

The Training Investors' Guide to Occupational Licensing

Technical Paper

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Abstract

The area of postsecondary training investment portfolios, directed at licensed occupations, was not specified in 6-digit Classification of Instructional Program (CIP) detail, heretofore, in terms of the magnitude of the linked training output, the demographics of the related training graduates, the educational levels of degrees awarded and certificates conferred to the related training completers, and, at the state level, representative examples of the types of training institutions involved in this sector of postsecondary education which supported licensed occupations. Consequently, this study supplemented the Kleiner/Krueger and U.S. Treasury/Labor/Council of Economic Advisors (CEA) estimates of the magnitude of workforce employment in licensed occupations with conservative estimates of the magnitude of structured training output (i.e., graduates/completers) linked to national licensed occupations. Because of the well-documented research about the wage premium enjoyed by the licensed occupational workforce, this review also compared the demographics (by gender and racial/ethnic categories) of the national licensed occupational workers with the demographics of the related training graduates to assess the likelihood of long-term, group changes in the recipients of the licensed occupational wage benefits.

Acknowledgements

The literature review, supporting the findings of this paper, benefitted greatly from the excellent assistance of Denison University Research Librarian Sarah Schaff and U.S. Department of the Treasury, Office of Economic Policy, Economist Ryan Nunn. Dr. Gabriela Borcoman, Senior Program Director of the Texas Higher Education Coordinating Board, gave important assistance with the labor supply specification utilized in this report by sharing wage record follow-up tables about the industries of employment post-training of Texas higher education graduates from educational programs linked to the national licensed occupations. Director Les Janis, Economic Development and Employer Planning System (EDEPS), and Evan Cunningham, Economist, Current Population Survey (CPS), U.S. Bureau of Labor Statistics (BLS), provided special assistance with applications of CPS data to this policy paper. This technical paper grew out of work commissioned by the [Georgetown University Center on Education and the Workforce](#). I am grateful for the contributions of Anthony P. Carnevale, Jeff Strohl, and Neil Ridley.

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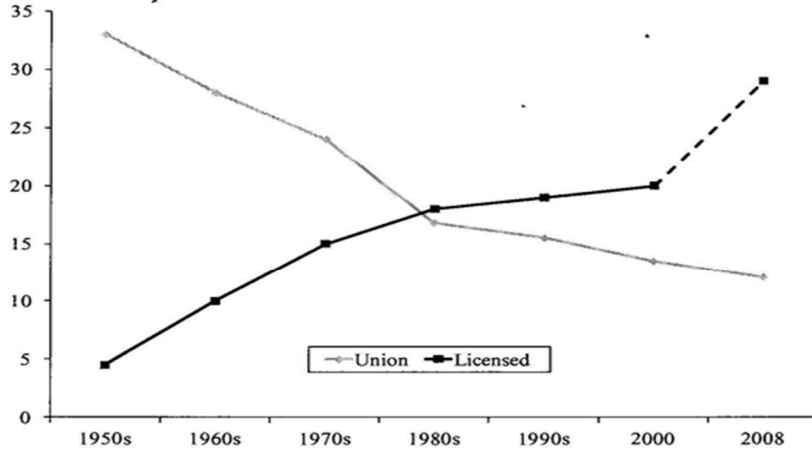
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Leading labor economists described occupational licensure as a labor market *institution*, which eclipsed unionization in its workforce impact, as shown below with the Kleiner estimates of the trends in the percentages of licensed and union workers.¹

Figure 1.1 Percentage of Union and Licensed Workers, 1950–2008, Trends in Two Labor Market Institutions



NOTE: Dashed line shows the value of estimates from state-level data of licensing from the Gallup and Westat survey results, including licensing by local, state, or federal governments. More than 800 occupations are licensed on at least one level, according to the Council of State Governments.

SOURCE: Licensing data are estimated from the author's surveys, Department of Labor estimates, a Gallup survey, and a Westat survey; union data are from the Current Population Survey (CPS).

Table 1.1 Percentage of Union and Nonunion Workers Who Are Licensed and Certified

Union status	Licensed		Certified	
	No	Yes	No	Yes
Union	55.4	44.6	95.0	5.0
Nonunion	74.3	25.7	94.0	6.0
Total	71.4	28.6	94.2	5.8

SOURCE: Princeton Data Improvement Initiative (2008).

(Source: Kleiner, Morris, *Stages of Occupational Regulation: Analysis of Case Studies*, W.E. Upjohn Institute for Employment Research, p. 8, 2013.)

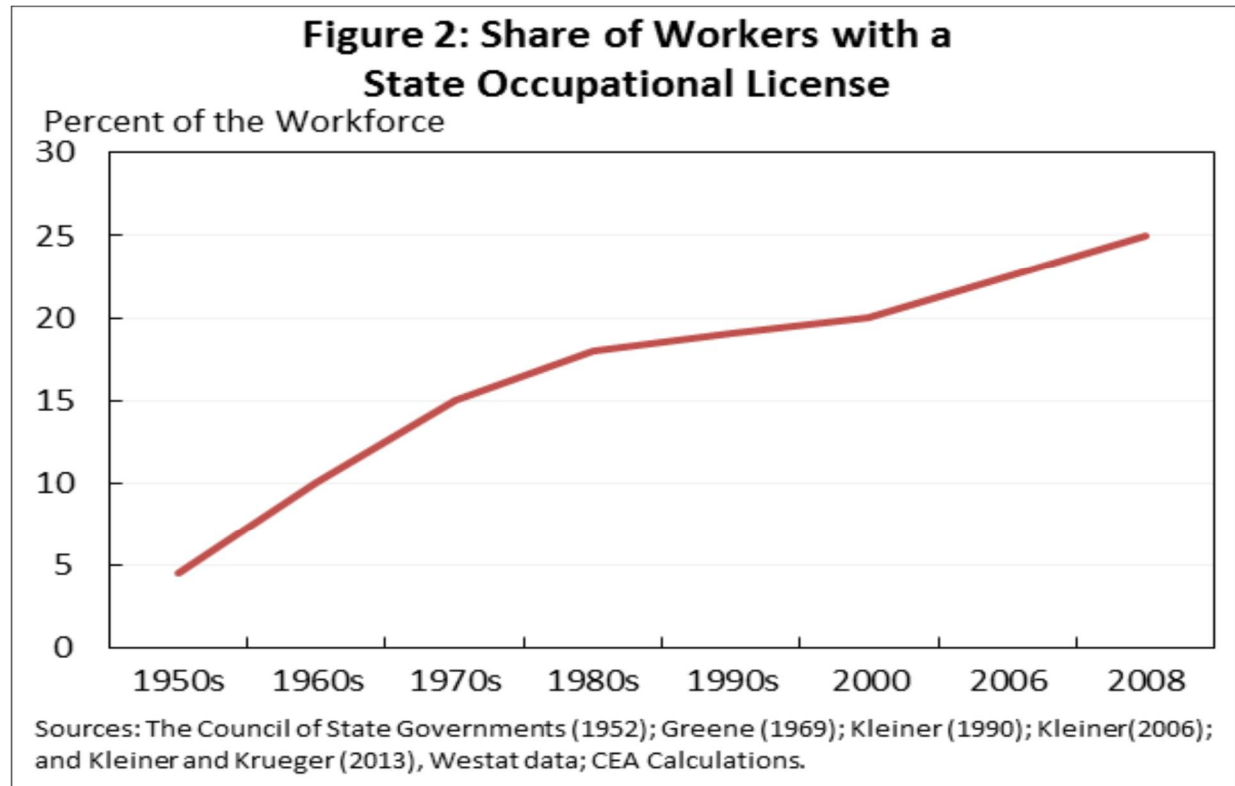
The inter-agency working Group on Expanded Measures of Enrollment and Attainment² (GEMEnA) defined an occupational license as a credential awarded by a government agency that constitutes legal authority to do a specific job. Licenses are based on some combination of

¹ Kleiner, Morris, *Licensing Occupations Ensuring Quality Or Restricting Competition*, W.E. Upjohn Institute for Employment Research, 2006, p. 13 and pp. 17–41; and Kleiner, Morris, *Stages of Occupational Regulation: Analysis of Case Studies*, W.E. Upjohn Institute for Employment Research, p. 8, 2013.

² About GEMEnA, at <http://nces.ed.gov/surveys/GEMEnA/index.asp>.

degree or certificate attainment, certifications, assessments, or work experience; are time-limited; and must be renewed periodically.³

Because of the significant size of licensed occupations, which the U. S. Departments of Treasury and Labor and the President’s Council of Economic Advisors (CEA) recently estimated at 25% of the U.S. workforce in 2008 for workers with state occupational licenses,⁴ the infrastructure of the institution of occupational licensure became important, including the structured training programs designed to train graduates for job openings in licensed occupations.



Source: U.S. Departments of the Treasury and Labor, Council of Economic Advisors (CEA), White House, *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 17.

The area of related, U.S. structured training programs (that is, postsecondary training investment portfolios directed at licensed occupations) was not specified in 6-digit program code detail, heretofore, in terms of the magnitude of the linked training output, the demographics of the related training graduates, the educational levels of degrees awarded and certificates conferred to the related training completers, and, at the state level, representative examples of the types of training institutions involved in this sector of postsecondary education which supported licensed occupations. Consequently, this study supplemented the Kleiner/Krueger and CEA estimates of the magnitude of workforce employment in licensed occupations with conservative

³ GEMEnA Definitions, at <http://nces.ed.gov/surveys/GEMEnA/definitions.asp>.

⁴ U.S. Department of the Treasury Office of Economic Policy, U.S. Department of Labor, and the White House Council of Economic Advisors (CEA), *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 17. In this report, the Treasury (Office of Economic Policy)/Labor/CEA estimated the 2008 national employment in federal, state, and locally licensed occupations at 29% of the U.S. workforce (p. 17).

estimates of the magnitude of structured training output (i.e., graduates/completers) linked to national licensed occupations. Because of the well-documented research about the wage premium enjoyed by the licensed occupational workforce,⁵ this review also compared the demographics (by gender and racial/ethnic categories) of the national licensed occupational workers with the demographics of the related training graduates to assess the likelihood of long-term, group changes in the recipients of the licensed occupational wage benefits.

As documented by the Economic Development and Employer Planning System⁶ (EDEPS), the "License Finder" of the Career OneStop, U.S. Department of Labor (USDOL),⁷ and the *Occupational Outlook Handbook* publication of the U.S. Bureau of Labor Statistics (BLS),⁸ licensed occupations were defined in part by educational and training requisites. Further, many of the regulated occupations also included continuing education requirements, after issuance of the initial licensing award.⁹ The training requirements for licensed occupations, and the postsecondary institutions which responded to these educational standards, represented a critical part of the infrastructure which supported the institution of occupational licensure in the U.S.

Several important empirical studies estimated the size of the training component of the labor market institution of occupational licensing, but without detail and standardized classification, that is, 6-digit Classification of Instructional Programs (CIP) coding, regarding the related training programs. For instance, Messrs. Gittleman, Klee, and Kleiner, in their September, 2014, working paper for the U. S. Bureau of Labor Statistics (BLS), entitled *Analyzing the Labor Market Outcomes of Occupational Licensing*,¹⁰ found that 93% of surveyed licensed workers (definition 2) encountered "courses or training" requirements, and 73% faced "continuing education" requirements as part of occupational licensing, based on sample data from the Survey of Income and Program Participation of the U.S. Census Bureau.¹¹ (See below, "Table 2, Requirements for Becoming Licensed or Certified.")

⁵ *Ibid.*, p. 4, pp. 14 -15, and pp. 62-64. As stated in the Treasury/Labor/CEA report (p. 14), "Estimates that account for differences in education, training, and experience find that licensing results in 10 percent to 15 percent higher wages for licensed workers relative to unlicensed workers." In support of this estimate of the wage premium for licensed workers, the CEA monograph cited the research paper of Morris M. Kleiner and Alan B. Krueger, 2010, "The Prevalence and Effects of Occupational Licensing," *British Journal of Industrial Relations* 48, no. 4, pp. 676-687.

⁶ Economic Development and Employer Planning System (EDEPS), state occupational demand indicators, licensed occupations, at <http://www.edeps.org>.

⁷ License Finder, Career OneStop, U.S. Department of Labor (USDOL), at <http://www.careeronestop.org/toolkit/training/find-licenses.aspx>.

⁸ U.S. Bureau of Labor Statistics (BLS), USDOL, *Occupational Outlook Handbook* (OOH), 2016-17 Edition, at www.bls.gov/ooh.

⁹ EDEPS (at <http://www.edeps.org>); License Finder/Career One-Stop/USDOL (at <http://www.careeronestop.org/toolkit/training/find-licenses.aspx>); plus Brinegar, Pamela L., and Kara L. Schmitt, "State Occupational and Professional Licensure," *The Council of State Governments*, Lexington, KY., *The Book of the States 1992-93*, Table 8.31, Status of Mandatory Continuing Education for Selected Professions: 1991, p.580. In addition, see Ewert, Stephanie, and Robert Kominski, "Measuring Alternative Educational Credentials: 2012," *Household Economic Studies*, P70-138, January, 2014, Census Bureau, Survey of Income and Program Participation (SIPP), p. 9, at <http://www.census.gov/hhes/socdemo/education/data/files/p70-138.pdf>, where Ewert and Kominski stated, "About two-thirds of adults who held a professional certification or license had to take periodic tests or continuing education credits in order to maintain it."

¹⁰ Gittleman, Maury (BLS), Mark A. Klee, (Census Bureau), and Morris M. Kleiner, (Univ. of Minn./NBER), *Analyzing the Labor Market Outcomes of Occupational Licensing*, BLS Working Papers, Office of Compensation and Working Conditions, U.S. Bureau of Labor Statistics, U.S. Department of Labor, Working Paper 476, September, 2014;

¹¹ Gittleman, Klee, and Kleiner, *op. cit.*, BLS Working Paper 476, September, 2014, Table 2, p. 39.

“Table 2¹²

Requirements for Becoming Licensed or Certified

Definition 1			Definition 2		
Variable	% of Licensed or Certified Workers Facing Requirement	<i>N</i>	% of Licensed Workers Facing Requirement	% of Certified Workers Facing Requirement	<i>N</i>
Requirement:					
Courses or Training	93.0	7,211	93.4	92.1	7,133
Skills or Exam	92.0	7,183	91.9	91.8	7,111
Continuing Education	69.5	7,080	73.4	60.3	7,019
Level of government:					
Federal only	4.8	7,160	6.8	0	7,160
State only	64.1	7,160	89.9	0	7,160
Local only	2.3	7,160	3.3	0	7,160
Private only	28.7	7,160	0	1	7,160

Source: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module

Note: Sample includes all respondents aged 18-64 who were employed in the civilian labor force as of the end of at least one reference month. Summary statistics exclude imputed values. The reference period is September through December 2012. Definition 1 does not distinguish between workers who have a certification and workers who have a license. Definition 2 identifies a worker as licensed if a governmental body issued the credential and certified if a private body issued the credential.

(Source: Gittleman, Maury (BLS), Mark A. Klee, (Census Bureau), and Morris M. Kleiner, (Univ. of Minn./NBER), *Analyzing the Labor Market Outcomes of Occupational Licensing*, BLS Working Papers, Office of Compensation and Working Conditions, U.S. Bureau of Labor Statistics, U.S. Department of Labor, Working Paper 476, September, 2014, Table 2, p. 39.)

Additional Kleiner research refined the educational and training categories related to occupational licensing requirements to the broad divisions of high school diploma, college degree, exam, performance test, continuing education, internship, and renewal test, in his recent book, *Guild-Ridden Labor Markets The Curious Case of Occupational Licensing*,¹³ as follows:

Table 3.1 Percentage of Workers Who Require Specific Education and Testing to Become Licensed or Certified

	Licensed workers facing requirement	Certified workers facing requirement
High school diploma	75.1	66.6
College degree	47.7	28.5
Pass an exam	88.9	85.9
Performance test	67.8	61.1
Continuing education	67.8	52.9
Internship	46.5	35.3
License/certificate renewal test	34.5	33.9

SOURCE: Kleiner and Vorotnikov (2015). Harris conducted the survey in early and mid-2013. Individuals aged 18 or older who were in the labor force were eligible for the survey. A total of 9,850 individuals were interviewed. Kleiner and Vorotnikov limit their analysis to those who were at the time of the survey employed or had a job during the previous 12 months.

(Source: Kleiner, Morris M., *Guild-Ridden Labor Markets The Curious Case of Occupational Licensing*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2015, Table 3.1, p. 28.)

¹² *Ibid.*

¹³ Kleiner, Morris M., *Guild-Ridden Labor Markets The Curious Case of Occupational Licensing*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2015, Table 3.1, p. 28.

With regard to the research findings about the correlations between occupational licensure and training, the results were mixed, implying a weak association. In his 2013 national study of the effects of occupational licensing upon training enrollments for the occupations of accountants, attorneys, cosmetologists, and teachers, after analyzing a Kleiner dataset about licensing stringency and the Current Population Survey (CPS) supplements for school enrollment and occupational mobility, job tenure, and training, Klee found:

There is no evidence that professional licensing is positively related to class enrollment. To the extent that this relationship exists, I [Klee] estimate it to be negative. I [Klee] find some evidence of a positive effect of licensing on a stock measure of training, controlling for tenure. These countervailing effects suggest that licensing regulations are slightly positively correlated with training, on balance.¹⁴

Furthermore, in his book, *Stages of Occupational Regulation Analysis of Case Studies*,¹⁵ Kleiner provided three state examples each of "switchers" in occupational regulation for electricians and plumbers. According to the Kleiner examples, electricians "switched" from no regulation to statewide occupational licensing within Louisiana in 2004, within Massachusetts in 2007, and within Tennessee in 2000.¹⁶ Also with the Kleiner examples, plumbers "switched" from no occupational licensure to statewide licensing within Alaska in 2005, within North Dakota in 1993, and within Tennessee in 2006.¹⁷ The units of analysis from the Economic Development and Employer Planning System (EDEPS)¹⁸ and the Integrated Postsecondary Education Data System (IPEDS)¹⁹ provided taxonomic and data links between these two occupations, before and after the initiation of licensing, and the output (graduates/completers) over time from their respective, related training programs.

After controlling for cyclical effects and time, for the states with multiple postsecondary linked educational providers and sufficient magnitude of graduates, these clusters for electricians demonstrated statistically significant associations over time between the licensed occupation at the 6-digit level of detail for the Standard Occupational Classification (SOC) code, and the lagged related training output at the 6-digit level of detail for the Classification of Instructional Program (CIP) code, as shown below for the examples of electricians in Louisiana and Tennessee, based on least squares multiple regression. However, regarding the same types of data for electricians in Massachusetts and plumbers in Alaska, North Dakota, and Tennessee, the paucity of related training providers and graduates after the Great Recession precluded similar linear regression tests of correlation. Appendix I included additional information regarding the postsecondary educational institutions in all of the "switcher" states for electricians and plumbers. As shown in Appendix I, the trend lines for linked electrician training completers in

¹⁴ Klee, Mark A., "How Do Professional Licensing Regulations Affect Practitioners? New Evidence," Social, Economic, and Housing Statistics Division (SEHSD), U.S. Census Bureau, *SEHSD Working Paper Number 2013-30*, June 5, 2013, p. 25. In contrast to current class enrollment, Klee described the "stock measure of training" as "... a coarse measure of the respondent's investment in human capital." (*Ibid.*, p. 15.)

¹⁵ Kleiner, Morris M., *Stages of Occupational Regulation Analysis of Case Studies*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2013, Tables 5.3 and 5.4, pp. 144-145.

¹⁶ *Ibid.*, p. 144.

¹⁷ *Ibid.*, p. 145.

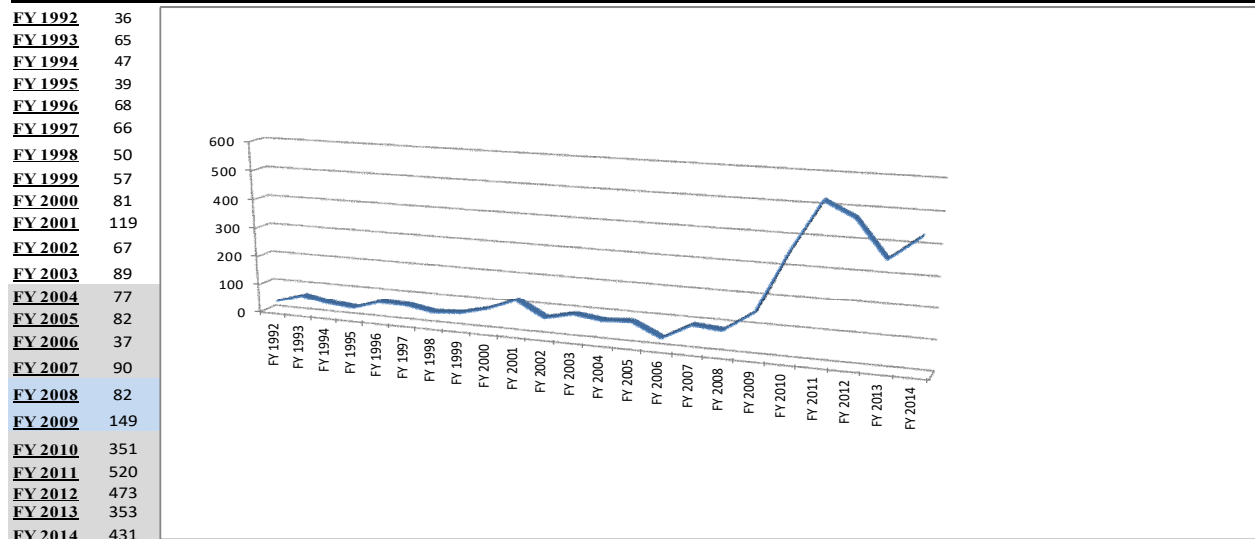
¹⁸ Economic Development and Employer Planning System (EDEPS), Units of Analysis, at www.edeps.org.

¹⁹ Integrated Postsecondary Education Data System (IPEDS), Use the Data, Compare Institutions, at <http://nces.ed.gov/ipeds/Home/UseTheData>.

Massachusetts and plumbing training graduates in Alaska, North Dakota, and Tennessee did not show pronounced increases in training output subsequent to the initiation of statewide occupational licensing.

EDEPS Unit of Analysis: 4614A Electrical	
<p style="text-align: center;">CIP 46.0302 Electrician</p> <p>A program that prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair electric apparatus and systems such as residential, commercial, and industrial electric-power wiring; and DC and AC motors, controls, and electrical distribution panels. Includes instruction in the principles of electronics and electrical systems, wiring, power transmission, safety, industrial and household appliances, job estimation, electrical testing and inspection, and applicable codes and standards.</p>	<p style="text-align: center;">SOC 47-2111 Electricians</p> <p>Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems. Excludes "Security and Fire Alarm Systems Installers" (49-2098).</p>

Louisiana Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:

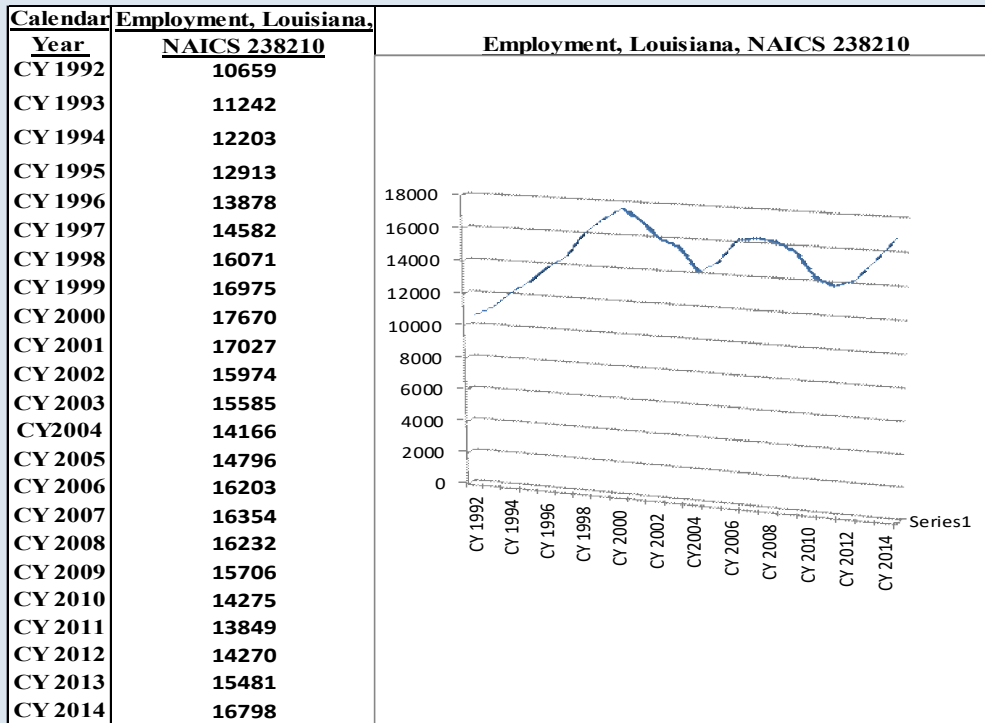


Note #1: shaded (grey and blue), background area represented years during which electricians in Louisiana were a licensed occupation statewide, i.e., FY 2004-FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of 12/2007 (peak)-6/2009 (trough), i.e., FY 2008-FY 2009.
 Note #3: the U.S. economy suffered mild recessions from 7/1990 (peak, not shaded)-3/1991 (trough, not shaded), and from 3/2001 (peak, not shaded)-11/2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Louisiana.

