer needs.
- Future opportunity to **diversify and grow** the manufacturing programs offered in New Jersey
 - Program design and marketing should consider **systemic ways to increase proportion of female, Black and Hispanic students**.

The research has shown the value of sub-baccalaureate credentials in New Jersey. We believe this can be further enhanced through increased investment in the manufacturing programs.

Based on the employment data presented at the motivation sections, New Jersey has both a need and an opportunity, via short term credentials in the manufacturing programs, to aid in quickly bolstering the post-pandemic return to work through their manufacturing credentialing programs.

Finally, our recommendation, focusing on increased communication between the education program developers and industry leaders, might lead to improved alignment between skills taught and employer needs.

As we saw in the last 2 findings, men complete manufacturing programs approximately 9x more than women and non-Hispanic whites complete manufacturing programs approximately 2 x more than all other racial groups combined. Based on the earnings potential of people in the manufacturing industry, this may be a missed opportunity to decrease the wage gap between men (non-Hispanic white men) and people in other demographic categories.

Future deep dive research regarding Diversity both in gender and race and ethnicity may uncover future opportunities to diversify and grow employment opportunities to minorities through program design and marketing strategies.

Additionally, advanced manufacturing also tends to be tied to specific cutting-edge industries such as medical, aerospace, pharmaceutical, and nanotechnology. According to the Bureau of Economic Analysis, manufacturers in the United States perform nearly 62% of all private-sector R&D in the nation, driving more innovation than any other sector. As manufacturing processes continue to advance, there will continue to be a greater need for skilled talent. New Jersey should look to capitalize on this market opportunity.

Next Steps:




- Additionally, more in-depth descriptive analysis should look at the detailed education program areas to determine where the greatest areas of need and strength are located. Due to limitations on cell sizes for the manufacturing program we were not able to share this information at this level.
- Other outcomes of interest include ROI, employability rates by majors, mobility rates, and retention rates.
- Forecast future demand of majors related to Manufacturing Sector in New Jersey.
- Predictive analytics is recommended in order to forecast future demand of majors within the Manufacturing Sector in the State of New Jersey.
- Manufacturing employer demand data would provide helpful **insight** information to be used by Colleges and Universities in New Jersey to design programs.
- Our research had limitations based on data available from both the employment and wage data. Alternatives to obtain missing employment and education information from other states.
 - Graduate Surveys
 - Regional and National data sharing agreements

Assumptions & Caveats:

- Manufacturing majors are defined narrowly and are not inclusive of all potentially relevant programs. Further analysis and custom selection for CIP and NAICS codes used to filter the cohort may provide more refined findings.
- There are limitations of the Unemployment Insurance data set.
- Self Employed or Military employees are not included in the cohort wage information. Further research to identify possible resources for this data would improve the findings on the cohort earnings post completion.
- Data does not account for:
 - Completers who continue with their education, for example someone who obtained an associate degree and then transferred to a 4-year institution to seek a higher level degree. Further analysis of the data may provide insight into this caveat if the cohort is joined back to the enrollments data with appropriate filter.
 - Individuals who do not enter the workforce directly after completion. Further analysis of the data may provide additional insight into this caveat if the cohort wage data has a deeper dive over time.
 - Individuals who obtain employment out-of-state. Once wage data is available across multiple states, further analysis may provide additional employment outcomes.

Literature Review: Sources

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Agenda

1. Motivation & Literature Review
2. Research Question
3. Approach
4. Findings
5. Policy Implications
6. Next Steps
7. Assumptions & Caveats
8. Sources



Motivation: Getting back to work



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Initial Unemployment Claims in NJ Surpass 2 Million Since COVID-19 Hit

FOR IMMEDIATE RELEASE

February 11, 2021



Motivation: Getting back to work swiftly





SENATE, No. 3216
STATE OF NEW JERSEY
219th LEGISLATURE

INTRODUCED DECEMBER 7, 2020

Motivation: Manufacturing

- **Important Industry:** “The manufacturing industry cluster contributed **\$50.5 billion** to the Gross Domestic Product in 2019 or about 9.1 percent of all output”
- **Employment Opportunity:** “There were nearly **9,000 establishments** in New Jersey that employed nearly **250,000 people** in the manufacturing sector in 2019.
- **Need to replace aging workforce:** “The profile of the average New Jersey resident worker is generally **older than average** and male.”

