WORKFORCE DEMAND AND THE SKILLS GAP IN TEXAS

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EXECUTIVE SUMMARY & RECOMMENDATIONS

- Community colleges are an important provider of educational services and play a critical role in meeting the workforce demands of Texas employers. Community colleges add to the supply of credentialed workers through two broad avenues. They contribute to the supply of bachelor's degrees by offering academic associate degree programs that prepare participants for transfer and completion of their BA or BS at a four-year institution. They also contribute to the supply of technical workforce skills through applied programs that lead to technical associate degrees, technical certificates, and occupational skills awards.

- This study focuses on the second role of community colleges as occupational skills suppliers. A particular objective of our study is to provide an analysis of the direct contribution of Texas community colleges to addressing the projected future growth in skill demands of Texas employers.

- There are 89 occupations which have post-secondary entry requirement (according to the Bureau of Labor Statistics (BLS) and the Texas Workforce Commission (TWC)) that can be immediately satisfied by community college degrees, certificates, or awards.

- The TWC's projected average annual growth in position openings for the period 2018-28 for these 89 occupations provides an estimate of the demand for new skills.

- Data on two-year college degrees, certificates, and awards for the period 2019-21 provides data on the supply of new skills. These degree counts include community colleges, Texas state and Lamar technical colleges, and private two-year colleges.

- Demand is stated in terms of Standard Occupation Codes (SOCs). Supply is stated in terms of Classification of Instructional Program Codes (CIP codes). The match of demand by SOC with community college credential supply by CIP code is via a jointly developed BLS/National Center for Educational Statistics (NCES) crosswalk.

- There are challenges to this matching process, largely due to multiple CIP-to-SOC matches in the data. Where the matches are tight – think nursing – the crosswalk works well. When the matches are loose – think general degrees such as business administration – the matching process works less well and requires judgment decisions.

- Here we allocate degrees awarded by CIP codes to their matching SOCs in proportion to the job openings in the SOCs, thereby avoiding overcounting.

- At the end of this matching process, we calculate the gaps by occupation between the projected demand by occupation and the number of credentials supplied. Nearly half (47%) of the degrees produced by Texas two-year colleges are in occupations in which the number of degrees is reasonably well-aligned with the projected number of openings, where the supply is within 50% of demand.

- A sizable percentage (33%) of the degrees are matched to occupations in which supply exceeds demand by more than 50%. A smaller percentage (19%) of the degrees are in occupations where supply is less than demand.

- Among 20 high growth occupations also characterized by relatively high entry wages, wages above the average for these 89 occupations, the two-year college supply well-matches demand for 40% of the occupations. The "over" and "under" supplied cases are evenly distributed at 30% of these 20 high growth/high wage occupations.

- Large skill gaps, positive or negative, can serve as a basis for case studies, but should not be used as a sole basis for action.

- When projected demand far exceeds supply, there are often many alternative suppliers of job training services that are filling at least some of the projected gap. Private firms in the education business for specific skills, and on-the-job training programs, can provide the majority of business demand for trained workers for some occupations. The prime example is Heavy and Tractor Trailer Truck Drivers, but there are also many private firms providing training for specific jobs such as Medical Assistants and Dental Assistants.

- When supply far exceeds projected demand, the possible explanations are less straightforward. These cases do seem concentrated among higher-wage occupations, so in part this may be a market-driven move by workers to acquire skills leading to higher pay.

- The recommendation that follows is not to take the large gaps between projected demand and supply at face value, as calling for action. Instead, for those cases that are most of interest, study them in much greater detail.

- The gap analysis would be more informative if there is further development of data sources and methodology. On the data side, it would better inform issues surrounding the demand and supply gap if data were available for the many private specialty skill and training providers such as those listed above. Private boutique educational providers offering certification as a Medical Assistant, or Dental Assistant, or Heavy and Tractor Trailer Truck Driver, are substitutes for certificates, awards, or degrees offered by community colleges, and should be included in any analysis of a gap between demand and supply of said skills.

- With respect to methodology, the use of BLS/NCES SOC-CIP and CIP-SOC crosswalks should be reexamined, especially for broad degree categories.

- Compounding some of the data and methodology issues is the elephant in the room in terms of analyzing data, and that is the influence of the pandemic. Our demand data includes projections for the period 2018-2028 that were made pre-pandemic and extending for years afterwards. At the same time, our supply data from 2019-2021 included two years where community college enrollments declined during the pandemic. Later this year, the demand projections will be redone to cover a period that does not include the year of pandemic-related shutdowns and enrollment declines.

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INTRODUCTION

This research on workforce demand and the skills gap is part of a larger project that explores several key questions regarding the equitable finance of community college education. Our specific task in this chapter is to address the fourth question enumerated in the scope of work: What is the current state of workforce demand and skills gaps in Texas?

Answering this question begins with identifying and defining the concepts of "workforce demand" and "skills gaps."

The Bureau of Labor Statistics (BLS) writes that the labor force "includes all people age 16 and older who are classified as either employed and unemployed." The BLS adds that "Conceptually, the labor force level is the number of people who are either working or actively looking for work." The term workforce is commonly used to mean those individuals who are working, i.e., it leaves out the unemployed.

Economists at the BLS and elsewhere have studied labor markets extensively and often apply the workforce supply-and-demand model. In this approach, the labor demand curve indicates employer's desire to hire, and is defined as a graph of the schedule indicating the quantity of workers demanded at each possible wage rate within a particular labor market.

A labor market, conceptually, is where employers and workers interact with each other in the exchange of labor effort for wages and other compensation. Employers want to hire labor – they demand labor – and workers want to sell their labor hours – they supply labor. A labor market can be defined for a specified geographic area, as well as by the occupation or skill set that firms want to employ and that workers are qualified to provide. The geographic area could be the entire United States, an individual state such as Texas, or a smaller region within the state. The occupation or skill set of interest, the skills that firms want to employ and the skills that workers can supply, may also be specified at various levels of detail. Occupations are frequently classified by the Standard Occupational Classification (or SOC) System that is available at an aggregated level (a major group or two-digit group), or at finer levels down to six-digit groupings. An example of a major occupation group is "Production Occupations," SOC code 51-000, a two-digit group. A three-digit group is "Assemblers and Fabricators," SOC code 51-2000. A five-digit group is "Electrical, Electronics, and Electromechanical Assemblers," SOC code 51-2020. A six-digit group is "Coil Winders, Tapers and Finishers," SOC code 51-2021.

The demand curve is generated by aggregating the demand schedules of all firms within the geographic area for a particular type (or occupation/skills) of workers. Typically, demand curves slope downward. This means that at higher wages, the quantity of workers demanded by firms is less than at lower wages. In a typical graph of labor demand, wages are on the vertical axis and the number of workers (quantity demanded) on the horizontal axis. The demand curve is therefore downward sloping.

On the other side of the labor market are workers, the suppliers of labor. These are workers in a particular occupation or with a particular skill set that correspond to the market definition. In general,

workers are willing to supply more labor as the wage rate rises. The supply curve of labor aggregates the individual supply curves of all workers within a particular market. Such a curve is typically upward sloping in a graph with wages on the vertical axis and the number of workers (quantity supplied) on the horizontal axis.

The intersection of the labor demand and labor supply curves in a particular market identifies an equilibrium, yielding both the equilibrium wage and the equilibrium number of workers employed. It is the point where the quantity demanded equals the quantity supplied. The equilibrium wage is also known as the market clearing wage. At this wage, the firms' demand for labor in this market is equal to the number of workers willing to work. The number of workers in a certain occupation and within a specified geographic area is often referred to as employment by occupation. Importantly, this equilibrium employment by area and occupation carries with it the prevailing wage.

The prevailing wage is bid up if there is an increase in the overall demand (a shift right in the demand curve) or if there is a contraction in the overall supply of workers (a shift left in the supply curve) in a particular market. Increases in the overall demand for workers occurs through a variety of reasons including increased demand for the products or services produced by the firms in a labor market area, new firms moving to an area, or any other expansion of production. Higher wages in a particular area and occupation are market signals to existing workers – and to potential future workers, i.e. students – to develop the skills necessary to perform the occupation's tasks. Higher wages attract new workers via immigration from other geographic areas, via occupation changes by existing workers with the necessary skills, through workers in other occupations developing the necessary skills to transfer for the higher wages, and via new workers - students - developing the necessary skills from classroom experiences or other training venues. As workers move into the higher-wage occupation, the supply curve shifts right, equilibrium employment grows, and the equilibrium wage may decline.

These labor market dynamics are constantly occurring, and some market adjustments take time. This may be especially true of workers who need to gain additional skills to get jobs in the higher-wage occupations. Expanding industries, occupations, and rapidly changing technologies require an adaptable and responsive workforce. But as workers respond to increased demand, signaled by higher wages, through migration of workers to an area, workers who retrain, workers who transition from other similar jobs, or new entrants who receive the necessary education, there may be a perceived, and actual, skills gap.

There are times when firms may not be able to hire all the workers they desire with the necessary skills at a particular wage rate. Their job posting may not elicit the quantity of qualified applicants they want to employ.

A skills gap in a labor market is sometimes defined as the difference between the demand and supply of workers with the necessary skills. This definition is insufficient because it does not include the wage offered. A gap, or shortage, exists between the quantity demanded and the quantity supplied if the offered wage is less than the equilibrium or market clearing wage.

But the skills gap, as it is typically used in the discussion of labor market dynamics, refers to increasing demand for particular skills that outpaces the existing supply of workers with those skills. In this notion of a skills gap, the offered wage is not mentioned, but it is implied. "Demand" and "supply" in

this context are often defined in a variety of ways – not always in the way economists formally define the terms. In this context, demand and supply are typically operationalized by counts of workers in a particular occupation, industry, or area, irrespective of wages.

For example, demand may be defined by the number of job postings for a particular skill set or occupation in a particular area at one point in time and supply would be defined as the number of workers who post the matching skill set. This form of analysis can be thought of as "current" demand and supply. In this context, and in other contexts where the analyst attempts to match demand and supply, there will be overlap in the potential matches of workers to jobs and jobs to workers. A worker is often qualified for and will apply to jobs that may not align perfectly with one's skill set. Similarly, firms will interview some workers whose past occupation of work experience only meet some of the qualifications expressed in a job posting.

A longer run view of the demand and supply of workers is based on a measure of projected employment in a future time period relative to the current employment in an occupation in an area. The supply of workers includes current workers in the occupation and area, new entrants from other employment who transition to the occupation, new entrants who migrate to the area, or newly certified or degreed awardees who have the requisite skills to enter the occupation. The demand for workers depends on projections of demand for firm products. It also depends on how firms choose to create said products. Firms can choose among alternative production methods, and the state of technology and the influence of technological innovations also matters.

ANALYTICAL FRAMEWORK AND DATA

In this present exercise we analyze the degree to which projected employment growth in specific occupations is met by the supply of degree and/or certificate awardees from community colleges in the state of Texas. We focus on occupations for which entry requires additional post-secondary education but less than a four-year degree.

The projected employment growth from 2018 to 2028 for each of these occupations is developed by the Labor Market and Career Information (LMCI) of the Texas Workforce Commission (TWC). These TWC projections follow a methodology developed by the Bureau of Labor Statistics (BLS).[1] For each occupation, the TWC estimates annual job openings as the sum of employment change by growth, employment change by exits, and employment change by transitions. Growth is the net addition of new jobs, or the number of new employed positions in that occupation. Exits are the number of employees retiring or quitting their jobs in that occupation, positions that must be replaced in order to keep employment constant after the exits occur. Finally, transitions are employees moving out of the occupation under consideration and presumably into another occupation. Transitions are like exits, except that the transitioning employee remains employed at some other occupation.

The TWC projections of annual job openings due to growth and due to exits, summed, will serve as our estimates of annual "demand" by occupation. This matches the approach used in Leigh and Gill (2007).

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[1] The TWC's projections of employment change by occupational can be found at: https://texaslaboranalysis.com/Demand. This fall the TWC will produce a new set of employment projections for 2020-2030. The description of the BLS's projection methodology can be found at: https://www.bls.gov/emp/documentation/projections-methods.htm.

Job transfers represent losses to one occupation but gains to another, and as a general matter, occupational transfer churn should be net zero. Conceptually, the demand for new skills (the demand for additional human capital) comes from job growth and from labor force separations, and community colleges help generate the supply of new skills, or additions to human capital stocks.

As mentioned, the supply of workers within an occupation can be met in a variety of ways, one of which is through new degree and/or certificate awardees with different education levels and curriculum concentrations. Here, a degree and/or certificate awardee may be a student earning a formal two-year degree but will also include a student earning a certificate in an area of study. The BLS identifies different occupations by SOCs, and the National Center for Education Statistics (NCES) has developed Classification of Instruction Programs (CIP) codes to identify curriculum concentrations. Together, the BLS (2022a) and the NCES (2022a) have developed SOC-to-CIP and CIP-to-SOC crosswalks that match the relevant CIPs that are appropriate for each SOC and the SOCs to which students with a particular CIP can potentially find employment.[2]

The next section focuses on identifying how community colleges and other two-year institutions in the state of Texas are responding to changing employment trends in Texas. To measure this response, we match the public and private two-year schools' degree and/or certificate awardee counts by CIPs to the SOCs using the CIP-to-SOC crosswalk. These public and private two-year schools' degree and/or certificate awardee counts are from the Texas Higher Education Coordinating Board (THECB).[3]

STATE LEVEL ANALYSIS
Occupations

Our study focuses on occupations with post-secondary education entry requirements that can be met by completion of or participation in public and private two-year college program offerings. We analyze occupations at the detailed six-digit SOC level. BLS also produces a file that identifies the "typical" education required for entry into each occupation. This mapping is estimated based on the Census Bureau's American Community Survey (ACS) data, Department of Labor (DOL) employer survey data, and BLS interviews with employers and occupational training professionals. We use the BLS assignment of typical education needed for entry to identify SOCs with post-secondary requirements. Our analysis will center upon the detailed occupations for which the BLS (2022b) identifies the typical minimum education entry requirements as an associate degree, a post-secondary nondegree award (certificates), or completion of some post-secondary college hours. This definition of post-secondary requirements matches the one used by the Community and Technical Colleges Formula Advisory Committee (CTCFAC) in a recent study of "Targeted Fields" for Texas community colleges. The objective is to focus upon those occupations for which a community college credential enables entry, but for which a high school diploma typically is not sufficient to clear the minimum entry bar.

Out of the 867 detailed SOC occupations identified by the BLS, 89 meet our post-secondary requirement filter. An associate degree is the entry level requirement for 43 of these 89 occupations. A post-secondary non-degree award is required for entry to 41 of the occupations. The third post-secondary classification of "Some college, no degree" applies to 5 occupations. These 89 occupations

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[2] See the description of the crosswalk at: https://nces.ed.gov/ipeds/cipcode/post3.aspx?y=56
[3] The enrollment and degree and/or certificate awardee count data is available at:
http://www.txhigheredaccountability.org/AcctPublic/InteractiveReport/ManageReports

represent 34 of the 98 four-digit minor SOC occupation groups and 16 of the 23 major SOC occupation groups. Over half (50) of the detailed occupations that meet our post-secondary education requirements filter come from four of the two-digit SOC major groups: Architecture and Engineering Occupations (12), Healthcare Practitioners and Technical Occupations (16), Installation, Maintenance, and Repair Occupations (14), and Healthcare Support Occupations (8). A complete listing of the included/matched occupations is provided in Appendix A Table 1.

Demand

The distribution of employment in Texas by the required entry level of education is shown in Figure 1. The requirements vary from "No Formal Education Credential" to "High School Diploma or Equivalent" all the way to "Doctoral or Professional Degree." Our interest is focused on "Post-secondary Non-Degree Award," "Some College No Degree," and "Associate Degree," as these are the realm of community colleges. The employment numbers for 2018 and 2028 are from the TWC employment demand projections for the same period. The 2020 numbers are actual employment values in 2020. Based on the BLS assignment mechanism, over two-thirds (70.2%) of employment in Texas is in occupations that require no more than a high school diploma for entry.