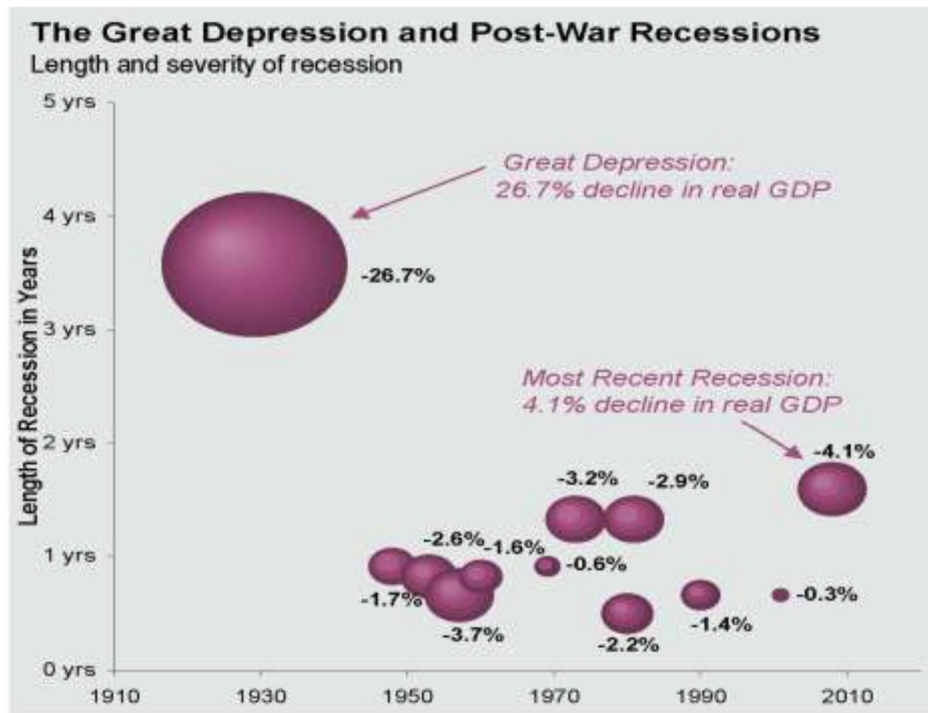
Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>; and EDEPS at www.edeps.org.

SOC 47-2111 Electricians							
Top 10 Industries By Employment, U.S.		Occupation Employment			% of Occupation in Industry		
Industry Code	Industry Title	2012	2022	Pct. Chg. 2012-22	2012	2022	
(Total employment is presented for comparison purposes.)		Total employment	583,500	698,200	19.7%	100.00%	100.00%
238210	Electrical contractors and other wiring installation contractors	357,300	454,600	27.2%	61.20%	65.10%	
	Self-employed workers	55,200	60,200	9.1%	9.50%	8.60%	
999300	Local government, excluding education and hospitals	15,200	16,300	6.8%	2.60%	2.30%	
561300	Employment services	10,600	13,500	27.3%	1.80%	1.90%	
	Nonresidential building construction	7,900	9,800	22.8%	1.40%	1.40%	
	Plumbing, heating, and air-conditioning contractors	7,300	9,400	29.4%	1.20%	1.30%	
221100	Electric power generation, transmission and distribution	6,800	5,700	-16.2%	1.20%	0.80%	
237130	Power and communication line and related structures construction	6,000	7,800	29.7%	1.00%	1.10%	
336600	Ship and boat building	5,300	4,800	-10.1%	0.90%	0.70%	
999100	Federal government, excluding postal service	4,900	4,300	-11.9%	0.80%	0.60%	

Source: U.S. Department of Labor, Bureau of Labor Statistics, National Industry-Occupation Employment Matrix; and EDEPS.



Employment Data Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW).

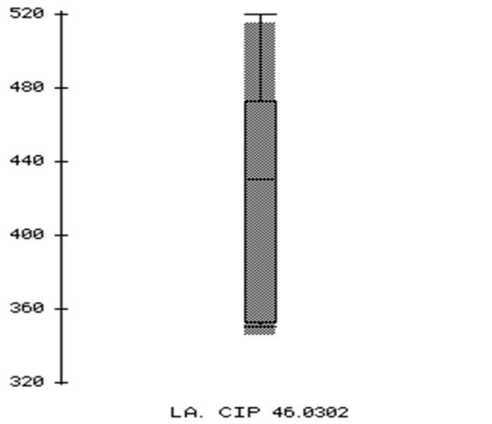


Source: NBER, BEA, J.P. Morgan Asset Management.

Bubble size reflects the severity of the recession, which is calculated as the decline in real GDP from the peak quarter to the trough quarter except in the case of the Great Depression, where it is calculated from the peak year (1929) to the trough year (1933), due to a lack of available quarterly data. Data are as of 12/31/10.

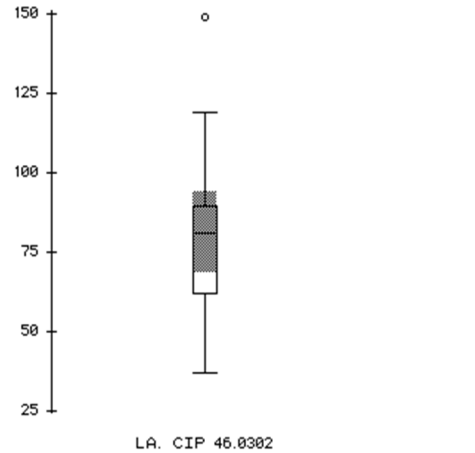
Above quotation and graph from J.P. Morgan Asset Management, *Guide to the Markets*, 4th Qrt., 2010, p. 13.

LA. CIP 46.0302 (Electricians)
Completers Lagged 6 Yrs. FY 2010 - FY 2014
Yes Statewide Licensure FY 2004 - FY 2008



Count	Mean	St.Dev.	Variance	Range	Min	Max	IQR	25th%	75th%
5	425.6	74.201	5505.8	169	351	520	132.25	352.5	484.75

LA. CIP 46.0302 (Electricians)
Completers Lagged 6 Yrs. FY 1998 - FY 2009
No Statewide Licensure FY 1992 - FY 2003



Count	Mean	St.Dev.	Variance	Range	Min	Max	IQR	25th%	75th%
12	81.67	29.992	899.515	112	37	149	27.5	62	89.5

Dependent variable is: CIP 46.0302 (Electricians) LA. # Completers Lagged 6 Years					
(Note: LA. refers to Louisiana)					
R squared = 93.7% R squared (adjusted) = 92.3%					
s = 46.64 with 17 - 4 = 13 degrees of freedom					
Source	Sum of Squares	df	Mean Square	F-ratio	
Regression	421135	3	140378	64.5	
Residual	28277.5	13	2175.19		
Variable	Coefficient	s.e. of Coeff	t-ratio	prob	
Constant	187.176	133.2	1.41	0.1833	
NAICS 238210	-0.0116913	0.01204	-0.971	0.3492	
Time Period (Yearly)	9.96524	7.901	1.26	0.2294	
Statewide Licensure Required (Yes=1, No=0)	270.748	62.18	4.35	0.0008	

where: $Y_t = a + b_1 X_{1t} + b_2 X_{2t} + b_3 X_{3t}$

Y_t is the annual linked training program completers (CIP 46.0302, electricians) lagged 6 fiscal years (FY)

X_{1t} is the national industry employment for electrical contractors and other wiring installation contractors (NAICS 238210), the industry of occupational employment concentration for electricians, by calendar years

X_{2t} is the time period (yearly)

X_{3t} is a dummy variable = 0 for the years prior to statewide licensing for electricians in Louisiana (i.e., before FY 2004)
 = 1 for FY 2004 through FY 2014 (statewide licensing for electricians in Louisiana)

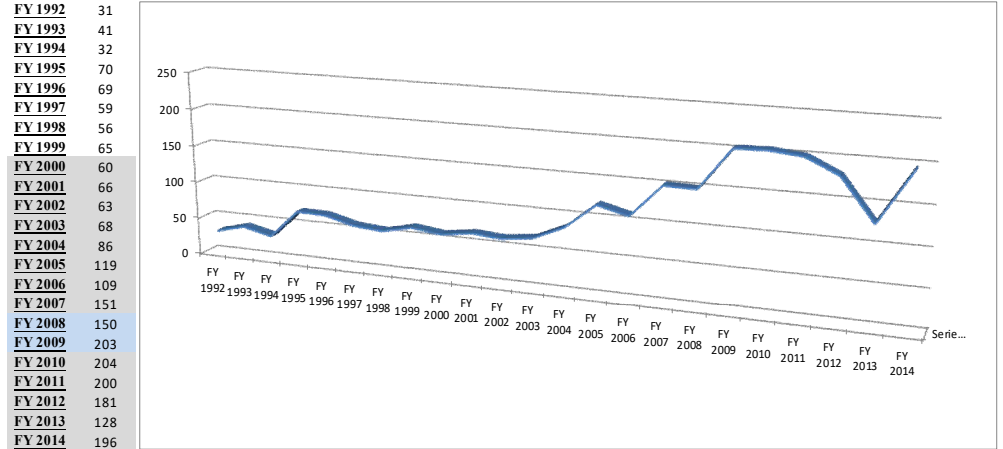
b_3 is the estimated magnitude of the difference in lagged training output (that is, completers/graduates) resulting from the initiation of occupational licensing for electricians in Louisiana

The 6-year lag for the dependent variable of related training program completers from CIP 46.0302 was necessary, because of the cumulative nature of the institutional effects of occupational licensing, as described by Kleiner:

Occupational licensing . . . is an institution whose effects are not immediately apparent, but rather reveal their efficacy over some time. Specifically, occupational licensing usually does not regulate current practitioners, implements new exams, and develops educational and location-specific requirements so that implementing

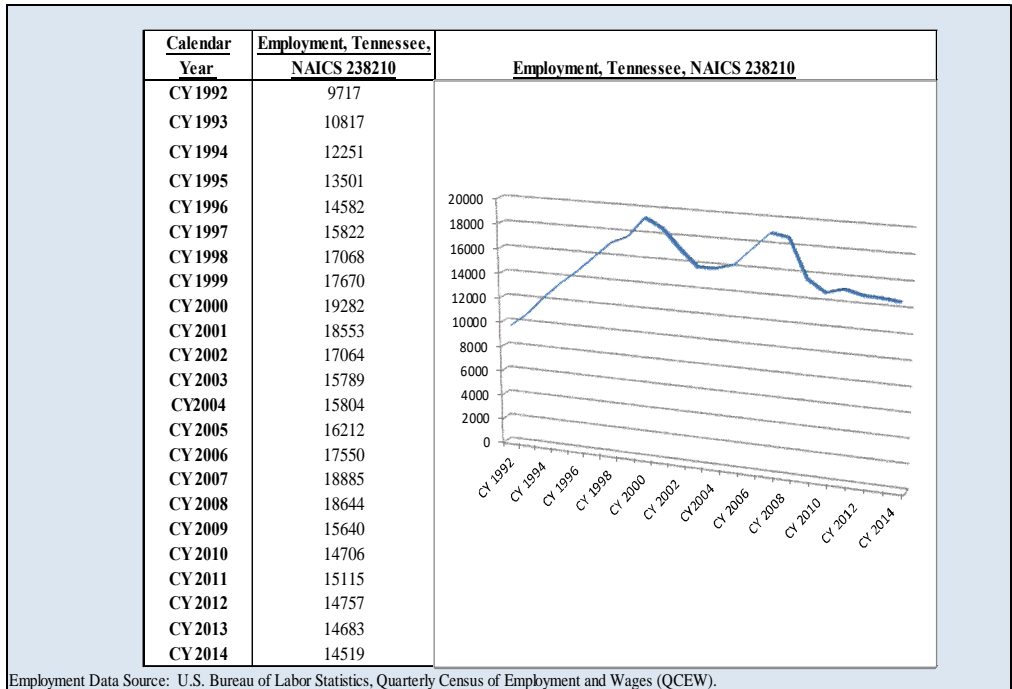
these policies takes many years. Consequently, the labor market or consumer outcomes are not immediately apparent. Understanding this institution requires a longer-run perspective before wage, price, quality, and distributional effects can be fully realized.²⁰

Tennessee Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:



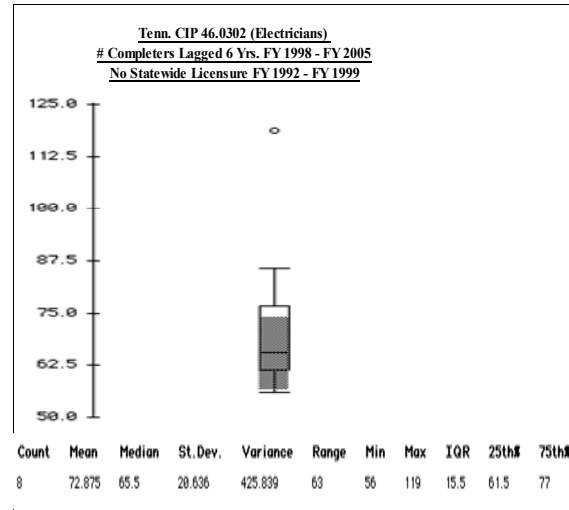
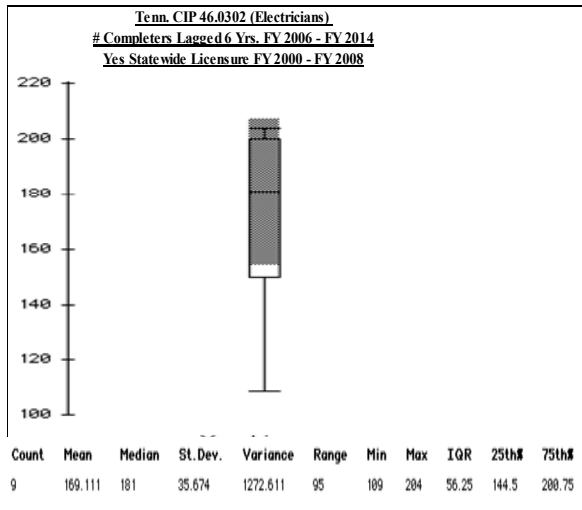
Note #1: shaded (grey and blue), background area represented years during which electricians in Tennessee were a licensed occupation statewide, i.e., FY 2000-FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of 12/2007 (peak)-6/2009 (trough), i.e., FY 2008-FY 2009.
 Note #3: the U.S. economy suffered mild recessions from 7/1990 (peak, not shaded)-3/1991 (trough, not shaded), and from 3/2001 (peak, not shaded)-11/2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 between FY 1992 and FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Tennessee.

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>; and EDEPS at www.edeps.org.



Employment Data Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW).

²⁰ Kleiner, Morris, *Stages of Occupational Regulation Analysis of Case Studies, op. cit.*, Upjohn Institute, 2013, p. xvi.



Dependent variable is: CIP 46.0302 (Electricians) Tenn. # Completers Lagged 6 Years
 (Note: Tenn. refers to Tennessee)

R squared = 85.2% R squared (adjusted) = 81.7%
 s = 24.46 with 17 - 4 = 13 degrees of freedom

Source	Sum of Squares	df	Mean Square	F-ratio
Regression	44610.8	3	14870.3	24.9
Residual	7775.69	13	598.13	

Variable	Coefficient	s.e. of Coeff	t-ratio	prob
Constant	112.146	43.09	2.6	0.0219
NAICS 238210	-0.00567192	0.003469	-1.64	0.126
Time Period (Yearly)	8.82895	2.943	3	0.0102
Statewide Licensing Required (Yes=1, No=0)	41.6257	23.83	1.75	0.1042

^ ^ ^ ^ ^

$$Y_t = a + b_1X_{1t} + b_2X_{2t} + b_3X_{3t}$$

where: Y_t is the annual linked training program completers (CIP 46.0302, electricians) lagged 6 fiscal years (FY)
 X_{1t} is the national industry employment for electrical contractors and other wiring installation contractors (NAICS 238210), the industry of occupational employment concentration for electricians, by calendar years
 X_{2t} is the time period (yearly)
 X_{3t} is a dummy variable = 0 for the years prior to statewide licensing for electricians in Tennessee (i.e., before FY 2000)
 = 1 for FY 2000 through FY 2014 (statewide licensing for electricians in Tennessee)
 b_3 is the estimated magnitude of the difference in lagged training output (that is, completers/graduates) resulting from the initiation of occupational licensing for electricians in Tennessee

In order to specify in detail (6-digit CIP) the education and training related to the labor market institution of national licensed occupations (6-digit SOC specificity), this study relied principally upon thirteen data resources:

- (1) the 2014-16 census of U.S. occupations licensed by the states, which was completed by the U.S. Department of Labor (USDOL) and its affiliated state bureaus of labor market information (LMI), and which mapped regulated occupational titles into detailed SOC codes and titles;
- (2) the EDEPS units of analysis (primarily the ðAö clusters),²¹ which provided specific and congruent definitional matches between detailed (6-digit) SOC licensed occupations, and the supportive, detailed (6-digit) CIP related training programs;
- (3) table 8.29, ðState Regulation of Selected Non-Health Occupations and Professions: 1991,ö

²¹ EDEPS at <http://www.edeps.org>. Frequently Asked Questions #7, *What are the Units of Analysis?* ð. . . ðAö clusters are those that are most valid for supply/demand analysis, as the occupations for the most part require formal educational training in one of the related programs.ö

table 8.30, State Regulation of Health Occupations and Professions: 1991, and table 8.31, Status of Mandatory Continuing Education for Selected Professions: 1991, as reported by Brinegar and Schmitt in their 1992 paper, *State Occupational and Professional Licensure*, for the Council of State Governments;²²

(4) Karen Greene, *Occupational Licensing and the Supply of Nonprofessional Manpower*, Office of Manpower Research, Monograph No. 11, Manpower Administration, U. S. Department of Labor, 1969, Appendix C, Number of States Licensing Selected Occupations;

(5) Morris M. Kleiner, *Licensing Occupations Ensuring Quality Or Restricting Competition*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2006, Appendix C, "Occupations Analyzed in the United States Using Multivariate Techniques";

(6) Morris M. Kleiner, *Stages of Occupational Regulation Analysis of Case Studies*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2013, Appendix B, "Adoption of Occupational Regulations by State Statute for Electricians, and "Universally Licensed Occupations," pp. 212-215;

(7) Morris M. Kleiner, *Guild-Ridden Labor Markets The Curious Case of Occupational Licensing*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2015, Table 3.1, "Percentage of Workers Who Require Specific Education and Testing to Become Licensed or Certified";

(8) Maury Gittleman (BLS), Mark A. Klee (Census Bureau), and Morris M. Kleiner, (Univ. of Minn./NBER), *Analyzing the Labor Market Outcomes of Occupational Licensing*, BLS Working Papers, Office of Compensation and Working Conditions, U.S. Bureau of Labor Statistics, U.S. Department of Labor, Working Paper 476, September, 2014, Tables 1 and 2, "Characteristics of Licensed and Certified Workers," and "Requirements of Becoming Licensed or Certified," respectively, and Table 4, "Most Common Occupations for Credentialed Workers: Definition 2";

(9) Dick M. Carpenter, Lisa Knepper, Angela C. Erickson, and John K. Ross, *License to Work A National Study of Burdens from Occupational Licensing*, Institute for Justice, May, 2012, Occupation Profiles, pp. 137-188;

(10) Bureau of Labor Statistics (BLS), U.S. Department of Labor (USDOL), *Occupational Outlook Handbook*, 2016-17 Edition, "How To Become One, Licenses, Certifications, and Registrations";

(11) U.S. Census Bureau, Survey of Income and Program Participation (SIPP), Related Fields of Training and Occupations, in Stephanie Ewert, Current Population Reports, Household Economic Studies, *What It's Worth: Field of Training and Economic Status in 2009*, Feb., 2012;

(12) Suyoun Han and Morris M. Kleiner, *Analyzing the Influence of Occupational Licensing Duration on Labor Market Outcomes*, Working Paper 22810, National Bureau of Economic Research, November, 2016, "universally licensed occupations (i.e., licensed in all states)," p.3, and Figure 2, p. 28; and,

(13) Salim Furth, Institute for Economic Freedom and Opportunity at the Heritage Foundation, *Understanding the Data on Occupational Licensing*, September 28, 2016, Table 1, "Highly Licensed Occupations," p. 4.

(Because economists Robert Thornton and Edward Timmons documented the rarity of the revocation of established, statewide occupational licenses in their *Monthly Labor Review* article,

²² Brinegar, Pamela L., and Kara L. Schmitt, "State Occupational and Professional Licensure," The Council of State Governments, Lexington, KY., *The Book of the States 1992-93*, Tables 8.29 through 8.31, pp.573-580.

May, 2015, titled "The de-licensing of occupations in the United States," older listings of widespread, licensed occupations continued to provide useful references.)²³

These resources were utilized as the primary references to create a documented listing of 35 national licensed occupations and 62 related training programs (see below), which, in 2016, were either licensed nationally by federal agencies or national licensing boards (e.g., the Federal Aviation Agency for pilots), or licensed by 45 or more states in 2016 (for example, the occupation of cosmetologists, which was licensed by every state according to the USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-2016). The development of the category of *national licensed occupations* with symbiotic training programs was necessary; because the Treasury/Labor/CEA summary reported, "Estimates suggest that over 1100 occupations are regulated in at least one State, but fewer than 60 are regulated in all 50 States, showing substantial differences in which occupations States choose to regulate."²⁴

These taxonomic linkages, based largely upon functional occupational and related training program definitions of the 35 national licensed occupations and the 62 linked training/educational programs, plus the literature review and USDOL/State LMI Bureaus census of licensed occupations, were not directly comparable with the published empirical data from the Census Bureau/BLS Current Population Survey (CPS) and the Census Bureau Survey of Income and Program Participation (SIPP); because the categories of occupations and education in the CPS and SIPP in published reports and tables were significantly broader than the 6-digit, detailed occupational and training classifications of the national licensed occupations and linked training programs. Nonetheless, for three large, national licensed occupations, the CPS data suggested clearly that significant proportions of the workers in these occupations were regulated (licensed).²⁵

<u>Occupational Title & 2-digit, 5-digit, & 6-digit SOC Codes</u>	<u>2015 Annual Averages Total Employed U.S.</u>	<u>2-digit SOC Code Percent with License</u>	<u>2015 Annual Averages Total Employed U.S. 5- & 6-Digit SOC as Percent of Related 2-Digit SOC</u>
Legal occupations (SOC 23)	1,803,000*	63.6*	
Lawyers (SOC 23-1011)	1,160,000**		64.3
Healthcare practitioners & technical occupations (SOC 29)	8,766,000*	72.2*	
Physicians & surgeons (SOC 29-1060)	1,007,000**		11.5
Registered nurses (SOC 29-1141)	2,973,000**		33.9

*Source: U.S. Bureau of Labor Statistics (BLS), Current Population Survey (CPS), Table 5, Certification and licensing status of the employed by occupation, 2015 annual averages, at <http://www.bls.gov/cps/certifications-and-licenses-table-5.htm>. "Respondents may possess an occupational license and certification, or more than one license and certification."

**Source: U.S. BLS, CPS, Household Data Annual Averages, 2015, Table 11, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, at <http://www.bls.gov/cps/cpsaat11.htm>.

Although BLS published their 2015 CPS occupational licensing data in broad, 2-digit SOC categories, Furth extended the same data set to report greater detail, when he published his

²³ Thorton, Robert J., and Edward J. Timmons, "The de-licensing of occupations in the United States," *Monthly Labor Review*, May, 2015, pp. 1-19, at <http://www.bls.gov/opub/mlr/2015/article/the-de-licensing-of-occupations-in-the-united-states.htm>. Furthermore, in his 2013 paper entitled, "How Do Professional Licensing Regulations Affect Practitioners? New Evidence," Mark A. Klee, *op. cit.*, p. 12, also remarked about the unlikelihood of repeal of an established, occupational license in a state.

²⁴ U.S. Department of the Treasury Office of Economic Policy, U.S. Department of Labor, and the White House Council of Economic Advisors (CEA), *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 4.

²⁵ U.S. Bureau of Labor Statistics (BLS), Current Population Survey (CPS), Table 5, Certification and licensing status of the employed by occupation, 2015 annual averages, at <http://www.bls.gov/cps/certifications-and-licenses-table-5.htm>; and BLS/CPS, Household Data Annual Averages, 2015, Table 11, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, at <http://www.bld.gov/cps/cpsaat11.htm>.

listing of 15 “highly licensed occupations” (with more than 100 observations for each job), for which 75% or more of the labor force in these occupations was licensed according to the Furth analysis of the 2015 CPS, as shown below.

Excerpt from the Furth Table 1 of “Highly Licensed Occupations,” with more than 100 CPS Observations:²⁶

<u>Occupational Title and # of Observations</u>		<u>Occupational Title and # of Observations</u>	
Registered Nurses	3,961	Nurse Practitioners	220
Lawyers	1,706	Speech-Language Pathologists	215
Secondary School Teachers	1,592	Aircraft Pilots and Flight Engineers	199
Physicians and Surgeons	1,261	Occupational Therapists	156
Special Education Teachers	474	Respiratory Therapists	146
Pharmacists	363	Veterinarians	133
Physical Therapists	341	Physician Assistants	108
Dentists	245		

Based on national survey data, in 2016 the BLS posted information about the CPS percent distribution of licensed workers by 2-digit SOC occupations;²⁷ and in 2015 the National Center for Education Statistics (NCES) and the Census Bureau provided the SIPP percent distributions of adults with a license or certification by educational attainment levels (i.e., < high school, high school completion, some college, associate’s degree, bachelor’s degree, master’s degree, professional degree, and doctorate degree).²⁸ Since most postsecondary education training investments were made at the level of 6-digit SOC and 6-digit CIP related codes, the broader occupational (2-digit SOC) and educational attainment categories utilized by the BLS and NCES/Census, respectively, for their published licensing data reduced the utility of this information for program planners. Hence, for training investors, the following listing of national licensed occupations and linked training programs was developed at the 6-digit level of detail.



²⁶ Furth, Salim, Institute for Economic Freedom and Opportunity at The Heritage Foundation, *Understanding the Data on Occupational Licensing*, September 28, 2016, Table 1, “Highly Licensed Occupations,” p. 4.

