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Trends in Sub-baccalaureate Credentials in Manufacturing Programs of Study

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Introduction

Technician education programs that prepare students for the skilled technical workforce are an important part of the postsecondary education landscape in the United States. As such, they have garnered much recent interest from policymakers and researchers. Certain credentials unique to technician education, such as certificates, industry certifications, microcredentials, and badges, may represent a path toward retraining or upskilling for some workers, and a route into lucrative STEM occupations for others. But compared with more traditional programs of study, we have relatively little systematic information on the number and types of credentials awarded in career and technical education programs. Such information could be valuable for colleges, state policymakers, and industry leaders seeking to connect employment opportunities to a trained workforce.

The Technician Graduates Data Tool allows users to access public-use data on technician graduates spanning a 25-year period from 1995 to 2019, with new data to be added as it becomes available. The data tool facilitates comparisons of trends for multiple programs at the national and state levels, and it allows users to compare trends for a single program of study across states. It has an intuitive interface that allows users to easily select the programs and states they would like to examine.

This brief explores this new data tool by examining how the number of sub-baccalaureate credentials in manufacturing fields has changed over time, and whether these trends vary by region.

Data/Methods

The data for this brief come from the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS), arrayed in the Technician Graduates Data Tool. Though the tool allows users to examine trends at any credential level up to and including bachelor's degrees, this brief focuses on trends in sub-baccalaureate credentials: associate's degrees and short- and long-term certificates.

To facilitate analysis of the data, we first chose to group states into the four standard U.S. Census regions.¹ These aggregations are shown in Table 1 below. We then selected three programs of study that are typically associated with manufacturing: Industrial Production, Industrial and Heavy Equipment Maintenance, and Precision Metalwork.

Table 1: Region and Program Area Specifications

Grouping	Included Values
<i>Regions</i>	
Midwest	Indiana, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin
Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
South	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
<i>Program Areas</i>	
Manufacturing	Industrial Production, Industrial and Heavy Equipment Maintenance, Precision Metalwork

One trend graph was produced for each combination of region and program area, resulting in a total of 12 graphs. We also created 12 tables with underlying frequencies for each graph. These choices of aggregation have limitations. For example, the four standard census regions may have too much internal heterogeneity, particularly in the South – which includes 16 states and the District of Columbia. The program area groupings may also be internally heterogeneous; we will address that issue below.

¹ US Census Bureau. (2010). *2010 Census Regions and Divisions of the United States*. Washington, DC: US Census Bureau. <https://www.census.gov/geographies/reference-maps/2010/geo/2010-census-regions-and-divisions-of-the-united-states.html>

Findings

Figure 1: Sub-Baccalaureate Graduates in Industrial Production in Western States, 1995–2019