Figure 1. Employment by Entry Level of Education
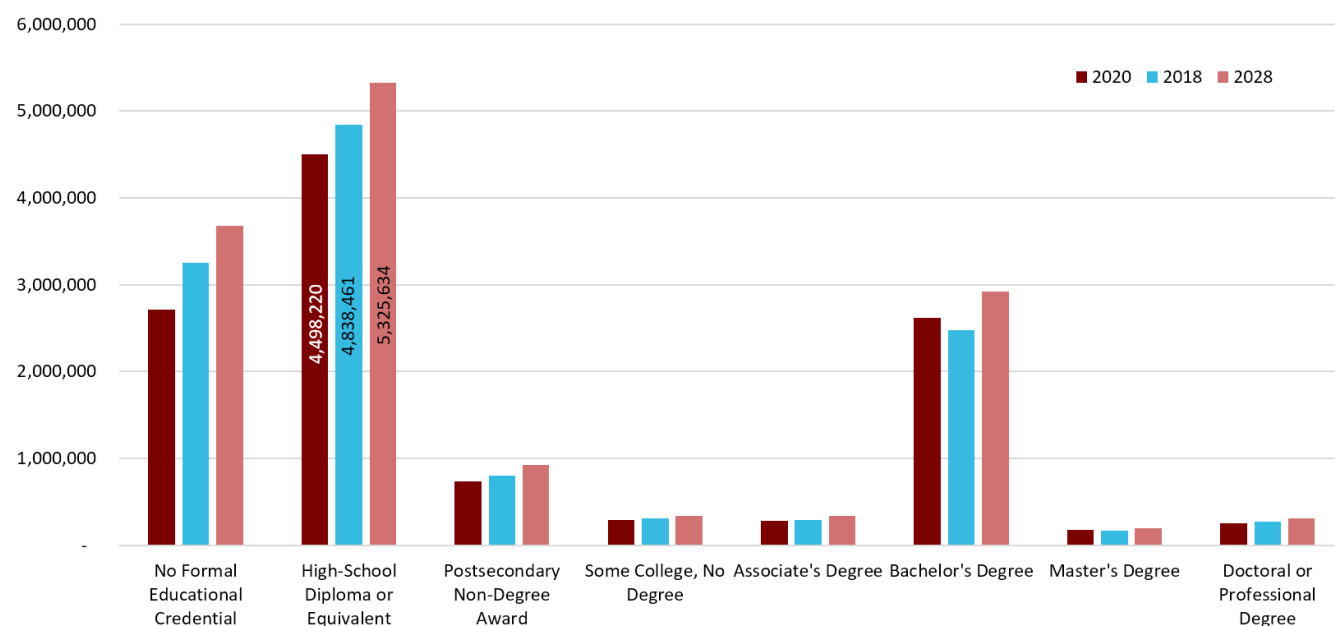
Distribution of employment by entry level of education. Source: Texas Workforce Commission.

Figure 2 provides information on the top 20 of our included occupations as ranked by statewide employment in 2020. The employment distribution is strongly concentrated. Among the 89 occupations with post-secondary education requirements, the 20 largest occupations represent 76% of employment in 2020.

Figure 2. Top 20 Occupations Requiring Some College by Employment in 2020

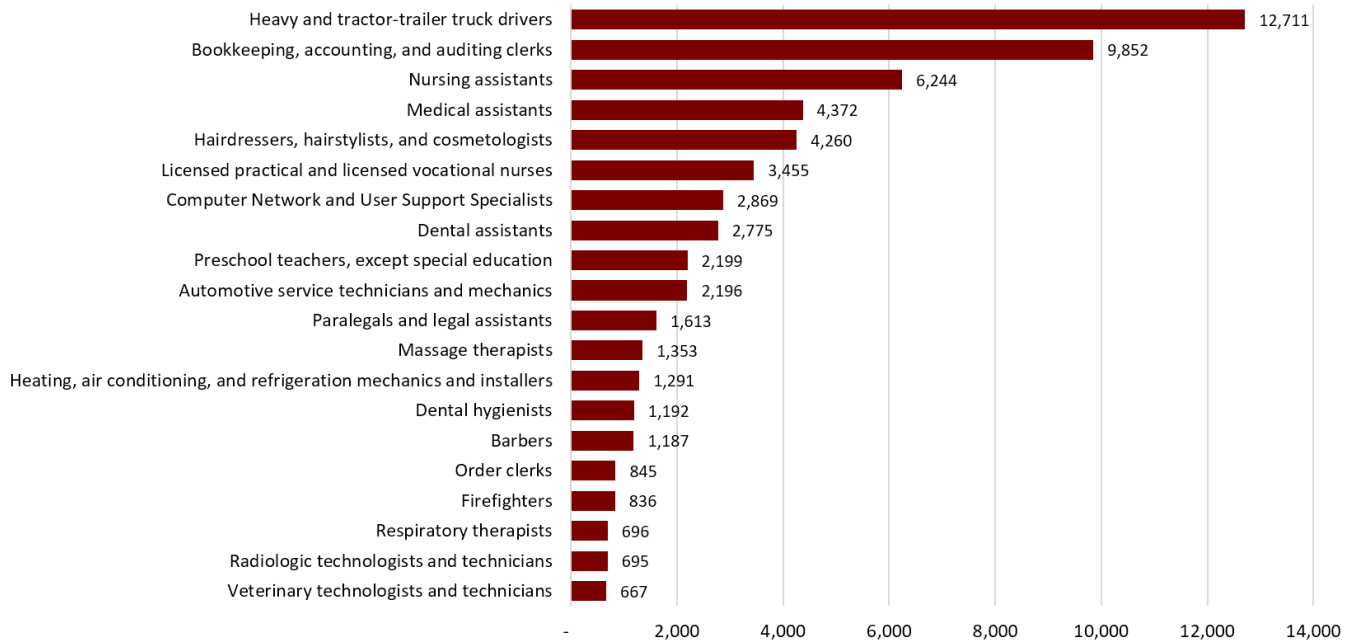| Occupation	Value
Heavy and tractor-trailer truck drivers	195,850
Bookkeeping, accounting, and auditing clerks	131,120
Computer Network and User Support Specialists	79,160
Nursing assistants	75,690
Medical assistants	72,640
Licensed practical and licensed vocational nurses	69,650
Automotive service technicians and mechanics	49,860
Hairdressers, hairstylists, and cosmetologists	30,730
Dental assistants	29,950
Heating, air conditioning, and refrigeration mechanics and installers	28,010
Paralegals and legal assistants	27,630
Preschool teachers, except special education	25,320
Firefighters	24,690
Telecommunications equipment installers and repairers, except line installers	17,120
Radiologic technologists and technicians	16,660
Aircraft mechanics and service technicians	15,860
Dental hygienists	13,230
Veterinary technologists and technicians	12,480
Architectural and civil drafters	12,200
Order clerks	11,830

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Top 20 occupations based on current employment. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Workforce Commission.

In our analysis, projected demand for newly minted public and private two-year schools' degree and/or certificate awardees is key. The TWC sums three sources of projected openings: employment growth, labor force exits, and job transfers.

Figure 3 plots the top 20 occupations requiring some college (less than a bachelor's degree) by net job openings as calculated by summing the TWC estimates of employment growth plus labor force exits. Table 2 looks at occupations by sheer size, while Table 3 looks at occupations by projected need for additional workers. Many of the same occupations that appear in Table 2 also appear in Table 3. Heavy and tractor-trailer truck drivers lead both lists. "Aircraft mechanics and service technicians" is one of the three occupations listed on Table 2 that do not appear in Table 3. "Respiratory therapists" is one of the three occupations listed on Table 3 that does not appear in Table 2.
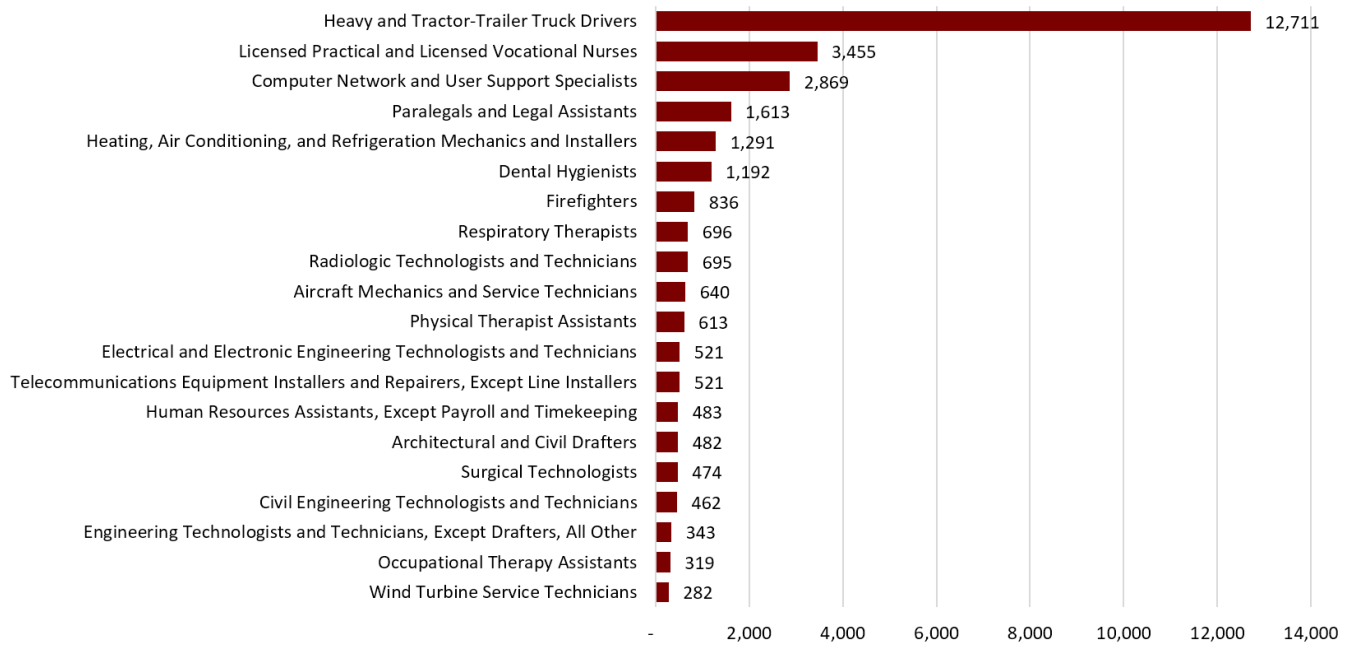
Figure 3. Top 20 Occupations Requiring Some College by Job Openings

Occupation	Job Openings
Heavy and tractor-trailer truck drivers	12,711
Bookkeeping, accounting, and auditing clerks	9,852
Nursing assistants	6,244
Medical assistants	4,372
Hairdressers, hairstylists, and cosmetologists	4,260
Licensed practical and licensed vocational nurses	3,455
Computer Network and User Support Specialists	2,869
Dental assistants	2,775
Preschool teachers, except special education	2,199
Automotive service technicians and mechanics	2,196
Paralegals and legal assistants	1,613
Massage therapists	1,353
Heating, air conditioning, and refrigeration mechanics and installers	1,291
Dental hygienists	1,192
Barbers	1,187
Order clerks	845
Firefighters	836
Respiratory therapists	696
Radiologic technologists and technicians	695
Veterinary technologists and technicians	667

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Top 20 occupations based on job openings. Job openings are defined as the summation of change in exits and change in growth. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Workforce Commission.

In Figure 4 we apply a starting wage filter to create a ranking of annual openings for only those occupations with relatively high wages. Our criteria for being classified as a high-wage occupation is for the starting wage to be above the mean wage in our sample of occupations. That is, we dropped all occupations listing a starting wage below the mean wage, and then ranked the remaining occupations. Figure 4 lists the top 20 highest demand occupations from our set of high-wage occupations. Here, the overlap with Figure 3 is much less. Fully 11 of the occupations listed in Figure 4 were not listed in Figure 3. Examples include "Wind Turbine Service Technicians," "Occupational Therapy Assistants," and "Civil Engineering Technologists and Technicians."

Figure 4. Top 20 High Wage Occupations by Job Openings

Occupation	Job Openings
Heavy and Tractor-Trailer Truck Drivers	12,711
Licensed Practical and Licensed Vocational Nurses	3,455
Computer Network and User Support Specialists	2,869
Paralegals and Legal Assistants	1,613
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,291
Dental Hygienists	1,192
Firefighters	836
Respiratory Therapists	696
Radiologic Technologists and Technicians	695
Aircraft Mechanics and Service Technicians	640
Physical Therapist Assistants	613
Electrical and Electronic Engineering Technologists and Technicians	521
Telecommunications Equipment Installers and Repairers, Except Line Installers	521
Human Resources Assistants, Except Payroll and Timekeeping	483
Architectural and Civil Drafters	482
Surgical Technologists	474
Civil Engineering Technologists and Technicians	462
Engineering Technologists and Technicians, Except Drafters, All Other	343
Occupational Therapy Assistants	319
Wind Turbine Service Technicians	282

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. High wage occupations are defined as occupations for which the wage is above the average wage. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Sources: Texas Workforce Commission, Texas Higher Education Coordinating Board.

Supply
Degrees, Certificates, and Awards

Two of the central missions of community colleges are to supply introductory college-level courses to students who are planning to transfer to a four-year college or university and to provide more applied occupational training aimed at equipping enrollees with the skills necessary for jobs in the local labor market. The applied training mission includes a workforce development component, which involves more specific training designed to match the particular needs of one or more local employers.

In this report, we focus upon the applied occupational preparation role of Texas community colleges. The primary measures of community college supply will be the number of applied science/technical associate degrees awarded, the number of certificates awarded, and the number of occupational skills awards received. These measures are intended to capture the direct effect of community colleges on the flow of occupational knowledge and skills of new workers to the Texas labor force. These measures do not attempt to capture the indirect or complementary effect of community colleges on the flow of bachelor's degrees from students who complete an academic associate degree at a community college as part of their bachelor's degree program path.

The balance between the transfer of educational mission and the applied occupational mission exhibited by Texas public community colleges is seen in Table 1. In 2021, the mission split was nearly down the middle. Community colleges in Texas awarded 129,597 degrees, certificates, and skills awards, and academic associate degrees were 52% of those completion awards. Among the technical award types, the majority (56%) were Certificates, while Technical Associate Awards represented 34% and Occupational Skill Awards made up 9%.

Table 1. All Degrees and Certificates Awarded
Community Colleges, Technical Colleges, and Two-Year Career Institutions

Community Colleges	2019	2020	2021	Average 2019-2021
Associate-Academic	65,059	67,633	67,330	66,674
Associate-Technical	21,103	20,687	21,355	21,048
Certificate	39,088	35,015	35,082	36,395
Enhanced Skills Certificate	184	117	74	125
Occupational Skill Award	5,919	5,773	5,756	5,816
Total	**131,353**	**129,225**	**129,597**	**130,058**
Technical Colleges				
Associate-Academic	342	454	524	440
Associate-Technical	2,618	2,595	2,339	2,517
Certificate	1,991	1,520	1,783	1,765
Enhanced Skills Certificate	1			1
Occupational Skill Award	41	82	177	100
Total	**4,993**	**4,651**	**4,823**	**4,823**
Two-year Career Institutions				
Associate-Technical*	4,256	4,168	4,453	4,292
Certificate	10,811	10,439	11,092	10,781
Total	**15,067**	**14,607**	**15,545**	**15,073**
Combined				
Associate-Academic	65,401	72,255	72,307	69,988
Associate-Technical	27,977	27,450	28,147	27,858
Certificate	51,890	46,974	47,957	48,940
Enhanced Skills Certificate	185	117	74	125
Occupational Skill Award	5,960	5,855	5,933	5,916
Total	**151,413**	**152,651**	**154,418**	**152,827**

It is important to consider the market setting when analyzing the supply behavior of community colleges. Table 1 also provides information on the two-year college market in Texas within which public community colleges operate. The state two-year colleges (Lamar Colleges and State Technical Colleges) are also public institutions. Those colleges awarded 3% of the total two-year college completion awards for 2021. Private two-year career academic institutions contributed 10% of the total 2021 two-institution awards.[4] Public community colleges are the clear two-year schools market leader, but the competitive fringe is not trivial in size.