²⁷ Current Population Survey (CPS), Labor Force Statistics, Data on certifications and licenses, Table 5, Certification and licensing status of the employed by occupation, 2015 annual averages, at <http://www.bls.gov/cps/certifications-and-licenses-table-5.htm>.

²⁸ Ewert, Stephanie, Current Population Reports, Household Economic Studies, *What It’s Worth: Field of Training and Economic Status in 2009*, Survey of Income and Program Participation (SIPP), February, 2012, P70-129, U. S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau, “Related Fields of Training and Occupations,” pp. 10-11; and Hudson, Lisa, National Center for Education Statistics (NCES), and Stephanie Ewert, Census Bureau, “The Relationship Between Education and Work Credentials,” *Data Point*, U.S. Department of Education, NCES 2015-556, June, 2015, at <http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015556>.

*EDEPS = Economic Development and Employer Planning System at www.edeps.org		**IPEDS = Integrated Postsecondary Education Data System, National Center for Education Statistics (NCES)	
Units of Analysis: Source - EDEPS* for National Licensed Occupations (U.S.)		IPEDS** Training Programs Linked to National Licensed Occupations (U.S.):	
Code	Title	Standard Occupational Classification (SOC) Code and Title	Related Classification of Instructional Program (CIP) Code and Title
5218A	Accounting	13-2011 Accountants and Auditors	52.0301 Accounting
5212B	Actuarial Science	15-2011 Actuaries	52.1304 Actuarial Science
4915A	Airplane Piloting	53-2011 Airline Pilots, Copilots, and Flight Engineers 53-2012 Commercial Pilots	49.0102 Airline/Commercial/Professional Pilot and Flight Crew
5113A	All Other Health Diagnosis and Treatment	29-1199 Health Diagnosing and Treating Practitioners, All Other	51.3301 Acupuncture and Oriental Medicine 51.3300 Alternative and Complementary Medicine and Medical Systems, General 51.3399 Alternative and Complementary Medicine and Medical Systems, Other 51.3305 Ayurvedic Medicine/Ayurveda 51.3401 Direct Entry Midwifery 51.3306 Holistic Health 51.3304 Homeopathic Medicine/Homeopathy 51.3303 Naturopathic Medicine/Naturopathy 51.3302 Traditional Chinese Medicine and Chinese Herbology
0411A	Architecture	17-1011 Architects, Except Landscape and Naval	04.0902 Architectural and Building Sciences/Technology 04.0901 Architectural Technology/Technician 04.0201 Architecture 04.9999 Architecture and Related Services, Other 04.0401 Environmental Design/Architecture 04.0501 Interior Architecture 04.1001 Real Estate Development
1211A	Barbering/Cosmetology	39-5011 Barbers 39-5012 Hairdressers, Hairstylists, and Cosmetologists	12.0402 Barbering/Barber 12.0413 Cosmetology, Barber/Styling, and Nail Instructor 12.0401 Cosmetology/Cosmetologist, General
5133A	Chiropractic	29-1011 Chiropractors	51.0101 Chiropractic
4712A	Communication Electronics	27-4013 Radio Operators	47.0103 Communications Systems Installation and Repair Technology
5135A	Dental Hygiene	29-2021 Dental Hygienists	51.0602 Dental Hygiene/Hygienist
5119A	Dentistry	29-1021 Dentists, General	51.0401 Dentistry
5230B	Insurance	41-3021 Insurance Sales Agents	52.1701 Insurance
0412A	Landscape Architecture	17-1012 Landscape Architects	04.0601 Landscape Architecture
2211A	Legal Services	23-1011 Lawyers	22.0101 Law
5159A	LPN	29-2061 Licensed Practical and Licensed Vocational Nurses	51.3901 Licensed Practical/Vocational Nurse Training 51.3999 Practical Nursing, Vocational Nursing and Nursing Assistants, Other
6011A	Medicine	29-1060 Physicians and Surgeons	51.1201 Medicine 51.1901 Osteopathic Medicine/Osteopathy
4114A	Nuclear/Radiologic Technology	51-8011 Nuclear Power Reactor Operators	41.0299 Nuclear and Industrial Radiologic Technologies/Technicians, Other 15.1401 Nuclear Engineering Technology/Technician 41.0205 Nuclear/Nuclear Power Technology/Technician
5123A	Nursing	29-1141 Registered Nurses	51.3801 Registered Nursing/Registered Nurse
5150A	Occupational Therapy	29-1122 Occupational Therapists	51.2306 Occupational Therapy/Therapist
5125A	Optometry	29-1041 Optometrists	51.1701 Optometry
5163B	Pharmacy	29-1051 Pharmacists	51.2001 Pharmacy
5151A	Physical Therapy	29-1123 Physical Therapists	51.2308 Physical Therapy/Therapist
5121A	Physician Assisting	29-1071 Physician Assistants	51.0912 Physician Assistant
5127A	Podiatry	29-1081 Podiatrists	51.2101 Podiatric Medicine/Podiatry
5227A	Real Estate	13-2021 Appraisers and Assessors of Real Estate 41-9022 Real Estate Sales Agents	52.1501 Real Estate
5116A	Speech Pathology/Audiology	29-1181 Audiologists 29-1127 Speech-Language Pathologists	51.0202 Audiology/Audiologist 51.0204 Audiology/Audiologist and Speech-Language Pathology/Pathologist 51.0299 Communication Disorders Sciences and Services, Other 51.0201 Communication Sciences and Disorders, General 51.0203 Speech-Language Pathology/Pathologist
4511A	Surveying/Cartography	17-1022 Surveyors	14.3801 Surveying Engineering 15.1102 Surveying Technology/Surveying
4912B	Truck and Bus Driving	53-3022 Bus Drivers, School or Special Client 53-3021 Bus Drivers, Transit and Intercity 53-3032 Heavy and Tractor-Trailer Truck Drivers 53-3033 Light Truck or Delivery Services Drivers	49.0205 Truck and Bus Driver/Commercial Vehicle Operator and Instructor
5129A	Veterinary Medicine	29-1131 Veterinarians	51.2509 Comparative and Laboratory Animal Medicine 51.2507 Large Animal/Food Animal and Equine Surgery and Medicine 51.2508 Small/Companion Animal Surgery and Medicine 51.2511 Veterinary Infectious Diseases 51.2401 Veterinary Medicine 51.2504 Veterinary Microbiology and Immunobiology 51.2505 Veterinary Pathology and Pathobiology 51.2503 Veterinary Physiology 51.2510 Veterinary Preventive Medicine, Epidemiology, and Public Health 51.2501 Veterinary Sciences/Veterinary Clinical Sciences, General

The national licensed occupations with their respective, supportive CIP training programs and completions data by degree/certificate award used in this analysis were linked by functional definitions after taxonomic review, where the subject content of the linked CIP training programs was strongly related to the SOC work functions of the linked national licensed occupations.²⁹ The following example of the straightforward SOC/CIP training link for the licensed occupation of dental hygienist (licensed by 50 states in 2016)³⁰ was representative of the close links by program and occupational definitions between the national licensed occupations and their related training programs reviewed in this study.

Unit of Analysis: 5135A Dental Hygiene³¹	
Program of Study and Training Related to National Licensed Occupation	National Licensed Occupation
<p><u>CIP 51.0602 Dental Hygiene/Hygienist</u> </p> <p>A program that prepares individuals to clean teeth and apply preventive materials, provide oral health education and treatment counseling to patients, identify oral pathologies and injuries, and manage dental hygiene practices. Includes instruction in dental anatomy, microbiology, and pathology; dental hygiene theory and techniques; cleaning equipment operation and maintenance; dental materials; radiology; patient education and counseling; office management; supervised clinical training; and professional standards.</p>	<p><u>SOC 29-2021 Dental Hygienists</u> </p> <p>Clean teeth and examine oral areas, head, and neck for signs of oral disease. May educate patients on oral hygiene, take and develop x rays, or apply fluoride or sealants.</p>

²⁹ The precedent for the application of this type of SOC/CIP crosswalk was described in footnotes 9 and 10 of the paper by Ewert, Stephanie, *What It's Worth: Field of Training and Economic Status in 2009*, *op. cit.*, p. 10. Teachers were not included in the list of national licensed occupations (definition #1); because the USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-16, reported fewer than 45 states licensed the occupations of elementary school teachers, except special education (SOC 25-2021); kindergarten teachers, except special education (SOC 25-2012); preschool teachers, except special education (SOC 25-2011); secondary school teachers, except special and career/technical education (SOC 25-2031); special education teachers, all other (SOC 25-2059); special education teachers, kindergarten and elementary school (SOC 25-2052); special education teachers, middle school (SOC 25-2053); special education teachers, preschool (SOC 25-2051); and special education teachers, secondary school (SOC 25-2054). Similarly, Mark A. Klee (in his paper, *How Do Professional Licensing Regulations Affect Practitioners? New Evidence*, *op. cit.*, p. 12) noted that teachers may be issued certifications, but not licenses. Further, electricians were not included among the listing of national licensed occupations; since both the USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-2016, and the Morris Kleiner publication, *Stages Of Occupational Regulation Analysis of Case Studies* (Appendix B, Adoption of Occupational Regulations by State Statute for Electricians, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2013, pp. 235-238), indicated that electricians were state-licensed by fewer than 45 states. In addition, plumbers and psychologists were excluded from the set of national licensed occupations as a result of the finding by the USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-16, that plumbers and psychologists were licensed in fewer than 45 states. Also, as reported in the *Occupational Outlook Handbook* (OOH) of the U.S. Bureau of Labor Statistics (BLS at <http://www.bls.gov/oooh>), all certified public accountants must be licensed by their state's Board of Accountancy, and all pension actuaries must be licensed by the U.S. Departments of Labor and Treasury through the Joint Board for the Enrollment of Actuaries; hence, these two occupations were included in the listing of the national licensed occupations. Civil, electrical, and industrial engineers were not included among the national licensed occupations; because the OOH reported for these occupations that, "Licensure is not required for entry-level positions . . ." (See OOH/BLS at <http://www.bls.gov/oooh>). Ship pilots were excluded from the listing of national licensed occupations, because "a license or endorsement as a Pilot is route-specific . . ." (See EDEPS, licensed occupations, at www.edeps.org). Furthermore, according to the USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-2016, social workers (at the 6-digit SOC level of detail) and respiratory therapists (SOC 29-1126) were licensed in less than 45 states. Finally, since nurse practitioners must be licensed registered nurses, and RNs were included among the national licensed jobs; the nurse practitioners were not added to avoid redundancy.

³⁰ USDOL/State LMI Bureaus, Census of Licensed Occupations, 2014-16; and, EDEPS, *op. cit.*, state occupational demand indicators, licensed occupations, at <http://www.edeps.org>.

³¹ Economic Development and Employer Planning System (EDEPS), *op. cit.*, units of analysis, state occupational demand indicators, licensed occupations, at <http://www.edeps.org>.

In addition to the taxonomic review, survey data from the National Survey of College Graduates (NSCG, 2015) reinforced the labor supply specification of the postsecondary education programs linked to the national licensed occupations.³² Appendix III presented tabular outputs from the NSCG (weighted and non-weighted) of columns of the principal job held by respondents during the week of 2/1/15 (for national licensed occupations) by rows of the field of study for highest degree received by respondents before 2/1/15 (for training programs related to the national licensed occupations), which supported empirically the association of linked training programs to national licensed occupations based on the taxonomic review.³³ Also included in Appendix III are links to similar, national survey data from the American Community Survey (ACS) for bachelor degree recipients, which supported the taxonomically-based, labor supply specification with field of degree (college major) data related to the national licensed occupations.³⁴ The third appendix, in addition, summarized statewide wage record follow-up reports from the Texas Higher Education Coordinating Board (THECB) about the output (graduates) from the linked educational programs distributed by detailed industry (4-digit NAICS codes), where those industries also matched the occupational/industry employment distribution for the linked national licensed jobs.³⁵

These postsecondary training programs, related to national licensed occupations, represented a significant portion (13%) of the total U.S. postsecondary education output of program graduates in FY 2015, based on the Integrated Postsecondary Education Data System (IPEDS) census of completions.³⁶ FY 2015 training for national licensed occupations dominated the doctoral education programs at 59% of the total U.S. doctorate completers,³⁷ and represented a third of the U.S. total associate plus awards/certificates for postsecondary training programs of at least 2, but less than 4, academic years (that is, 33%), and almost a third for total U.S. certificate 2 postsecondary educational programs of at least 1, but less than 2, academic years (i.e., 28%).³⁸

The significant amount of training related to national licensed occupations at the level of associate plus awards/certificates 2-4 years resulted from the output of graduates from training

³² As described by Program Director John Finamore of the National Center for Science and Engineering Statistics (at <https://www.nsf.gov/statistics/srvygrads/#sd>). The National Survey of College Graduates is a longitudinal biennial survey conducted since the 1970s that provides data on the nation's college graduates, with particular focus on those in the science and engineering workforce. The survey samples individuals who are living in the United States during the survey reference period, have at least a bachelor's degree, and are under the age of 76. This survey is a unique source for examining the relationship of degree field and occupation in addition to other characteristics of college-educated individuals, including occupation, work activities, salary, and demographic information. Director Finamore also provided the major 2015 NSCG parameters: reference period - week 2/1/15; response unit - individuals with at least a bachelor's degree; sample size - approximately 135,000 individuals; population size - 58 million individuals approximately (see Key Survey Information at <https://www.nsf.gov/statistics/srvygrads/#sd>).

³³ Tables generated from the Scientists and Engineers Statistical Data System (SESTAT), Table Output for National Survey of College Graduates, NSCG PUBLIC 2015, at <https://ncesdata.nsf.gov/sestat/sestat.html>, accessed March, 2017.

³⁴ The Hamilton Project, The Brookings Institution, *Putting Your Major to Work: Career Paths after College*, interactive tool at http://www.hamiltonproject.org/charts/median_earnings_for_largest_occupations. Also, see Rotrosen, Anna, Diane Whitmore Schanzenbach, Greg Nantz, and Ryan Nunn, *Where will your degree take you? Career paths after college*, at <https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college>, May 11, 2017.

³⁵ Borcoman, Gabriela, Senior Program Director, Texas Higher Education Coordinating Board (THECB), statewide employment of 6-digit CIP program output (for programs linked to the national licensed occupations) by detailed industry of employment post-training (4-digit NAICS), wage record follow-up reports, April, 2017. As reported by Dr. Borcoman, "The graduates in this sample graduated sometime between September 2014 and August 2015, were employed in 4th quarter of 2015 and they were not enrolled in Texas higher education in Fall 2015 semester." Email communication to author on 5/19/2017.

³⁶ Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, and EDEPS at www.edeps.org. See also Appendix II.

³⁷ *Ibid.*

³⁸ *Ibid.*

programs linked to the national licensed occupations of cosmetologists and registered nurses.³⁹ For the related training certificate programs 1-2 years, this output of completers was focused primarily upon the national licensed occupations of licensed practical nurses, cosmetologists, and barbers.⁴⁰ The estimate of the large proportion of doctoral education completers, graduating from programs linked to regulated occupations, reflected recent CIP taxonomic changes (starting in FY 2008) that subsumed the prior category of *first professional degree* graduates under the new classification of *Doctor's degree – professional practice*.⁴¹

IPEDS Training Programs Linked to National Licensed Occupations, U.S.: (Definition #1)	Program Completers by Degree Level (2014 - 2015)										United States
	Cert1	Cert2	Asse	Asse+	Bach	CertB	Mast	CertM	Doct	Total	
SUBSET U.S. POSTSECONDARY TRAINING PROGRAM COMPLETERS, 2014-15, LINKED BY RELATED PROGRAM AND OCCUPATIONAL DEFINITIONS, TO OCCUPATIONS LICENSED BY 45 OR MORE STATES OR BY FEDERAL AGENCY OR NATIONAL LICENSING AUTHORITY= Source: Economic Development and Employer Planning System (EDEPS at www.edeps.org , Units of Analysis, Supply Indicators, Training Program Completers), and U.S. Department of Labor (USDOL) State Labor Market Information (LMI) Bureaus, Census of Licensed Occupations, 2014-16.	38,235	122,979	103,004	11,747	206,353	1,094	64,950	423	105,834	654,619	
TOTAL U.S. POSTSECONDARY TRAINING PROGRAM COMPLETERS, 2014-2015= Source: U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data). Note: These completions data were collected from Title IV institutions in the United States, 7013 institutions, NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/ganswer.aspx?si=4&qid=24 (accessed 4/16/17).	485,304	440,551	1,014,023	35,312	1,894,934	38,219	758,708	17,625	178,547	4,863,223	
SUBSET U.S. POSTSECONDARY TRAINING PROGRAM COMPLETERS, 2014-15, LINKED BY RELATED PROGRAM AND OCCUPATIONAL DEFINITIONS, TO OCCUPATIONS LICENSED BY 45 OR MORE STATES OR BY FEDERAL AGENCY OR NATIONAL LICENSING AUTHORITY, AS PERCENT OF TOTAL U.S. POSTSECONDARY TRAINING PROGRAM COMPLETERS, 2014-2015=	8%	28%	10%	33%	11%	3%	9%	2%	59%	13%	

IPEDS Training Programs Linked to National Licensed Occupations,
as % of Total U.S. Postsecondary Education Program Completions,
Title IV Institutions, FY 2015

Cert1 = Postsecondary award, certificate, or diploma of less than 1 academic year
 Cert2 = Postsecondary award, certificate, or diploma of at least 1 but less than 2 academic years
 Asse = Associate's degree
 Asse+ = Postsecondary award, certificate, or diploma of at least 2 but less than 4 academic years
 Bach = Bachelor's degree or equivalent CertB = Post-baccalaureate certificate
 Mast = Master's degree CertM = Post-master's certificate
 Doct = Doctor's degree

Source: National Center for Educational Statistics, Degrees Conferred 2014-15. An individual with a double-major (receiving two degrees) is counted as a completer for their primary degree program.

During FY 2015, the U.S. postsecondary training institutions produced a total of 178,547 doctoral graduates, of whom 59% (or 105,834 completers) graduated from programs linked to national licensed occupations. The top five doctoral training programs targeting and supporting national licensed occupations, and their respective magnitude of output, are listed below by the number of U.S. FY 2015 doctorate completers:⁴²

<u>CIP Code</u>	<u>Program Title</u>	<u># U.S. FY 2015 Doctorate Graduates from Programs Linked to National Licensed Occupations</u>	<u>% of Total U.S. FY 2015 Doctoral Completers (Regardless of Licensure)</u>
22.0101	Law	40,630	23%
51.1201	Medicine	18,551	10%
51.2001	Pharmacy	14,344	8%
51.2308	Physical Therapy/Therapist	10,618	6%
51.0401	Dentistry	5,867	3%

³⁹ See Appendix II, SOC 39-5012 (hairdressers, hairstylists, and cosmetologists) and the linked CIP 12.0401 (cosmetology/cosmetologist, general), and SOC 29-1141 (registered nurses) and the related CIP 51.3801 (registered nursing/registered nurse).

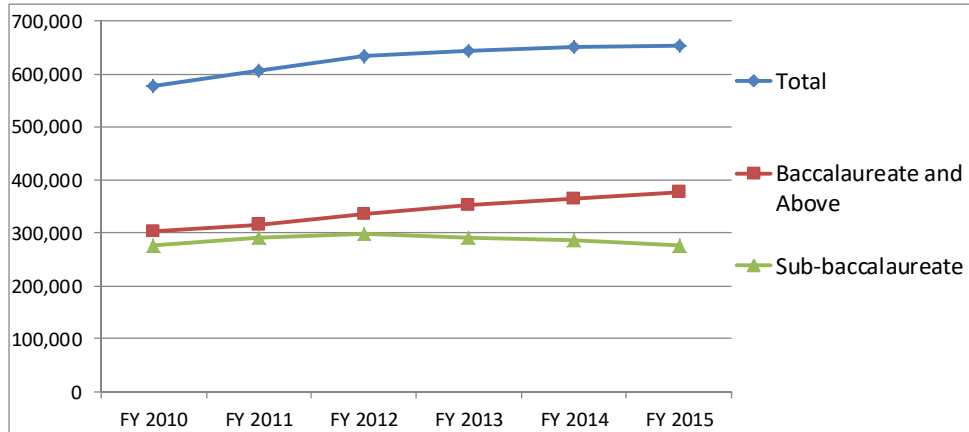
⁴⁰ See Appendix II, SOC 29-2061 (licensed practical and licensed vocational nurses) related to CIP 51.3901 (licensed practical/vocational nurse training) and CIP 51.3999 (practical nursing, vocational nursing, and nursing assistants, other); and SOC 39-5012 (hairdressers, hairstylists, and cosmetologists) linked to CIP 12.0401 (cosmetology/cosmetologist, general); and SOC 39-5011 (barbers) linked to CIP 12.0402 (barbering/barber).

⁴¹ U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data), Number of degrees/certificates awarded at postsecondary institutions by award level, U.S. Title IV institutions, at <http://nces.ed.gov/ipeds/trendgenerator>; and EDEPS at www.edeps.org (accessed April, 2017).

⁴² *Ibid.*, and EDEPS at www.edeps.org.

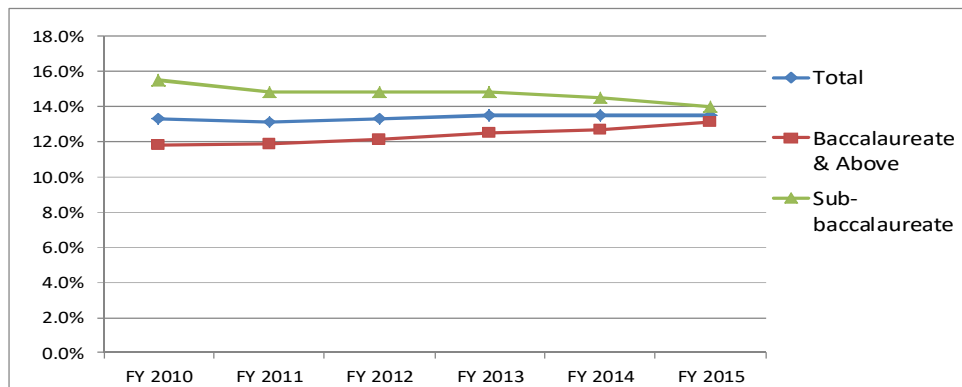
In addition, recent trends in the IPEDS completions data, for educational programs related to national licensed occupations, revealed contrasting patterns between baccalaureate and above training output and sub-baccalaureate training production of graduates, both in absolute terms and as shares of the corresponding total U.S. postsecondary education completers, by degree/awards and certificates.⁴³

U.S. Graduates from Training Programs Linked to National Licensed Occupations



Program Year	Total	Baccalaureate and Above	Sub-baccalaureate
FY 2010	578,135	302,284	275,851
FY 2011	606,828	315,702	291,126
FY 2012	633,919	336,403	297,516
FY 2013	645,107	353,039	292,068
FY 2014	650,567	364,184	286,383
FY 2015	654,619	378,654	275,965

U.S. Graduates from Training Programs Linked to National Licensed Occupations, as Shares of Total U.S. Postsecondary Educational Program Completers



Program Year	% of Total	% of Baccalaureate and Above	% of Sub-baccalaureate
FY 2010	13.3%	11.8%	15.5%
FY 2011	13.1%	11.9%	14.8%
FY 2012	13.3%	12.1%	14.8%
FY 2013	13.5%	12.5%	14.8%
FY 2014	13.5%	12.7%	14.5%
FY 2015	13.5%	13.1%	14.0%

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), provisional completions data; and EDEPS at www.edeps.org. See also Appendix II.

⁴³ Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), provisional completions data, and EDEPS at www.edeps.org. See also Appendix II.

Between FY 2010 and FY 2015, the comparisons between the graduates from training programs related to national licensed occupations, by type of degree/award or certificate/diploma, revealed that only the categories of (a) postsecondary award, certificate, or diploma of at least 1 but less than 2 academic years (i.e., *Cert2*), (b) postsecondary award, certificate, or diploma for training of at least 2, but less than 4, academic years (i.e., *Assc+*), (c) post-baccalaureate certificate (that is, *CertB*), and (d) post-master's certificate (that is, *CertM*), declined in the number of completers. However, in the case of the *Assc+* training completers linked to national licensed jobs, their percentage of the total U.S. graduates, in the comparative award classification of certificate training ≥ 2 and < 4 academic years without regard to licensure, increased even with the declining number of graduates. The increase in percentage share developed, because the total U.S. graduates with an award, certificate, or diploma from training programs of at least 2, but less than 4, academic years without regard to licensure also declined, but at a greater rate (that is, negative percent change FY 2010 to FY 2015).