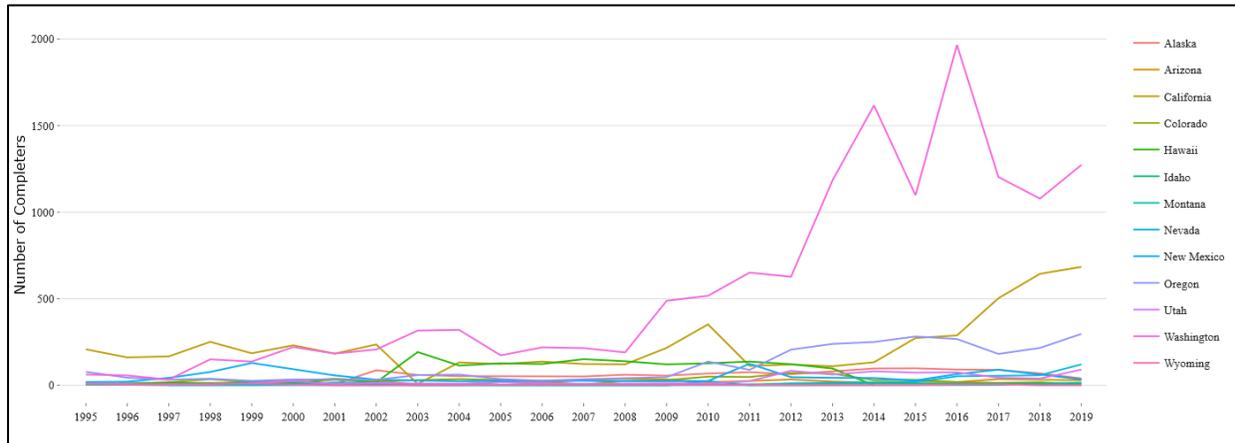


Figure 1 plots the number of sub-baccalaureate credentials awarded in Industrial Production (IP) in western states from 1995 to 2019. Examining the trends, we observe that many of the states in this region did not undergo a marked change in the number of IP credentials awarded over the study period. In the three states that did increase the number of awarded credentials – Oregon, California, and Washington – growth began after 2008. Oregon modestly increased awards from less than 50 in 2009 to nearly 300 by 2019. California awarded just over 100 credentials in 2013 but grew that total to nearly 700 in 2019. Washington state saw the most dramatic increase, however, with its awards total shooting up from 190 in 2008 to nearly 2,000 in 2016; that number has since declined to 1,273 in 2019 but remains higher than the total awards given in any other state in the region.

Figure 2: Sub-Baccalaureate Graduates in Heavy and Industrial Equipment Maintenance in Midwestern States, 1995–2019

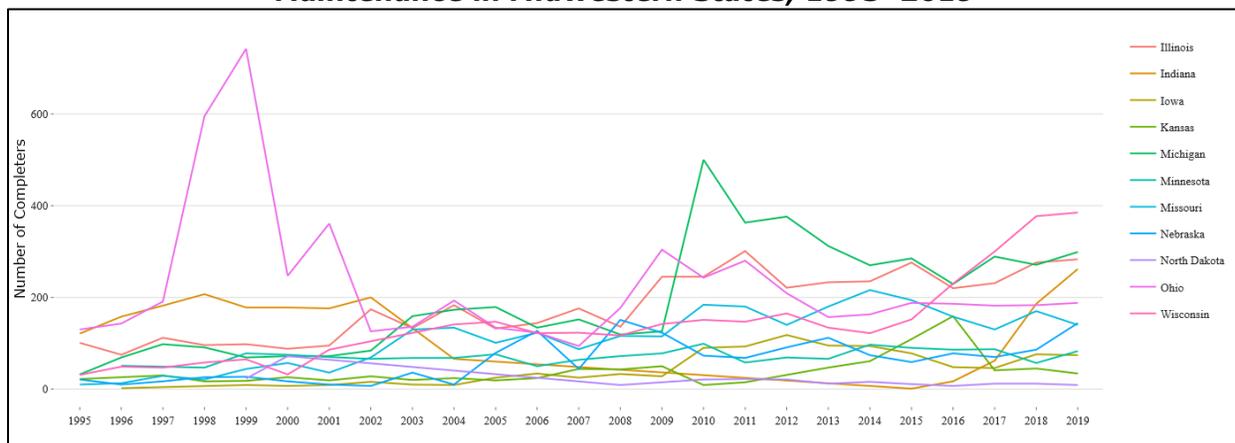


Figure 2 plots the number of sub-baccalaureate credentials awarded in Heavy and Industrial Equipment Maintenance (IEM) in midwestern states from 1995 to 2019. As observed in Figure 1, most states awarded a consistent number of IEM credentials throughout the study period, usually fewer than 200 each year. In the states where growth in IEM credentials is observed, that growth typically occurred after 2007. In Michigan, awards grew from 125 to

500 between 2009 and 2010, then leveled off to around 300 per year thereafter. In Wisconsin, IEM credential awards increased from 122 in 2014 to 385 in 2019. Ohio showed a divergent trend; this state awarded 742 IEM credentials in 1999, but fell sharply to less than 100 in 2007, with a modest rebound thereafter.