Occupational skills enhancement opportunities are also supplied by private non-academic firms. There are many of these specialized skill providers, including private trucking schools, private schools that train medical assistants, and private cosmetology schools. There are also employer-operated training programs, such as in trucking. Data from these many specialized providers are generally not available,

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[4] A list of the private two-year schools included in our study is given in Appendix B.

but for certain occupations, these specialized training and skill providers make up the majority of the supply of skilled workers (e.g. trucking). Community colleges compete with these private firms to attract individuals who are looking to increase their set of occupational skills.

Matching Degree Programs to Occupations

Each degree/certificate/award has an associated CIP code in the THECB's public and private two-year college degrees and certificates awarded file. We utilize the BLS CIP-SOC crosswalk to map from the educational credential earned to the matched occupation(s). This crosswalk works best when there is a clear link between the degree or certificate program and the occupation served by that program. For example, there is a clear link between degrees and certificates in nursing and the occupation "Licensed Practical and Licensed Vocational Nurses." This occupation requires certifications of some type, and community colleges and their competitors provide those certifications. There are, however, occupations for which the match of CIPs to SOCs is less precise, and the lack of precision can be in either direction, CIP to SOC or SOC to CIP. Each CIP can be matched to multiple SOCs, and each SOC has an associated entry level education requirement. Thus, for a given CIP, the education levels for the matched SOCs may be all above, all below, all equal, or any combination of above, equal or below, our three selected education levels. We restrict our degree counts to those SOC matches that include at least one entry education category among our selected levels.

For our restricted set of matched SOCs, the supply of degrees and awards from public and private two-year colleges to those occupations is given in Table 2. The application of our minimum required education filter reduced the supply of newly credentialed degree and/or certificate awardees by almost 70%, e.g., from 154,418 to 47,515, in 2021. As a reminder, the largest reduction comes from the Associate - Academic degrees. There were 72,307 in 2021, of which we matched 4,679 to the SOCs we examined.

Table 2. Degrees and Certificates Awarded
Restricted to matching Standard Occupation Codes in the Texas Workforce
Commission Projections*

Community Colleges	2019	2020	2021	Average 2019-2021
Associate-Academic	4,158	4,583	4,631	4,457
Associate-Technical	8,813	8,486	8,944	8,748
Certificate	18,868	16,616	16,808	17,431
Enhanced Skills Certificate	115	70	29	71
Occupational Skill Award	3,845	3,548	3,696	3,696
Total matched	**35,799**	**33,303**	**34,108**	**34,403**
% of Total	**27.25%**	**25.77%**	**26.32%**	**26.45%**
Technical Colleges				
Associate-Academic	48	56	48	51
Associate-Technical	1,718	1,678	1,517	1,638
Certificate	1,035	661	790	829
Enhanced Skills Certificate	1			1
Occupational Skill Award	6	4	106	39
Total matched	**2,808**	**2,399**	**2,461**	**2,557**
% of Total	**56.24%**	**51.58%**	**51.03%**	**53.01%**
Two-year Career Institutions				
Associate-Technical*	2,257	2,177	2,482	2,305
Certificate	8,095	8,011	8,464	8,190
Total matched	**10,352**	**10,188**	**10,946**	**10,495**
% of Total	**68.71%**	**69.75%**	**70.41%**	**69.63%**
Combined				
Associate-Academic	4,206	4,639	4,679	4,508
Associate-Technical	12,788	12,341	12,943	12,691
Certificate	27,998	25,288	26,062	26,449
Enhanced Skills Certificate	116	70	29	72
Occupational Skill Award	3,851	3,552	3,802	3,735
Total matched	**48,959**	**45,890**	**47,515**	**47,455**
% of Total	**32.33%**	**30.06%**	**30.77%**	**31.05%**

* Standard Occupation Codes limited to those with typical entry level education of Associate, Post-secondary, nondegree award, and Some college, no degree.

We can illustrate the sample attrition in community college degree and/or certificate awardees by degree type due to our post-secondary education entry requirement filter in Figure 5. The largest attrition is among Academic Associate degrees, which declined by 93.1%. This is driven by the fact that over 85% of the Academic Associate community college degrees were matched to SOCs that had entry levels of education that were all above the education levels that we consider to be associated with community college degree and/or certificate awardees. This is not surprising, since the Academic Associate Degrees are designed to prepare participants to earn a bachelor's degree (after transferring to

a four-year institution) in the relevant program area, and the CIP-SOC mapping assigns final occupation SOCs that have an associated minimum education entry requirement of a bachelor's degree.

It is of course an important undertaking for community colleges to prepare students for this educational path, but these occupations are not the focus of the present study.

Still, it is not just the Academic Associate Degrees that cause attrition in our sample. There is significant attrition for all applied/technical degrees, certificates, and occupational skill awards as well. Certificate degrees were more likely to be matched to SOCs with the selected levels of education than were technical associate degrees. In 2021, 47.9% of the community college certificate degrees by CIP were matched to at least one SOC that had an entry level of education equal to at least one of our post-secondary required levels, while 41.9% of the community college technical associate degrees were matched.

Figure 5. Comparison of Distribution of Average Degrees Awarded, 2019-2021
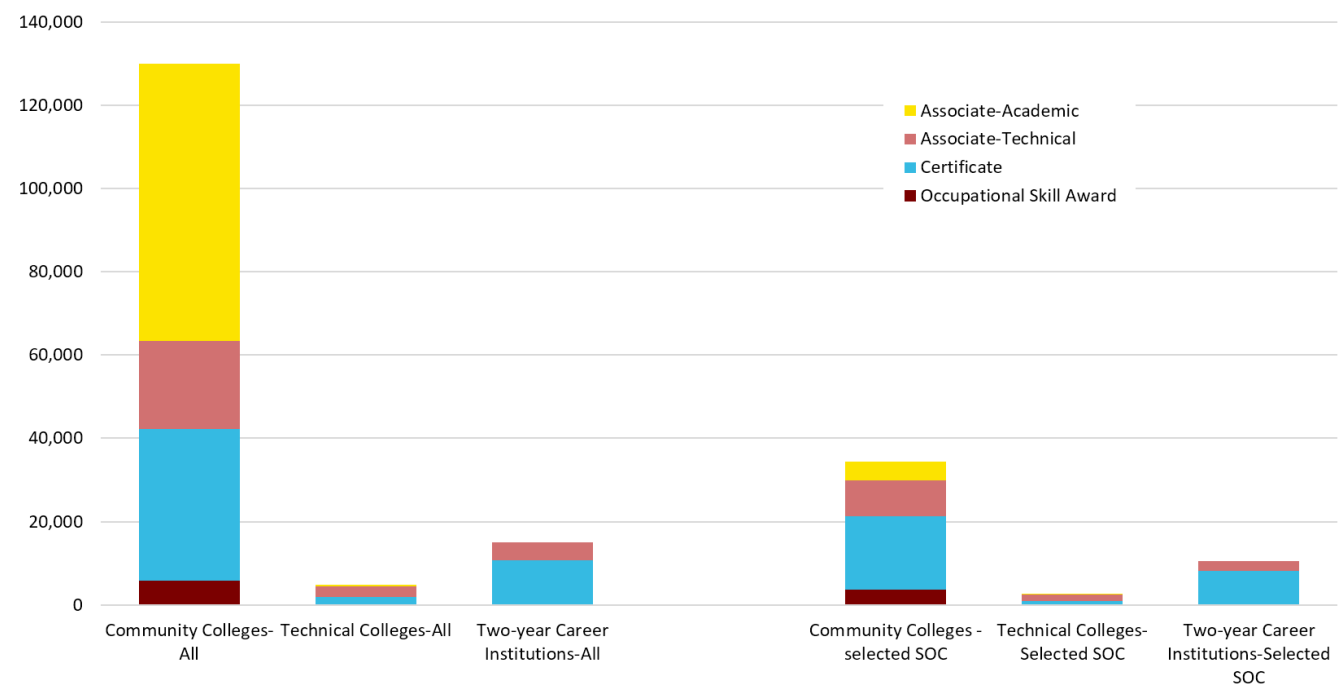
Left: Distribution of degrees awarded using full sample. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission. Right: Distribution of degrees awarded using restricted sample of 89 occupations. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

For the set of CIPs with multiple qualifying SOC matches, there is a possible over-counting issue. A CIP degree and/or certificate awardee from this set can potentially fill a position in multiple SOCs, but in actuality, that awardee will only actually fill one job (ignoring the possibility of multiple concurrent employment).[5] Among our set of matched CIPS, there are multiple matching SOCS in 45% (number and/or percent) of the cases. Assigning the supply from public and private two-year colleges to occupations without double or triple-counting the degree and/or certificates requires an allocation rule.

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[5] The TWC website currently assigns a particular CIP awardee to ALL of the potential SOC matches, thereby providing an over-counting of the available supply.

To mitigate this overcounting issue, we allocate the degree and/or certificates in a given CIP to the multiple matching occupations in proportion to the occupation's share of net job openings (by CIP). We illustrate the counting issue and our allocation rule approach in Table 3 below.

Table 3. Two Alternative Allocations of the 3,280 Awardees with CIP 470604, Automobile/Automotive Mechanics Technology/Technician to the Two Matching SOCs

Matching SOCs	Net Openings	Percent of Net Openings	Study's Allocation	TWC Allocation
Electrical and Electronics Installers and Repairers, Transportation and Equipment	26	1.17%	38	3,280
Automotive Service Technicians and Mechanics	2,196	98.82%	3,241	3,280
Total	**2,222**		**3,280**	**6,560**

The 3,280 public and private two-year college degree and/or certificate awardees in 2019 with CIP 470604, Automobile/Automotive Mechanics Technology/Technician, match to two SOCs that meet our post-secondary degree entry requirements filter. Our supply allocation rule assigns the 3,280 awardees across the two SOCs in proportion to the relative share of projected net position openings. The lion's share of the openings (98.82%) are in SOC 493023, Automotive Service Technicians and Mechanics, and we allocate the lion's share of the awardees (3,196) as suppliers to that occupation. The TWC supply analysis approach allocates the 3,280 awardees fully to each of the two matching SOCs, which represents a double-counting of the actual supply.

GAP ANALYSIS

The Texas Workforce Commission defines the employment gap as the difference between projected annual demand and realized annual supply by occupation type. The central focus of this study is to assess the role that community colleges are playing in filling this employment gap. For reasons stated above, we define projected annual demand as projected net demand which includes projected openings from growth and replacement of exits (i.e. we do not include transfers between occupations). We define annual supply as the number of degrees that we can assign to an occupation in our sample. The assignment mechanism is the matching and apportioning process described above. In order to account for the presence of other two-year institution suppliers to these markets, we include in this gap analysis the relevant assigned degrees from state technical colleges and from private career colleges located in Texas.

We have observations on projected net demand and realized community college (plus other two-year institution supply) for the three-year period 2019-21. We calculate the average annual supply to each of our 89 sample occupations over 2019-21, and then generate a gap measure as the difference between the WFC's projected annual net demand and our constructed measure of average annual supply.

As we have noted at several junctures, the matching of position openings (demand) by occupation with a corresponding measure of community college (and other two-year institutions) degree and/or certificate awardee position fillers (supply) is a delicate matter that requires a number of assumptions

and judgment calls. A direct comparison of demand and supply by occupation using our measures must be approached with care and caution.

A second consideration in a gap analysis is norming the size of the gap. Even if the demand and supply numbers were precisely measured, evaluating the closeness of the match by the absolute difference between the quantities supplied and demanded could be somewhat misleading. A gap of 100 for an occupation with demand of 2000 positions might well be considered a closer match than a gap of 100 for an occupation with demand of 200 positions. In our approach to assessing the gap-filling role of community colleges, we will classify matches by the relative gaps, i.e. the gap relative to the demand.

In what follows we provide our method for providing appropriately nuanced evidence on the quality of the skill match between community college degree/award recipients and employers. We assess the match quality in a broad way. Specifically, we first rank the relative skills gaps by occupation, and then divide the occupations into three groups. One group is where supply is well-aligned with openings. A second group is where supply is well below openings, and a third group is where supply is well above openings. A crucial consideration is our operational definition of "well-aligned." We use a 50% threshold to classify our gaps. A well-aligned gap for our purpose is a gap that is less in absolute value than 50% of the number of annual projected job openings for that occupation. Correspondingly, the 'well below' occupations are those occupations in which the gap is greater than 50% of the demand count, and the 'well-above' occupations have a gap that is smaller (numerically) than 50% of the demand count.
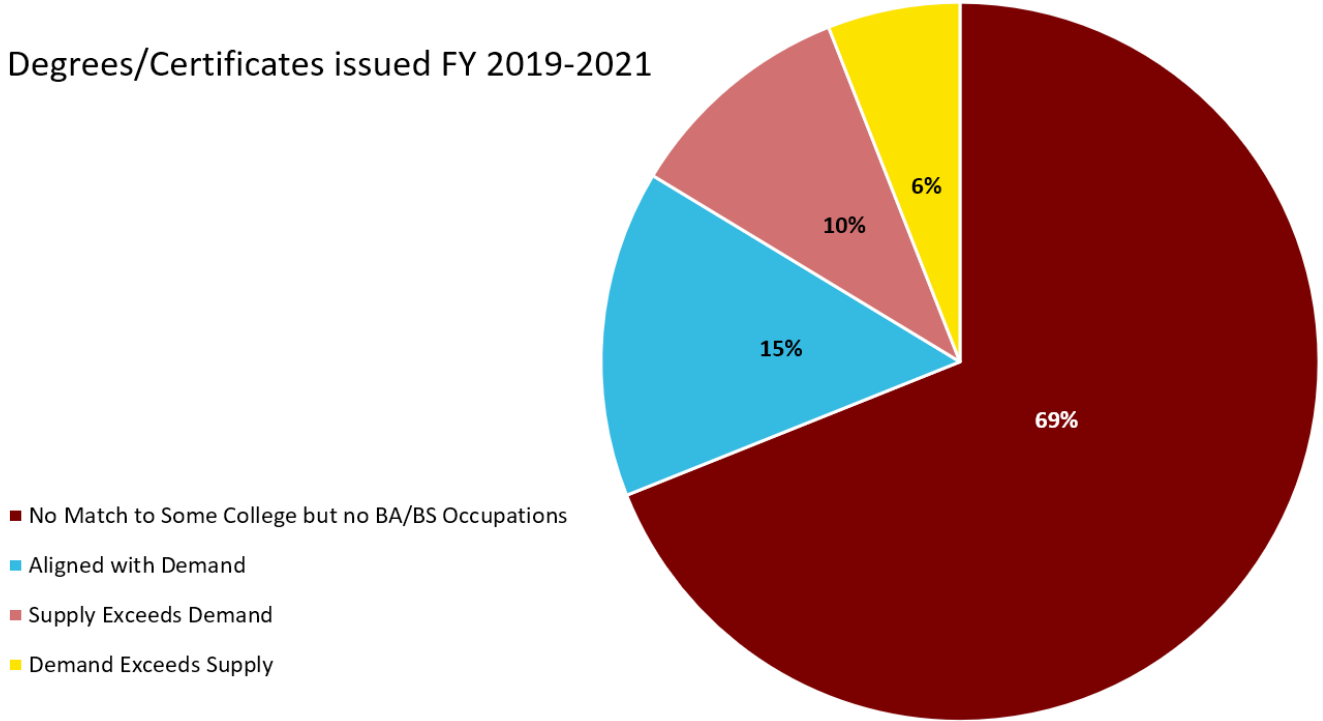
RESULTS

We provide a broad look at the relative role of community and other two-year colleges in meeting projected workforce demand in Figures 6 and 7 . Figure 6 summarizes the matching issue that was discussed with respect to Tables 1 and 2 above. In Figure 6, we see that for 69% of degrees and certificates, we fail to match our target list of SOCs. We match 31%, and consider 15% well-matched between supply and demand, 10% where supply exceeds demand, and 6% where demand exceeds supply.