Quotes are public information from “New Jersey’s Manufacturing Industry Cluster” by NJ Bureau of Labor Market Information, Winter 2020-21.



Literature Review

Sub-baccalaureate credentials provide value.

- The combined number of Certificate and Associate credentials awarded is about the same as Bachelor's degrees, about 2 million. (Carnevale, Anthony et. al., 2020)
- Value of sub-baccalaureate credentials for getting people back to work was evidenced after the 2008 recession (Bettinger & Soliz, 2016)

Manufacturing is important in New Jersey.

- Manufacturing is the fifth industry identified as providing good jobs without a BA credential with 95,000 non-BA "Good Jobs" (Georgetown Center on Education and Workforce)
- In 2019, manufacturing employed almost 6% of the workforce in NJ and there were an average of 251,000 manufacturing employees (National Association of Manufacturers, 2020)
- Manufacturing in NJ has a large proportion of workers who are older. They will retire and take their experience with them. (NJ Dept of Labor & Workforce Development, Winter 2020-21)



Research Question

What are the employment outcomes and earnings for **graduates** of short-term occupational degrees, certificate and associate programs, in **Manufacturing** in New Jersey?



Approach: The Cohort

- All **graduates** (degree levels such as **certificates, associates, bachelors, masters etc.**) from academic years 2012-13 through 2017-18 of programs that align with manufacturing.
 - Alignment with manufacturing is based on 78 CIP codes identified by Advance CTE which created the Perkins IV CIP-SOC crosswalks for reporting on National Career Clusters.



Approach: Datasets & Variables

Data sets

- NJ OSHE data for graduates (Enrollments and Completions)
- NJ Dept of Labor and Workforce Development (Employers and Wage)
- Advance Career Technical Education (CTE) public data for manufacturing related CIP Codes
- Map graduates data with wage data to understand the employment and earnings

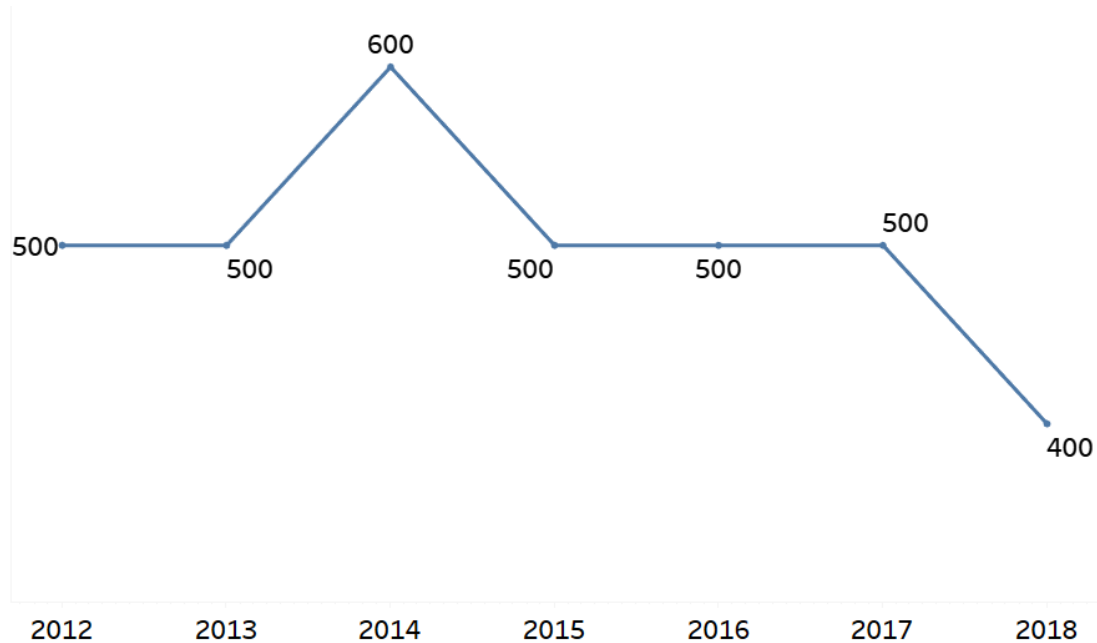
Variables & metrics

- NAICS code gives us industry
- Award type provides level of credential earned
- Major provides the type of education program studied
- **Race and Gender gives us demographic data**
- Wage, quarter, year provides information about employment so we can calculate metrics such as quarterly median wages and percent employed after one year

Overall, there are relatively few graduates from manufacturing specific programs.