Figure 3: Sub-Baccalaureate Graduates in Precision Metalwork in Southern States, 1995–2019

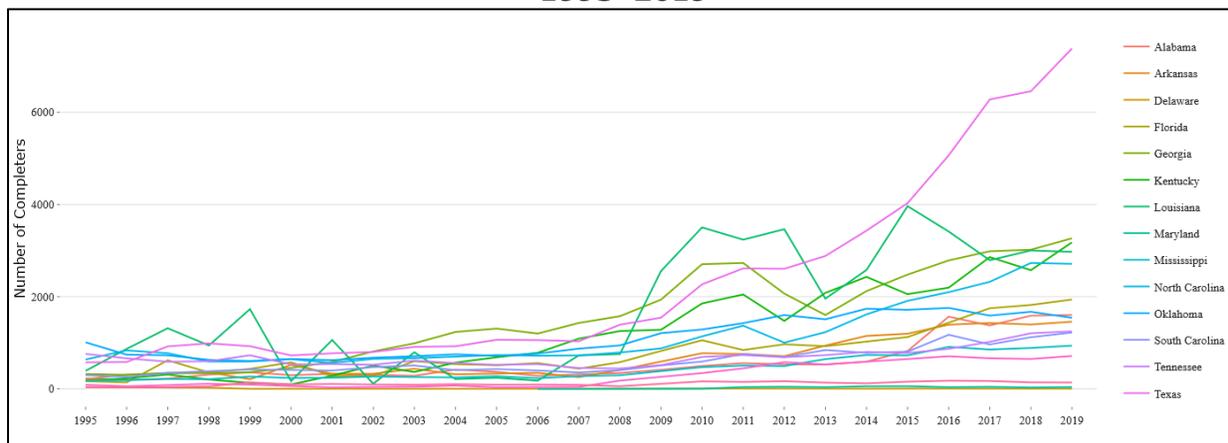


Figure 3 plots the number of sub-baccalaureate credentials awarded in Precision Metalwork (PM) in southern states from 1995 to 2019. The picture here is one of dramatic growth, which is markedly different from the trends we observed in IP and IEM credential awards during this period.² Nearly all southern states showed measurable or marked increases in the number of PM credentials awarded during the study period, with most of this growth beginning around 2008. North Carolina was typical of this pattern, steadily increasing from 789 PM credentials in 2008 to 2,712 in 2019. Texas dramatically increased its awards in this field, from just over 1,000 in 2007 to nearly 7,400 in 2019.

Notable Patterns

While we stop short of making any explanatory claims in these descriptive briefs, it is useful to note some patterns that warrant investigation. In two of the three fields examined here – Industrial Production and more notably in Precision Metalwork – increases in credential awards occurred after 2007. This timing coincides with policy responses to the Great Recession, but understanding growth in specific fields will require more detailed analysis. One important question is how responsive community colleges are to local labor market demands. A second is whether the credentials produced necessarily lead to field-specific employment. The same questions could be asked of the sudden decreases in credential production observed in Industrial Production after 2016.

Limitations

In addition to the limitations of our methodological choices described above, there are further limits presented by both the data tool and the IPEDS data that underlie it.

² Readers can examine the appendix to observe similar trends in midwestern (Figure A2) and western states (Figure A9), as well as certain northeastern states (Figure A5).

The Technician Graduates Data Tool provides visualizations (graphs) of the trends in credential and degree awards. But complex analysis of these trends could perhaps be better accomplished with data tables where actual frequencies can be easily viewed and manipulated. For example, populations vary substantially within states, and these variations may make an examination of unadjusted frequencies misleading. Thus, it might be of value to see the rate of production of a given type of degree or credential per 100,000 residents. Tabular data would allow for this more complex analysis. The visualizations also automatically fit the y-axis (number of credentials) to the selected data. Thus, though the graphs look similar, the meanings of the trend lines may be inconsistent. Recent updates to the Technician Graduates Data Tool provide some of this functionality.

IPEDS data rely on the Classification of Instructional Programs (CIP) coding scheme. CIP was intended to “assist in collecting, reporting, and interpreting data about instructional programs.”³ Importantly, CIP data are compiled by individual institutions rather than by a centralized government entity, and different postsecondary institutions may use the codes in different ways. Similarly, uses of CIP codes within an institution may change over time as program content evolves. Another reason CIP coding may change within technician programs, for example, is in response to changes in the federal government’s designation of certain programs of study as eligible for optional practical training for f-1 visa students.