Figure 7 looks just at our matches. For our sample of 89 community-college relevant occupations, the supply of degree and/or certificate awardees from Texas community and other two-year colleges are classified as well-aligned with the projected net position needs of Texas employers in nearly half (47%) of the cases. The occupations for which supply far (proportionally) outstrips demand comprise 33% of gap situations, leaving 19% of the occupations with relatively large positive gaps between demand and supply.

Figure 6. How Well Do Public and Private Two-year College Degree and/or Certificate Awardees Fill Projected Workforce Gaps?

Degrees/Certificates issued FY 2019-2021

- No Match to Some College but no BA/BS Occupations
- Aligned with Demand
- Supply Exceeds Demand
- Demand Exceeds Supply

Figure 7. 89 Matched SOCs. How Well Do Public and Private Two-year College Degree and/or Certificate Awardees Fill Projected Workforce Gaps?

Degrees/Certificates issued FY 2019-2021

- Aligned with Demand
- Supply Exceeds Demand
- Demand Exceeds Supply
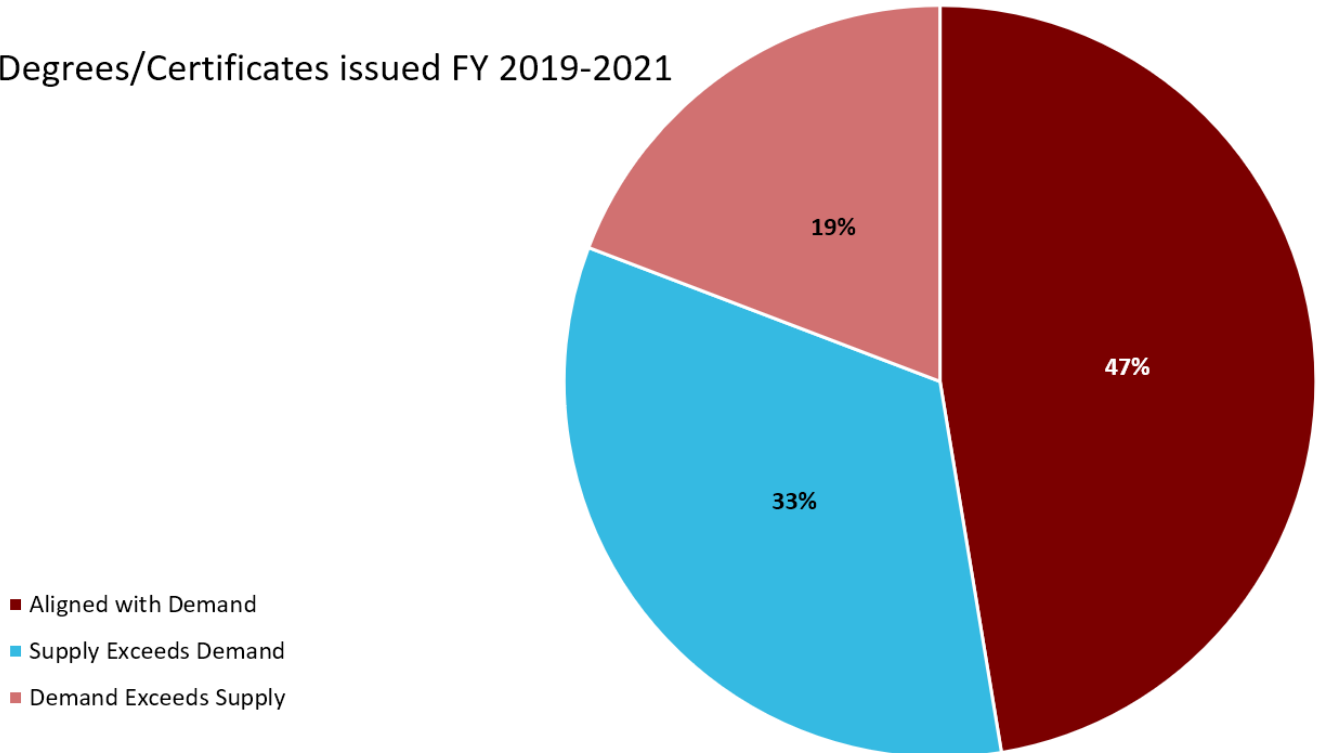
Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figure 8 provides a list of ten occupations for which supply is closely aligned with projected job openings. It is clear that many of these are in professions that require certifications specific to the occupation, such as various occupations in the medical field, but also fields such as "Computer Network and User Support Specialists," "Firefighters," and both "Aircraft Mechanics and Service Technicians" and "Automotive Service Technicians and Mechanics."

Interestingly, in a few professions, the contribution to supply of career schools, an alternative to community colleges, is large. For "Medical Assistants," the vast majority of supply is provided by career school degree and/or certificate awardees. Career school awardees also comprise a large share of awardees matched to "Licensed Practical and Licensed Vocational Nurses" and "Automotive Service Technicians and Mechanics," although community colleges still provide the greater numbers of awardees in these two occupations.

Figure 8. Occupations in Which Supply is Closely Aligned with Openings
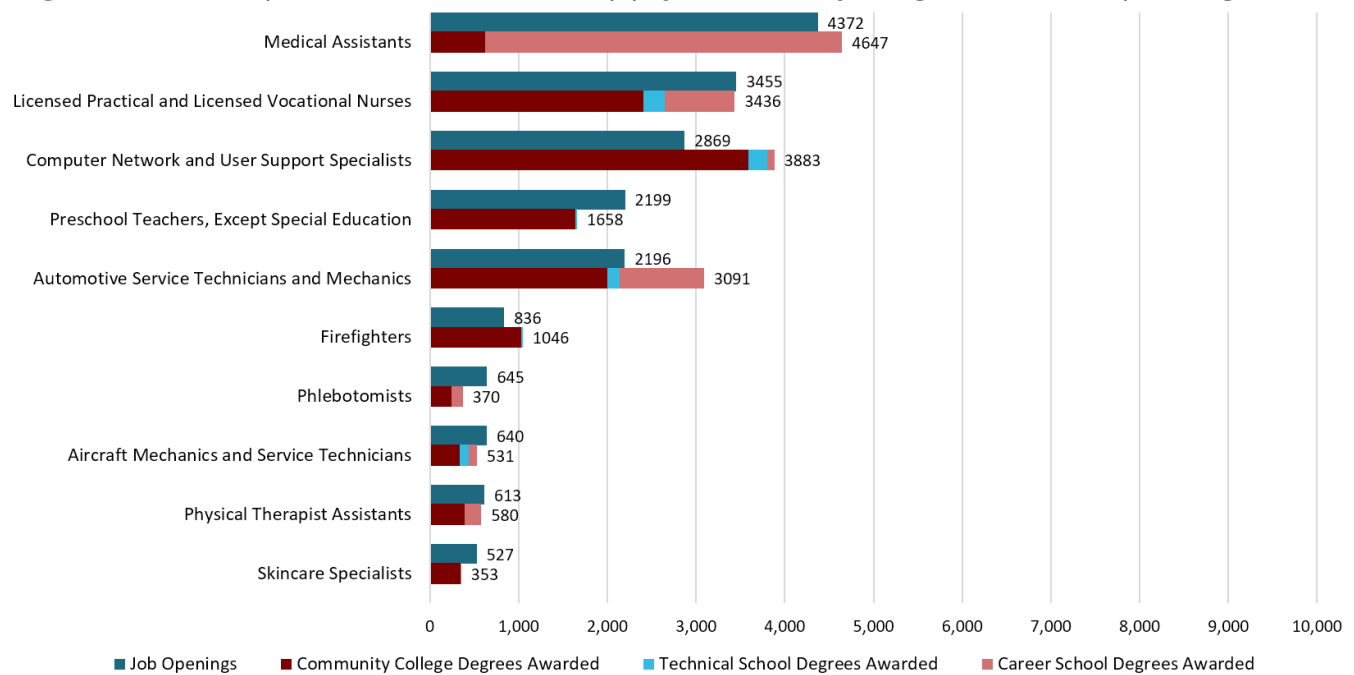
Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021.Occupations in which average annual degrees and certificates awarded are within +/- 50% of the number of job openings. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figure 9 lists occupations for which supply is well below projected job openings. Number one on this list is "Heavy and Tractor-Trailer Truck Drivers." However, this is definitely not a case where the small contribution of community colleges signifies a huge unmet demand. There may well be an unmet demand, but it is much smaller than what might be expected when looking at Figure 9 because those interested in this occupation can pick up the necessary skills in a variety of unmeasured ways. Many third party, specialized training programs exist for truck drivers. The Texas Department of Public Safety lists 279 for-profit schools in 44 Texas counties that provide training services and administer the Commercial Driving License drive test required for licensure. In addition, many trucking companies and firms make available on-the-job training for potential truck drivers, usually in exchange for a

period of work for the company at a special entry-level wage. There are similar stories for other occupations as well, including massage and cosmetology.

One large group of specialized schools serve various medical specialties, from Dental Assistants to Dental Hygienists to Medical Assistants. Schools such as College Station Dental Assistant School (part of the Zollege interstate network of dental assistant schools) provide specialized dental assistant training and certification. These schools are not part of the THECB's list of career schools.

Nursing assistants are also prominent in the list in Figure 9. Again, nursing assistant certification is available from many providers, including the Red Cross.

The conclusion is that while supply from community and technical colleges and career schools are far below projected openings for these occupations, this is not necessarily indicative of an undersupply of skilled workers in these occupations from a market perspective. It very likely indicates that there are a large number of alternative non-college suppliers that are providing these skills in large numbers that are not captured by the THECB or the TWC.

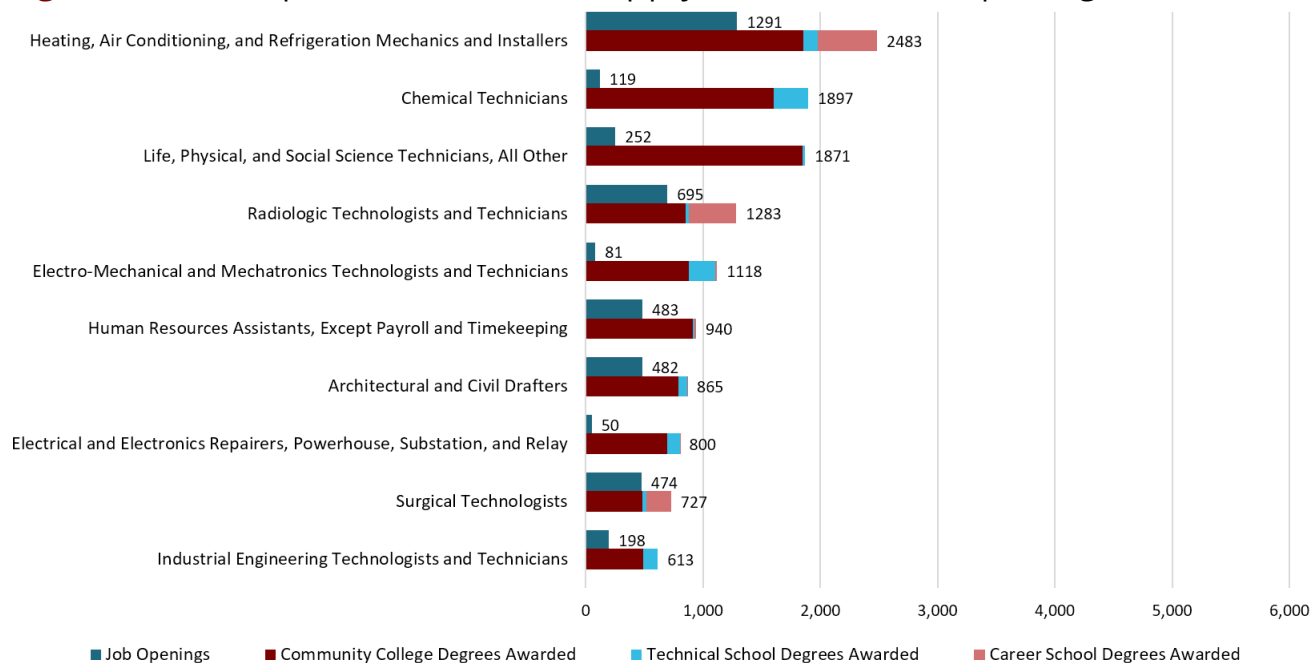**Figure 9.** Occupations in Which Supply is Well Below Openings
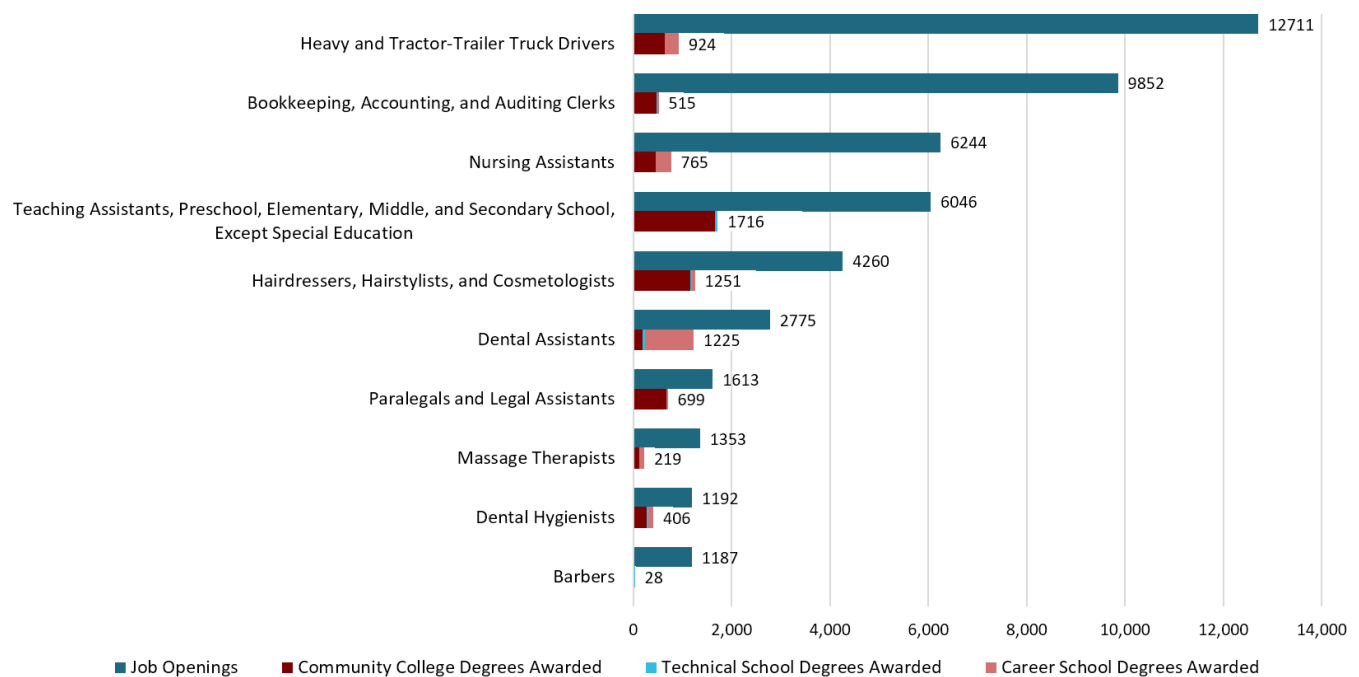
Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021. Occupations in which average annual degrees and certificates awarded is more than 50% below the number of job openings. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Finally, Figure 10 provides a list of the occupations with the ten highest openings for which the supply of skilled workers exceeds the projected openings. While the magnitude of the openings, and hence the absolute magnitude of the gaps, is much lower than in Figure 8, the explanations are not so clear. There is a large difference between the projected openings in "Heating, Air Conditioning, and Refrigeration Mechanics and Installers" and the supply generated by community and technical colleges and career schools. It is interesting, however, that all but two of the occupations in the list in Figure 10 are also occupations that we would classify as 'high wage,' meaning that they provide an entry level wage that

is above the average of the 89 occupations we study. The two exceptions are "Life, Physical, and Social Science Technicians, All Other" and "Chemical Technicians." One explanation for the possible oversupply is potential workers seeking skills to enter occupations with above-average entry level wages.