Finding #1

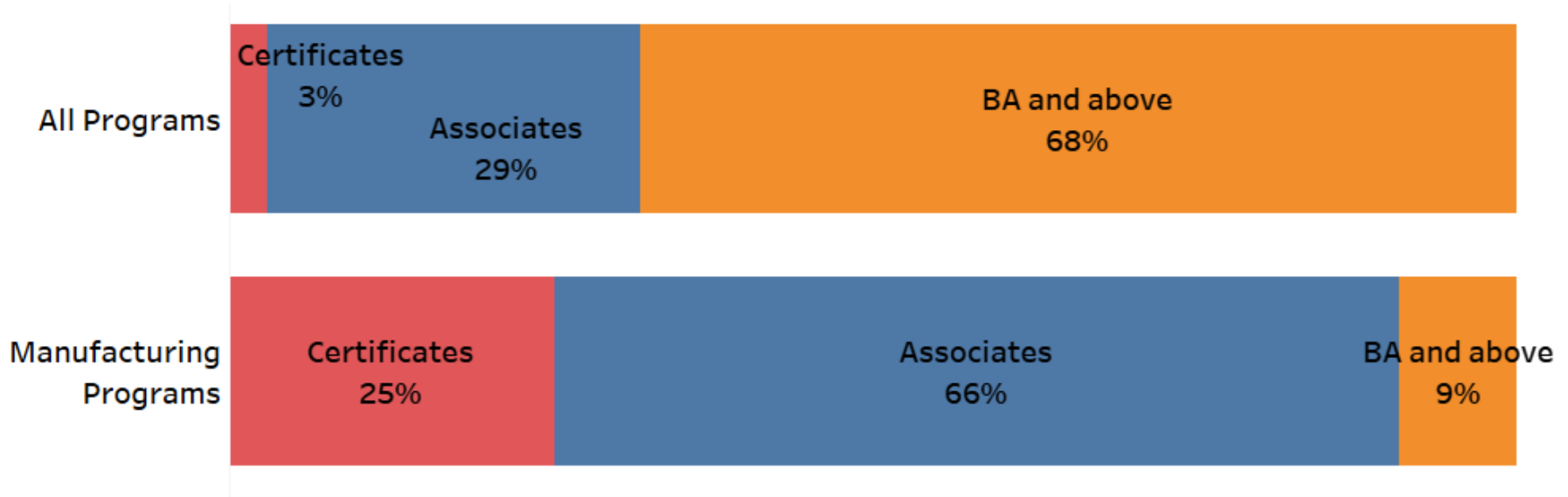
Manufacturing graduates in New Jersey, 2012-2018



Sub-baccalaureate credentials make up a higher proportion of the credentials awarded in manufacturing.

Finding #2

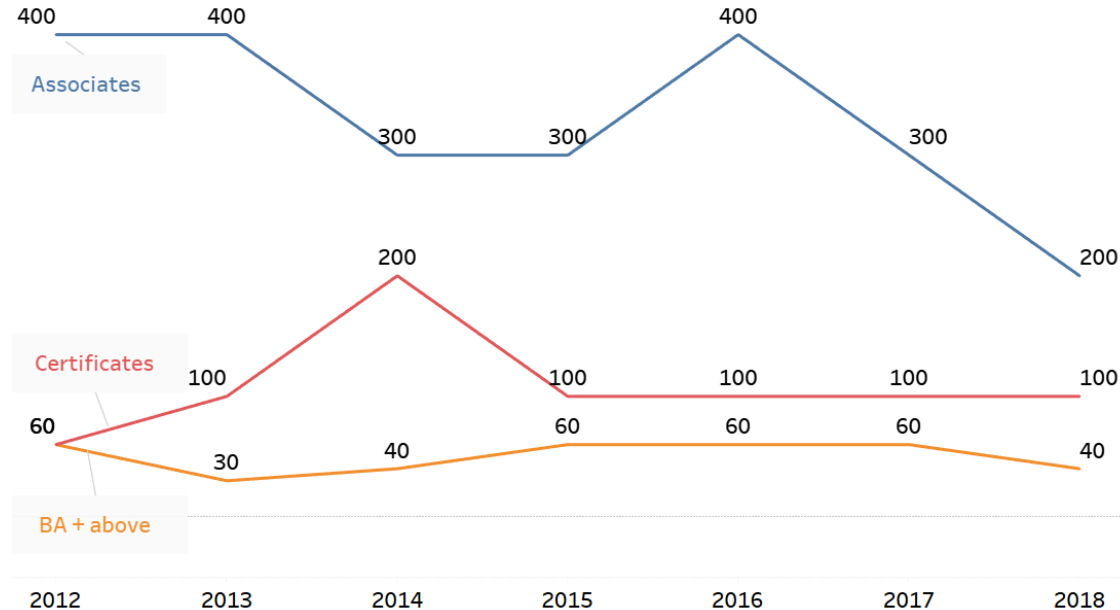
Manufacturing graduates in New Jersey, 2012-2018