Conclusion

this brief used ipeds data arrayed in the technician graduates data tool to examine trends in awards of sub-baccalaureate credentials in three manufacturing programs of study, with a focus on regional variation. we observed distinct patterns in the three program areas, but we also noted similar patterns within the four geographic regions specified. beyond these substantive observations, this brief demonstrated the utility and functionality of the technician graduates data tool for comparing program trends across states.

³Malitz, Gerald. (1987). *A Classification of Instructional Programs (CIP)*. Washington, DC: Center for Education Statistics, Office of Educational Research and Improvement.

About the Author

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Appendix. Supplemental Figures

Figure A1. Sub-Baccalaureate Graduates in Industrial Production in Midwestern States, 1995–2019

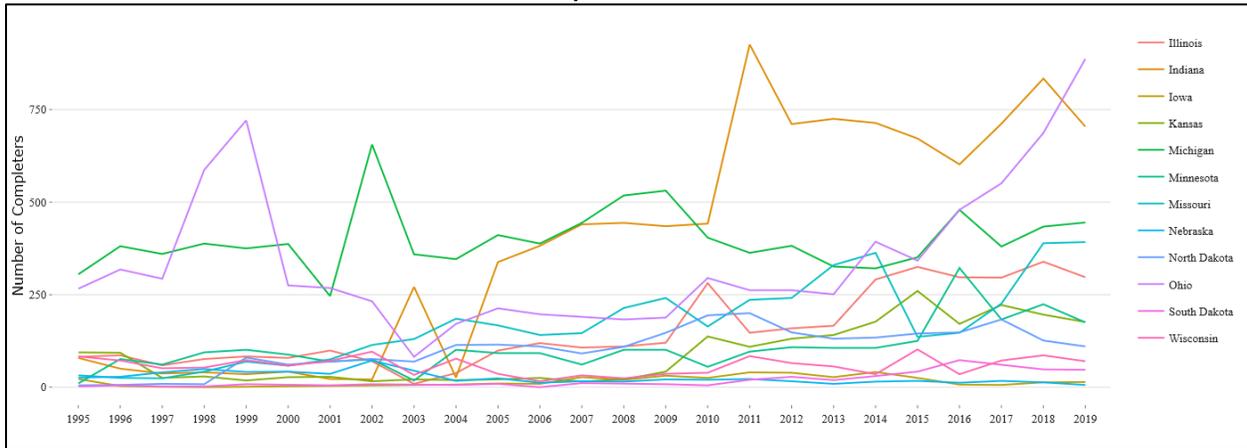


Figure A2. Sub-Baccalaureate Graduates in Precision Metalwork in Midwestern States, 1995–2019

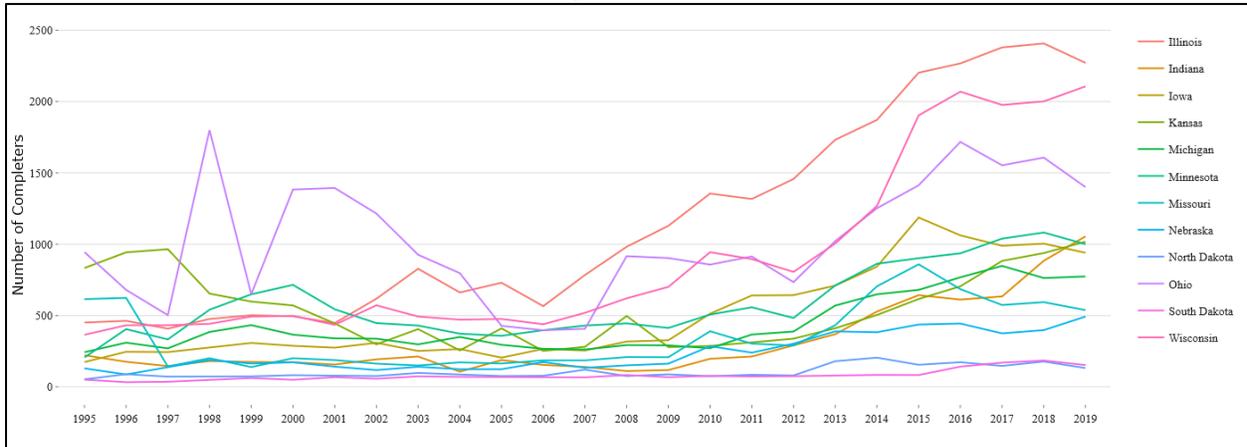


Figure A3. Sub-Baccalaureate Graduates in Industrial Production in Northeastern States, 1995–2019