Figure 10. Occupations in Which Supply is Well Above Openings

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021. Occupations in which average annual degrees and certificates awarded is more than 50% above the number of job openings. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

We also look at the gap situation among the high wage and high demand occupations in our sample. For the 20 highest demand growth occupations within the set of high wage occupations in our sample, we show the relevant demand-supply gap information in Figure 11. These 20 occupations would be considered strong potential targets of opportunity for community college students.

Under our gap measure, the two-year college supply well-matches with demand for 40% of the top 20 high demand/high wage occupations. The two-year college supply is well-under demand for 30% of occupations and is well-over demand for 30% of occupations. If we were to limit supply to community college degree and/or certificate awardees only, the matching categorizations would remain the same for 16 of the occupations. The four changes would be for Heating, Air Conditioning, and Refrigeration Mechanics and Installers; Radiologic Technologists and Technicians; Surgical Technicians; and Engineering Technologists, Except Drafter, All Other. The community college only supply is well-matched with demand for those four occupations, and community college supply thus matches demand for 60% of the top 20 high demand/high wage occupations.

The 50% threshold for assessing gap size is an arbitrary threshold. We explore the sensitivity of the gap analysis findings to the choice of threshold by choosing a tighter measure of "closeness" by adopting a 25% threshold. Under the tighter gap standard, the two-year college well-matched set falls from size 8 to 6, with 2 occupations moving to well-over status. If we were again to consider the community

college supply only, the number of well-matched occupations decreases from 12 to 8, with the HVAC occupational category moving to the well-over category and the Licensed Nurses; the Electrical and Electronic Engineering Technologists and Technicians; and the Physical Therapist Assistants moving to the well-under category.

Figure 11. Top 20 High Wage Occupations by Job Openings
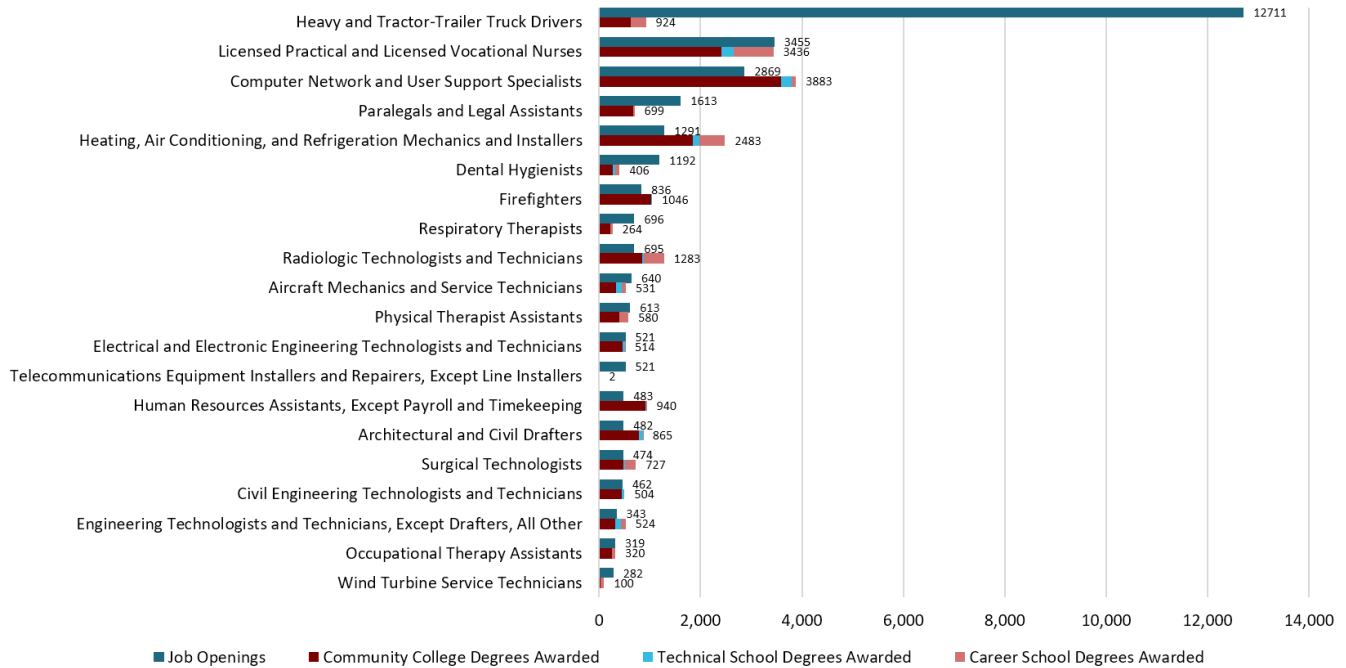
Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021.High wage occupations are defined as occupations for which the wage is above the average wage. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

REGIONAL LEVEL ANALYSIS

In addition to a state-level look at the role of community colleges as suppliers of workers, it is valuable to examine a disaggregated regional analysis of employment demand and community college supply. The local geographic focus of community colleges suggests that their performance should also be assessed by their success in meeting the educational needs of the students and employers in their local service area. As conditions change on either the student side or the employer side of the local labor market, employers, students and local government want the local community college to respond to the student demand for specific training and/or employer demand for specific skills by making adjustments to program offerings. Those adjustments could take the form of structural changes to existing programs, expansions of existing programs, or the introduction of new programs. The linkage between community colleges and their service areas is also reflected in the local property tax funding provided to community colleges.

A local labor market assessment focus is supported by findings from a 2018 national study of college alumni migration patterns produced by Emsi Burning Glass. The study used the Emsi database of over 100 million resumes and social profiles to compile data on the average distance higher education degree and/or certificate awardees live from their alma mater. For community colleges, 61% live within 50 miles of the college and 90% live within 100 miles of the college.

We will use the 10 higher education planning regions established by the THECB as the geographic unit of analysis. Since community college policy proposals and decisions are reviewed at the education planning region level, this is a relevant unit of study. From a labor market perspective, we are adopting the education planning regions as our effective definition of the relevant local/regional labor market for community colleges.

Conceptually, the choice of labor market definition represents a balancing of two major concerns. The potential of significant, and often hard-to-account-for cross-labor market migration and commuting is an argument for using larger labor market area definitions. The potential for falsely assuming perfect worker mobility within each labor market is an argument for defining small labor market areas. In our case, the conceptual balancing act is also influenced by data considerations. The labor force demand data are available for 28 official Workforce Development Areas (WDAs), each of which contains one or more whole counties. The 28 WDAs are aggregated cleanly (with respect to county borders) into the 10 regions defined by the THECB, so the generation of projected demand by the THECB regions is straightforward. The supply of new community college degree and/or certificate awardees is available by individual community college, and each of the community college districts in Texas has been assigned a Community College District Service Area (CCDSA). Districts are charged with the responsibility of meeting the educational and vocational needs of students and employers in their service areas. A case could be made for considering the 50 CCDSAs as the relevant market areas. However, this would require a methodology for allocating the 28 WDA workforce demand projections to the 50 CCDSAs. There are many overlapping WDA/CCDSA boundaries, and no obvious way to apportion the demand in the overlapping areas.

A decision to use the 10 THECB regions as the geographic unit of analysis flips the spatial allocation problem to the supply side. The supply of new technical associate and certificate degree holders from each of the 50 community college districts have to be apportioned across the 10 THECB regions. For 34 of the community college districts, their CCDSA lies completely within the boundaries of a single THECB. For the other 16 community college districts, their service area overlaps with more than one of the THECB regions, and an apportionment decision has to be made. The Texas Workforce Commission has assigned each of the 50 public community college districts to one of the 28 WDAs, and we use their assignment mechanism to generate data on the supply of new applied science associate degree, certificate and occupational award recipients for each THECB region.

There are a few other conceptual and implementation issues to consider. First, as described above, we have allocated degrees and certificates by CIP to match SOC in proportion to the job openings in the SOCs. This allocation has been performed at the state level. Re-allocating degrees at the regional level would result in differing allocations for each region that would not add to the state count and would implicitly assume zero mobility between regions. Second, the TWC's regional projections of employment growth and job openings by CIP do not necessarily add up to the statewide projections due to data suppression and independent regional employment projections by industry. As an example, the statewide projection of annual openings due to employment growth and exits for Wind Turbine Service Technicians, SOC 49-9081, is 282, but the sum of the regional projections is 40. The regional counts for some industry projections are suppressed to avoid identifying a large single employer in an industry and this suppression results in suppressed counts for the occupations in that industry.

For the following regional estimates, we allocate the statewide projected openings by SOC to the ten regions if the statewide projection of job openings (growth and exists) is within +/- 10% of the sum of the regional projections. The regional share of the total regional projections are then used to allocate the statewide openings. On the supply-side, the statewide supply of degrees and certificates are allocated to regions based on the regional supply for 2019 to 2020.[6]

Figure 12 depicts the ten higher education regions in Texas. The largest population centers are in the Metroplex region, which includes the Dallas-Fort Worth-Arlington metropolitan area, the Gulf-Coast region, which includes the Houston-The Woodlands-Sugar Land metropolitan area, the Central region, which includes Austin-Round Rock, and the South Texas region, which includes the San Antonio-New Braunfels metropolitan area as well as the metropolitan areas in the Rio Grande Valley.

Figure 12. Higher Education Regions
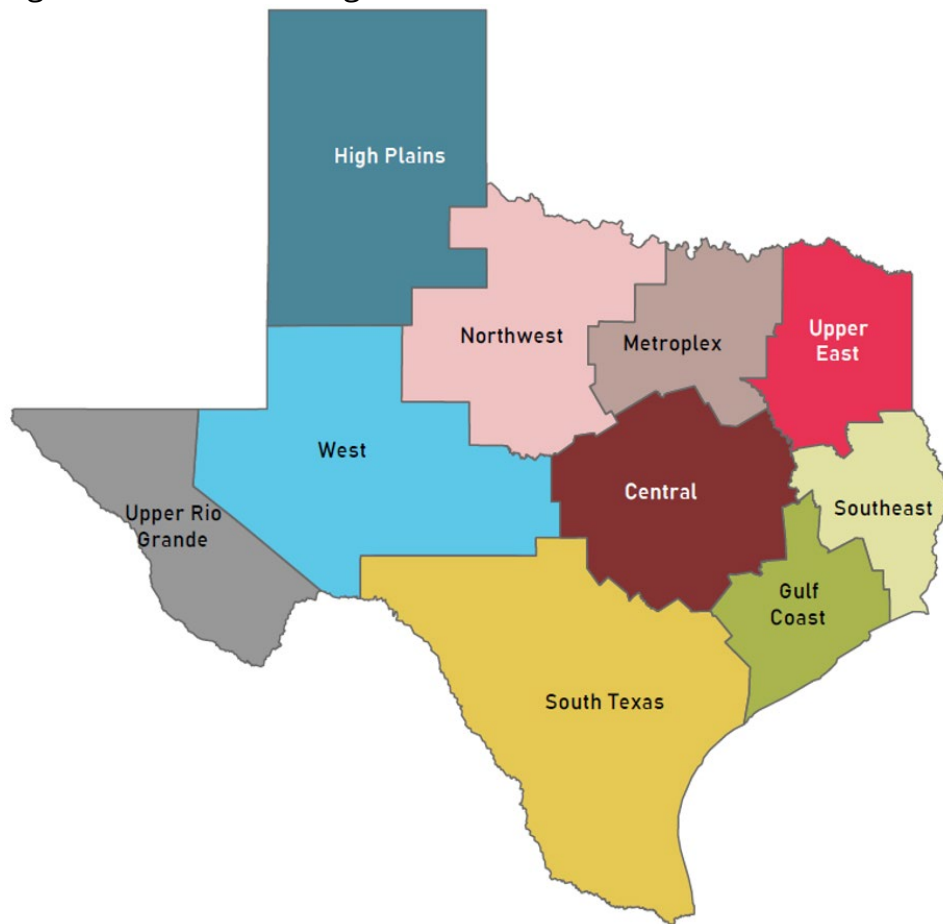
Source: Texas Higher Education Coordinating Board.

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[6] In 2021 the Dallas Community College District and San Jacinto Community College began reporting at the district level rather than at the individual college level. The data available on the THECB Accountability website at the district level presents unduplicated counts of degrees and certificates by CIP, while the statewide and campus level data is for all degrees and certificates awarded. The latter counts of statewide degrees and certificates awarded are the data used throughout the present study. Given that the campus-level data is limited to the years 2019 and 2021, those years are used here to allocate the statewide averages for 2019-2021.

Figures 13-16 follow the same order as Figures 8-11, allocating the job openings, or demand, and the degrees, or supply, to the ten regions. The SOCs depicted in each figure are limited to the five largest SOCs in those figures for which the statewide projection of job openings (growth and exists) is within +/- 10% of the sum of the regional projections.

Figure 13 depicts the regional composition of supply and demand for the occupations in which supply is closely aligned with job openings. From this figure, we see how the four largest regions dominate the supply and demand for these SOCs.

For each occupation, the Metroplex had the highest numbers of job openings followed by the Gulf Coast region. South Texas had the third largest openings for Medical Assistants, Licensed Practical and Vocational Nurses, and Automotive Service Technicians and Mechanics. Central Texas had the third highest openings for Computer Network and User Support Specialists and for Preschool Teachers.

The ordering of the supply by region for each occupation is more varied. The regions with the three highest counts of degrees that supply the Medical Assistant occupation are the Gulf Coast, the Metroplex and the Upper Rio Grande, respectively. Recall from Figure 8 that the majority of the degrees that match this occupation are granted by two-year private institutions. The South Texas region produces the highest number of degrees in CIPs that supply the Licensed Practical and Vocational Nurses followed by the Metroplex and the Upper East region. The Metroplex region, followed by the Central region, produces the most degrees that feed the Computer Network and Support Specialist occupation. The Gulf Coast region leads in the supply of degrees that lead to employment of Preschool Teachers. The Metroplex region, followed by the South Texas and the Gulf Coast region produce the highest numbers of degrees matched to Automotive Service Technicians and Mechanics; however, the Metroplex supply is more than the other two regions combined.