In the cases of associate degree programs (*Assc*), and doctoral training programs (*Doct*) linked to national licensed occupations, the share of these training program categories fell as a percent of the correlative, overall U.S. number of graduates with the same program completion degree (*Assc* or *Doct*), without regard to licensure. This result occurred, because the degree categories of associate and doctoral degrees (without regard to licensure) produced graduates at greater rates than their respective sub-sets of (i) associate degree programs, and (ii) doctorate programs (both linked to national licensed occupations), as shown in the following tables.⁴⁴

Total U.S. Completers from Training Programs Linked to National Licensed Occupations (Definition #1)

Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total	Baccalaureate & Above	Sub-baccalaureate
FY 2010	35,174	125,089	100,072	15,516	152,155	1,116	47,941	566	100,506	578,135	302,284	275,851
FY 2011	35,093	137,064	102,695	16,274	158,551	1,144	53,015	403	102,589	606,828	315,702	291,126
FY 2012	34,942	140,933	104,940	16,701	172,516	940	56,812	455	105,680	633,919	336,403	297,516
FY 2013	33,562	136,997	106,425	15,084	183,492	955	59,955	389	108,248	645,107	353,039	292,068
FY 2014	36,744	130,348	106,060	13,231	193,722	1,073	61,955	366	107,068	650,567	364,184	286,383
FY 2015	38,235	122,979	103,004	11,747	206,353	1,094	64,950	423	105,834	654,619	378,654	275,965

Total U.S. Postsecondary Training Program Completers (Linked & Non-linked to National Licensed Occupations)

Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total	Baccalaureate & Above	Sub-baccalaureate
FY 2010	503,325	382,373	849,572	50,091	1,650,014	31,559	693,025	18,363	158,558	4,336,880	2,551,519	1,785,361
FY 2011	482,947	502,835	942,336	43,775	1,715,913	34,487	730,635	18,175	163,765	4,634,868	2,662,975	1,971,893
FY 2012	463,849	480,457	1,017,538	43,409	1,791,046	35,148	754,229	18,282	170,062	4,774,020	2,768,767	2,005,253
FY 2013	452,202	473,121	1,007,076	40,761	1,840,164	33,954	751,751	18,067	175,038	4,792,134	2,818,974	1,973,160
FY 2014	479,574	452,533	1,003,422	37,246	1,869,814	36,238	754,475	19,228	177,580	4,830,110	2,857,335	1,972,775
FY 2015	485,304	440,551	1,014,023	35,312	1,894,934	38,219	758,708	17,625	178,547	4,863,223	2,888,033	1,975,190

Total U.S. Completers from Training Programs Linked to National Licensed Occupations (Definition #1), as % of Total U.S. Postsecondary Training Program Graduates (Linked & Non-linked to National Licensed Occupations)

Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total	Baccalaureate & Above	Sub-baccalaureate
FY 2010	7.0%	32.7%	11.8%	31.0%	9.2%	3.5%	6.9%	3.1%	63.4%	13.3%	11.8%	15.5%
FY 2011	7.3%	27.3%	10.9%	37.2%	9.2%	3.3%	7.3%	2.2%	62.6%	13.1%	11.9%	14.8%
FY 2012	7.5%	29.3%	10.3%	38.5%	9.6%	2.7%	7.5%	2.5%	62.1%	13.3%	12.1%	14.8%
FY 2013	7.4%	29.0%	10.6%	37.0%	10.0%	2.8%	8.0%	2.2%	61.8%	13.5%	12.5%	14.8%
FY 2014	7.7%	28.8%	10.6%	35.5%	10.4%	3.0%	8.2%	1.9%	60.3%	13.5%	12.7%	14.5%
FY 2015	7.9%	27.9%	10.2%	33.3%	10.9%	2.9%	8.6%	2.4%	59.3%	13.5%	13.1%	14.0%

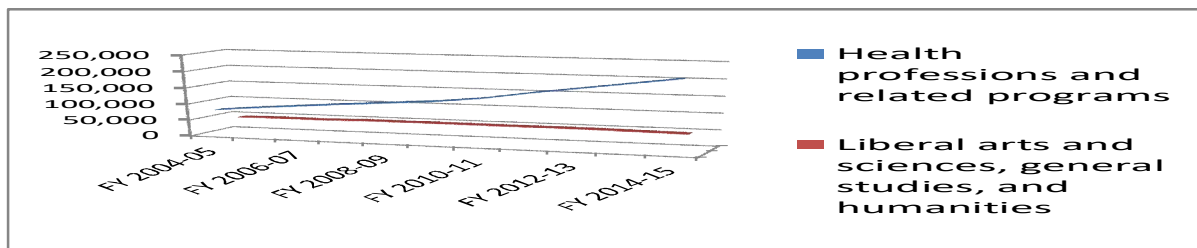
Sources: Economic Development and Employer Planning System (EDEPS at www.edeps.org, Units of Analysis, Supply Indicators, Training Program Completers, Provisional Data); U.S. Department of Labor (USDOL)/State Labor Market Information (LMI) Bureaus, Census of Licensed Occupations, 2014-16; and U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data), Number of degrees/certificates awarded at postsecondary institutions by award level, U.S. Title IV institutions, at <http://nces.ed.gov/ipeds/trendgenerator>.

⁴⁴ Economic Development and Employer Planning System (EDEPS at www.edeps.org, Units of Analysis, Supply Indicators, Training Program Completers, Provisional Data); U.S. Department of Labor (USDOL)/State Labor Market Information (LMI) Bureaus, Census of Licensed Occupations, 2014-16; and U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data), Number of degrees/certificates awarded at postsecondary institutions by award level, U.S. Title IV institutions, at <http://nces.ed.gov/ipeds/trendgenerator>.

The increasing share of baccalaureate training output linked to the national licensed occupations between FY 2010 - FY 2015 (that is, 9% to 11% of total U.S. baccalaureate graduates), coupled with the growing proportion of the workforce employed in licensed jobs (estimated at 29% of the 2008 U.S. workforce by Kleiner and the U.S. Departments of the Treasury and Labor and the White House Council of Economic Advisors, up from an estimated 5% in the 1950s),⁴⁵ will influence administrative and curricular developments for higher education, especially liberal arts colleges. The historical debate about the relative merits of a liberal arts education versus vocational training has been superseded over time by the dichotomy between training programs linked to the national licensed occupations (which emphasize vocational skills) and educational programs oriented towards non-regulated career fields (to which liberal arts education may be increasingly consigned as a consequence of the growth of the labor market institution of occupational licensure).

For example, the National Center for Education Statistics (NCES) reported the largest percent change in U.S. baccalaureate degrees by field of study from FY 2005 to FY 2015 in the health professions and related programs,⁴⁶ which were dominated by training linked to the national licensed occupations, e.g., (definition #1) health diagnosing and treating practitioners, all other; dental hygienists; general dentists; licensed practical and licensed vocational nurses; physicians and surgeons; registered nurses; occupational therapists; optometrists; pharmacists; physical therapists; physician assistants; podiatrists; audiologists; speech-language pathologists; veterinarians; (definition #2) nurse practitioners; respiratory therapists; and emergency medical technicians/paramedics. For the same time period, the contrast between the superlative U.S. growth of bachelor's degrees in the field of study of the health professions and related programs, and the decline (especially since FY 2013 ó a 7% decrease in only two years) of the U.S. baccalaureate degrees in the field of study of liberal arts and sciences, general studies, and humanities, was striking.

U.S. Bachelor's Degrees Conferred, Title IV Postsecondary Institutions, by Field of Study



⁴⁵ U.S. Departments of the Treasury and Labor, Council of Economic Advisors (CEA), White House, *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 17.

⁴⁶ National Center for Education Statistics (NCES), *Digest of Educational Statistics*, 2016, Table 322.10. Bachelor's degrees conferred by postsecondary institutions, by field of study: Selected years, 1970-71 through 2014-15, Title IV participating postsecondary institutions, at https://nces.ed.gov/programs/digest/d16/tables/dt16_322.10.asp?current=yes.

U.S. Bachelor's Degrees Conferred, Title IV Postsecondary Institutions, Field of Study	FY 2004-2005	FY 2005-2006	FY 2006-2007	FY 2007-2008	FY 2008-2009	FY 2009-2010	FY 2010-2011	FY 2011-2012	FY 2012-2013	FY 2013-2014	FY 2014-2015	% Change FY 2005-15
Total	1,439,264	1,485,242	1,524,092	1,563,069	1,601,399	1,649,919	1,716,053	1,792,163	1,840,381	1,870,150	1,894,934	32%
Health professions & related programs	80,685	91,973	101,810	111,478	120,420	129,623	143,463	163,675	181,149	198,777	216,228	168%
Liberal arts & sciences, gen. studies, & humanities	43,751	44,898	44,255	46,940	47,095	46,963	46,717	46,961	46,790	45,281	43,647	-0.20%

Source: National Center for Education Statistics (NCES), *Digest of Educational Statistics*, 2016, Table 322.10.

Furthermore, the demographics of the workforce of national licensed occupations, when contrasted with the gender and racial/ethnic proportions of the completers of the linked training/educational programs, identified the specific licensed occupational labor markets where demographic workforce changes are likely to occur in the future. The demographic data about national licensed occupations and their related training program completers helped to specify which groups will likely receive the wage premiums enjoyed by workers in the labor markets of national regulated (that is, licensed) occupations.⁴⁷

With regard to women, the recent U.S. training completion data for programs linked to national licensed occupations suggest the likelihood of an increasing female share over time of the wage premiums paid to the licensed workforce of architects, chiropractors, dentists, lawyers, physicians/surgeons, and veterinarians, resulting from the increased output of women graduates from related training programs.⁴⁸

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Architects, except Naval (SOC 17-1010)	203,000	26%	6%	8%	6%		3,130
Architecture (CIP 04.0201)		43%	4%	8%	12%	10,531	
Landscape Architecture (CIP 04.0601)		49%	2%	5%	8%	1,662	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Architecture (CIP 04.0201)		43%	4%	8%	14%	10,415	
Landscape Architecture (CIP 04.0601)		49%	3%	5%	8%	1,552	

Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Chiropractors (SOC 29-1011)	75,000	30%	3%	3%	9%		1,600
Chiropractic (CIP 51.0101)		40%	4%	6%	5%	2,420	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Chiropractic (CIP 51.0101)		40%	5%	6%	6%	2,544	

⁴⁷ Citing the research report by Kleiner, Morris M., and Alan B. Krueger, "The Prevalence and Effects of Occupational Licensing," *British Journal of Industrial Relations* 48, no. 4, 2010, pp. 676-687, the U.S. Departments of Treasury (Office of Economic Policy) and Labor and the President's Council of Economic Advisors (CEA), in their summary report entitled, *Occupational Licensing: A Framework For Policymakers*, July, 2015, p. 14, concluded that, "Estimates that account for differences in education, training, and experience find that licensing results in 10 percent to 15 percent higher wages for licensed workers relative to unlicensed workers." See also Gittleman, Maury (BLS), Mark A. Klee, (Census Bureau), and Morris M. Kleiner, (Univ. of Minn./NBER), *Analyzing the Labor Market Outcomes of Occupational Licensing*, BLS Working Papers, Office of Compensation and Working Conditions, U.S. Bureau of Labor Statistics, U.S. Department of Labor, Working Paper 476, September, 2014, pp. 20-25 and pp. 32-33.

⁴⁸ U.S. Bureau of Labor Statistics (BLS), Current Population Survey (CPS), Household Data Annual Averages, Table 11, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, at <http://www.bls.gov/cps/cpsaat11.htm>; and BLS, Employment Projections (EP), Table 1.2, Employment by detailed occupation, 2014, and projected 2024, at http://www.bls.gov/emp/ep_table_102.htm; and National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Final Release Data FY 2014, Provisional Release Data FY 2015, Change Year 2015, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>, accessed April, 2017.

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Dentists (SOC 29-1020)	196,000	26%	3%	17%	9%	5,545	5,760
Dentistry (CIP 51.0401)		47%	5%	20%	7%		
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Dentistry (CIP 51.0401)		48%	4%	22%	7%	5,934	

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Lawyers (SOC 23-1011)	1,160,000	35%	5%	5%	5%	44,394	15,770
Law (CIP 22.0101)		47%	7%	7%	10%		
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Law (CIP 22.0101)		48%	8%	6%	10%	40584*	

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Physicians and Surgeons (SOC 29-1060)	1,007,000	38%	6%	18%	6%	17,881	29,000
Medicine (CIP 51.1201)		48%	6%	20%	7%		
Osteopathic Medicine/Osteopathy (CIP 51.1901)		47%	2%	19%	3%	4,990	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Medicine (CIP 51.1201)		48%	6%	19%	7%	18,551	
Osteopathic Medicine/Osteopathy (CIP 51.1901)		45%	3%	19%	4%	5,355	

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014-24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Veterinarians (SOC 29-1131)	90,000	61%	3%	5%	3%	2,690	1,900
Veterinary Medicine (CIP 51.2401)		79%	2%	5%	6%		
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Veterinary Medicine (CIP 51.2401)		78%	3%	5%	5%	2,815	

(Difference of % women between national licensed occupations and linked training programs shown above statistically significant at .10 level.)

The increased output of female graduates from training programs linked to the national licensed occupations of architects, chiropractors, dentists, lawyers, physicians/surgeons, and veterinarians was consistent with the general trend of majority female completers for all degree levels in the U.S.⁴⁹

Degrees Awarded by U.S. Postsecondary Education Institutions, Level of Degree and Gender, FY 2011 - 2015																
Fiscal Year	Associate's Degree				Bachelor's Degree				Master's Degree				Doctor's Degree**			
	Total	Male	Female	% Female	Total	Male	Female	% Female	Total	Male	Female	% Female	Total	Male	Female	% Female
2010-11	943,506	361,408	582,098	61.7	1,716,053	734,159	981,894	57.2	730,922	291,680	439,242	60.1	163,827	79,672	84,155	51.4
2011-12	1,021,718	393,479	628,239	61.5	1,792,163	765,772	1,026,391	57.3	755,967	302,484	453,483	60.0	170,217	82,670	87,547	51.4
2012-13	1,007,427	389,195	618,232	61.4	1,840,381	787,408	1,052,973	57.2	751,718	301,552	450,166	59.9	175,026	85,080	89,946	51.4
2013-14	1,003,364	390,805	612,559	61.1	1,869,814	801,692	1,068,122	57.1	754,475	302,807	451,668	59.9	177,580	85,587	91,993	51.8
2014-15p	979,000	379,000	600,000	61.3	1,868,000	802,000	1,066,000	57.1	763,000	308,000	454,000	59.6	178,000	85,000	92,000	51.9

Source: U.S. Department of Education, *The Condition of Education*, 2016, Table 38.10, Degrees conferred by postsecondary institutions, by level of degree and sex of student: selected years, 1869-70 through 2025-26, at http://nces.ed.gov/programs/digest/d15/tables/dt15_318.10.asp?current=yes. 2014-15 projected.

**Includes Ph.D., Ed.D., and comparable degrees at the doctoral level. Includes most degrees formerly classified as first-professional such as M.D., D.D.S., and law degrees . . . Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs."

*The total of related U.S. postsecondary FY 2015 law graduates in the demographic tables (provisional release data from the USDOE/NCES/IPEDS/Use the Data/Compare Institutions at <https://nces.ed.gov/ipeds/datacenter/login.aspx?gotoReportId=1>) with a single asterisk were less (by < .1%) than the total linked training completers for the same law educational programs (CIP 22.0101) shown in Appendix II (EDEPS provisional release data at www.edeps.org, accessed April, 2017).

⁴⁹ U.S. Department of Education, *The Condition of Education*, 2016, Table 38.10, Degrees conferred by postsecondary institutions, by level of degree and sex of student: selected years, 1869-70 through 2025-26, at http://nces.ed.gov/programs/digest/d15/tables/dt15_318.10.asp?current=yes. 2014-15 projected.

Among the licensed national occupations, barbers occupied a unique position as the only national regulated occupation where the proportions of the two groups of Black or African American, and Hispanic or Latino, together represented a majority of the barber workforce and the related output of barbering training graduates.⁵⁰

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s)	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014–24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Barbers (SOC 39-5011)	116,000	22%	41%	6%	21%		1,700
Barbering/Barber (CIP 12.0402)		21%	40%	1%	41%	7,089	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s)	
Barbering/Barber (CIP 12.0402)		25%	40%	1%	39%	7,605**	

When contrasting the sub-set of training completers from postsecondary education programs linked to the national licensed occupations with the universe of total postsecondary program completers for the recent past, two salient characteristics emerged. First, women represented a greater share of the training completers from programs supporting national licensed occupations than they did for all postsecondary education graduates. In addition, the ethnic category of Hispanic or Latino experienced the greatest growth rate of completers among the standard demographic groups for both the total postsecondary training completers and the sub-set of postsecondary education graduates from programs related to national licensed jobs.⁵¹

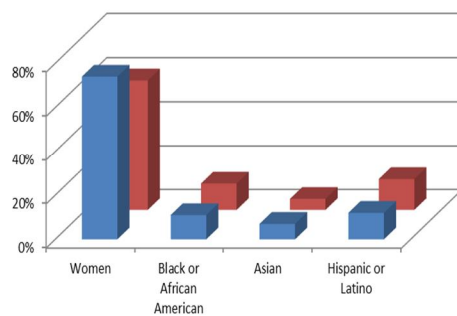
⁵⁰ *Ibid.* The U.S. Bureau of Labor Statistics (BLS) did not publish 2015 Current Population Survey (CPS) employment estimates by demographic groups for 6-digit SOC occupations, where the estimated total U.S. base employment was less than 50,000. Hence, this BLS publication standard excluded the national licensed occupations of actuaries (SOC 15-2011), audiologists (SOC 29-1181), health diagnosing and treating practitioners, all other (SOC 29-1199), nuclear power reactor operators (SOC 51-8011), optometrists (SOC 29-1041), podiatrists (SOC 29-1081), and surveyors (SOC 17-1022) from the demographic tables above. See U.S. BLS, Labor Force Statistics from the CPS, Household Data Annual Averages, Table 11, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, at <http://www.bls.gov/cps/cpsaat11.htm>.

**The total of related U.S. postsecondary FY 2015 barbering graduates (CIP 12.0402) in the demographic table (provisional release data from the USDOE/NCES/IPEDS/Use the Data/Compare Institutions at <https://nces.ed.gov/ipeds/datacenter/login.aspx?gotoReportId=1>) with a double asterisk were less (by 6%) than the total linked training completers for the same barbering educational program (CIP 12.0402) shown in Appendix II (EDEPS provisional release data at www.edeps.org, accessed April, 2017).

⁵¹ National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Final Release Data FY 2011, Provisional Release Data FY 2015, Change Year 2015, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>. (See footnote #52 regarding the differences between final release and provisional release completions data.)

	<u>Total</u>	<u>Women</u>	<u>Black or African American</u>	<u>Asian</u>	<u>Hispanic or Latino</u>
U.S. Training Completers Linked to National Licensed Occupations (Definition 1), FY 2011, Demographic Information (IPEDS Final Data):	579,147	423,544	64,227	37,133	59,319
U.S. Training Completers Linked to National Licensed Occupations (Definition 1), FY 2015, Demographic Information (IPEDS Provisional Data):	646,612	476,238	74,255	42,249	78,772
Percent Change, FY 2011 - FY 2015:	12%	12%	16%	14%	33%
U.S. Total Completers, FY 2011, Demographic Information (IPEDS Final Data):	4,411,170	2,604,620	499,973	232,230	503,951
U.S. Total Completers, FY 2015, Demographic Information (IPEDS Provisional Data):	4,917,849	2,882,286	578,160	267,648	684,093
Percent Change, FY 2011 - FY 2015:	11%	11%	16%	15%	36%

646,612* FY 2015 U.S. Completers (provisional data), Postsecondary Education Programs Linked to National Licensed Occup., Title IV Participating Institutions	FY 2015 U.S. Completers (provisional data), Postsecondary Education Programs Linked to National Licensed Occup., Title IV Participating Institutions	FY 2015 U.S. Completers (provisional data), Total Postsecondary Education Programs, Title IV Participating Institutions	4,917,849* FY 2015 U.S. Completers (provisional data), Total Postsecondary Education Programs, Title IV Participating Institutions
Women**	74%	59%	Women
Black or African American	11%	12%	Black or African American
Asian	7%	5%	Asian
Hispanic or Latino	12%	14%	Hispanic or Latino



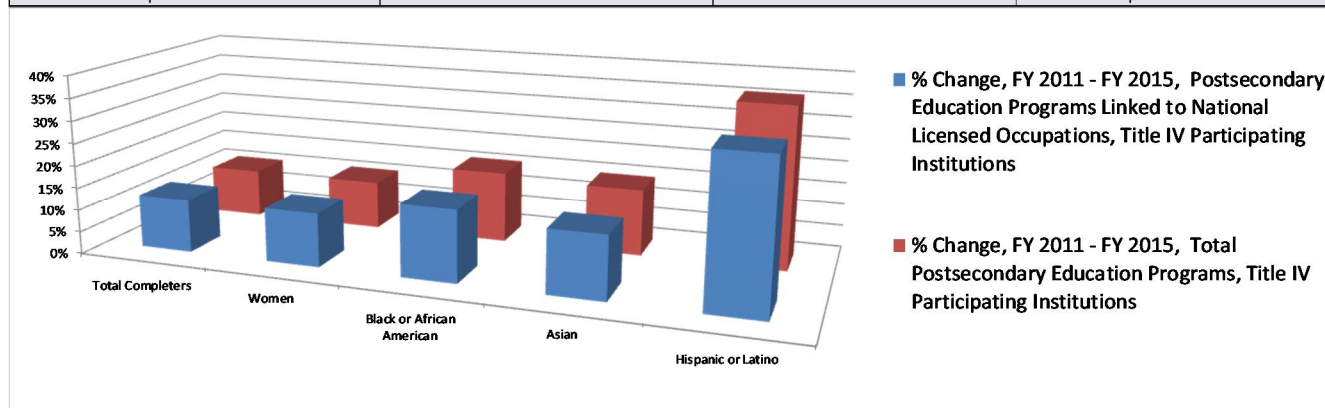
- FY 2015 U.S. Completers (provisional data), Postsecondary Education Programs Linked to National Licensed Occup., Title IV Participating Institutions
- FY 2015 U.S. Completers (provisional data), Total Postsecondary Education Programs, Title IV Participating Institutions

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U. S. Department of Education (USDOE), Use The Data, Compare Institutions, Provisional Release Data, Title IV Participating Institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx?gotoReportId=1>.

*Demographic totals differ from the totals by certificate/degree awards by 1%.

**Difference of % women between FY 2015 U.S. completers from postsecondary training programs linked to national licensed occupations, and the FY 2015 total U.S. postsecondary education completers, statistically significant at .10 level.

	% Change, FY 2011 - FY 2015, Postsecondary Education Programs Linked to National Licensed Occupations, Title IV Participating Institutions	% Change, FY 2011 - FY 2015, Total Postsecondary Education Programs, Title IV Participating Institutions	
Total Completers	12%	11%	Total Completers
Women	12%	11%	Women
Black or African American	16%	16%	Black or African American
Asian	14%	15%	Asian
Hispanic or Latino	33%	36%	Hispanic or Latino



Source: U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Provisional Release Data, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>.⁵²

The conclusions of this paper regarding the linked postsecondary training infrastructure in support of the labor market institution of occupational licensure were corroborated by three reinforcing sets of data ó namely, (i) the literature review of prior research, (ii) three census resources regarding occupational licensure and related postsecondary training programs, i.e., the Integrated Postsecondary Education Data System (IPEDS), the USDOL/State LMI Bureaus Census of Licensed Occupations, 2014-16, and the Texas wage record follow-up reports, and (iii) empirical, survey-based data (from the CPS, the SIPP, the NSCG, and the ACS). The complement of resources utilized in this paper was advantageous, because of the relative lack of research experience with the new CPS licensing data by occupation (2-digit SOC), where questions remained about the stability of the CPS findings regarding the proportions of licensed workers by occupational categories over time.⁵³

To test the sensitivity of these findings about the shares of training output by degree/award level and by demographic graduate groups of the educational programs linked to the national licensed occupations, calculations were made of the same output measures for an expanded definition (#2) of the occupations licensed nationally and their supportive training programs, based on recent research reports by Han and Kleiner, and by Furth. In their November, 2016, National Bureau of Economic Research (NBER) paper, entitled *Analyzing the Influence of Occupational Licensing Duration on Labor Market Outcomes*, Suyoun Han and Morris Kleiner studied a dozen occupations, which they described as “universally licensed occupations (i.e., licensed in all states).”⁵⁴ In addition, Salim Furth, in his Heritage Foundation

⁵² As described by the USDOE/NCES/IPEDS at <https://nces.ed.gov/ipeds/datacenter/login.aspx>, “Final release data include revisions to the provisional release data that have been made by institutions during the subsequent data collection year.” By contrast, “Provisional release data have undergone all NCES data quality control procedures. Data are imputed for nonresponding institutions.”

⁵³ Cunningham, Evan, Current Population Survey (CPS), U.S. Bureau of Labor Statistics (BLS), in email communication with author 9/30/16.

⁵⁴ Han, Suyoun, and Morris M. Kleiner, *Analyzing the Influence of Occupational Licensing Duration on Labor Market Outcomes*, Working Paper 22810, NBER, November, 2016, p.3, and Figure 2, p. 28. The Han/Kleiner listing of “universally licensed occupations” included teachers.

paper about *Understanding the Data on Occupational Licensing* (table 1), listed fifteen “highly licensed occupations” with more than 100 observations from the 2015 Current Population Survey (CPS), where the Furth “Table 1 includes occupations in which at least 75 percent of the labor force reports a government-issued certification or license. Due to underreporting, true licensure prevalence in many of these occupations probably approaches 100 percent.”⁵⁵ The twelve “universally licensed occupations” from the Han/Kleiner paper, and the fifteen “highly licensed occupations” from the Furth study (with more than 100 observations from the 2015 CPS), were included in the original listing of national licensed occupations (definition #1, p. 16 of this paper), with the exception of *teachers* from the Han/Kleiner study, and *secondary school teachers, special education teachers, respiratory therapists, and nurse practitioners* from the Furth CPS study. Also, although the 2014-16 census of U.S. occupations licensed by the states (completed by the U.S. Department of Labor and its affiliated state bureaus of labor market information) reported emergency medical technicians (EMTs) and paramedics (SOC 29-2041) as licensed in fewer than 45 states, the *Occupational Outlook Handbook* (OOH) of the U.S. Bureau of Labor Statistics (BLS) stated that EMTs and paramedics were licensed in all states.⁵⁶

Hence, an expanded definition #2 of national licensed occupations was developed that included the original (definition #1) 35 occupations (6-digit SOC detail) and 62 linked training programs (6-digit CIP detail), plus the following 11 teaching occupations, nurse practitioner, respiratory therapist, and EMTs and paramedics, as well as their affiliated 13 training programs (all at the 6-digit level of detail). As was the case with the taxonomic review of the related occupations and educational programs from the first listing of national licensed occupations, for the second, expanded definition and listing, the subject content of the concomitant training programs targeted the work functions of the linked teaching, nurse practitioner, respiratory therapist, and EMT/paramedic occupations.