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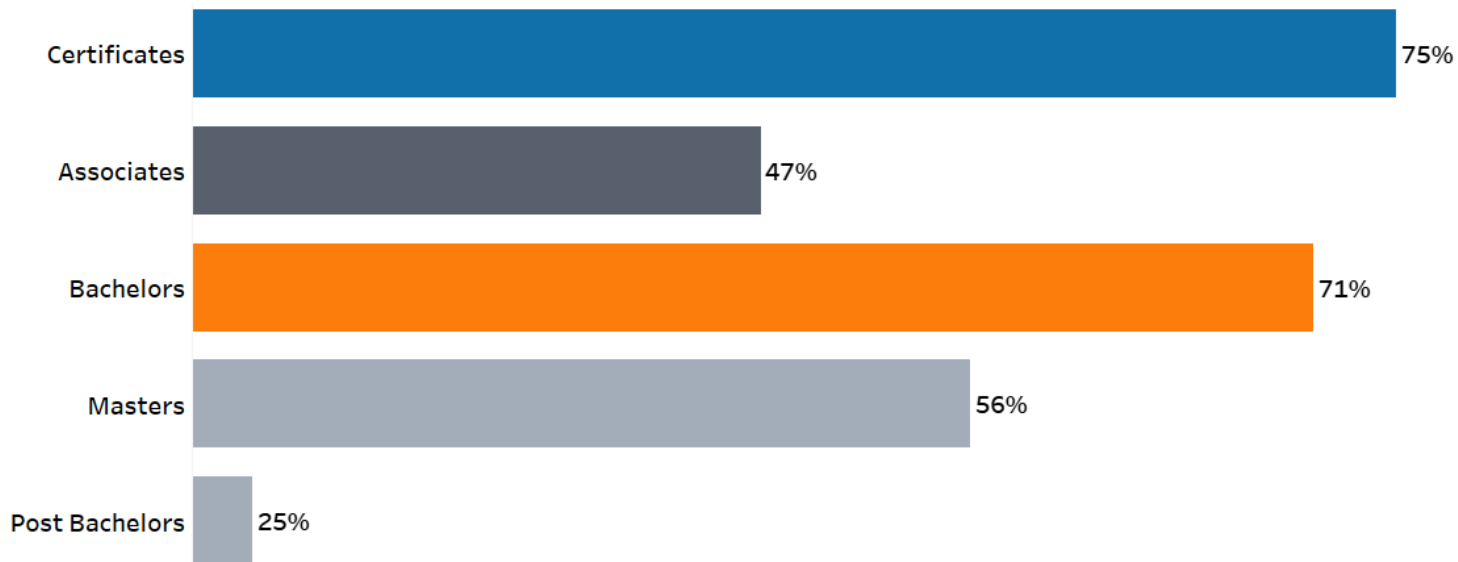
Manufacturing graduates in New Jersey, 2012-2018




Finding #3

Graduates of certificate programs have the same rate of employment one year after completion as those who obtained a Bachelor's degree.