While at the statewide level, supply is closely aligned with openings for these occupations, the same is not necessarily true at the regional level. This can be seen by comparing the relative size of degrees and certificates and openings by regions within the occupations. For example, the Upper Rio Grande region's supply of Medical Assistants degrees was more than nine times the number of projected openings in that region. The mismatch within regions is also evident for the supply of Computer Network and User Support Specialists from the Central Texas Region which is almost double that region's job openings. With the mobility of graduates, some of the regional mismatches are ameliorated.
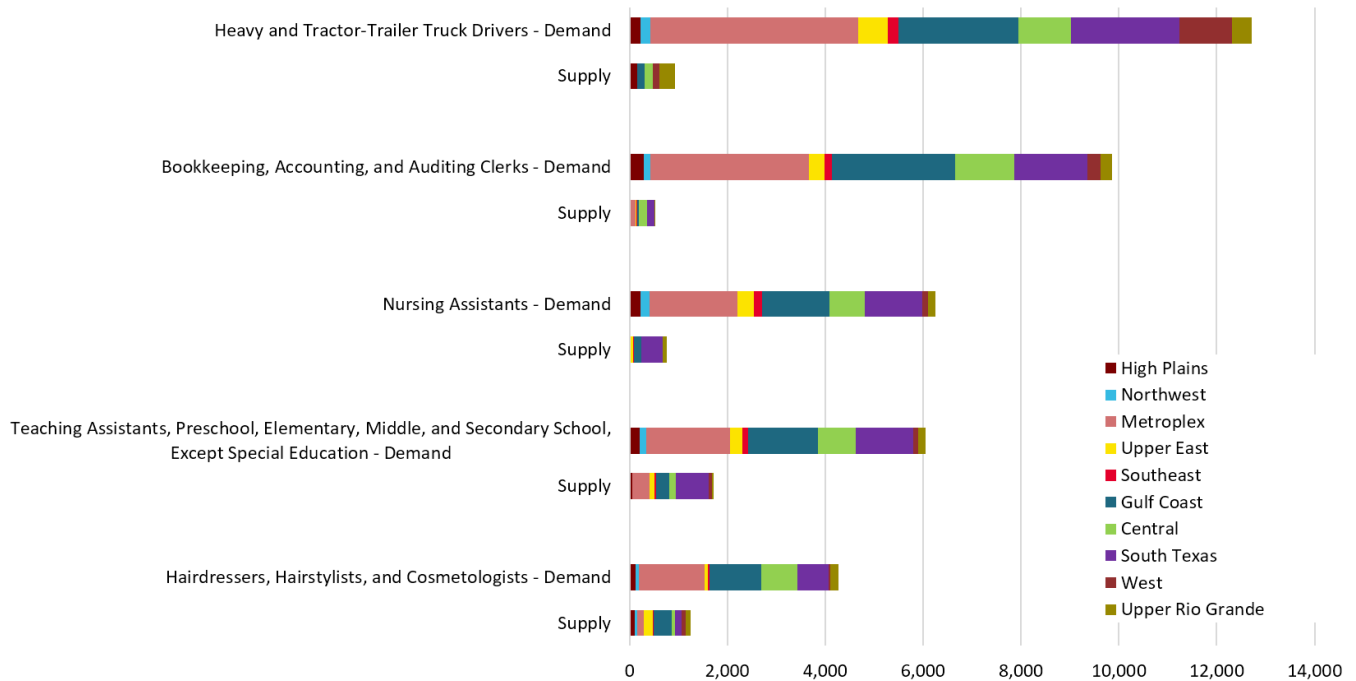
Figure 13. Occupations in which Supply is Closely Aligned with Openings by Region
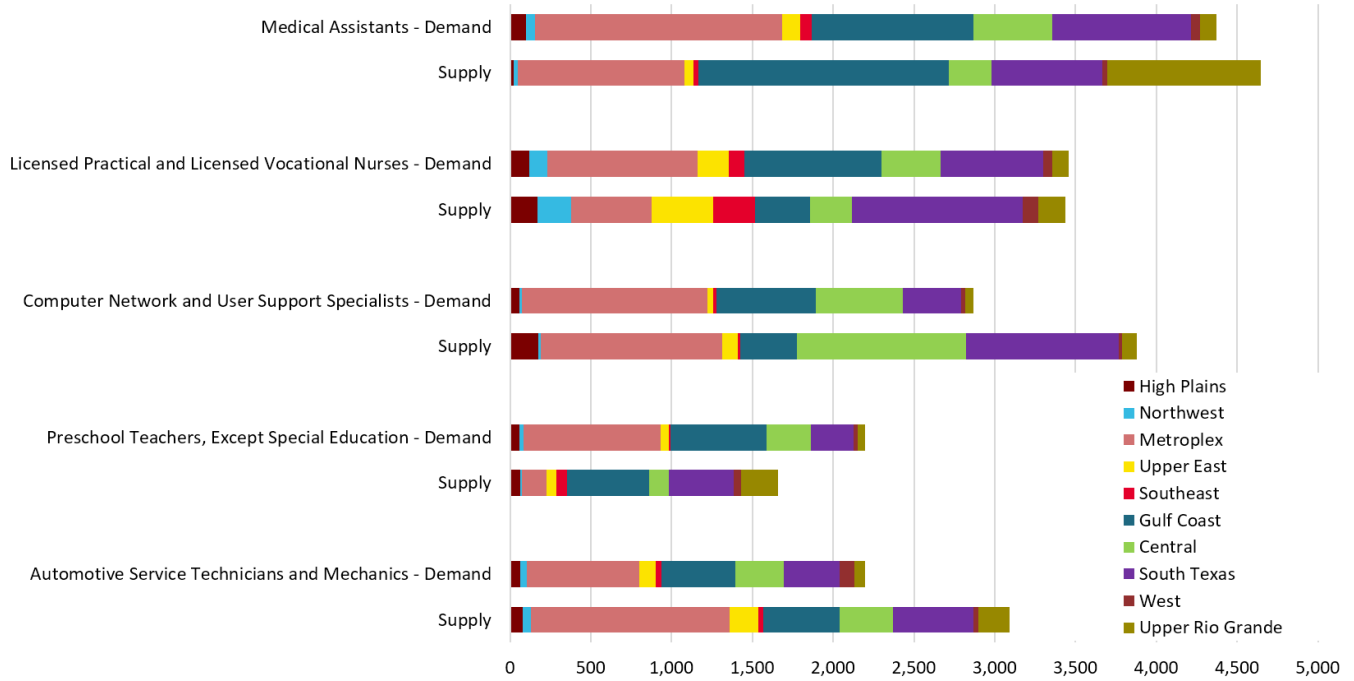
Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree matched to the Texas Workforce Commission data. Supply reflects average degrees and certificates awarded 2019 to 2021 allocated to the 10 Higher Education Coordinating Board's planning regions. Demand reflects job openings allocated to the regions based on regional shares of demand. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figure 14 presents the regional composition of demand and supply for the five largest occupations in terms of demand in which supply is well below demand. As mentioned in our discussion of Figure 9, there are other specialized providers of training for most of the occupations in this category. In this figure we again see that the Metroplex, the Gulf Coast, and South Texas exhibit the highest number of job openings. The Metroplex accounts for the highest share of the openings in each occupation, with 33% of openings for Heavy and Tractor-Trailer Truck Drivers and Bookkeeping, Accounting, and Auditing Clerks. This region also accounts for 29% of the openings for Nursing Assistants, 28% of openings for Teaching Assistants, and 32% of the openings for Hairdressers, Hairstylists, and Cosmetologists.
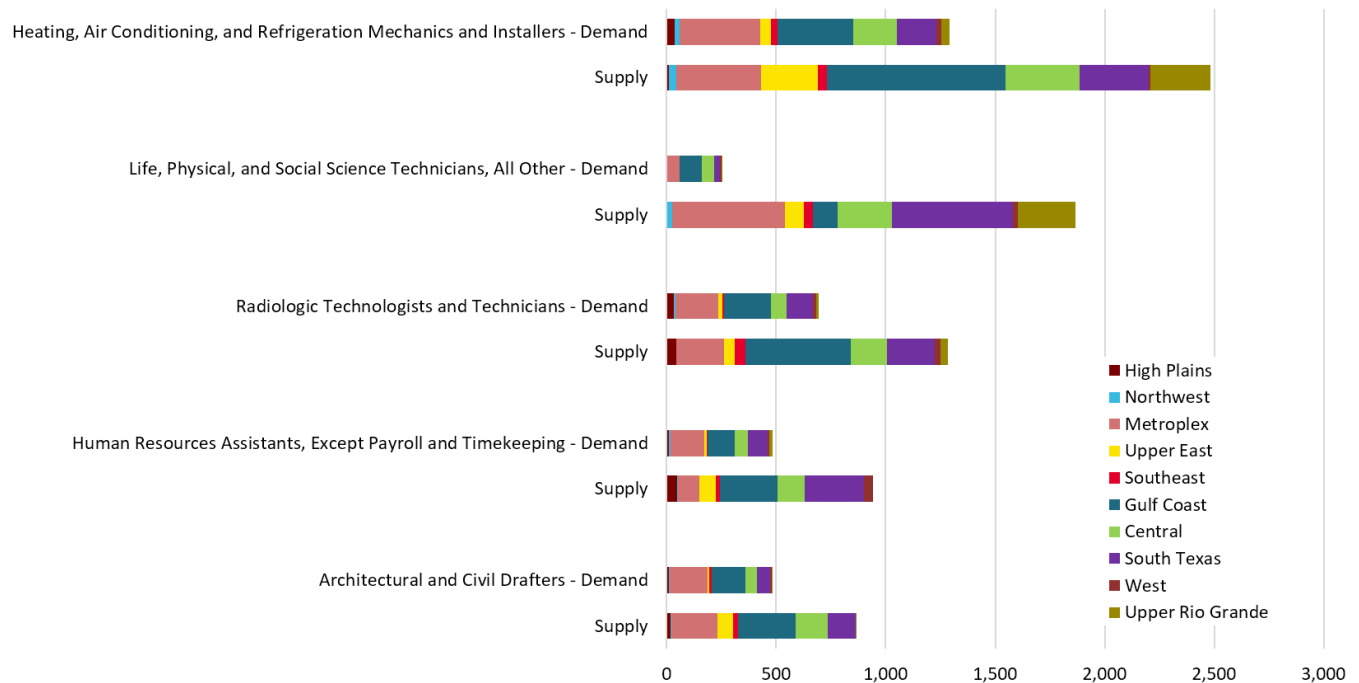
Figure 14. Occupations in which Supply is Well Below Openings by Region

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree matched to the Texas Workforce Commission data. Supply reflects average degrees and certificates awarded 2019 to 2021 allocated to the 10 Higher Education Coordinating Board's planning regions. Demand reflects job openings allocated to the regions based on regional shares of demand. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

The regional composition of the five largest occupations in terms of supply in which supply is well above demand is shown in Figure 15. This is the companion to Figure 10. Recall that for an SOCs to be depicted in this set of regional figures, the statewide projection of job openings (growth and exists) must be within +/- 10% of the sum of the regional projections. Two occupations, Chemical Technicians and Electro-Mechanical and Mechatronics Technologists and Technicians, depicted in Figure 10 did not meet our inclusion restriction. Of those depicted, the Gulf Coast region supplied the highest share of degrees in Heating, Air Conditioning, and Refrigeration Mechanics and Installers; Radiologic Technologists and Technicians; and Architectural and Civil Drafters. The South Texas region supplied the highest share of Life, Physical, and Social Science Technicians and Human Resource Assistants.

Figure 15. Occupations in which Supply is Well Above Openings by Region

Legend:
- High Plains
- Northwest
- Metroplex
- Upper East
- Southeast
- Gulf Coast
- Central
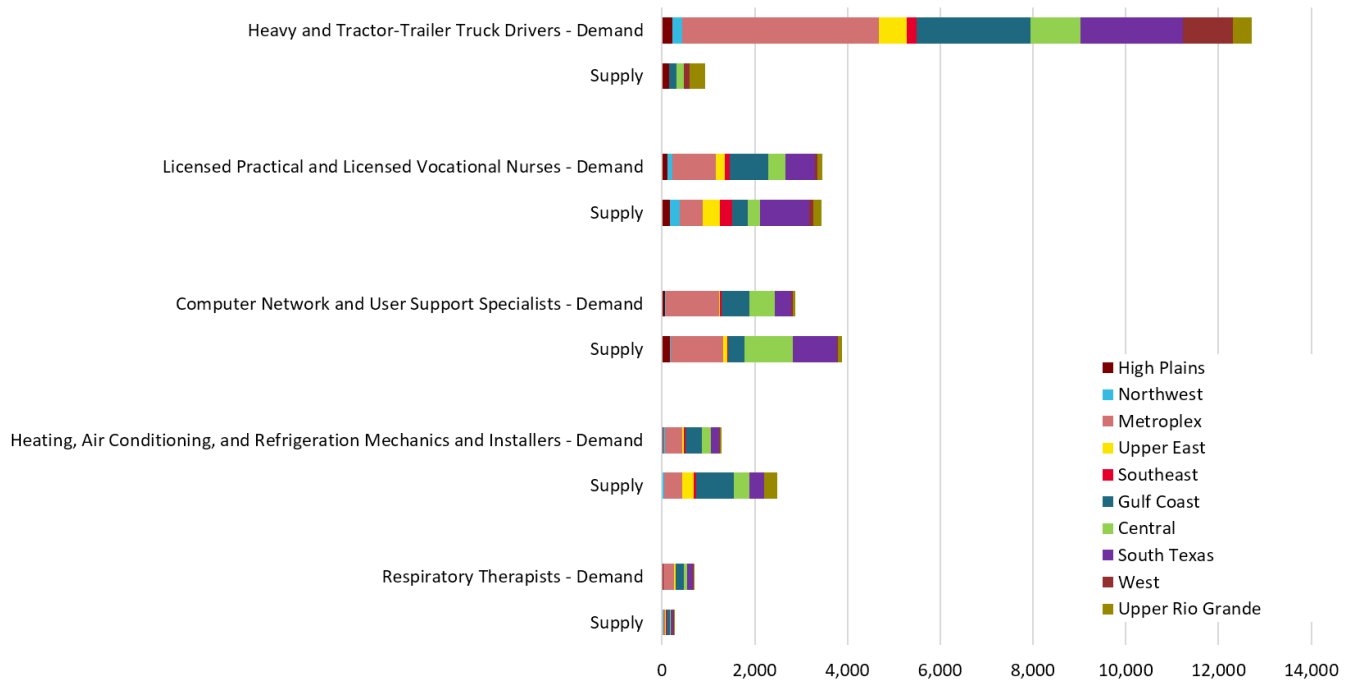- South Texas
- West
- Upper Rio Grande

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree matched to the Texas Workforce Commission data. Supply reflects average degrees and certificates awarded 2019 to 2021 allocated to the 10 Higher Education Coordinating Board's planning regions. Demand reflects job openings allocated to the regions based on regional shares of demand.. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figure 16 presents the regional composition of supply and demand for the five largest high wage, high job opening occupations. Each of the occupations depicted in this figure were previously depicted in Figures 13 -15, with the exception of Respiratory Therapists. Statewide job openings for Respiratory Therapists are projected to be 696 per year and the number of degrees and certificates between 2019 and 2021 averaged 264. This occupation would fall into the category of an occupation in which supply is well below demand or the same category as Heavy and Tractor-Trailer Truck Drivers. Two of the occupations in Figure 16, Licensed Practical and Vocational Nurses and Computer Network and User Support Specialists are in the group in which openings and degrees are well aligned. The supply of Heating, Air Conditioning, and Refrigeration Mechanics and Installers is well above the number of openings in this field. As noted, the Gulf Coast supplies the highest share of degrees in this field. The region's supply is almost 2.4 times the number of job openings in this region. Students with this degree may well find employment in other states or in related occupations.

At the regional level, the identification of occupations in which supply is closely aligned is well above or is well below the number of openings would vary compared to the identification at the state level. Conceptually, the boundaries on sub-state, state, region, and national labor markets are arbitrary particularly when worker mobility is considered. Here, the regional analysis of job openings and the supply of degrees within occupations indicates that the largest regions dominate the Texas market. The regional analysis can also point to potential degree programs that can be expanded or scaled back in particular regions.

Figure 16. Occupations with High Wage and High Job Openings Demand and Supply by Region

Based on the 89 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, and some college no degree matched to the Texas Workforce Commission data. Supply reflects average degrees and certificates awarded 2019 to 2021 allocated to the 10 Higher Education Coordinating Board's planning regions. Demand reflects job openings allocated to the regions based on regional shares of demand. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

SUMMARY

Community colleges are an important provider of educational services and play a critical role in meeting the workforce demands from Texas employers. Community colleges add to the supply of credentialed workers through two broad avenues. They contribute to the supply of bachelor's degrees by offering academic associate degree programs that prepare participants for transfer and completion of their BA or BS at a four-year institution. They also contribute to the supply of technical workforce skills through applied programs that lead to technical associate degrees, technical certificates, and occupational skills awards. In this study, we focus on this second role of community colleges as occupational skills suppliers. A particular objective of our study is to provide an analysis of the direct contribution of Texas community colleges to addressing the projected future growth in skill demands of Texas employers.

We generate a set of 89 occupations which have post-secondary entry requirements that can be immediately satisfied by community college degrees, certificates, or awards. We use the projected average annual growth in position openings for the period 2018-28 for these occupations as produced by the Texas Workforce Commission to identify the annual demand for new skills. We use data on two-year college degrees, certificates, and awards for the period 2019-21 to identify the supply of new skills produced. We include degree counts from State and Lamar technical colleges plus private two-year colleges in addition to community college counts in order to provide a fuller picture of the market within which community colleges operate. We match the position demand by occupation SOC code with the community college credential supply by CIP code via a crosswalk developed jointly by the BLS and the NCES. There are a number of methodological challenges to this matching process. These

are largely traceable to the multiple CIP-to-SOC matches in the data. We make best judgment decisions in dealing with these challenges, and we make clear the issues and assumptions required.