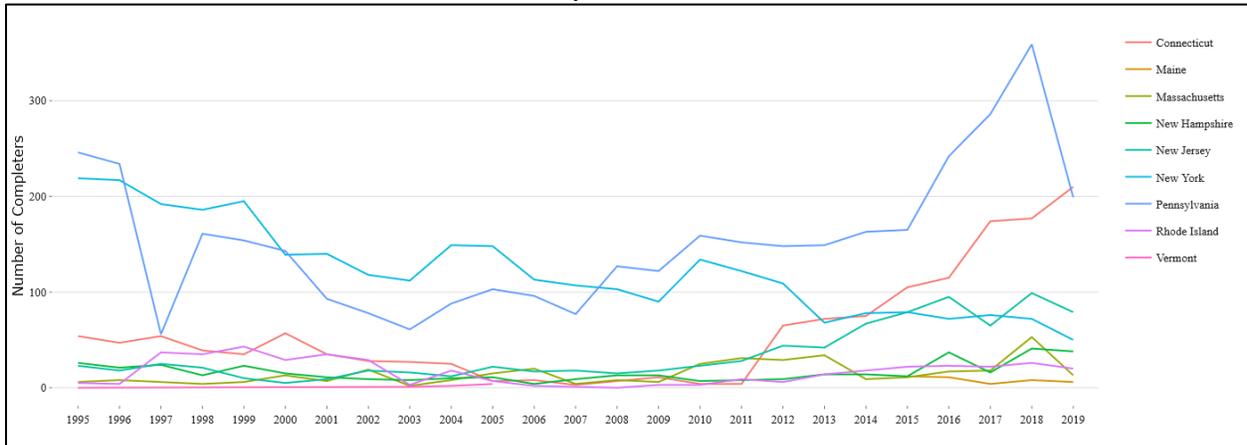


Figure A4. Sub-Baccalaureate Graduates in Heavy and Industrial Equipment Maintenance in Northeastern States, 1995–2019

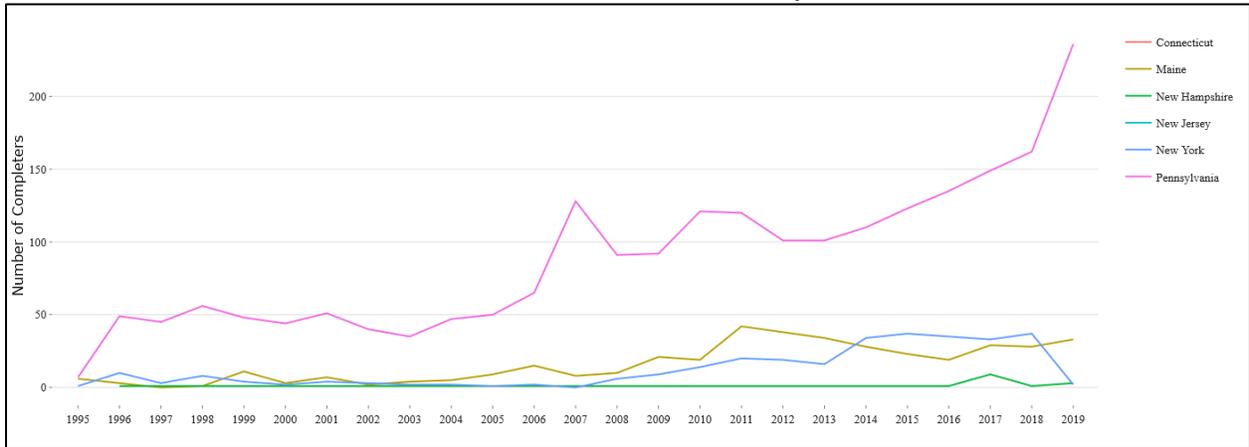


Figure A5. Sub-Baccalaureate Graduates in Precision Metalwork in Northeastern States, 1995–2019