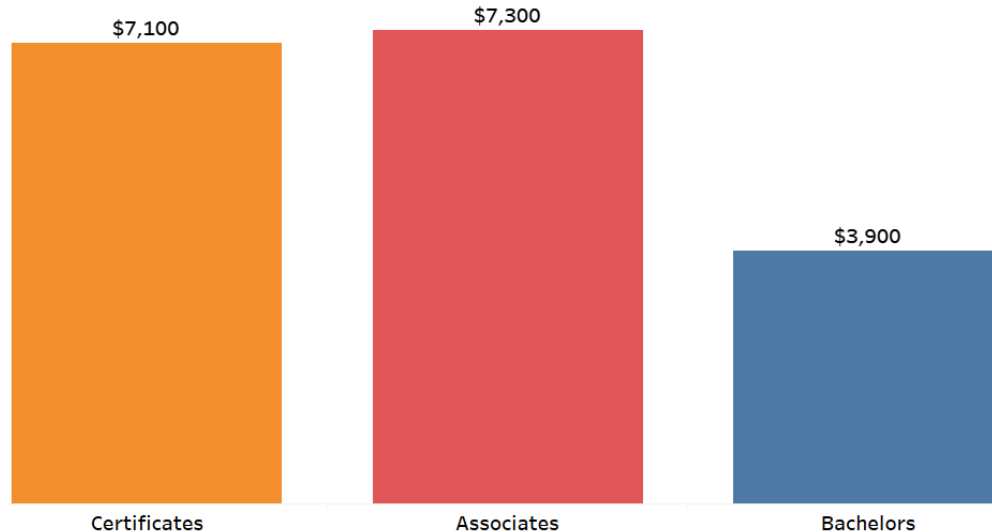
Percentage of graduates employed 1 year after graduation




Finding #4

Both the Certificate and Associates credentials in manufacturing lead to higher wages one year after completion than a Bachelor's degree.

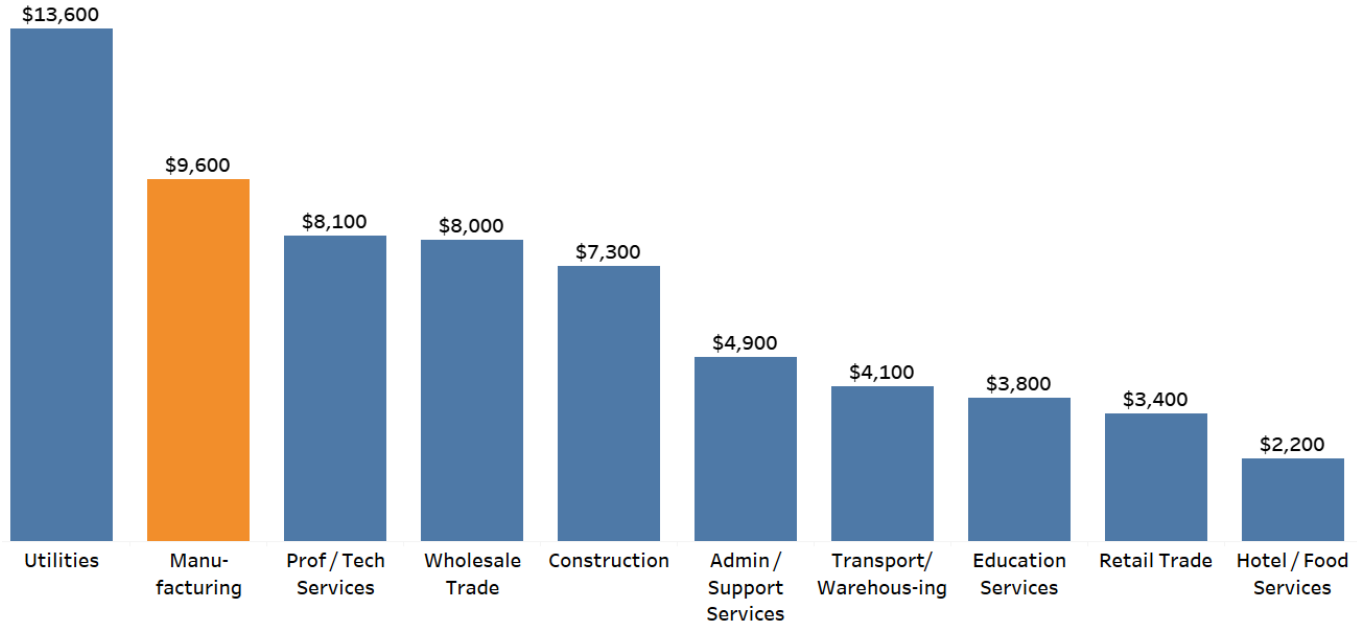
Quarterly median wages for manufacturing graduates by program level 1 year after graduation, 2012-2018



Finding #5

Graduates employed in the manufacturing industry earn higher wages relative to graduates in most other industries 1 year after completion.