The heart of our study is an analysis of the gaps by occupation between the number of positions demanded and the number of credentials supplied by community colleges. We find that nearly half (47%) of the degrees produced by Texas two-year colleges are in occupations in which the number of degrees is reasonably well-aligned with the projected number of openings. The closeness of the alignment between demand and supply is determined by an "acceptable" gap size criterion that requires that supply be within 50% of demand. A sizable percentage (33%) of the degrees are matched to occupations in which supply exceeds demand by more than 50%. A smaller percentage(19%) of the degrees are in occupations where supply is less than demand. We also provide some interpretation of these gap relationships.

We also carry out a gap analysis of the 20 highest growth occupations that are also characterized by entry wage that is higher than our sample average. Among these 20 high growth/high wage "target of opportunity" occupations, the two-year college supply well-matches demand for 40% of the occupations. The "over" and "under" supplied cases are evenly distributed at 30% of these 20 high growth/high wage occupations.

FINDINGS AND RECOMMENDATIONS
Key Findings
- Community colleges in Texas produce degree and/or certificate awardees from a variety of curricula, some leading to further education and some designed to train workers to enter occupations immediately after receiving a degree or certificate.
- This study focuses on the latter set of curricula representing 46% of degrees conferred in 2019. Degree counts from the THECB (supply) are matched to net annual projected job openings (demand) from the TWC via a CIP to SOC crosswalk.
- The matching of CIPs-to-SOCs produces multiple SOC matches in both directions.
- To avoid overcounting awardees, this study allocates awardees to SOCs in proportion to net openings.
- Only 31% of the degrees and certificates awarded by two-year colleges over the 2019-2021 period match with our target SOCs (i.e., those SOCs that satisfy our post-secondary entry requirements criterion).
- Of the degrees by CIP matched to SOCs that meet our post-secondary entry requirements, 47% are in occupations in which the number of degrees is reasonably well-aligned with the projected net openings.
- 19% are matched to occupations in which supply is less than 50% of demand.
- 33% are matched to occupations in which supply exceeds demand by more than 50%.
- When analyzing community college gaps, it is important to consider other market suppliers, particularly close competitors – State two-year colleges and private colleges. Undersupply by two-year colleges is characterized by occupations in which there are often alternative formal and informal training programs that lead to placement.
- Oversupply is characterized by occupations in which the occupation is quite specific and narrow and the matching CIPs via the crosswalk are general and broad degrees that
  o May be preparatory for further education or
  o Primarily match occupations for which the typical entry level of education is a bachelor's degree.

- Large skill gaps, positive or negative, can serve as a basis for case studies, but should not be used as a basis for action.

Recommendations

- Large skill gaps, positive or negative, can serve as a basis for case studies, but should not be used as a sole basis for action.
  - When projected demand far exceeds supply, there are often many alternative suppliers of job training services that are filling at least some of the projected gap. Private firms in the education business for specific skills, and on-the-job training programs, can provide the majority of business demand for trained workers for some occupations. The prime example is Heavy and Tractor Trailer Truck Drivers, but there are also many private firms providing training for specific jobs such as Medical Assistants and Dental Assistants.
  - There are cases where supply far exceeds projected demand, and the possible explanations are less straightforward. These do seem concentrated among higher-wage occupations, so in part this may be a market-driven move by workers to acquire skills leading to higher pay.
  - The recommendation that follows is not to take the large gaps between projected demand and supply at face value, as calling for action. Instead, for those cases that are most of interest, we suggest a course further study in much greater detail.
- Also, in respect to the demand and supply gaps, there is a need for further development of data sources and methodology. On the data side, it would better inform about the demand and supply gap if data were available from the many private specialty skill and training providers such as those listed above. Private boutique educational providers offering certification as a Medical Assistant, or Dental Assistant, or Heavy and Tractor Trailer Truck Driver, are substitutes for certificates, awards, or degrees offered by community colleges, and should be included in any analysis of a gap between demand and supply of said skills.
- With respect to methodology, the use of Bureau of Labor Statistics/National Center for Education Statistics SOC-CIP crosswalks should be reexamined, especially for broad degree categories. While some CIPs match closely with SOCs – think of nursing – other matches between CIPs and SOCs are more diffuse.
- Compounding some of the data and methodology issues is the elephant in the room in terms of analyzing data, and that is the influence of the pandemic. Our demand data had projections made for the period 2018 - 2028, projections made pre-Covid and extending for years after the pandemic event. At the same time, our supply data from 2019 - 2021 (or 2019-2020) included two years where community college enrollments declined during the pandemic. Later this year, the demand projections will be redone to cover a period that does not include the year of pandemic-related shutdowns and enrollment declines.

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APPENDIX A

| Set of 89 Matched Occupations to CIP Codes | |
Standard Occupation Classification (SOC)	SOC Code
Funeral Home Managers	11-9171
Insurance Appraisers, Auto Damage	13-1032
Computer Network and User Support Specialists	15-1231
Architectural and Civil Drafters	17-3011
Electrical and Electronics Drafters	17-3012
Mechanical Drafters	17-3013
Drafters, All Other	17-3019
Aerospace Engineering and Operations Technologists and Technicians	17-3021
Civil Engineering Technologists and Technicians	17-3022
Electrical and Electronic Engineering Technologists and Technicians	17-3023
Electro-Mechanical and Mechatronics Technologists and Technicians	17-3024
Environmental Engineering Technologists and Technicians	17-3025
Industrial Engineering Technologists and Technicians	17-3026
Mechanical Engineering Technologists and Technicians	17-3027
Engineering Technologists and Technicians, Except Drafters, All Other	17-3029
Chemical Technicians	19-4031
Environmental Science and Protection Technicians, Including Health	19-4042
Geological Technicians, Except Hydrologic Technicians	19-4043
Nuclear Technicians	19-4051
Forest and Conservation Technicians	19-4071
Life, Physical, and Social Science Technicians, All Other	19-4099
Paralegals and Legal Assistants	23-2011
Preschool Teachers, Except Special Education	25-2011
Library Technicians	25-4031
Teaching Assistants, Preschool, Elementary, Middle, and Secondary School, Except Special Education	25-9042
Actors	27-2011
Audio and Video Technicians	27-4011
Broadcast Technicians	27-4012
Sound Engineering Technicians	27-4014
Radiation Therapists	29-1124
Respiratory Therapists	29-1126
Dental Hygienists	29-1292
Cardiovascular Technologists and Technicians	29-2031
Diagnostic Medical Sonographers	29-2032
Nuclear Medicine Technologists	29-2033
Radiologic Technologists and Technicians	29-2034
Magnetic Resonance Imaging Technologists	29-2035
Dietetic Technicians	29-2051
Psychiatric Technicians	29-2053
Surgical Technologists	29-2055
Veterinary Technologists and Technicians	29-2056
Ophthalmic Medical Technicians	29-2057
Licensed Practical and Licensed Vocational Nurses	29-2061
Health Technologists and Technicians, All Other	29-2099
Healthcare Practitioners and Technical Workers, All Other	29-9099

Nursing Assistants	31-1131
Occupational Therapy Assistants	31-2011
Physical Therapist Assistants	31-2021
Massage Therapists	31-9011
Dental Assistants	31-9091
Medical Assistants	31-9092
Medical Transcriptionists	31-9094
Phlebotomists	31-9097
First-Line Supervisors of Firefighting and Prevention Workers	33-1021
Firefighters	33-2011
Fire Inspectors and Investigators	33-2021
Embalmers	39-4011
Morticians, Undertakers, and Funeral Arrangers	39-4031
Barbers	39-5011
Hairdressers, Hairstylists, and Cosmetologists	39-5012
Makeup Artists, Theatrical and Performance	39-5091
Manicurists and Pedicurists	39-5092
Skincare Specialists	39-5094
Bookkeeping, Accounting, and Auditing Clerks	43-3031
Order Clerks	43-4151
Human Resources Assistants, Except Payroll and Timekeeping	43-4161
Desktop Publishers	43-9031
Computer, Automated Teller, and Office Machine Repairers	49-2011
Radio, Cellular, and Tower Equipment Installers and Repairers	49-2021
Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022
Avionics Technicians	49-2091
Electrical and Electronics Installers and Repairers, Transportation Equipment	49-2093
Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	49-2095
Audiovisual Equipment Installers and Repairers	49-2097
Aircraft Mechanics and Service Technicians	49-3011
Automotive Service Technicians and Mechanics	49-3023
Motorcycle Mechanics	49-3052
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021
Medical Equipment Repairers	49-9062
Wind Turbine Service Technicians	49-9081
Tool and Die Makers	51-4111
Prepress Technicians and Workers	51-5111
Computer Numerically Controlled Tool Programmers	51-9162
Air Traffic Controllers	53-2021
Heavy and Tractor-Trailer Truck Drivers	53-3032
Captains, Mates, and Pilots of Water Vessels	53-5021
Motorboat Operators	53-5022
Ship Engineers	53-5031

List of Career Schools in our Sample

Altierus Career College-Houston Bissonnet
Asher College-Dallas
Auguste Escoffier School of Culinary Arts-Austin
Carrington College-Mesquite
Commonwealth Institute of Funeral Service-Houston
Concorde Career College-Dallas
Concorde Career College-Grand Prairie
Concorde Career College-San Antonio
Covenant School of Nursing and Allied Health-Lubbock
Culinary Institute Lenotre-Houston
Dallas Institute of Funeral Service
Dallas Nursing Institute
Fortis College-Houston South
Fortis Institute-Houston
Galen College of Nursing-San Antonio
Interactive College of Technology-Houston Gessner
Interactive College of Technology-Houston Greensp
Interactive College of Technology-Pasadena
KD Conservatory College of Film and Dramatic Arts
Lincoln College of Technology-Grand Prairie
MediaTech Institute-Dallas
MediaTech Institute-Houston
MediSend College of Biomedical Engineering Technology
MIAT College of Technology-Houston
Peloton College-Arlington
Peloton College-Dallas
Pima Medical Institute-El Paso
Pima Medical Institute-Houston
Quest College-San Antonio
Remington College-Dallas Campus
Remington College-Fort Worth Campus
Remington College-Houston North
Remington College-Houston Southeast
Rio Grande Valley College
School of Automotive Machinists & Technology-Houston
Southern Careers Institute
Southwest University-El Paso
The College of Health Care Professions - Houston Northwest
The College of Health Care Professions - Houston Southwest
The College of Health Care Professions-Austin
The College of Health Care Professions-Dallas
The College of Health Care Professions-Fort Worth
The College of Health Care Professions-Houston Ast

The College of Health Care Professions-McAllen
The College of Health Care Professions-San Antonio
The College of Health Care Professions-San Antonio South
The Recording Conservatory of Austin
Universal Technical Institute of Northern Texas
Universal Technical Institute-Houston
Vet Tech Institute of Houston
Vista College
Wade College-Dallas
Western Technical College-El Paso (Diana Campus)
Western Technical College-El Paso (Main Campus)

APPENDIX C

For the core analysis presented in the main body of this report, we adopted the BLS assignment of the typical education needed for entry into the various occupations when setting our post-secondary education required filter. These assignment requirements may, however, differ from the qualifications that are often expected of and held by most of the successful applicants.

In Appendix C, we change the education filter to consider a larger set of SOCs to which we match the degrees awarded from the community colleges, technical schools, and two-year career schools. Here, we consider some SOCs for which the typical entry level of education is high school or equivalent if 50% or more of the workers employed in the SOC have post-secondary educational training. Our approach is similar to that used in the RAND Texas Degree Planning Study. We use national worker characteristics data from BLS from 2019 to evaluate the 50% threshold. The RAND report used Texas worker data from the ACS, adopted a 65% threshold and restricted the workers to ages 25 to 44. Our national level data included all workers in an occupation. Under an assumption that effective educational attainment expectations have risen over time, our selection of a 50% threshold was motivated by a desire to adjust for the possible lower incidence of post-secondary training among workers age 45 and above.

Under our augmented classification system, of the 867 detailed SOC occupations, 174 of those occupations clear our post-secondary requirements filter. In addition to our core analysis 89 occupations, an additional 85 occupations are included under our augmented category of "High school required, but 50% or more workers having post-secondary credentials."

Figure C1 amends Figure 1 in the text by including one category that is labeled "High School Diploma or Equivalent >50," shorthand for employment in occupations that the BLS classifies as requiring a high school diploma, but occupations that in practice have over 50% of the workforce with some sort of formal post-secondary certification. In 2020, 40.1% of the occupations that are identified as having a High-School Diploma or Equivalent entry requirement by the BLS are slotted to our fourth category for the Appendix exercise.

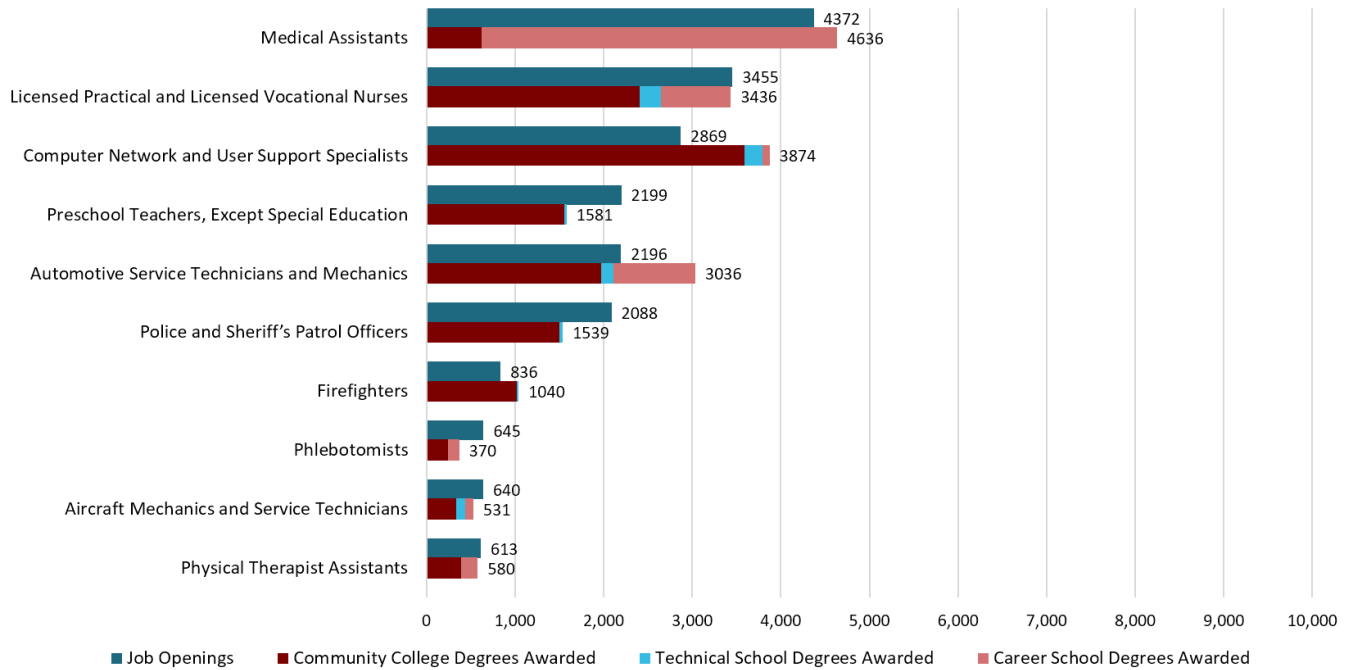# Figure C1. Employment by Augmented Entry Requirements
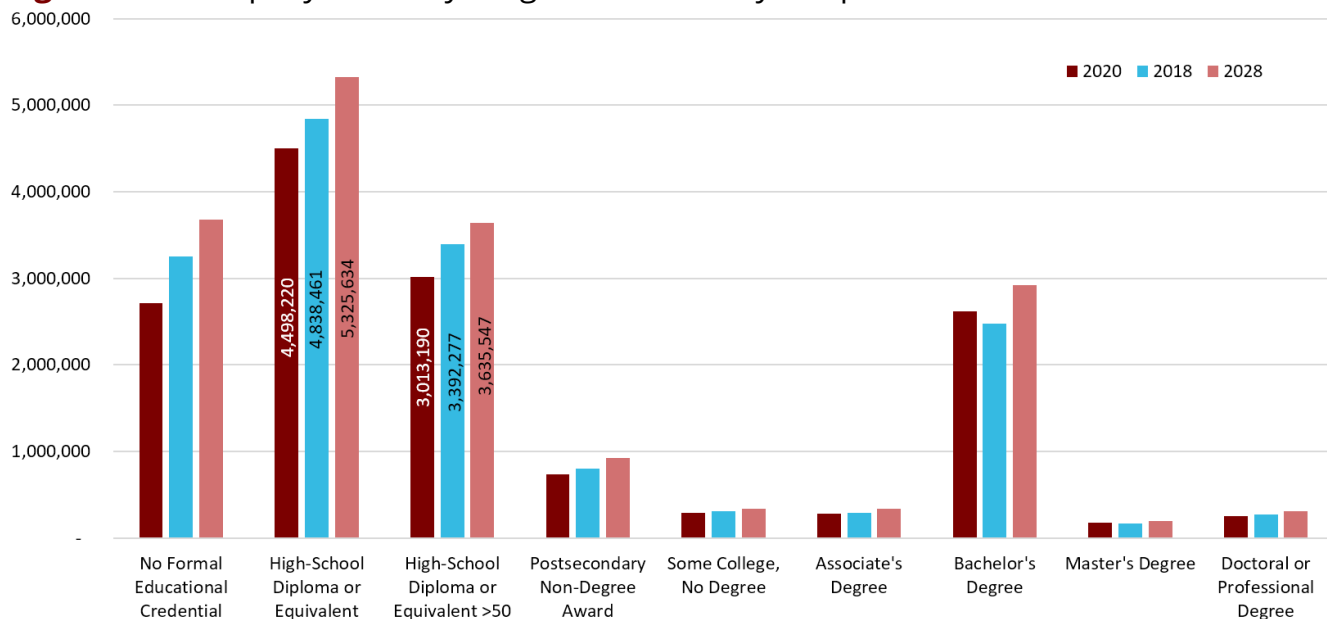
Distribution of employment by entry level of education and composition of high school degrees awarded with greater than 50% of workers greater than HS. Source: Texas Workforce Commission.