EDEPS Unit of Analysis		Additional National Licensed Occupations (Definition #2)		Additional Linked Training Programs (Definition #2)	
Code	Title	SOC Code	SOC Job Title	CIP Code	CIP Educational Program Title
1314A	Preschool Education	25-2011	Preschool Teachers, Except Special Education	13.1210	Early Childhood Education and Teaching
		25-2012	Kindergarten Teachers, Except Special Education	13.1209	Kindergarten/Preschool Education and Teaching
1313A	Elementary Education	25-2021	Elementary School Teachers, Except Special Education	13.1202	Elementary Education and Teaching
1318B	Secondary and Vocational Education	25-2032	Career/Technical Education Teachers, Secondary School	13.1205	Secondary Education and Teaching
		25-2031	Secondary School Teachers, Except Special and Career/Technical Education		
1312A	Special Education	25-2051	Special Education Teachers, Preschool	13.1015	Education/Teaching of Individuals in Early Childhood Special Education Programs
		25-2052	Special Education Teachers, Kindergarten and Elementary School	13.1017	Education/Teaching of Individuals in Elementary Special Education Programs
		25-2053	Special Education Teachers, Middle School	13.1018	Education/Teaching of Individuals in Junior High/Middle School Special Education Programs
		25-2054	Special Education Teachers, Secondary School	13.1019	Education/Teaching of Individuals in Secondary Special Education Programs
		25-2059	Special Education Teachers, All Other	13.1001	Special Education and Teaching, General
1317B	Adult and Continuing Education	25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors	13.1201	Adult and Continuing Education and Teaching
5123A	Nursing	29-1171	Nurse Practitioners	51.3818	Nursing Practice
5148A	Respiratory Therapy	29-1126	Respiratory Therapists	51.0908	Respiratory Care Therapy/Therapist
5140A	Emergency Medical Technology	29-2041	Emergency Medical Technicians and Paramedics	51.0904	Emergency Medical Technology/Technician (EMT Paramedic)

EDEPS = Economic Development and Employer Planning System at www.edeps.org.

SOC = Standard Occupational Classification

CIP = Classification of Instructional Program

Other researchers concluded that teachers were certified, not licensed. For example, Mark Klee, in his paper titled, “How Do Professional Licensing Regulations Affect Practitioners? New Evidence,” (Social, Economic, and Housing Statistics Division (SEHSD), U.S. Census Bureau, SEHSD Working Paper Number 2013-30, June 5, 2013, p. 12), reported, “One disadvantage of the regulations data is that two of the four occupations are not licensed in the strictest sense. In all states and D.C., policy toward accountants and teachers is one of certification.”⁵⁵ Furth, Salim, Institute for Economic Freedom and Opportunity at the Heritage Foundation, *Understanding the Data on Occupational Licensing*, September 28, 2016, Table 1, “Highly Licensed Occupations,” p. 4, and footnote #4, p. 13.

⁵⁶ U.S. Bureau of Labor Statistics (BLS), U.S. Department of Labor (USDOL), *Occupational Outlook Handbook*, 2016-17 Edition, “How To Become One, Licenses, Certifications, and Registrations,” EMTs and paramedics, at <https://www.bls.gov/OOH/healthcare/emts-and-paramedics.htm#tab-4>, accessed May, 2017; and USDOL/State LMI Bureaus, *Census of Licensed Occupations, 2014-16*.

The expanded definition (#2) for the national licensed occupations and their associated training programs did not result in any significant, proportional changes in the linked educational output of magnitudes large enough to require amendments to the prior conclusions about the post-secondary education programs that supported the labor market institution of occupational licensing in the U.S., except for the precipitous decline in the post-baccalaureate certificates (CertB) linked training output under the definition #2. This linked training decrease, from a 23% share in FY 2010 of the total CertB U.S. postsecondary output to an 8% share in FY 2015 in the proportion of post-baccalaureate certificate completers from training programs linked to the definition #2 national licensed occupations, resulted from the large decline in graduates from the teaching program for special education and teaching, general (CIP 13.1001); the elementary education and teaching program (CIP 13.1202); and the secondary education and teaching program (CIP 13.1205).⁵⁷

FY 2015 Definition #2 Linked Education Completer Totals From Training Programs Not Included Under Definition #1.⁵⁸

Program Completers by Degree Level (2014 - 2015) United States											
CIP Code	Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
13.121	Early Childhood Education and Teaching	4,161	2,019	7,730	0	13,096	222	2,871	36	18	30,153
13.1209	Kindergarten/Preschool Education and Teaching	72	41	620	0	1,296	94	244	1	16	2,384
13.1202	Elementary Education and Teaching	39	313	1,908	22	29,461	591	8,412	122	58	40,926
13.1205	Secondary Education and Teaching	11	241	685	0	3,590	336	5,865	62	25	10,815
13.1015	Education/Teaching of Individuals in Early Childhood Special Education Programs	116	36	59	0	425	50	841	7	0	1,534
13.1017	Education/Teaching of Individuals in Elementary Special Education Programs	0	0	0	0	261	21	1,005	43	0	1,330
13.1018	Education/Teaching of Individuals in Junior High/Middle School Special Education Programs	0	0	0	0	8	0	132	0	0	140
13.1019	Education/Teaching of Individuals in Secondary Special Education Programs	0	0	0	0	31	4	569	10	0	614
13.1001	Special Education and Teaching, General	48	77	120	0	7,187	592	11,332	472	208	20,036
13.1201	Adult and Continuing Education and Teaching	11	0	17	0	26	94	1,199	5	166	1,518
51.3818	Nursing Practice	0	703	236	66	887	5	248	91	2,202	4,438
51.0908	Respiratory Care Therapy/Therapist	161	474	5,870	91	1,251	0	52	0	0	7,899
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	16,646	6,002	3,497	0	272	5	8	0	0	26,430
Program Completers by Degree Level (2014 - 2015) United States											
FY 2015 Definition #1 Linked Training Completer Totals=		38,235	122,979	103,004	11,747	206,353	1,094	64,950	423	105,834	654,619
FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Completer Totals=		59,500	132,885	123,746	11,926	264,144	3,108	97,728	1,272	108,527	802,836
Total U.S. Postsecondary Training Program Completers, 2014-2015=		485,304	440,551	1,014,023	35,312	1,894,934	38,219	758,708	17,625	178,547	4,863,223
Source: U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data). Note: These completions data were collected from Title IV institutions in the United States, 7013 institutions, NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/ganswer.aspx?sid=4&qid=24 (accessed 4/16/17).											
FY 2015 Definition #1 Linked Training Graduate Totals,											
as % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)		8%	28%	10%	33%	11%	3%	9%	2%	59%	13%
FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Graduate Totals,											
as % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)		12%	30%	12%	34%	14%	8%	13%	7%	61%	17%

Source for FY 2015 Linked Training Completers, Definitions #1 and 2: EDEPS at www.edeps.org, accessed May, 2017.

Cert1=Postsecondary award, certificate, or diploma of less than 1 academic year; **Cert2**=Postsecondary award, certificate, or diploma of at least 1 but less than 2 academic years; **Assc**=Associate's degree; **Assc+**=Postsecondary award, certificate, or diploma of at least 2 but less than 4 academic years; **Bach**=Bachelor's degree or equivalent; **CertB**=Post-baccalaureate certificate; **Mast**=Master's degree; **CertM**=Post-master's certificate; **Doct**=Doctor's degree.

⁵⁷ EDEPS at www.edeps.org, accessed May, 2017; and National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Provisional Release Data, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>.

⁵⁸ EDEPS at www.edeps.org, accessed May, 2017.

Total U.S. Completers from Training Programs Linked to National Licensed Occupations (Definition #2)													
Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total		Baccalaureate & Above	Sub-baccalaureate
FY 2010	56,248	132,407	117,905	15,820	216,518	7,404	93,908	1,106	101,506	742,822		420,442	322,380
FY 2015	59,500	132,885	123,746	11,926	264,144	3,108	97,728	1,272	108,527	802,836		474,779	328,057

Total U.S. Postsecondary Training Program Completers (Linked & Non-linked to National Licensed Occupations)													
Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total		Baccalaureate & Above	Sub-baccalaureate
FY 2010	503,325	382,373	849,572	50,091	1,650,014	31,559	693,025	18,363	158,558	4,336,880		2,551,519	1,785,361
FY 2015	485,304	440,551	1,014,023	35,312	1,894,934	38,219	758,708	17,625	178,547	4,863,223		2,888,033	1,975,190

Total U.S. Completers from Training Programs Linked to National Licensed Occupations (Definition #2), as % of Total U.S. Postsecondary Training Program Graduates (Linked & Non-linked to National Licensed Occupations)													
Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total		Baccalaureate & Above	Sub-baccalaureate
FY 2010	11%	35%	14%	32%	13%	23%	14%	6%	64%	17%		16%	18%
FY 2015	12%	30%	12%	34%	14%	8%	13%	7%	61%	17%		16%	17%

Source for FY 2010 and FY 2015 Linked Training Completers, Definition #2: EDEPS at www.edeps.org, accessed May, 2017.⁵⁹

For the demographic categories of the training program completers linked to the national licensed occupations, the expansion of the listing of national regulated jobs (definition #2) resulted in two new findings, both related to the high growth rates of Hispanic or Latino completers from educational programs supporting the national licensed occupations. As a consequence of their approximately one-fifth proportion of recent U.S. postsecondary graduates from educational programs related to the occupations of nurse practitioners and respiratory therapists, greater percentages of the Hispanic or Latino ethnic group will likely enjoy the future licensing wage premiums of these two healthcare jobs.⁶⁰

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s), Def. #2	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014–24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Nurse Practitioners (SOC 29-1171)	149,000	91%	8%	4%	3%		7,470
Nursing Practice (CIP 51.3818)		89%	12%	4%	22%	3,865	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s), Def. #2	
Nursing Practice (CIP 51.3818)		89%	11%	4%	20%	4,438	

National Licensed Occupations and Linked Training Programs	% of Total Employed or % of Total Linked Training Completers, As Indicated					Total U.S. Postsecondary Training Program Completers, FY 2014, Linked to National Licensed Occupation(s), Def. #2	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014–24
	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino		
Respiratory Therapists (SOC 29-1126)	108,000	67%	15%	6%	9%		4,330
Respiratory Care Therapy/Therapist (CIP 51.0908)		67%	11%	8%	21%	8,497	
						Total U.S. Postsecondary Training Program Completers, FY 2015, Linked to National Licensed Occupation(s), Def. #2	
Respiratory Care Therapy/Therapist (CIP 51.0908)		69%	12%	8%	20%	7,899	

With both definitions of the national licensed occupations, women continued to represent a greater proportion (74%) of the training graduates from the linked educational programs than their share (59%) of all postsecondary training completers. Further, definitions 1 and 2 of the national regulated jobs and their associated educational programs consistently indicated the highest percentage growth in training completers, FY 2011 - FY 2015, for the ethnic category of Hispanic or Latino among the standard demographic groups. However, the definition #2 of the national licensed occupations, with the addition of preschool, elementary, and secondary

⁵⁹ EDEPS at www.edeps.org, accessed Oct., 2016, and May, 2017; and the U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (provisional data), at <https://nces.ed.gov/ipeds/trendgenerator>, accessed May, 2017.

⁶⁰ U.S. Bureau of Labor Statistics (BLS), Current Population Survey (CPS), Household Data Annual Averages, Table 11, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity, at <http://www.bls.gov/cps/cpsaat11.htm>; and BLS, Employment Projections (EP), Table 1.2, Employment by detailed occupation, 2014, and projected 2024, at http://www.bls.gov/emp/ep_table_102.htm; and, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Final Release Data FY 2014, Provisional Release Data FY 2015, Change Year 2015, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>, accessed April, 2017.

teaching occupations, also reflected a slower growth rate of related training output, because of the 14% decrease in U.S. graduates, FY 2011 - FY 2015, from these educational programs linked to the teaching licensed occupations, under the second definition.⁶¹

	Total	Women	Black or African American	Asian	Hispanic or Latino
U.S. Training Completers Linked to National Licensed Occupations (Definition 1), FY 2011, Demographic Information (IPEDS Final Data):	579,147*	423,544	64,227	37,133	59,319
U.S. Training Completers Linked to National Licensed Occupations (Definition 1), FY 2015, Demographic Information (IPEDS Provisional Data):	646,612**	476,238	74,255	42,249	78,772
Percent Change, FY 2011 - FY 2015:	12%	12%	16%	14%	33%
U.S. Total Completers, FY 2011, Demographic Information (IPEDS Final Data):	4,411,170*	2,604,620	499,973	232,230	503,951
U.S. Total Completers, FY 2015, Demographic Information (IPEDS Provisional Data):	4,917,849**	2,882,286	578,160	267,648	684,093
Percent Change, FY 2011 - FY 2015:	11%	11%	16%	15%	36%
	Total	Women	Black or African American	Asian	Hispanic or Latino
U.S. Training Completers Linked to National Licensed Occupations (Definition 2), FY 2011, Demographic Information (IPEDS Final Data):	741,811	549,012	78,124	40,663	75,360
U.S. Training Completers Linked to National Licensed Occupations (Definition 2), FY 2015, Demographic Information (IPEDS Provisional Data):	794,583**	590,262	88,294	45,859	97,303
Percent Change, FY 2011 - FY 2015:	7%	8%	13%	13%	29%
U.S. Total Completers, FY 2011, Demographic Information (IPEDS Final Data):	4,411,170*	2,604,620	499,973	232,230	503,951
U.S. Total Completers, FY 2015, Demographic Information (IPEDS Provisional Data):	4,917,849**	2,882,286	578,160	267,648	684,093
Percent Change, FY 2011 - FY 2015:	11%	11%	16%	15%	36%

*Demographic totals differ from the totals by certificate/degree awards by 5%.

**Demographic totals differ from the totals by certificate/degree awards by 1%.

Linked SOC Code	Additional Teaching National Licensed Occupations (Definition #2) SOC Job Title	Linked CIP Code	Additional Teaching Linked Training Programs (Definition #2) CIP Educational Program Title	U.S. Linked Training Completers FY 2011	U.S. Linked Training Completers FY 2015	Percent Change FY 2011-FY 2015
25-2011	Preschool Teachers, Except Special Education	13.1210	Early Childhood Education and Teaching	23,158	30,147	30%
25-2012	Kindergarten Teachers, Except Special Education	13.1209	Kindergarten/Preschool Education and Teaching	3,309	2,384	-28%
25-2021	Elementary School Teachers, Except Special Education	13.1202	Elementary Education and Teaching	58,932	40,872	-31%
25-2032	Career/Technical Education Teachers, Secondary School					
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	13.1205	Secondary Education and Teaching	15,131	10,812	-29%
25-2051	Special Education Teachers, Preschool	13.1015	Education/Teaching of Individuals in Early Childhood Special Education Programs	984	1,534	56%
25-2052	Special Education Teachers, Kindergarten and Elementary School	13.1017	Education/Teaching of Individuals in Elementary Special Education Programs	575	1,330	131%
25-2053	Special Education Teachers, Middle School	13.1018	Education/Teaching of Individuals in Junior High/Middle School Special Education Programs	201	140	-30%
25-2054	Special Education Teachers, Secondary School	13.1019	Education/Teaching of Individuals in Secondary Special Education Programs	119	614	416%
25-2059	Special Education Teachers, All Other	13.1001	Special Education and Teaching, General	23,369	20,016	-14%
25-3011	Adult Basic and Secondary Education and Literacy Teachers and Instructors	13.1201	Adult and Continuing Education and Teaching	1,305	1,518	16%
Sub-Total=				127,083	109,367	-14%

The policy recommendations, based on this review, grew directly from the significant size and variability of the training sector linked to the institution of U.S. occupational licensure, particularly the national licensed occupations. For instance, public policy needed to encourage the use of standard occupational taxonomies (i.e., SOC, Census, or O*NET) by all state licensing agencies to avoid confusion about the functional parameters of the licensed occupational labor markets. The licensing file of the Economic Development and Employer Planning System (EDEPS) mapped licensed occupational titles into standard O*Net codes, and it displayed the variation in the extant regulated titles.⁶² It is plausible that many of the occupational titles, identified through the USDOL/State LMI Bureaus, 2014-16 census of U.S. occupations licensed by the states, were originally based on the antiquated Dictionary of Occupational Titles (DOT) taxonomy and subsequently modified over the years by individual state licensing authorities,

⁶¹ National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Final Release Data FY 2014, Provisional Release Data FY 2015, Change Year 2015, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>, accessed April, 2017.

⁶² EDEPS, licensed occupations, by U.S. and state, at www.edeps.org.

resulting in a peculiar coding system to map into standard occupational taxonomies. The current use by some licensing agencies of occupational licensing titles and functional definitions from non-standard and out-of-date coding systems may have negative legal and research repercussions because of vagueness.

The need for increased standardization (with its corollary production efficiencies and cost reductions) was also evident with a dozen of the sub-baccalaureate training programs linked to national licensed occupations, where the same detailed educational program type (6-digit CIP code) produced FY 2014 graduates distributed among the four sub-baccalaureate degree/certificate levels (that is, certificate < 1 academic year, certificate >= 1 and < 2 academic years, associate degree, and certificate >= 2 and < 4 academic years), with no single sub-baccalaureate degree or award level representing 85% or more of the total sub-baccalaureate completers for the detailed training program.⁶³

Detailed Training Programs, Linked to National Licensed Occupations, Lacking Standardized Sub-Baccalaureate Output Levels by Certificates/Degree:

Program Completers by Degree Level (2013 - 2014) United States											
CIP Code	Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
52.0301	Accounting	1,442	1,186	6,029	158	50,802	567	18,548	9	47	78,788
49.0102	Airline/Commercial/Professional Pilot and Flight Crew	332	48	441	7	907	0	0	0	0	1,735
51.33	Alternative and Complementary Medicine and Medical Systems, General	139	39	16	0	0	29	22	4	8	257
51.3306	Holistic Health	68	93	103	0	157	11	30	0	0	462
4.0901	Architectural Technology/Technician	169	93	297	0	214	0	0	0	0	773
12.0413	Cosmetology, Barber/Styling, and Nail Instructor	1,381	707	7	33	0	0	0	0	0	2,128
12.0401	Cosmetology/Cosmetologist, General	3,350	69,146	725	9,048	0	0	0	0	0	82,269
47.0103	Communications Systems Installation and Repair Technology	102	148	158	47	0	0	0	0	0	455
15.1401	Nuclear Engineering Technology/Technician	0	49	137	0	169	0	0	0	0	355
52.1501	Real Estate	1,352	208	220	0	536	63	755	0	1	3,135
14.3801	Surveying Engineering	21	2	12	0	28	0	15	0	0	78
15.1102	Surveying Technology/Surveying	137	71	237	0	196	0	2	0	8	651

Source: Economic Development and Employer Planning System (EDEPS), Programs of Study, Units of Analysis, Supply Indicators, at www.edeps.org, and IPEDS completions data

Detailed Training Programs, Linked to National Licensed Occupations, Lacking Standardized Sub-Baccalaureate Output Levels by Certificates/Degree, Percent Distribution:

Program Completers by Degree Level (2013 - 2014) United States		Sub-baccalaureate	Percent Distribution*			
CIP Code	Program Title	Total Completers	Cert1	Cert2	Assc	Assc+
52.0301	Accounting	8,815	16%	13%	68%	2%
49.0102	Airline/Commercial/Professional Pilot and Flight Crew	828	40%	6%	53%	1%
51.33	Alternative and Complementary Medicine and Medical Systems, General	194	72%	20%	8%	NA
51.3306	Holistic Health	264	26%	35%	39%	NA
4.0901	Architectural Technology/Technician	559	30%	17%	53%	NA
12.0413	Cosmetology, Barber/Styling, and Nail Instructor	2,128	65%	33%	0%	2%
12.0401	Cosmetology/Cosmetologist, General	82,269	4%	84%	1%	11%
47.0103	Communications Systems Installation and Repair Technology	455	22%	33%	35%	10%
15.1401	Nuclear Engineering Technology/Technician	186	NA	26%	74%	NA
52.1501	Real Estate	1,780	76%	12%	12%	NA
14.3801	Surveying Engineering	35	60%	6%	34%	NA
15.1102	Surveying Technology/Surveying	445	31%	16%	53%	NA

*May not equal 100% due to rounding.

Source: Economic Development and Employer Planning System (EDEPS), Programs of Study, Units of Analysis, Supply Indicators, at www.edeps.org, and IPEDS completions data. **Cert1**=Postsecondary award, certificate, or diploma of less than 1 academic year; **Cert2**=Postsecondary award, certificate, or diploma of at least 1 but less than 2 academic years; **Assc**=Associate's degree; **Assc+**=Postsecondary award, certificate, or diploma of at least 2 but less than 4 academic years; **Bach**=Bachelor's degree or equivalent; **CertB**=Post-baccalaureate certificate; **Mast**=Master's degree; **CertM**=Post-master's certificate; **Doct**=Doctor's degree.

Further, the policy recommendation for occupational licensing reform from the federal departments of Treasury, Labor, and the President's Council of Economic Advisors (CEA) to carry out comprehensive cost-benefit assessments of licensing laws through both sunrise and

⁶³ EDEPS, supply indicators, at www.edeps.org, and Appendix II, p. 42.

regular sunset reviews⁶⁴ needed to be extended to include *ex post* cost/benefit analyses of the postsecondary training programs linked to regulated occupations, especially the national licensed occupations. Recently, the Workforce Information Council studied and reported on the feasibility of implementing such a recommendation using the unemployment insurance wage records of the states.⁶⁵ As reported by the Employment and Training Administration, U.S. Department of Labor, under the new Workforce Innovation and Opportunity Act (WIOA), the use of wage records is mandatory for WIOA core program performance and eligible training provider performance reporting purposes.⁶⁶

Finally, the wage premiums enjoyed by workers in licensed occupations made these jobs attractive targets for postsecondary education/training investments. The *ex ante* process of making these costly training investments in educational programs to support regulated occupations (and deciding on the detailed, licensed occupations and postsecondary training programs on which to focus, as well as the planned magnitudes of program output/completers/graduates) would benefit from the analysis of hard-to-fill job order statistics, as originally developed by Economist Norman Medvin.⁶⁷ The development of these recommended, hard-to-fill job order statistics for national licensed occupations would add a useful time dimension to the typical training investment process of supply and demand (gap) analysis, or the similar human resource accounting approach with occupational wage data over time.⁶⁸

Basically, under the Medvin technique, hard-to-fill job order statistics indicated the percent of occupationally-specific (6-digit SOC coded or 8-digit O*Net coded) job orders that remained unfilled for a significant period (e.g., < 31 days, >= 31 days but <62 days, >= 62 days

⁶⁴ U.S. Department of the Treasury Office of Economic Policy, U.S. Department of Labor, and the White House Council of Economic Advisors (CEA), *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 42.

⁶⁵ Workforce Information Council, "[Enhancing Unemployment Insurance Wage Records, Potential Benefits, Barriers, and Opportunities, A Summary of First Year Study Activities and Findings](http://www.edeps.org/AppliedResearch.aspx)," prepared for the Council by the Administrative Wage Record Enhancement Study Group, September, 2014, at <http://www.edeps.org/AppliedResearch.aspx>.

⁶⁶ Presentation by Simonetta, Suzanne, Pam Mertens, and Agnes Wells, Office of Unemployment Insurance, U.S. Department of Labor, *WIOA and UI Confidentiality: What States Should Know About the Recent Amendments to 20 CFR 603*, Innovation and Opportunity Network/Workforce GPS, Nov. 22, 2016, at <https://www.workforcegps.org/events/2016/11/02/11/48/WIOA-and-Unemployment-Insurance-UI-Confidentiality-What-States>.

⁶⁷ Medvin, Norman, "[Occupational Job Requirements, A Short-Cut Approach To Long-Range Forecasting](http://www.edeps.org/AppliedResearch.aspx)," *Employment Service Review*, January-February, 1967, at <http://www.edeps.org/AppliedResearch.aspx>. For a more recent application of the Medvin approach, see Schaff, Mark, and Lew Horner, "[Research Documentation Identifying Regional Skill Shortages Dayton Metropolitan Statistical Area, and Executive Summary](http://www.edeps.org/AppliedResearch/DaytonResearch.pdf)," November, 2007, Appendix I, Hard-to-Fill Job Order Statistics from the Ohio Job Matching System, pp. 31-36, at <http://www.edeps.org/AppliedResearch/DaytonResearch.pdf>.

⁶⁸ For an example of the supply and demand (gap) analysis planning process for human capital investments, see Hershbein, Brad J., and Kevin Hollenbeck, 2015, "Refining Workforce Education Supply and Demand Analysis: Final Report," Upjohn Institute Technical Report No. 15-031, Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, <http://dx.doi.org/10.17848/tr15-031>. For a review of the human resource accounting approach with occupational wage data (with small relative standard errors) over time, see EDEPS, planning models, at <http://www.edeps.org/PlanningModels.aspx>.

but < 93 days, etc.), after eliminating job orders with occupational wages below the 25th percentile for the respective occupation, and deleting job orders from firms with obviously unattractive work environments (e.g., private prison companies). These hard-to-fill job order statistics were complemented with long-term (structural), occupational employment demand projections of job openings due to growth and replacement needs, assuming a full employment economy at the end of the planning horizon (generally 10 years). These supplementary occupational employment projections, which are produced biennially at the national level by the U.S. Bureau of Labor Statistics (BLS) and at the state level by the State Labor Market Information (LMI) Bureaus, provided the demand-side estimates of the labor requirements of the future (projected) full-employment economy. Thus, Medvin utilized time to summarize the actions and reactions of all the demand and supply-side actors in an occupational labor market in a manner analogous to the summary indicators of occupational wage data (with small relative standard errors) over time.