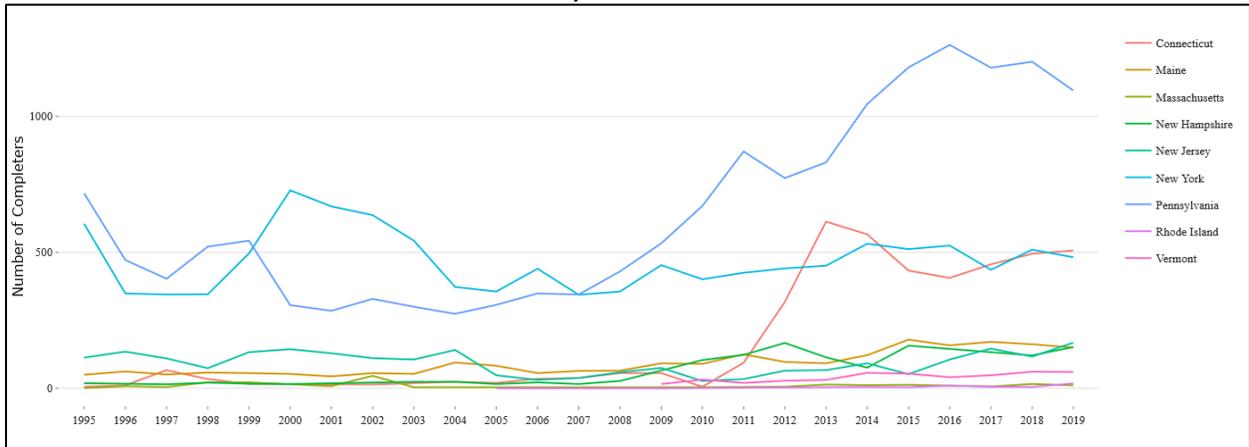
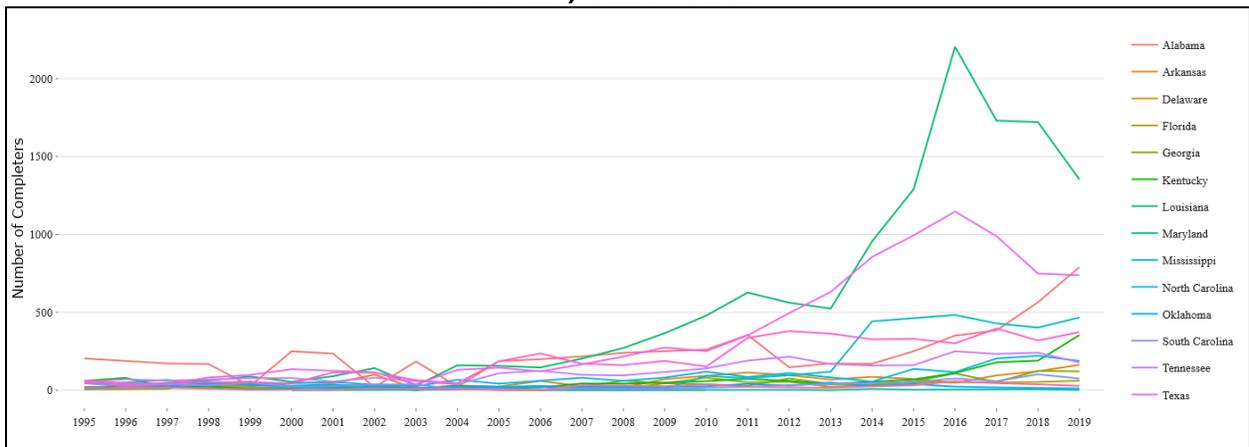
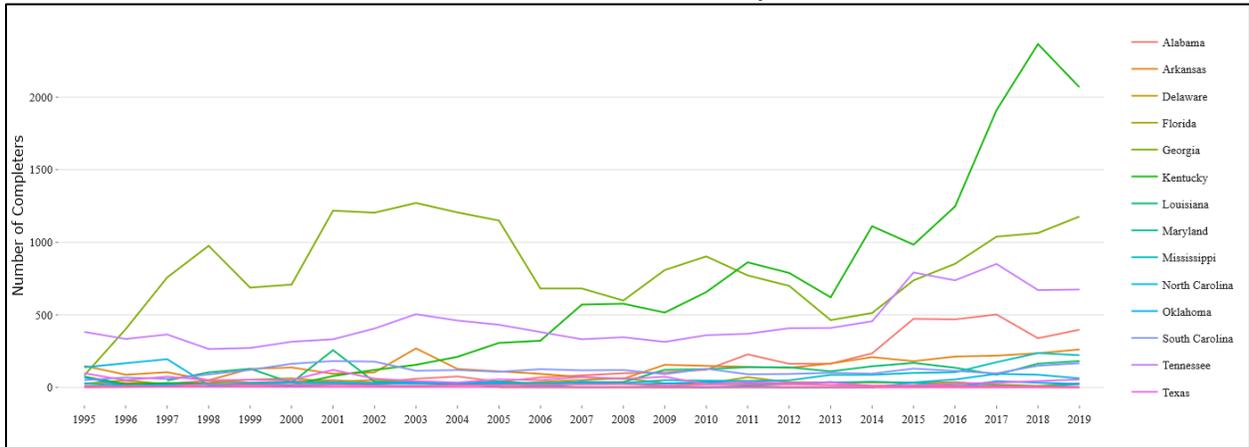