Figures C2-C5 replicate Figures 8-11, but for the new expanded set of 174 occupations rather than the core analysis based on the 89 occupations in the core sample. The expanded set of SOCs results in an expansion of the number of degrees matched to 68,482 on average for the years 2019 to 2021 from the 47,455 matched in the core sample. While the total number of matched degrees increases due to the expanded set of occupations, for the CIPs that matched in the core analysis, the count of degrees matched to any particular occupation may decline if the CIP also matches to one of the newly included occupations. The allocation mechanism we have adopted spreads the match CIP degrees in proportion to the openings in each of the matching occupations.

Figure C2 like Figure 8 presents the occupations in which supply is closely aligned with openings. This set of occupations is almost identical to the set included in Figure 8, except for the addition of Police and Sheriff's Patrol Officers which replaces Skincare Specialists. As noted above, some of the degree counts decline as the awardees are spread across the additional matching occupations.
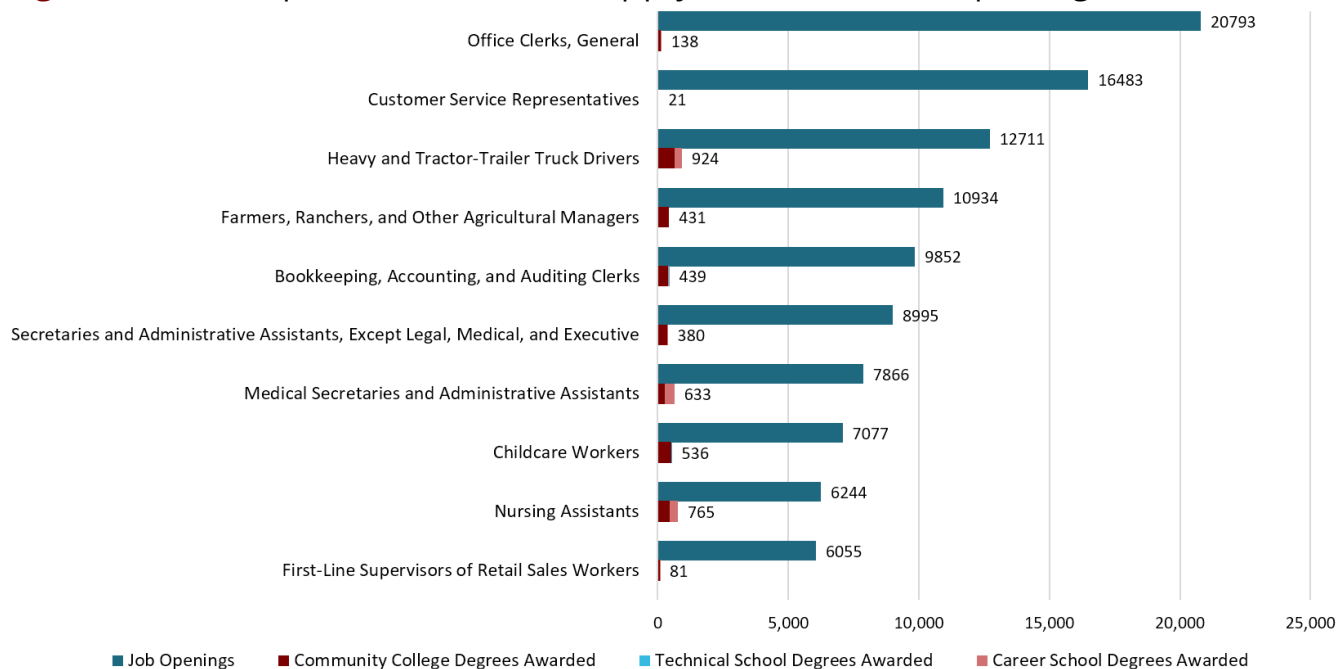
Figure C2. Occupations in which Supply is Closely Aligned with Openings

Based on the 174 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, some college, no degree or with High School Degree and greater than 50% of workers in the occupation have education above a high school degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021.Occupations in which average annual degrees and certificates awarded are within +/- 50% of the number of job openings. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figures C3 and C4 present the occupations in which supply is well below and well above job openings, respectively. As was the case in our discussion of Figure 9, and further evidenced in Figure C3, the excess supply is sometimes due to the availability of alternative specialized certification programs. Only two of the occupations from Figure 9 appear in Figure C3 - Heavy and Tractor-Trailer Truck Drivers and Nursing Assistants. We also see that some of the occupations in Figure C3 are quite general in scope. While these occupations may match to many CIPs, the number of degrees conferred in these CIPs is low.

Figure C3. Occupations in which Supply is Well Below Openings

Occupation	Value
Office Clerks, General	20793 / 138
Customer Service Representatives	16483 / 21
Heavy and Tractor-Trailer Truck Drivers	12711 / 924
Farmers, Ranchers, and Other Agricultural Managers	10934 / 431
Bookkeeping, Accounting, and Auditing Clerks	9852 / 439
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	8995 / 380
Medical Secretaries and Administrative Assistants	7866 / 633
Childcare Workers	7077 / 536
Nursing Assistants	6244 / 765
First-Line Supervisors of Retail Sales Workers	6055 / 81

■ Job Openings ■ Community College Degrees Awarded ■ Technical School Degrees Awarded ■ Career School Degrees Awarded
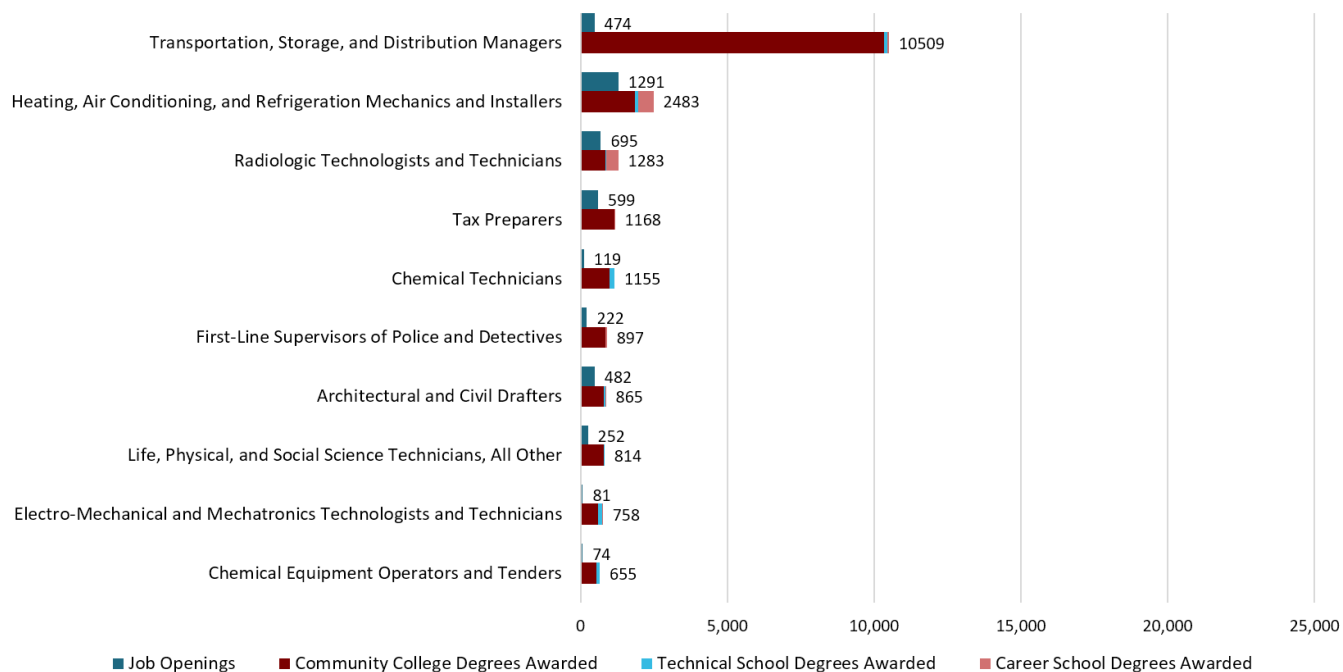
Based on the 174 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, some college, no degree or with High School Degree and greater than 50% of workers in the occupation have education above a high school degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021. Occupations in which average annual degrees and certificates awarded is more than 50% below the number of job openings. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Figure C4 identifies ten occupations in which supply is well above job openings, sorted by the number of degrees and awards, based on the expanded set of SOCs. Three of the occupations from Figure 10 are also included in Figure C4 including Heating, Air Conditioning, and Refrigeration Mechanics and Installers; Life, Physical, and Social Science Technicians; and Electro-Mechanical and Mechatronics Technologists and Technicians.

The occupation with the highest largest excess supply is Transportation, Storage, and Distribution Managers. This occupation has a small number of annual openings but is fed by 8 CIP codes with general courses of study. The TWC website identifies 29,155 graduates from the eight CIPs associated with this SOC 11-3071. The TWC website includes graduates from four-year institutions. The 8 CIPs matched to this occupation are also associated with 28 other SOCs that have estimated openings of over 20,000, based on the TWC website. However, this occupation is only one of two, fed by these CIPs, that has an entry level of education lower than a bachelor's degree. The two largest feeders of the 8 CIPs that match to this SOC are Business Administration and Management, General and Business/Commerce, General. They account for over 90% of the graduates that feed into this SOC based on the study's matches. Assigning all of these graduates to SOC 11-0371 is highly misleading but is a consequence of the SOC-CIP crosswalk in combination with our post-secondary entry study filter.

Figure C4. Occupations in which Supply is Well Above Openings
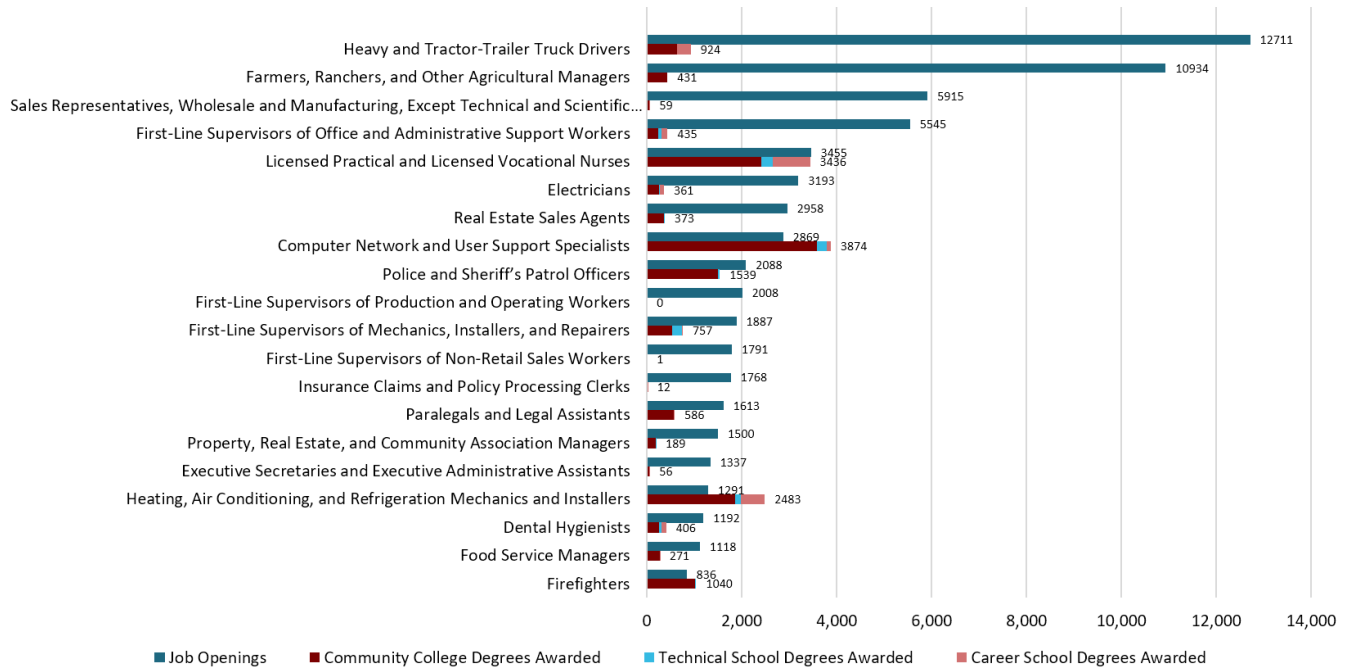

Based on the 174 occupations with typical entry levels of education of associates degrees, post secondary, non degree award, some college, no degree or with High School Degree and greater than 50% of workers in the occupation have education above a high school degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021. Occupations in which average annual degrees and certificates awarded is more than 50% above the number of job openings. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.

Lastly, Figure C5 presents the top 20 high wage, high job opening occupations. Seven of the occupations listed in this figure also appeared in Figure 11. Several of the occupations that have been added due to the lowered education threshold are quite general. While the general occupations match up to quite a few CIPs, the number of degrees awarded to these CIPs is small. For example, First-Line Supervisors of Office and Administrative Support Workers with 5,545 openings matched to thirteen CIP codes in the crosswalk, but only 431 degrees are allocated to this CIP.

This exercise of expanding the set of SOCs considered as matches for the degrees awarded by the two-year public and private institutions in Texas suggests that while more degrees are matched to SOCs and thereby matched to more job openings, the "quality" of the matches goes down. The share of degrees conferred in CIPs that match occupations in which supply is closely aligned with demand was 47% when the occupations were limited to Associates, Post Secondary, non Degree, and Some College, no Degree. However, when the set of SOCs was expanded the share of degrees conferred in CIPs that match occupations in which supply is closely aligned with demand drops to 37%.

Figure C5. Top 20 High Wage Occupations by Job Openings

Based on the 174 occupations with typical entry levels of education of associates degrees, post-secondary, non-degree award, some college, no degree or with High School Degree and greater than 50% of workers in the occupation have education above a high school degree. Degrees Awarded are the average degrees and certificates awarded 2019 to 2021.High wage occupations are defined as occupations for which the wage is above the average wage. Computer Network and User Support Specialists combine Computer Network Support Specialists and Computer User Support Specialists. Source: Texas Higher Education Coordinating Board and Texas Workforce Commission.