The Medvin hard-to-fill job order statistics would enhance indicators of the reactions to wage signals of the postsecondary education institutions and program completers linked to national licensed occupations. To gauge the responsiveness to wage signals, the training output elasticities of supply were computed for the graduates of training programs linked to the national licensed occupations (broad definition #2) in the short-run (that is, FY 2011 - FY 2015). The elasticity of supply measure calculated here (based on the midpoint formula of Cowen and Tabarrok)⁶⁹ compared the percent changes in training output and wages as follows:

$$\begin{aligned} \text{Elasticity of supply (training output)} = E_s &= \% \hat{e} \frac{\text{Quantity}_{\text{supplied}} \text{ (linked training program output U.S., 6-digit CIP)}}{\text{Price}_{\text{(annual U.S. median wage, linked national licensed occupation, 6-digit SOC)}}} \\ &= \frac{Q_{\text{After, FY 2015}} - Q_{\text{Before, FY 2011}}}{(Q_{\text{After, FY 2015}} + Q_{\text{Before, FY 2011}})/2} \\ &= \frac{\text{Price}_{\text{Wage After, CY 2015}} - \text{Price}_{\text{Wage Before, CY 2011}}}{(\text{Price}_{\text{Wage After, CY 2015}} + \text{Price}_{\text{Wage Before, CY 2011}})/2} \end{aligned}$$

The short-run, training output labor supply elasticities were greater than 1 (absolute value) for 86% of the linked training programs, indicating the training investment decisions of postsecondary institutions with completers from educational programs concomitant to the national licensed occupations were generally sensitive to wage signals about the national licensed occupations. This result was consistent with the fundamental determinant of the elasticity of supply, as described by Economists Cowen and Tabarrok:⁷⁰

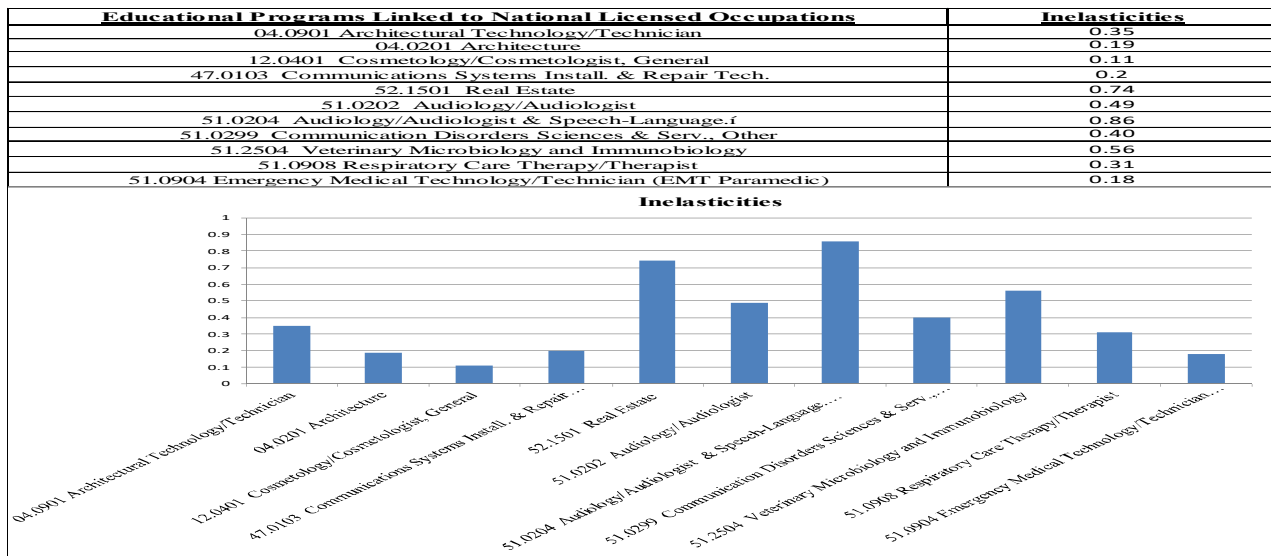
⁶⁹ Cowen, Tyler, and Alex Tabarrok, George Mason University, *Modern Principles: Economics*, Worth Publishers, 2010, p.63.

⁷⁰ *Ibid.*, p. 61.

The fundamental determinant of the elasticity of supply is how quickly per-unit costs increase with an increase in production. If increased production requires much higher per-unit costs, then supply will be less elastic ó or inelastic. If production can increase with constant per-unit costs, then supply will be elastic.⁷¹

In contradistinction, over substantial time periods the training output elasticities of supply tend to be more elastic; because of the ability of postsecondary educational institutions to adjust all factors of production related to the linked training output of graduates in the long-run.⁷²

From a training investment perspective, the exercise of computing elasticities of training supply from educational programs linked to the national licensed jobs provided an efficacious means by which to readily identify inelastic (< 1) training programs, where planning models (such as human resource accounting and occupational wage data over time, supply/demand gap analyses, and hard-to-fill job order statistics) may be useful supplements to the review and projection of enrollment and graduation patterns, in order to ensure that labor requirements are met in these regulated, occupational labor markets. The following chart of linked training output elasticities of supply identified educational program candidates for supplementary planning efforts, based on their inelasticities.⁷³ Training investors may wish to prioritize for supplementary applications of planning models the postsecondary education programs related to national licensed jobs with training supply wage elasticities < 1 (i.e., inelastic).



⁷¹ *Ibid.*

⁷² *Ibid.*, pp. 62-63.

⁷³ National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Completions, Final Release Data FY 2011, Provisional Release Data FY 2015, Change Year 2015, Title IV participating institutions, 6-digit CIP, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>; and U.S. Bureau of Labor Statistics (BLS), Occupational Employment Statistics (OES), May, 2015, and May, 2011, annual median U.S. occupational wages, 6-digit SOC, at <https://www.bls.gov/oes/tables.htm>.

Appendix I: Additional information over time between the switchers of occupational regulation⁷⁴ and their linked training programs and postsecondary educational institutions in the states of Louisiana, Massachusetts, and Tennessee for electricians, and the states of Alaska, North Dakota, and Tennessee for plumbers.

The postsecondary educational institutions, which provided CIP 46.0302 (electrician) training completers in Louisiana, Massachusetts, and Tennessee, were all sub-baccalaureate schools and colleges that included public community and technical colleges and private-for-profit, proprietary schools.

Louisiana Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
158662	Delgado Community College	10	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	10	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Note #1: shaded (grey and blue), background area represented years during which electricians in Louisiana were a licensed occupation statewide, that is, FY 2004 through FY 2014.																								
Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.																								
Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.																								
IPEDS = Integrated Postsecondary Education Data System.																								
CIP = Classification of Instructional Programs.																								
FY = Fiscal Year, July 1 through June 30.																								
Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014.																								
Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Louisiana.																								
Louisiana Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
159443	Acadiana Technical College-Lafayette Campus	6	6	11	9	7	6	7	4	9	47	11	17	12	10	1	7	6	37	115	160	133	41	0
158352	Capital Area Technical College	0	4	4	0	5	15	8	6	5	10	1	5	0	0	0	0	0	0	0	0	0	0	0
158088	Central Louisiana Technical Community College	10	15	12	15	28	19	15	14	6	13	4	4	15	4	9	5	6	5	10	35	37	35	29
158662	Delgado Community College	1	4	5	2	2	0	3	2	3	4	7	5	6	11	0	27	15	29	29	30	27	17	23
158723	Delta School of Business and Technology	8	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
159197	ITI Technical College	0	21	8	7	17	5	2	19	19	10	20	10	10	17	13	6	9	9	9	23	12	12	7
160481	L E Fletcher Technical Community College	0	0	0	0	0	0	0	0	11	6	9	13	9	9	0	3	5	23	46	44	27	39	20
483212	Louisiana Delta Community College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	50
160667	Northshore Technical Community College	0	0	0	0	0	9	8	0	0	0	0	0	0	0	0	0	0	0	6	24	43	7	36
160010	Northwest Louisiana Technical College	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	19	13	27	26	55
158884	Nunez Community College	0	0	0	0	0	0	0	1	3	2	1	4	11	4	0	5	1	6	6	5	1	4	1
160913	South Central Louisiana Technical College-Young Memorial Campus	0	0	0	0	0	0	0	7	9	5	6	21	3	7	1	0	9	10	61	63	31	26	22
434061	South Louisiana Community College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
160579	SOWELA Technical Community College	1	1	6	5	8	12	7	4	16	11	8	10	11	20	13	37	31	30	50	123	135	135	169
	Total	26	62	46	38	67	66	50	57	81	119	67	89	77	82	37	90	82	149	351	520	473	353	431
Note #1: shaded (grey and blue), background area represented years during which electricians in Louisiana were a licensed occupation statewide, that is, FY 2004 through FY 2014.																								
Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.																								
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Louisiana Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
	Total	36	65	47	39	68	66	50	57	81	119	67	89	77	82	37	90	82	149	351	520	473	353	431
Note #1: shaded (grey and blue), background area represented years during which electricians in Louisiana were a licensed occupation statewide, that is, FY 2004 through FY 2014.																								
Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.																								
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Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Louisiana.																								

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed December, 2015; and EDEPS at www.edeps.org, accessed December, 2015.

⁷⁴ Kleiner, Morris M., *Stages of Occupational Regulation Analysis of Case Studies*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2013, Tables 5.3 and 5.4, pp. 144-145.)

Massachusetts Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
165884	Benjamin Franklin Institute of Technology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	20	18	8	13
166823	Massasoit Community College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
166948	Mount Ida College	13	9	12	5	3	6	3	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		13	9	12	5	3	6	3	4	5	0	0	0	0	0	0	0	0	1	25	20	18	8	13

Note #1: shaded (grey and blue), background area represented years during which electricians in Massachusetts were a licensed occupation statewide, that is, FY 2007 through FY 2014.
 Note #2: the blue shaded, background area represents the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System.
 CIP = Classification of Instructional Programs.
 FY = Fiscal Year, July 1 through June 30.

Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Massachusetts.

Massachusetts Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
164535	Assabet Valley Regional Technical School	0	0	0	0	2	0	5	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165884	Benjamin Franklin Institute of Technology	17	12	12	5	6	7	5	9	10	6	7	8	9	18	21	8	7	3	0	0	0	0	0
243799	Blue Hills Regional Technical School	0	0	0	3	5	6	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
166948	Mount Ida College	12	13	4	8	5	3	1	18	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		29	25	16	16	18	16	15	31	22	6	7	8	9	18	21	8	7	3	0	0	0	0	0

Note #1: shaded (grey and blue), background area represented years during which electricians in Massachusetts were a licensed occupation statewide, that is, FY 2007 through FY 2014.
 Note #2: the blue shaded, background area represents the period of the Great Recession, as determined by the National Bureau of Economic Research, from December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System.
 CIP = Classification of Instructional Programs.
 FY = Fiscal Year, July 1 through June 30.

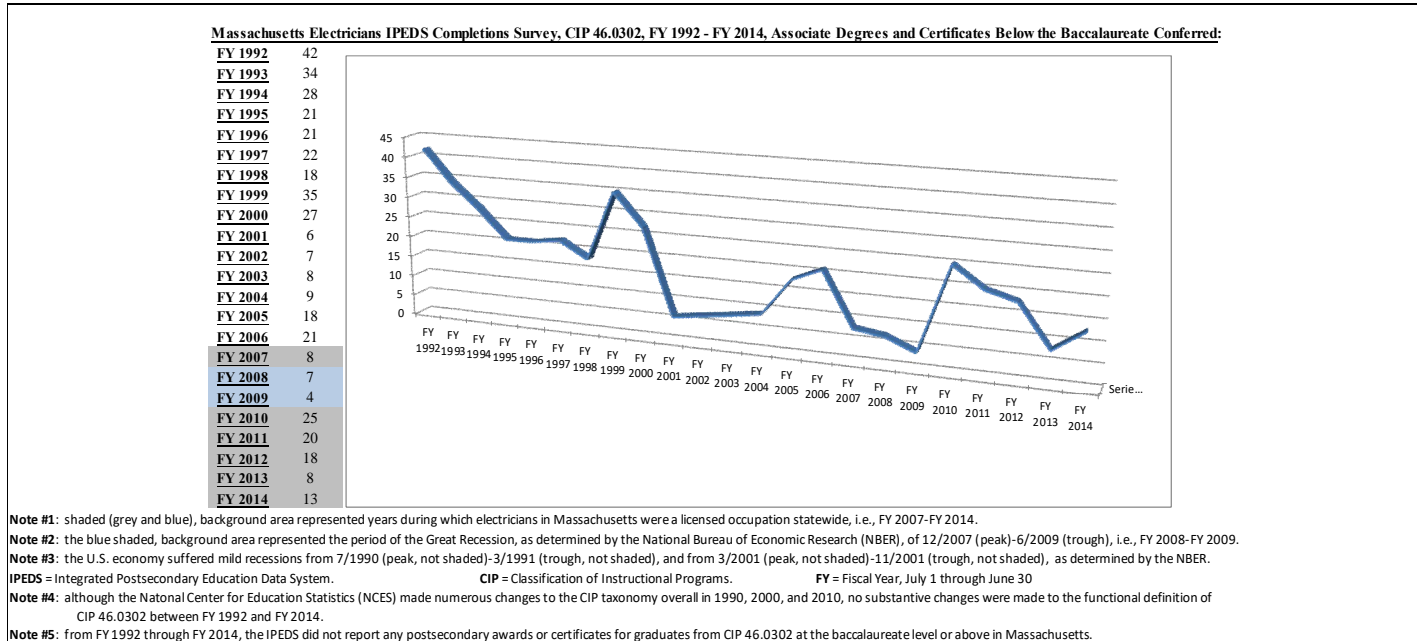
Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Massachusetts.

Massachusetts Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:																							
	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
Grand Total	42	34	28	21	21	22	18	35	27	6	7	8	9	18	21	8	7	4	25	20	18	8	13

Note #1: shaded (grey and blue), background area represented years during which electricians in Massachusetts were a licensed occupation statewide, that is, FY 2007 through FY 2014.
 Note #2: the blue shaded, background area represents the period of the Great Recession, as determined by the National Bureau of Economic Research, from December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System.
 CIP = Classification of Instructional Programs.
 FY = Fiscal Year, July 1 through June 30.

Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Massachusetts.

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed December, 2015; and EDEPS at www.edeps.org, accessed December, 2015.



Since the end of the Great Recession in FY 2009, only one Massachusetts postsecondary educational institution (i.e., the Benjamin-Franklin Institute of Technology) produced CIP 46.0302 electrician training completers from FY 2010 through FY 2014, which precluded meaningful statistical tests of association between the lagged output of sub-baccalaureate training graduates over time and the initiation of occupational licensing for electricians statewide in Massachusetts.

In contrast, the states of Louisiana and Tennessee both had greater variability in the number of postsecondary educational institutions providing CIP 46.0302 electrician training following the Great Recession, FY 2010-FY 2014, (that is, 12 postsecondary training institutions in Louisiana and Tennessee), which permitted statistical tests of association between the lagged completers of sub-baccalaureate electrician training over time and the initiation of statewide occupational licensing for electricians.

Tennessee Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees Conferred:																									
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	
448664	Miller-Motte Technical College-Madison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	8	13	10	1		
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	6	8	13	10	1		
Note #1: shaded (grey and blue), background area represented years during which electricians in Tennessee were a licensed occupation statewide, that is, FY 2000 through FY 2014. Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009. Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research. IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30. Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014. Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Tennessee. Tennessee Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																									
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	
246202	Kaplan Career Institute-Nashville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
382771	Miller-Motte Technical College-Clarksville	0	0	0	0	0	0	0	0	0	23	15	17	13	11	0	0	0	0	0	0	0	0	0	0
448664	Miller-Motte Technical College-Madison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	24	38	28	38	27	29	21	
221184	Nashville State Community College	11	4	6	11	24	10	17	16	15	9	18	16	18	27	17	10	6	21	19	11	7	1	15	
221908	Northeast State Community College	0	0	0	28	22	28	20	32	31	15	17	14	22	29	19	23	20	33	13	31	24	9	35	
221485	Southwest Tennessee Community College	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2	4	8	12	3	0	0	0	
219596	Tennessee College of Applied Technology-Athens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	27	16	16	16	15	
221616	Tennessee College of Applied Technology-Jackson	0	0	0	0	0	0	0	0	0	0	0	0	24	14	19	16	22	27	23	22	23	11	19	
221625	Tennessee College of Applied Technology-Knoxville	9	27	15	20	14	12	11	10	14	19	13	21	9	12	12	14	13	15	16	19	16	10	18	
220756	Tennessee College of Applied Technology-McKenzie	11	10	11	11	9	9	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
221607	Tennessee College of Applied Technology-McMinnville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	6	10	3	8	
221050	Tennessee College of Applied Technology-Morrisstown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	24	32	27	19	33	23	19	26	
221388	Tennessee College of Applied Technology-Ripley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	11	7	28	7	15	18	32	
221634	Tennessee College of Applied Technology-Whiteville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	5	6	7	2	0	
440873	Vatterott College-Dividend	0	0	0	0	0	0	0	0	0	0	0	0	25	13	34	18	0	0	0	0	0	0	0	
	Total	31	41	32	70	69	59	56	65	60	66	63	68	86	119	109	151	150	198	198	192	168	118	195	
Note #1: shaded (grey and blue), background area represented years during which electricians in Tennessee were a licensed occupation statewide, that is, FY 2000 through FY 2014. Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009. Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research. IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30. Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0302 during FY 1992 through FY 2014. Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0302 at the baccalaureate level or above in Tennessee. Tennessee Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:																									
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	
	Total	31	41	32	70	69	59	56	65	60	66	63	68	86	119	109	151	150	203	204	200	181	128	196	

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed December, 2015; and EDEPS at www.edeps.org, accessed December, 2015.

The Louisiana and Tennessee electricians IPEDS completions survey (census) data for CIP 46.0302, FY 1992 - FY 2014, associate degrees and certificates below the baccalaureate conferred, before and after the statewide initiation of electrician licensing, and the related graphs over time, boxplots, and regression statistics were presented in the preceding pages 6 through 11.

With respect to the training for plumbers (CIP 46.0501 and CIP 46.0503) in Alaska, North Dakota, and Tennessee, only one postsecondary education institution in each state produced low output levels of graduates following the Great Recession.

Alaska Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Associate Degrees:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
102711	AVTEC-Alaska's Institute of Technology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
434584	Iliisagvik College	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0

Note #1: shaded (grey and blue), background area represented years during which plumbers in Alaska were a licensed occupation statewide, that is, FY 2005 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0501 and CIP 46.0503 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0501 and CIP 46.0503 at the baccalaureate level or above in Alaska.

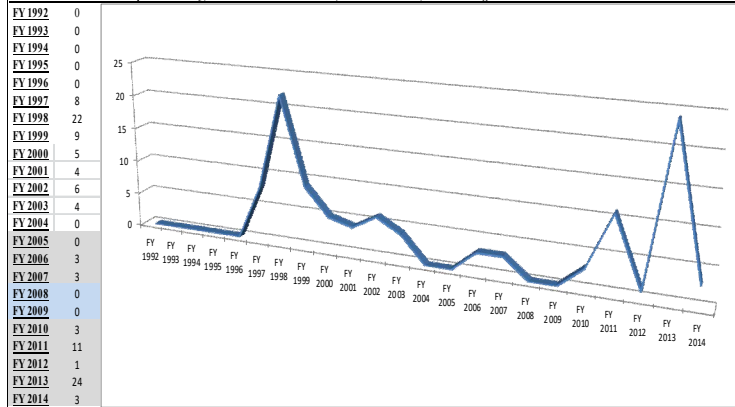
Alaska Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
102711	AVTEC-Alaska's Institute of Technology	0	0	0	0	0	8	22	8	5	4	6	0	0	0	0	0	0	0	0	0	0	0	0
434584	Iliisagvik College	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3	3	0	0	3	11	1	24	3
Total		0	0	0	0	0	8	22	9	5	4	6	2	0	0	3	3	0	0	3	11	1	24	3

Note #1: shaded (grey and blue), background area represented years during which plumbers in Alaska were a licensed occupation statewide, that is, FY 2005 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0501 and CIP 46.0503 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0501 and CIP 46.0503 at the baccalaureate level or above in Alaska.

Alaska Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
102711	AVTEC-Alaska's Institute of Technology	0	0	0	0	0	8	22	8	5	4	6	0	0	0	0	0	0	0	0	0	0	0	0
434584	Iliisagvik College	0	0	0	0	0	0	0	1	0	0	0	4	0	0	3	3	0	0	3	11	1	24	3
Total		0	0	0	0	0	8	22	9	5	4	6	4	0	0	3	3	0	0	3	11	1	24	3

Note #1: shaded (grey and blue), background area represented years during which plumbers in Alaska were a licensed occupation statewide, that is, FY 2005 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research, of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the National Bureau of Economic Research.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definition of CIP 46.0501 and CIP 46.0503 during FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0501 and CIP 46.0503 at the baccalaureate level or above in Alaska.

Alaska Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:



Note #1: shaded (grey and blue), background area represented years during which plumbers in Alaska were a licensed occupation statewide, i.e., FY 2005-FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of 12/2007 (peak)-6/2009 (trough), i.e., FY 2008-FY 2009.
 Note #3: the U.S. economy suffered mild recessions from 7/1990 (peak, not shaded)-3/1991 (trough, not shaded), and from 3/2001 (peak, not shaded)-11/2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definitions of CIP 46.0501 and CIP 46.0503 between FY 1992 and FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates for graduates from CIP 46.0501 and CIP 0503 at the baccalaureate level or above in Alaska.

Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed October, 2016; and EDEPS at www.edeps.org, accessed October, 2016.

North Dakota Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Associate Degrees Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
200305	North Dakota State College of Science	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200086	Nueta Hidatsa Sahnish College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200554	United Tribes Technical College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

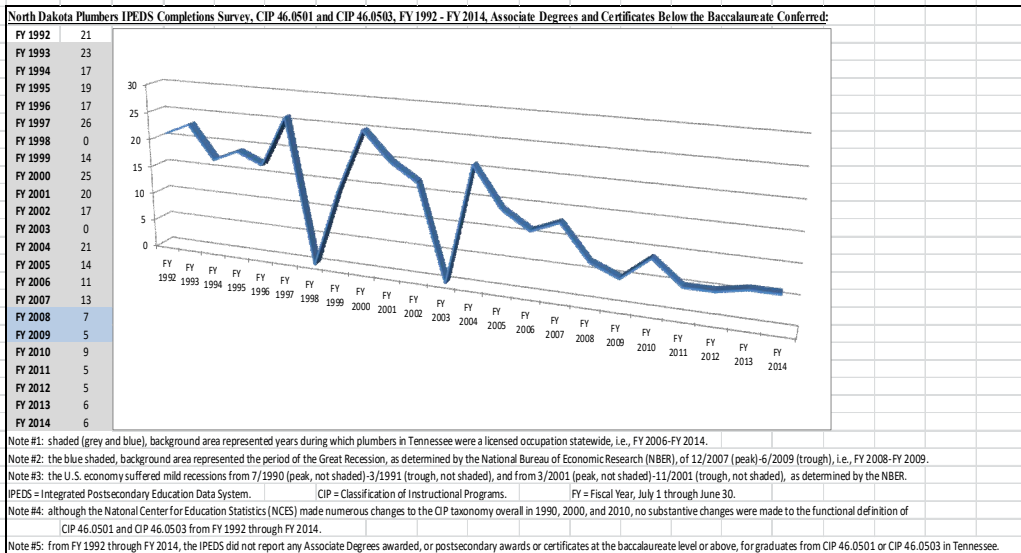
Note #1: shaded (grey and blue), background area represented years during which plumbers in North Dakota were a licensed occupation statewide, that is, FY 1993 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definitions of CIP 46.0501 and CIP 46.0503 from FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates at the baccalaureate level or above for graduates from CIP 46.0501 or CIP 46.0503 in North Dakota.

North Dakota Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
200305	North Dakota State College of Science	18	18	15	18	16	26	0	14	25	20	17	0	21	14	11	9	7	5	9	5	5	6	6
200086	Nueta Hidatsa Sahnish College	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
200554	United Tribes Technical College	3	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		21	22	17	19	17	26	0	14	25	20	17	0	21	14	11	13	7	5	9	5	5	6	6

Note #1: shaded (grey and blue), background area represented years during which plumbers in North Dakota were a licensed occupation statewide, that is, FY 1993 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definitions of CIP 46.0501 and CIP 46.0503 from FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates at the baccalaureate level or above for graduates from CIP 46.0501 or CIP 46.0503 in North Dakota.

North Dakota Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Associate Degrees and Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
Total		21	23	17	19	17	26	0	14	25	20	17	0	21	14	11	13	7	5	9	5	5	6	6

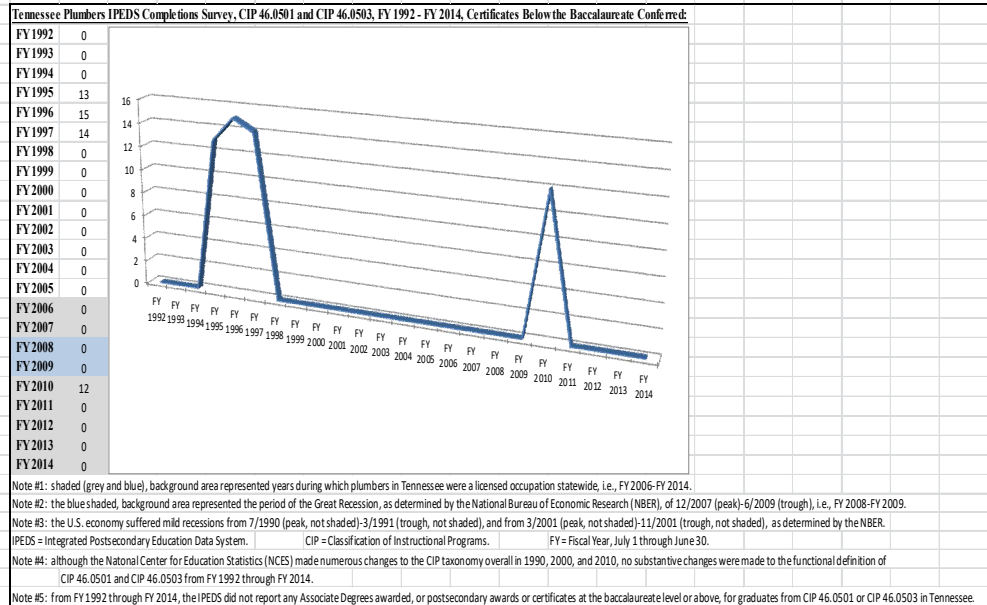
Note #1: shaded (grey and blue), background area represented years during which plumbers in North Dakota were a licensed occupation statewide, that is, FY 1993 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definitions of CIP 46.0501 and CIP 46.0503 from FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any postsecondary awards or certificates at the baccalaureate level or above for graduates from CIP 46.0501 or CIP 46.0503 in North Dakota.



Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed October, 2016; and EDEPS at www.edeps.org, accessed October, 2016.

Tennessee Plumbers IPEDS Completions Survey, CIP 46.0501 and CIP 46.0503, FY 1992 - FY 2014, Certificates Below the Baccalaureate Conferred:																								
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
221.616	Tennessee College of Applied Technology-Jackson	0	0	0	10	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220756	Tennessee College of Applied Technology-McKenzie	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0
221.281	Tennessee College of Applied Technology-Paris	0	0	0	3	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	13	15	14	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0

Note #1: shaded (grey and blue), background area represented years during which plumbers in Tennessee were a licensed occupation statewide, that is, FY 2006 through FY 2014.
 Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic Research (NBER), of December, 2007 (peak), through June, 2009 (trough), i.e., FY 2008 through FY 2009.
 Note #3: the U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), through March, 1991 (trough, not shaded), and from March, 2001 (peak, not shaded), through November, 2001 (trough, not shaded), as determined by the NBER.
 IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.
 Note #4: although the National Center for Education Statistics (NCES) made numerous changes to the CIP taxonomy overall in 1990, 2000, and 2010, no substantive changes were made to the functional definitions of CIP 46.0501 and CIP 46.0503 from FY 1992 through FY 2014.
 Note #5: from FY 1992 through FY 2014, the IPEDS did not report any Associate Degrees awarded, or postsecondary awards or certificates at the baccalaureate level or above, for graduates from CIP 46.0501 or CIP 46.0503 in Tennessee.



Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <http://nces.ed.gov/ipeds/Home/UseTheData>, accessed October, 2016; and EDEPS at www.edeps.org, accessed October, 2016.

The Tennessee postsecondary educational institutions produced no associate degree plumbing graduates from CIP 46.0501 or CIP 46.0503 programs during FY 1992 through FY 2014, according to IPEDS/NCES. Further, the plumbing CIP 46.0501 and CIP 46.0503 completers, from the postsecondary training schools and colleges of the ðswitcherö states of Alaska, North Dakota, and Tennessee, were all sub-baccalaureate graduates, FY 1992-FY 2014, as reported by IPEDS.

Appendix II: U.S. postsecondary program completers by degree level, FY 2015, linked to the national licensed occupations (def. #1). (Source: EDEPS, supply indicators, at www.edeps.org).

Program Completers by Degree Level (2014 - 2015) United States												
CIP Code	Program Title	Cert1	Cert2	Assoc	Assoc+	Bach	CertB	Mast	CertM	Doct	Total	
52.0301	Accounting	1,757	1,490	5,926	119	51,837	548	19,429	37	52	81,195	
Program Completers by Degree Level (2014 - 2015) United States												
52.1304	Actuarial Science	15	2	0	0	1,101	0	408	0	0	1,526	
Program Completers by Degree Level (2014 - 2015) United States												
49.0102	Airline/Commercial/Professional Pilot and Flight Crew	286	95	499	0	867	0	0	0	0	1,747	
Program Completers by Degree Level (2014 - 2015) United States												
51.3301	Acupuncture and Oriental Medicine	66	28	16	0	0	33	20	2	10	175	
51.3399	Alternative and Complementary Medicine and Medical Systems, General	16	0	0	0	173	8	12	0	0	209	
51.3305	Alternative and Complementary Medicine and Medical Systems, Other	28	1	0	0	0	0	1	0	0	30	
51.3401	Ayurvedic Medicine/Ayurveda	0	0	30	18	15	0	13	0	0	76	
51.3306	Direct Entry Midwifery	63	81	113	0	203	8	39	0	0	507	
51.3304	Holistic Health	42	7	9	0	199	3	94	4	0	358	
51.3303	Homeopathic Medicine/Homeopathy	0	0	0	0	0	0	0	0	0	0	
51.3303	Naturopathic Medicine/Naturopathy	0	0	0	0	0	0	0	0	406	406	
51.3302	Traditional Chinese Medicine and Chinese Herbology	0	0	0	0	0	23	192	3	11	229	
Program Completers by Degree Level (2014 - 2015) United States												
4.0902	Architectural and Building Sciences/Technology	1	6	20	0	235	19	229	0	14	524	
4.0901	Architectural Technology/Technician	134	79	340	0	211	0	0	0	0	764	
4.0201	Architecture	0	0	96	0	5,813	74	4,301	4	127	10,415	
4.4999	Architecture and Related Services, Other	2	0	0	0	199	3	94	4	0	358	
4.0401	Environmental Design/Architecture	2	0	6	0	612	5	112	0	22	759	
4.0501	Interior Architecture	3	0	8	0	400	0	214	0	0	625	
4.1001	Real Estate Development	0	0	0	0	0	18	221	0	0	239	
Program Completers by Degree Level (2014 - 2015) United States												
12.0402	Barbering/Barber	756	7,071	9	237	0	0	0	0	0	8,073	
12.0413	Cosmetology, Barber/Styling, and Nail Instructor	1,326	622	24	63	0	0	0	0	0	2,035	
12.0401	Cosmetology/Cosmetologist, General	3,399	64,949	750	7,975	0	0	0	0	0	77,073	
Program Completers by Degree Level (2014 - 2015) United States												
51.0101	Chiropractic	0	0	0	0	0	0	0	0	2,544	2,544	
Program Completers by Degree Level (2014 - 2015) United States												
47.0103	Communications Systems Installation and Repair Technology	137	63	168	35	0	0	0	0	0	403	
Program Completers by Degree Level (2014 - 2015) United States												
51.0602	Dental Hygiene/Hygienist	78	86	5,862	95	2,134	0	97	0	0	8,352	
Program Completers by Degree Level (2014 - 2015) United States												
51.0401	Dentistry	0	0	0	0	0	0	0	67	5,867	5,934	
Program Completers by Degree Level (2014 - 2015) United States												
52.1701	Insurance	1,355	10	4	5	848	38	86	0	1	2,347	
Program Completers by Degree Level (2014 - 2015) United States												
4.0601	Landscape Architecture	12	3	12	0	795	12	712	0	6	1,552	
Program Completers by Degree Level (2014 - 2015) United States												
22.0101	Law	0	0	0	0	0	0	0	0	40,630	40,630	
Program Completers by Degree Level (2014 - 2015) United States												
51.3901	Licensed Practical/Vocational Nurse Training	5,226	41,804	2,220	658	23	0	0	3	0	49,934	
51.3999	Practical Nursing, Vocational Nursing and Nursing Assistants, Other	627	4,986	159	138	150	0	10	0	0	6,070	
Program Completers by Degree Level (2014 - 2015) United States												
51.1201	Medicine	0	0	0	0	0	0	0	0	18,551	18,551	
51.1901	Osteopathic Medicine/Osteopathy	0	0	0	0	0	0	0	0	5,355	5,355	
Program Completers by Degree Level (2014 - 2015) United States												
41.0299	Nuclear and Industrial Radiologic Technologies/Technicians, Other	0	1	0	0	0	0	0	0	0	1	
15.1401	Nuclear Engineering Technology/Technician	0	35	130	0	168	0	0	0	0	333	
41.0205	Nuclear/Nuclear Power Technology/Technician	19	3	125	0	18	0	5	0	0	170	
Program Completers by Degree Level (2014 - 2015) United States												
51.3801	Registered Nursing/Registered Nurse	1,272	906	85,176	2,243	125,265	73	15,349	185	724	231,193	
Program Completers by Degree Level (2014 - 2015) United States												
51.2306	Occupational Therapy/Therapist	0	0	169	0	874	26	5,823	0	351	7,243	
Program Completers by Degree Level (2014 - 2015) United States												
51.1701	Optometry	0	0	0	0	0	0	0	17	1,549	1,566	
Program Completers by Degree Level (2014 - 2015) United States												
51.2001	Pharmacy	0	0	0	0	991	0	6	0	14,344	15,341	
Program Completers by Degree Level (2014 - 2015) United States												
51.2308	Physical Therapy/Therapist	5	0	286	0	427	62	150	46	10,618	11,594	
Program Completers by Degree Level (2014 - 2015) United States												
51.0912	Physician Assistant	0	124	161	135	626	0	7,025	18	17	8,106	
Program Completers by Degree Level (2014 - 2015) United States												
51.2101	Podiatric Medicine/Podiatry	0	0	0	0	0	0	0	0	574	574	
Program Completers by Degree Level (2014 - 2015) United States												
52.1501	Real Estate	1,256	327	243	0	604	64	816	0	0	3,310	
Program Completers by Degree Level (2014 - 2015) United States												
51.0202	Audiology/Audiologist	0	0	0	0	262	12	126	0	600	1,000	
51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	5	31	142	0	4,531	6	2,600	3	199	7,517	
51.0299	Communication Disorders Sciences and Services, Other	1	0	8	0	107	0	93	32	9	250	
51.0201	Communication Sciences and Disorders, General	0	0	12	0	4,946	1	1,928	1	47	6,935	
51.0203	Speech-Language Pathology/Pathologist	72	15	68	0	1,576	8	3,073	0	28	4,840	
Program Completers by Degree Level (2014 - 2015) United States												
14.3801	Surveying Engineering	23	2	4	0	26	0	12	0	1	68	
15.1102	Surveying Technology/Surveying	109	105	207	0	184	0	4	0	3	612	
Program Completers by Degree Level (2014 - 2015) United States												
49.0205	Truck and Bus Driver/Commercial Vehicle Operator and Instructor	20,144	47	2	0	0	0	0	0	0	20,193	
Program Completers by Degree Level (2014 - 2015) United States												
51.2509	Comparative and Laboratory Animal Medicine	0	0	0	0	0	0	41	0	0	41	
51.2507	Large Animal/Food Animal and Equine Surgery and Medicine	0	0	0	0	0	0	1	0	1	2	
51.2508	Small/Companion Animal Surgery and Medicine	0	0	0	0	0	0	3	0	0	3	
51.2511	Veterinary Infectious Diseases	0	0	0	0	0	0	0	0	5	5	
51.2401	Veterinary Medicine	0	0	0	0	0	0	0	0	2,815	2,815	
51.2504	Veterinary Microbiology and Immunobiology	0	0	0	0	23	0	3	0	2	28	
51.2505	Veterinary Pathology and Pathobiology	0	0	0	0	0	0	3	0	23	26	
51.2503	Veterinary Physiology	0	0	0	0	0	0	0	0	4	4	
51.251	Veterinary Preventive Medicine, Epidemiology, and Public Health	0	0	0	0	0	0	10	1	0	11	
51.2501	Veterinary Sciences/Veterinary Clinical Sciences, General	0	0	0	0	8	16	173	0	212	409	

Appendix III: In support of the labor supply specification, the taxonomic associations between the national licensed occupations and their linked educational programs (at the 6-digit SOC and CIP level of detail) were reinforced by empirical linkages of the same or broader classifications of the national licensed occupations and their respective, concomitant training programs, based on U.S. survey data (summarized in the following tables) about the principal job by field of study for highest degree from the National Survey of College Graduates (NSCG).⁷⁵ Also, for national survey data from the American Community Survey (ACS), the Hamilton Project (Brookings Institution) interactive website, “Putting Your Major to Work: Career Paths after College,” (at http://www.hamiltonproject.org/charts/median_earnings_for_largest_occupations) provided empirical linkages between field of study (college major) of college graduates and subsequent occupational employment similar to the tabular NSCG findings presented below.⁷⁶

Furthermore, for 38 out of 49 (78%) of the national licensed occupations (definition #2), where more than half of the occupational employment was concentrated in two or fewer detailed (4-digit) North American Industrial Classification System (NAICS) categories (as shown below), the statewide employment post-training by industry reported by the Texas Higher Education Coordinating Board (THECB) wage record follow-up distributions for the educational output from linked training programs was focused on the same detailed industries emphasized by the occupational/industry (O/I) employment profiles for the national licensed jobs, providing further empirical support (albeit indirect) for the labor supply specification. The following table for the national licensed occupation of dental hygienists provided a representative example of the reinforcing taxonomic and wage record data that supported the labor supply specification of educational programs linked to national licensed jobs. According to the U.S. Bureau of Labor Statistics (BLS) and EDEPS, in 2014 in the U.S., 94.4% of dental hygienists were employed in NAICS 6212, the offices of dentists;⁷⁷ and the wage record follow-up tables of the THECB reported a similar statewide concentration in NAICS 6212 post-training of graduates working without continuing their education from the linked training program CIP 51.0602, dental hygiene/hygienists.⁷⁸

Source: Texas Wage Record Follow-Up Data, Detailed CIP Graduates by Detailed Industry, Texas Higher Education Coordinating Board (THECB)			NAICS Industry Code and Title, Texas Employment, 4th Qtr., 2015, 6-12 Months Post-Training
CIP Training Program Code and Title*	Degree Level	# THECB Graduates**	
51.0602 Dental Hygiene/Hygienist	Associate	284	6212 Offices of Dentists
51.0602 Dental Hygiene/Hygienist	Baccalaureate	116	6212 Offices of Dentists
51.0602 Dental Hygiene/Hygienist	Master	1	6212 Offices of Dentists
*Texas completers graduated during FY 2015, and were not enrolled during the Fall, 2015, semester in Texas higher education.	Sub-Total THECB Graduates from CIP 51.0602 Employed (4th qtr., 2015) in NAICS 6212 Post-Training =	401	**Graduates working without continuing their education.
	THECB Total Graduates from CIP 51.0602 Employed (4th qtr., 2015) in all Industries Post-Training =	503	
	Texas Industry Employment Concentration of Texas CIP 51.0602 Training Output in NAICS 6212 =	80%	

⁷⁵ Tables generated from the Scientists and Engineers Statistical Data System (SESTAT), Table Output for National Survey of College Graduates, NSCG PUBLIC 2015, at <https://ncesdata.nsf.gov/sestat/sestat.html>, accessed March, 2017.

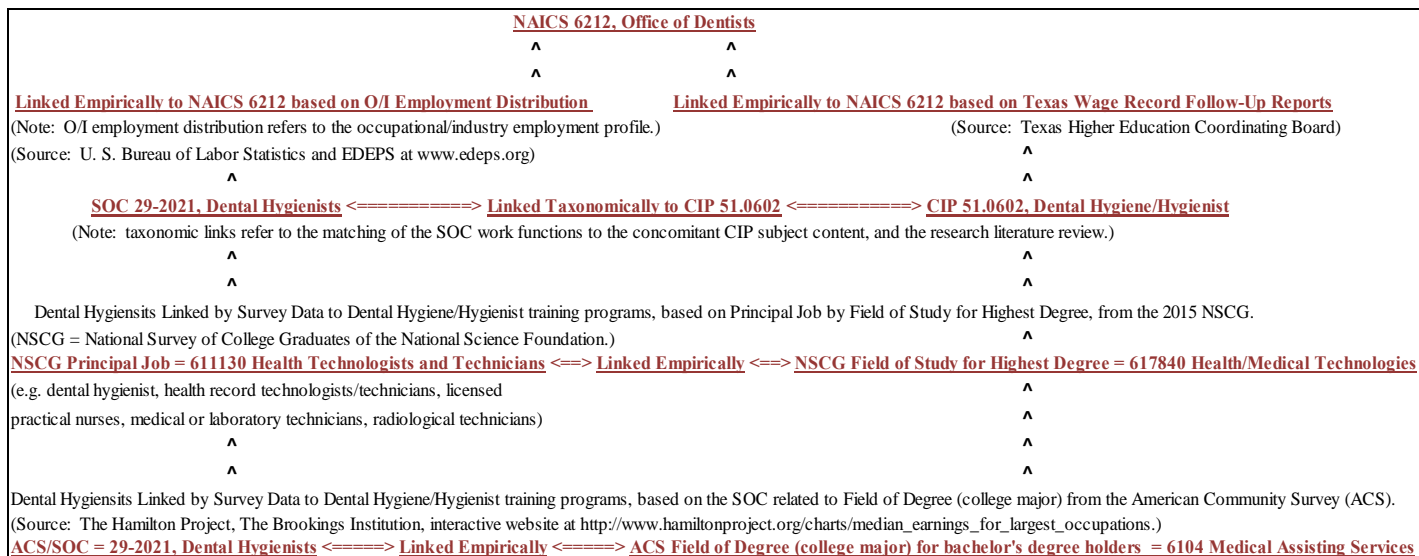
⁷⁶ The Hamilton Project, The Brookings Institution, *Putting Your Major to Work: Career Paths after College*, interactive website at http://www.hamiltonproject.org/charts/median_earnings_for_largest_occupations. Also, see Rotrosen, Anna, [Diane Whitmore Schanzenbach](#), [Greg Nantz](#), and [Ryan Nunn](#), *Where will your degree take you? Career paths after college*, at <https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college>, May 11, 2017.

⁷⁷ Economic Development and Employer Planning System (EDEPS at www.edeps.org), industry distribution of occupational employment, accessed April, 2017.

⁷⁸ Borcoman, Gabriela, Senior Program Director, Texas Higher Education Coordinating Board (THECB), statewide employment of 6-digit CIP program output (for programs linked to the national licensed occupations) by detailed industry, wage record follow-up reports, April, 2017.

Further, the U.S. staffing pattern (i.e., the industry employment distributed by occupation) for NAICS 6212 (offices of dentists) indicated that dental hygienists were a critical labor input into the production function for dental office services, representing one-fifth (21.3%) of the U.S. industry employment for dental offices.⁷⁹

To establish the labor supply specification, the taxonomic associations between the national licensed occupations and their linked educational programs were reinforced by empirical linkages of the same national licensed occupations and their respective, concomitant training programs, as summarized in the following schema.



The building of the labor supply specification, reflected in the national licensed occupations and linked educational programs, started with the taxonomic analysis of training program subject content focused on the national licensed occupational work functions. This taxonomic and research literature review was then reinforced with empirical associations of national licensed occupations and supportive educational programs from the U.S. survey data of the 2015 National Survey of College Graduates (NSCG) and the 2015 American Community Survey (ACS).

Finally, for more than three-fourths (78% or 38) of the national licensed jobs (total 49 occupations, definition #2), where more than half of the U.S. occupational employment in 2014 was concentrated in two or fewer detailed industries (4-digit NAICS level of detail), the THECB wage record follow-up reports provided statewide industry employment distributions for the graduates from training programs (with 100 or more completers) linked to the national licensed occupations, who did not continue their education. These detailed (6-digit CIP) Texas statewide linked educational program output/industry employment distributions 6-12 months post-training were then compared for matches at the same, detailed industry level (4-digit NAICS) against the occupational/industry employment (O/I) profiles for the 38 national licensed occupations with high employment concentrations (that is, more than half) in only one or two detailed industries.

⁷⁹ EDEPS, *op. cit.*, occupational distribution of industry employment (i.e., staffing pattern), accessed April, 2017.

Occupational/Industry Employment Distributions for National Licensed Jobs (Definition #2)

SOC Code and Title	Largest % National Occupational Employment 2014 in Detailed NAICS Industry	Second Largest % National Occupational Employment 2014 in Detailed NAICS Industry	Total % National Occupational Employment 2014 in Top Two Detailed Industries
13-2011 Accountants and Auditors	26.3	6.7	33.0
15-2011 Actuaries	31.2	12.9	44.1
53-2011 Airline Pilots, Copilots, and Flight Engineers	86.7	5.0	91.7
53-2012 Commercial Pilots	31.9	10.9	42.8
29-1199 Health Diagnosing and Treating Practitioners, All Other	28.1	25.9	54.0
17-1011 Architects, Except Landscape and Naval	19.5	6.5	26.0
39-5011 Barbers	76.0	22.6	98.6
39-5012 Hairdressers, Hairstylists, and Cosmetologists	52.7	42.5	95.2
29-1011 Chiropractors	60.0	33.9	93.9
27-4013 Radio Operators	34.4	25.0	59.4
29-2021 Dental Hygienists	94.4	1.0	95.4
29-1021 Dentists, General	69.1	23.1	92.2
41-3021 Insurance Sales Agents	56.8	14.1	70.9
17-1012 Landscape Architects	18.6	15.4	34.0
23-1011 Lawyers	48.3	21.3	69.6
29-2061 Licensed Practical and Licensed Vocational Nurses	29.5	12.8	42.3
29-1060 Physicians and Surgeons	51.3	21.8	73.1
51-8011 Nuclear Power Reactor Operators	80.0	7.6	87.6
29-1141 Registered Nurses	48.7	6.7	55.4
29-1122 Occupational Therapists	24.1	18.7	42.8
29-1041 Optometrists	48.6	16.8	65.4
29-1051 Pharmacists	42.4	18.8	61.2
29-1123 Physical Therapists	33.7	20.7	54.4
29-1071 Physician Assistants	56.7	18.3	75.0
29-1081 Podiatrists	67.3	11.1	78.4
13-2021 Appraisers and Assessors of Real Estate	29.8	28.8	58.6
41-9022 Real Estate Sales Agents	52.5	19.2	71.7
29-1181 Audiologists	25.1	24.9	50.0
29-1127 Speech-Language Pathologists	38.9	18.6	57.5
17-1022 Surveyors	35.0	6.5	41.5
53-3022 Bus Drivers, School or Special Client	40.9	30.2	71.1
53-3021 Bus Drivers, Transit and Intercity	47.7	16.9	64.6
53-3032 Heavy and Tractor-Trailer Truck Drivers	32.9	13.3	46.2
53-3033 Light Truck or Delivery Services Drivers	16.7	7.6	24.3
29-1131 Veterinarians	74.3	16.2	90.5
25-2011 Preschool Teachers, Except Special Education	55.2	10.6	65.8
25-2012 Kindergarten Teachers, Except Special Education	80.7	4.0	84.7
25-2021 Elementary School Teachers, Except Special Education	86.1	11.0	97.1
25-2032 Career/Technical Education Teachers, Secondary School	92.5	2.5	95.0
25-2031 Secondary School Teachers, Except Special and Career/Technical Education	83.9	13.4	97.3
25-2051 Special Education Teachers, Preschool	53.2	13.8	67.0
25-2052 Special Education Teachers, Kindergarten and Elementary School	88.3	6.5	94.8
25-2053 Special Education Teachers, Middle School	91.7	6.4	98.1
25-2054 Special Education Teachers, Secondary School	87.1	8.2	95.3
25-2059 Special Education Teachers, All Other	66.2	4.4	70.6
25-3011 Adult Basic and Secondary Education and Literacy Teachers and Instructors	26.5	14.6	41.1
29-1171 Nurse Practitioners	45.2	21.4	66.6
29-1126 Respiratory Therapists	64.0	8.6	72.6
29-2041 Emergency Medical Technicians and Paramedics	48.4	28.8	77.2

Note: The gray background, national licensed occupations (definition #2) have more than 50% of their occupational employment concentrated nationally in two or less detailed industries, i.e., 4-, 5-, or 6-digit NAICS code detail. Half or more of the U.S. employment in 2014 of 38 out of 49 (or 78%) national licensed jobs (definition #2) were concentrated in one or two detailed NAICS industries.

Source: U.S. Bureau of Labor Statistics (BLS) and the Economic Development and Employer Planning System (EDEPS), Occupational Patterns: Industry Distribution of Occupational Employment, at www.edeps.org.