Quarterly median wages 1 year after graduation by industry of employment



Finding #6

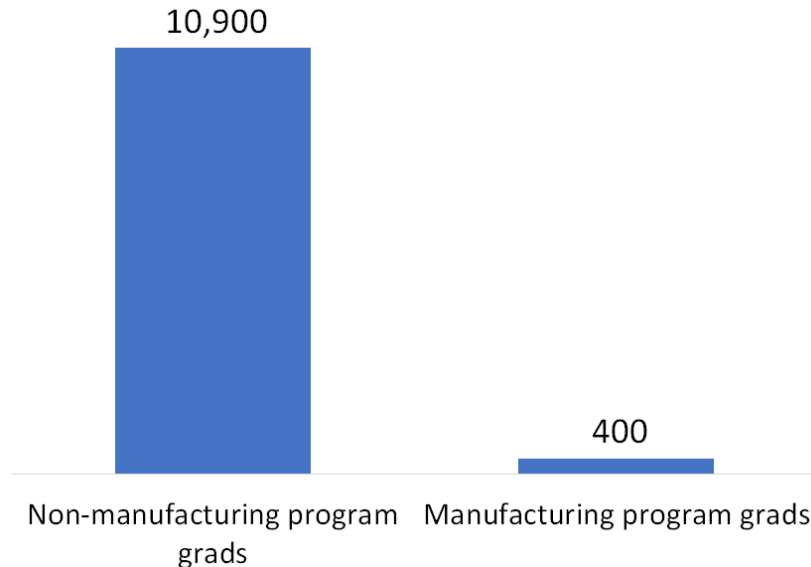
The graph displays the median wage for graduates over a 12-quarter period. The y-axis represents the Median Wage, ranging from 6,000 to 12,000. The x-axis represents the Quarter Past Graduation, from 0 to 12. Multiple lines represent different years, with 2017 and 2015 showing the highest wages and 2014 showing the lowest. A specific line for 2018 is highlighted with a callout indicating it is 'partial data'.

Quarter Past Graduation	2017	2015	2016	2013	2012	2014	2018
1	7,500	7,000	6,500	6,000	5,800	5,500	5,800
2	8,500	8,500	7,500	7,000	6,500	6,500	6,500
3	8,800	8,500	8,000	7,500	6,500	6,500	6,500
4	9,200	8,500	8,500	8,000	7,500	7,500	7,500
5	9,500	9,000	8,800	8,500	8,000	8,000	8,000
6	10,000	9,500	8,800	8,500	8,000	8,000	8,000
7	10,200	9,500	9,000	8,500	8,000	8,000	8,000
8	10,800	10,000	9,500	9,000	8,500	8,500	8,500
9	10,800	10,000	9,500	9,000	8,500	8,500	8,500
10	11,200	10,500	10,500	9,500	9,000	9,000	9,000
11	12,000	10,500	10,500	10,000	9,500	9,500	9,500
12	12,200	10,800	11,500	10,500	10,000	10,000	10,000

Finding #7

There is demand for employees in the manufacturing industry that extends beyond those with manufacturing specific credentials.

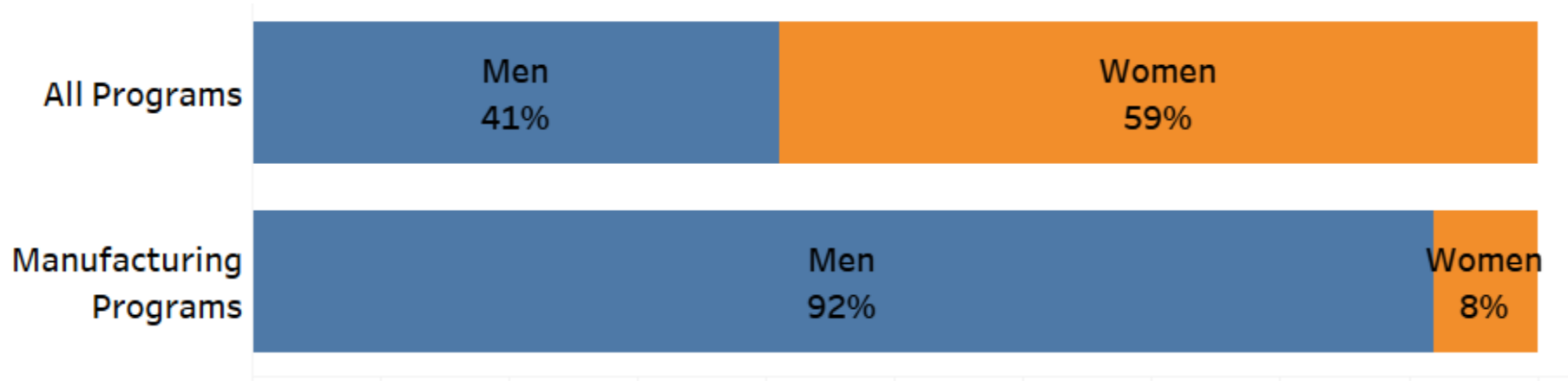
2012-2018 graduates employed in the manufacturing industry 1 year post-graduation