Figure A6. Sub-Baccalaureate Graduates in Industrial Production in Southern States, 1995–2019¹



¹ The Data Tool limits the size of the key, this not all states are clearly indicated in the key.

Figure A7. Sub-Baccalaureate Graduates in Heavy and Industrial Equipment Maintenance in Southern States, 1995–2019¹



¹ The Data Tool limits the size of the key, this not all states are clearly indicated in the key.

Figure A8. Sub-Baccalaureate Graduates in Heavy and Industrial Equipment Maintenance in Western States, 1995–2019

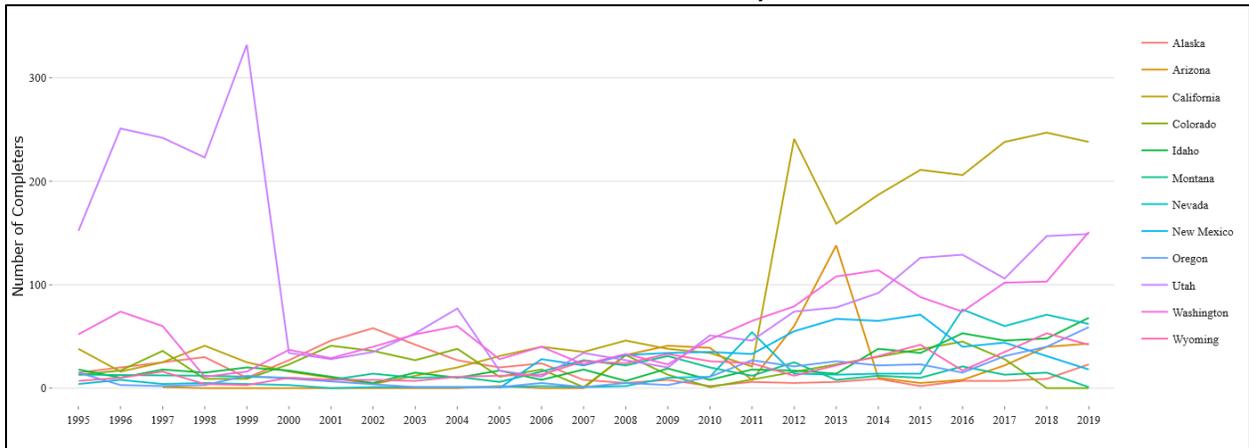


Figure A9. Sub-Baccalaureate Graduates in Precision Metalwork in Western States, 1995–2019