Finding #8

Opportunity to diversify by gender

Proportion of manufacturing graduates compared to graduates of all majors

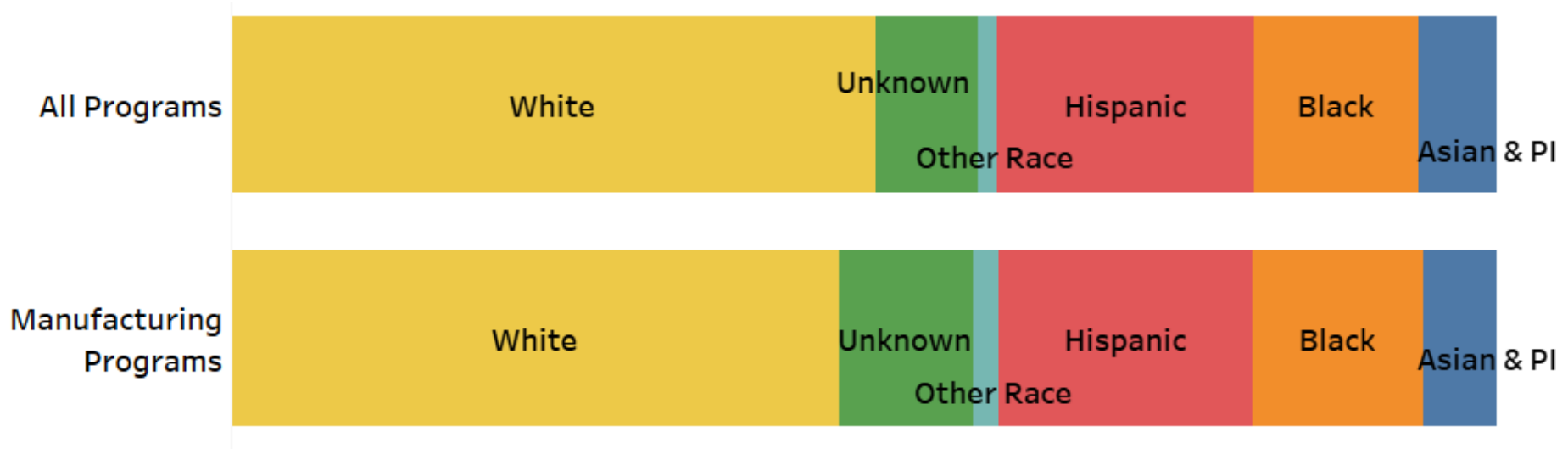




Finding #9

Opportunity to diversify by race and ethnicity

Proportion of manufacturing graduates by race/ethnicity compared to grads of all majors





Policy Implications

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- Short term credentials in manufacturing can help individuals **return to the workforce quickly** and bolster the manufacturing sector post-pandemic.
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- Future opportunity to **diversify and grow** the manufacturing programs offered in New Jersey
 - Program design and marketing should consider **systemic ways to increase proportion of female, Black and Hispanic students.**



Next Steps

- More in depth descriptive analysis
 - to determine where the greatest areas of need and strength are located
 - Outcomes: ROI, employability rates by majors, mobility rates, retention rates
- Forecast future demand of majors related to Manufacturing Sector in New Jersey.
 - Predictive analytics is recommended in order to forecast future demand of majors within the Manufacturing Sector in the State of New Jersey.
 - This will be a helpful **insight** information to be used by Colleges and Universities in New Jersey as well as students.
- Alternatives to obtain missing employment and education information from other states.
 - Graduate Surveys
 - Regional and National data sharing agreements



Assumptions & Caveats

- Manufacturing majors are defined narrowly and are not inclusive of all potentially relevant programs.
- There are limitations of the Unemployment Insurance data set.
 - Individual may have been employed out of state
 - Self Employed or Military.
- Data does not account for:
 - completers who continue with their education
 - Individuals who do not enter the workforce directly after completion.



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Thank you!