National Survey of College Graduates (NSCG), 2015, Principal Job by Field of Study for Highest Degree:

SESTAT Table Output:		Principal Job (for National Licensed Occupations)																
National Survey of College Graduates. NSCG PUBLIC 2015: Principal Job by Field of Study for Highest Degree.		Diagnosing/treating practitioners (dent,optom,physicians,psych,pod,surgn,vet)		RNs, pharmacists, dieticians, therapists, physician asst, nurse practitioners		Health technologists and technicians (dent hyg,hlth rcrd tech,LPN/lab/rad tech)		Teachers: Secondary - computer, math or sciences		Teachers: Secondary - social sciences		Surveyors, cartographers, photogrammetrists		Architects		Actuaries		
Field of Study for Highest Degree (Linked to National Licensed Occupations)	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %
Environmental science or studies	770	0.00%	5,207	1.00%	11,096	1.50%							686	6.20%	255	0.10%		
Geography	3,269	0.10%	1,333	0.30%	63	0.00%	3,743	1.20%	3,301	29.70%	1,252	0.70%						
Civil engineering	115	0.00%	402	0.10%					908	8.20%	2,025	1.20%						
Audiology and speech pathology	20,255	1.70%	89,084	3.90%	1,594	0.30%			165	0.10%								
Health/medical assistants	6,216	0.50%	31,173	1.40%	25,421	5.00%												
Health/medical technologies	103	0.00%	9,513	0.40%	74,359	14.50%	6,288	0.90%							2,071	1.20%		
Medicine (dentistry,optometry,osteopathic,podiatry,veterinary)	1,016,165	84.30%	55,325	2.40%	27,627	5.40%	9,279	1.30%										
Nursing (4 years or longer program)	51,601	4.30%	1,172,900	50.80%	13,542	2.60%												
Pharmacy	2,528	0.20%	227,941	9.90%	9,065	1.80%												
Physical therapy and other rehabilitation/therapeutic services	14,905	1.20%	251,601	10.90%	12,893	2.50%	1,729	0.20%	19	0.00%								
Computer teacher education							3,858	0.50%	190	0.10%								
Mathematics teacher education							84,048	11.50%									232	0.70%
Science teacher education	163	0.00%	864	0.00%			69,081	9.50%	24	0.00%								
Social science teacher education							10,553	1.40%	33,109	11.00%								
Architecture/Environmental Design	139	0.00%	4,415	0.20%	3,891	0.80%	6,028	0.80%			345	3.10%	137,148	78.80%				
Actuarial science					265	0.10%											14,238	43.20%
Accounting	1,942	0.20%	651	0.00%	1,200	0.20%	6,535	0.90%	354	0.10%					1,145	0.70%		
Elementary teacher education	9,768	0.40%	9,768	0.20%	799	0.20%	33,171	4.60%	7,170	2.40%								
Physical education and coaching	181	0.00%	1,045	0.00%	420	0.10%	5,534	0.80%	238	0.10%								
Pre-school/kindergarten/early childhood teacher education			2,144	0.10%	2,235	0.40%	27	0.00%										
Secondary teacher education			1,925	0.10%	634	0.10%	52,874	7.30%	57,926	19.30%								
Special education			5,525	0.20%			5,499	0.80%	4,975	1.70%								
Law/Prelaw/Legal Studies	1,913	0.20%	3,825	0.20%	1,494	0.30%	3,963	0.50%	8,120	2.70%					168	0.10%		
Total (All NSCG Fields of Study for Highest Degree)	1,205,328	100.00%	2,306,982	100.00%	513,118	100.00%	728,702	100.00%	300,035	100.00%	11,107	100.00%	174,080	100.00%	32,993	100.00%		

SESTAT Table Output:		Principal Job (for National Licensed Occupations)																
National Survey of College Graduates. NSCG PUBLIC 2015: Principal Job by Field of Study for Highest Degree.		Accountants, auditors, and other financial specialists		Teachers: Pre-kindergarten and kindergarten		Teachers: Elementary		Teachers: Secondary - other subjects		Teachers: Special education - primary and secondary		Lawyers, judges		Logical Skip		Total (All NSCG Primary Job Categories)		
Field of Study for Highest Degree (Linked to National Licensed Occupations)	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %	Weighted Count	Column %
Environmental science or studies	5,808	0.20%	36	0.00%	432	0.00%			125	0.00%	87	0.00%	23,994	0.20%	181,315	0.30%		
Geography	2,375	0.10%	378	0.10%	777	0.00%	138	0.00%	188	0.00%			38,578	0.30%	178,653	0.30%		
Civil engineering	8,060	0.30%			26	0.00%	52	0.00%	209	0.00%			87,289	0.70%	511,140	0.90%		
Audiology and speech pathology	191	0.00%	35,396	5.60%	15,116	0.80%	124	0.00%	13,143	2.30%			61,506	0.50%	293,991	0.50%		
Health/medical assistants	168	0.00%	318	0.10%									11,891	0.10%	97,895	0.20%		
Health/medical technologies	815	0.00%	429	0.10%	211	0.00%							45,077	0.40%	229,932	0.40%		
Medicine (dentistry,optometry,osteopathic,podiatry,veterinary)	3,282	0.10%	381	0.10%	8,251	0.40%	65	0.00%					176,593	1.50%	1,589,095	2.70%		
Nursing (4 years or longer program)	874	0.00%	286	0.00%			1,001	0.10%			2,039	0.20%	323,945	2.70%	1,806,627	3.10%		
Pharmacy	733	0.00%					139	0.00%			89	0.00%	54,470	0.50%	345,557	0.60%		
Physical therapy and other rehabilitation/therapeutic services	8,783	0.30%	603	0.10%	2,615	0.10%	1,524	0.20%	2,071	0.40%			59,387	0.50%	545,667	0.90%		
Computer teacher education			318	0.10%	6,683	0.40%	8,570	1.10%					6,484	0.10%	34,788	0.10%		
Mathematics teacher education	2,440	0.10%			12,597	0.70%	1,233	0.20%	2,065	0.40%			57,717	0.50%	200,143	0.30%		
Science teacher education			751	0.10%	5,907	0.30%	1,672	0.20%	913	0.20%	66	0.00%	54,477	0.50%	176,434	0.30%		
Social science teacher education	475	0.00%	2,803	0.40%	6,729	0.40%	2,184	0.30%	2,337	0.40%			45,552	0.40%	156,983	0.30%		
Architecture/Environmental Design	5,094	0.20%			2,830	0.20%	1,059	0.10%	44	0.00%			65,128	0.50%	473,633	0.80%		
Actuarial science	2,380	0.10%											1,799	0.00%	34,284	0.10%		
Accounting	1,063,225	35.40%							102	0.00%	8,977	0.70%	459,432	3.80%	2,409,982	4.20%		
Elementary teacher education	20,673	0.70%	167,578	26.60%	811,344	44.00%	28,793	3.60%	60,289	10.30%	108	0.00%	893,764	7.40%	2,456,533	4.20%		
Physical education and coaching	3,741	0.10%	624	0.10%	28,547	1.50%	65,958	8.20%	3,612	0.60%			99,108	0.80%	421,802	0.70%		
Pre-school/kindergarten/early childhood teacher education	97	0.00%	109,720	17.40%	51,866	2.80%			5,547	1.00%			94,676	0.80%	348,018	0.60%		
Secondary teacher education	12,656	0.40%	5,776	0.90%	38,252	2.10%	158,872	19.70%	9,521	1.60%	3,006	0.20%	226,285	1.90%	869,570	1.50%		
Special education	25	0.00%	27,692	4.40%	65,370	3.50%	14,688	1.80%	274,685	47.10%	138	0.00%	216,370	1.80%	772,337	1.30%		
Law/Prelaw/Legal Studies	27,464	0.90%	5,387	0.90%	8,705	0.50%	7,988	1.00%	862	0.10%	1,161,589	92.80%	255,692	2.10%	1,840,943	3.20%		
Total (All NSCG Fields of Study for Highest Degree)	3,002,057	100.00%	630,607	100.00%	1,845,835	100.00%	806,401	100.00%	582,695	100.00%	1,251,775	100.00%	12,064,653	100.00%	58,005,754	100.00%		

SESTAT Table Output: National Survey of College Graduates, NSCG PUBLIC 2015: Principal Job by Field of Study for Highest Degree Field of Study for Highest Degree (Linked to National Licensed Occupations)	Principal Job (for National Licensed Occupations)															
	Diagnosing/treating practitioners (dent,optom,physicians,psych,pod,surgn,vet)		RNs, pharmacists, dieticians, therapists, physician asst, nurse practitioners		Health technologists and technicians (dent hyg,hlth rcrd tech,LPN,lab/rad tech)		Teachers: Secondary - computer, math or sciences		Teachers: Secondary - social sciences		Surveyors, cartographers, photogrammetrists		Architects		Actuaries	
	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %
Environmental science or studies	.	.	2	0.10%	7	0.90%	14	0.80%	.	.	5	9.40%	4	1.20%	.	.
Geography	.	.	2	0.10%	2	0.30%	2	0.10%	6	1.30%	18	34.00%	3	0.90%	.	.
Civil engineering	.	.	.	.	1	0.10%	5	0.30%	.	.	5	9.40%	8	2.40%	.	.
Audiology and speech pathology	38	2.60%	291	7.40%	5	0.70%	.	.	1	0.20%	.	.	.	.	.	.
Health/medical assistants	4	0.30%	106	2.70%	38	5.10%	.	.	.	.	.	.	.	.	.	.
Health/medical technologies	1	0.10%	15	0.40%	132	17.60%	4	0.20%	.	.	.	.	1	0.30%	.	.
Medicine (dentistry,optometry,osteopathic,podiatry, veterinary)	997	69.00%	129	3.30%	31	4.10%	12	0.60%	.	.	.	.	.	.	.	.
Nursing (4 years or longer program)	143	9.90%	1,784	45.40%	20	2.70%	.	.	.	.	.	.	.	.	.	.
Pharmacy	3	0.20%	262	6.70%	6	0.80%	.	.	.	.	.	.	.	.	.	.
Physical therapy and other rehabilitation/therapeutic services	22	1.50%	502	12.80%	13	1.70%	5	0.30%	1	0.20%	.	.	.	.	.	.
Computer teacher education	.	.	.	.	.	.	10	0.50%	1	0.20%	.	.	.	.	.	.
Mathematics teacher education	.	.	.	.	.	.	237	12.70%	.	.	.	.	.	.	2	2.50%
Science teacher education	1	0.10%	1	0.00%	.	.	202	10.80%	1	0.20%	.	.	.	.	.	.
Social science teacher education	.	.	.	.	.	.	5	0.30%	61	12.70%	.	.	.	.	.	.
Architecture/Environmental Design	1	0.10%	2	0.10%	1	0.10%	3	0.20%	.	.	1	1.90%	239	71.60%	.	.
Actuarial science	.	.	.	.	1	0.10%	.	.	.	.	.	.	.	.	33	40.70%
Accounting	1	0.10%	2	0.10%	4	0.50%	7	0.40%	1	0.20%	.	.	2	0.60%	.	.
Elementary teacher education	.	.	8	0.20%	3	0.40%	25	1.30%	8	1.70%	.	.	.	.	.	.
Physical education and coaching	1	0.10%	3	0.10%	1	0.10%	6	0.30%	3	0.60%	.	.	.	.	.	.
Pre-school/kindergarten/early childhood teacher education	.	.	1	0.00%	1	0.10%	1	0.10%	.	.	.	.	.	.	.	.
Secondary teacher education	.	.	5	0.10%	1	0.10%	163	8.70%	82	17.10%	.	.	.	.	.	.
Special education	.	.	4	0.10%	.	.	18	1.00%	6	1.30%	.	.	.	.	.	.
Law/Prelaw/Legal Studies	3	0.20%	7	0.20%	3	0.40%	4	0.20%	7	1.50%	.	.	1	0.30%	.	.
Total (All NSCG Fields of Study for Highest Degree)	1,444	100.00%	3,928	100.00%	752	100.00%	1,863	100.00%	479	100.00%	53	100.00%	334	100.00%	81	100.00%

Source: Scientists and Engineers Statistical Data System (SESTAT), Table Output for National Survey of College Graduates, NSCG PUBLIC 2015, at <https://ncesdata.nsf.gov/sestat/sestat.html>, accessed March, 2017.

SESTAT Table Output: National Survey of College Graduates, NSCG PUBLIC 2015: Principal Job by Field of Study for Highest Degree Field of Study for Highest Degree (Linked to National Licensed Occupations)	Principal Job (for National Licensed Occupations)															
	Accountants, auditors, and other financial specialists		Teachers: Pre-kindergarten and kindergarten		Teachers: Elementary		Teachers: Secondary - other subjects		Teachers: Special education - primary and secondary		Lawyers, judges		Logical Skip		Total (All NSCG Primary Job Categories)	
	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %	Count	Column %
Environmental science or studies	8	0.30%	1	0.30%	1	0.10%	.	.	1	0.20%	3	0.20%	63	0.40%	627	0.70%
Geography	6	0.20%	1	0.30%	6	0.60%	2	0.20%	2	0.40%	.	.	62	0.40%	385	0.40%
Civil engineering	20	0.80%	.	.	1	0.10%	1	0.10%	1	0.20%	.	.	271	1.90%	2,576	2.80%
Audiology and speech pathology	1	0.00%	16	5.40%	36	3.50%	2	0.20%	54	9.80%	.	.	102	0.70%	669	0.70%
Health/medical assistants	1	0.00%	1	0.30%	.	.	.	.	.	.	.	.	14	0.10%	189	0.20%
Health/medical technologies	1	0.00%	2	0.70%	1	0.10%	.	.	.	.	.	.	78	0.50%	396	0.40%
Medicine (dentistry,optometry,osteopathic,podiatry, veterinary)	5	0.20%	2	0.70%	1	0.10%	2	0.20%	.	.	.	.	244	1.70%	1,933	2.10%
Nursing (4 years or longer program)	3	0.10%	1	0.30%	.	.	5	0.60%	.	.	1	0.10%	482	3.40%	2,907	3.20%
Pharmacy	1	0.00%	.	.	.	.	2	0.20%	.	.	1	0.10%	85	0.60%	530	0.60%
Physical therapy and other rehabilitation/therapeutic services	8	0.30%	4	1.40%	7	0.70%	4	0.50%	8	1.40%	.	.	103	0.70%	940	1.00%
Computer teacher education	.	.	1	0.30%	8	0.80%	5	0.60%	.	.	.	.	12	0.10%	61	0.10%
Mathematics teacher education	3	0.10%	.	.	9	0.90%	4	0.50%	4	0.70%	.	.	110	0.80%	491	0.50%
Science teacher education	.	.	2	0.70%	8	0.80%	5	0.60%	3	0.50%	1	0.10%	88	0.60%	407	0.40%
Social science teacher education	2	0.10%	1	0.30%	3	0.30%	8	0.90%	4	0.70%	.	.	48	0.30%	197	0.20%
Architecture/Environmental Design	17	0.70%	.	.	5	0.50%	4	0.50%	1	0.20%	.	.	109	0.80%	921	1.00%
Actuarial science	6	0.20%	.	.	.	.	.	.	.	.	.	.	8	0.10%	83	0.10%
Accounting	352	14.40%	.	.	.	.	.	.	1	0.20%	1	0.10%	179	1.30%	914	1.00%
Elementary teacher education	8	0.30%	44	14.90%	307	29.90%	24	2.80%	22	4.00%	1	0.10%	331	2.30%	1,000	1.10%
Physical education and coaching	3	0.10%	2	0.70%	19	1.90%	39	4.50%	3	0.50%	.	.	57	0.40%	226	0.20%
Pre-school/kindergarten/early childhood teacher education	1	0.00%	45	15.20%	14	1.40%	.	.	2	0.40%	.	.	42	0.30%	162	0.20%
Secondary teacher education	11	0.40%	2	0.70%	8	0.80%	150	17.20%	11	2.00%	1	0.10%	175	1.20%	832	0.90%
Special education	1	0.00%	16	5.40%	35	3.40%	17	1.90%	200	36.20%	1	0.10%	119	0.80%	569	0.60%
Law/Prelaw/Legal Studies	35	1.40%	1	0.30%	7	0.70%	10	1.10%	3	0.50%	1,218	89.40%	285	2.00%	2,128	2.30%
Total (All NSCG Fields of Study for Highest Degree)	2,446	100.00%	296	100.00%	1,027	100.00%	872	100.00%	553	100.00%	1,362	100.00%	14,186	100.00%	91,000	100.00%

Source: Scientists and Engineers Statistical Data System (SESTAT), Table Output for National Survey of College Graduates, NSCG PUBLIC 2015, at <https://ncesdata.nsf.gov/sestat/sestat.html>, accessed March, 2017.

Taxonomic, Research Literature, and Empirical Sources in Support of the Labor Supply Specification:

- (1) **Taxonomic Links and Research Literature Review** = taxonomic links, consisting of the matching of the Standard Occupational Classification (SOC) work functions to the concomitant Classification of Instructional Program (CIP) subject content, and the research literature review, as prepared by the staff of the Economic Development and Employer Planning System (EDEPS at www.edeps.org).
- (2) **O/I Profiles and THECB Wage Records** = linked empirically to the same detailed industry (4-digit NAICS), based on matches between the U.S. Bureau of Labor Statistics (BLS) occupational/industry employment distribution (profile) and the Texas Higher Education Coordinating Board (THECB) detailed training program output (i.e., FY 2015 6-digit CIP with > 100 graduates, unless otherwise noted, for completers not continuing their education) by detailed industry (4-digit NAICS) wage record follow-up reports 6-12 months post training (that is, 4th qrt., CY 2015), for national licensed jobs with high industry employment concentration.
- (3) **NSCG 2015** = National Survey of College Graduates, 2015, of the National Science Foundation (NSF), for the principal job held by respondents during the week of 2/1/2015 (for national licensed occupations), by rows of the field of study for highest degree received by respondents before 2/1/2015 (for training programs related to the national licensed jobs).
- (4) **Texas American Community Survey (ACS)** = Texas survey data for the Standard Occupational Classification (SOC) national licensed jobs by field of study (college major) from the 2015 American Community Survey (ACS), tabular data, as prepared by the Center on Education and the Workforce (CEW), Georgetown University.
- (5) **U.S. American Community Survey (ACS)** = national survey data from the American Community Survey (ACS) for bachelor degree recipients linked by field of degree (college major) graduate data to the national licensed occupations, as prepared by The Hamilton Project, The Brookings Institution, Putting Your Major to Work: Career Paths after College, interactive tool at http://www.hamiltonproject.org/charts/median_earnings_for_largest_occupations, (accessed May and July, 2017). Also, see Diane Whitmore Schanzenbach, Greg Nantz, and Ryan Nunn, *Where will your degree take you? Career paths after college*, at <https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college>, May 11, 2017.

National Licensed Occupations (U.S.):	IPEDS Training Programs Related to National Licensed Occupations (U.S.):	Taxonomic Links and	O/I Profiles &	NSCG	TX ACS	U.S. ACS
SOC Code and Title (Definition #2)	Linked CIP Code and Title (Definition #2)	Research Literature Review	THECB Wage Records	2015	2015	2015
13-2011 Accountants & Auditors	52.0301 Accounting	X	X	X	X	X
15-2011 Actuaries	52.1304 Actuarial Science	X		X		X
53-2011 Airline Pilots, Copilots, & Flight Engineers 53-2012 Commercial Pilots	49.0102 Airline/Commercial/Professional Pilot & Flight Crew	X				X
29-1199 Health Diagnosing & Treating Practitioners, AO (AO = All Other)	51.3301 Acupuncture & Oriental Medicine	X				
	51.3300 Alternative & Complementary Medicine & Med. Systems, Gen.	X				
	51.3399 Alternative & Complementary Medicine & Med. Systems, Other	X				
	51.3305 Ayurvedic Medicine/Ayurveda	X				
	51.3401 Direct Entry Midwifery	X				
	51.3306 Holistic Health	X				
	51.3304 Homeopathic Medicine/Homeopathy	X				
	51.3303 Naturopathic Medicine/Naturopathy	X				
	51.3302 Traditional Chinese Medicine & Chinese Herbology	X				
17-1011 Architects, Except Landscape & Naval	04.0902 Architectural & Building Sciences/Techn.	X				
	04.0901 Architectural Technology/Technician	X				
	04.0201 Architecture	X	X	X	X	X
	04.9999 Architecture & Related Services, Other	X				
	04.0401 Environmental Design/Architecture	X				
	04.0501 Interior Architecture	X				
	04.1001 Real Estate Development	X				
39-5011 Barbers	12.0402 Barbering/Barber	X				
39-5012 Hairdressers, Hairstylists, & Cosmetologists	12.0413 Cosmetology, Barber/Styling, & Nail Instructor	X				
	12.0401 Cosmetology/Cosmetologist, Gen.	X	X			
29-1011 Chiropractors	51.0101 Chiropractic	X				
27-4013 Radio Operators	47.0103 Communications Systems Installation & Repair Techn.	X				
29-2021 Dental Hygienists	51.0602 Dental Hygiene/Hygienist	X	X	X	X*	X
29-1021 Dentists, General	51.0401 Dentistry	X	X**	X		

(* 69 Respondents)

(** 77 Graduates)

National Licensed Occupations (U.S.): SOC Code and Title (Definition #2, cont.)	IPEDS Training Programs Related to National Licensed Occupations (U.S.): Linked CIP Code and Title (Definition #2, cont.)	Taxonomic Links and Research Literature Review	O/I Profiles & THECB Wage Records	NSCG 2015	TX. ACS 2015	U.S. ACS 2015
41-3021 Insurance Sales Agents	52.1701 Insurance	X				
17-1012 Landscape Architects	04.0601 Landscape Architecture	X				
23-1011 Lawyers	22.0101 Law	X	X	X		
29-2061 Licensed Practical & Licensed Vocational Nurses	51.3901 Licensed Practical/Vocational Nurse Training	X	X	X		
	51.3999 Practical Nursing, Vocational Nursing & Nursing Assist., Other	X	X			
29-1060 Physicians and Surgeons	51.1201 Medicine	X	X	X		X
	51.1901 Osteopathic Medicine/Osteopathy	X	X	X		X
51-8011 Nuclear Power Reactor Operators	41.0299 Nuclear & Industrial Radiologic Technologies/Techn., Other	X				
	15.1401 Nuclear Engineering Technology/Technician	X				
	41.0205 Nuclear/Nuclear Power Technology/Technician	X				
29-1141 Registered Nurses	51.3801 Registered Nursing/Registered Nurse	X	X	X	X	X
29-1122 Occupational Therapists	51.2306 Occupational Therapy/Therapist	X	X	X	X*	X
29-1041 Optometrists	51.1701 Optometry	X	X**	X		
(* * 96 Respondents)						
(** 76 Graduates)						
29-1051 Pharmacists	51.2001 Pharmacy	X	X	X	X	X
29-1123 Physical Therapists	51.2308 Physical Therapy/Therapist	X	X	X		X
29-1071 Physician Assistants	51.0912 Physician Assistant	X	X	X		
29-1081 Podiatrists	51.2101 Podiatric Medicine/Podiatry	X				X
13-2021 Appraisers and Assessors Real Estate 41-9022 Real Estate Sales Agents	52.1501 Real Estate	X				
29-1181 Audiologists 29-1127 Speech-Language Pathologists	51.0202 Audiology/Audiologist	X				
	51.0204 Audiology/Audiologist & Speech-Language Pathology/Pathologist	X	X			
	51.0299 Communication Disorders Sciences & Services, Other	X				
	51.0201 Communication Sciences & Disorders, General	X	X			X
	51.0203 Speech-Language Pathology/Pathologist	X	X			

National Licensed Occupations (U.S.):	IPEDS Training Programs Related to National Licensed Occupations (U.S.):	Taxonomic Links and Research Literature Review	O/I Profiles & THECB Wage Records	NSCG 2015	TX. ACS 2015	U.S. ACS 2015
SOC Code and Title (Definition #2, cont.)	Linked CIP Code and Title (Definition #2, cont.)					
17-1022 Surveyors	14.3801 Surveying Engineering 15.1102 Surveying Technology/Surveying	X X		X		
53-3022 Bus Drivers, School or Special Client 53-3021 Bus Drivers, Transit & Intercity 53-3032 Heavy & Tractor-Trailer Truck Drivers 53-3033 Light Truck or Delivery Services Drivers	49.0205 Truck & Bus Driver/Commercial Vehicle Op. & Instructor	X	X			
29-1131 Veterinarians	51.2509 Comparative & Laboratory Animal Medicine 51.2507 Large Animal/Food Animal & Equine Surgery & Medicine 51.2508 Small/Companion Animal Surgery & Medicine 51.2511 Veterinary Infectious Diseases 51.2401 Veterinary Medicine 51.2504 Veterinary Microbiology & Immunobiology 51.2505 Veterinary Pathology & Pathobiology 51.2503 Veterinary Physiology 51.2510 Veterinary Preventive Medicine, Epidemiology, & Public Health 51.2501 Veterinary Sciences/Veterinary Clinical Sciences, Gen.	X X X X X X X X X X		X** (**90 Graduates)	X	
25-2011 Preschool Teachers, Ex. Special Ed. 25-2012 Kindergarten Teachers, Ex. Special Ed.	13.1210 Early Childhood Education & Teaching 13.1209 Kindergarten/Preschool Education & Teaching	X X		X X		
25-2021 Elem. School Teachers, Ex. Special Ed.	13.1202 Elementary Education & Teaching	X	X	X		X
25-2032 Career/Techn. Ed. Teachers, Second. School 25-2031 Sec. School Teachers, Ex. Special & Career/Techn. Ed.	13.1205 Secondary Education and Teaching	X	X	X		X
25-2051 Special Ed. Teachers, Preschool 25-2052 Special Ed. Teachers, Kindergarten & Elem. School 25-2053 Special Ed. Teachers, Middle School 25-2054 Special Ed. Teachers, Secondary School 25-2059 Special Ed. Teachers, AO	13.1015 Ed./Teaching Individuals in Early Childhood Special Ed. Programs 13.1017 Ed./Teaching Individuals in Elementary Special Ed. Programs 13.1018 Ed./Teaching Individuals in Jr. High/Middle School Special Ed. Progr. 13.1019 Ed./Teaching Individuals in Secondary Special Ed. Programs 13.1001 Special Education & Teaching, General	X X X X X		X X X X X		X X X X X
25-3011 Adult Basic & Sec. Ed. & Literacy Teachers & Instruct.	13.1201 Adult & Continuing Education & Teaching	X				
29-1171 Nurse Practitioners	51.3818 Nursing Practice	X	X	X		
29-1126 Respiratory Therapists	51.0908 Respiratory Care Therapy/Therapist	X	X			
29-2041 Emergency Medical Technicians & Paramedics	51.0904 Emergency Medical Technology/Technician (EMT Paramedic)	X	X			

Appendix IV: Financial Expenditures and Training Output of U.S. Postsecondary Education Related to National Licensed Jobs, Orders of Magnitude.

Because the National Center for Education Statistics (NCES) collected financial data through its Integrated Postsecondary Education Data System (IPEDS) by institution without regard to training output categories,⁸⁰ it is not possible with IPEDS information to calculate the expenditures necessary to produce the postsecondary education graduates from detailed training programs linked to the national licensed jobs. However, the significant share of the total postsecondary educational output from the training portfolio supporting the labor market institution of occupational licensing ó that is, the conservatively estimated 13% of the total FY 2015 graduates, and over half of the doctoral completers, from training programs linked to the national licensed occupations ó indicated that the training expenditures of these postsecondary educational programs concomitant to the national licensed jobs were prodigious. (The estimates of the output magnitude from the training sector supporting the labor market institution of occupational licensing were conservative, because these estimates excluded training completers linked to occupations licensed in fewer than 45 states, i.e., the numerous less-than-national licensed occupations and related training.)⁸¹ These estimates of the large share of training output linked to national licensed jobs referred to the U.S. postsecondary education sector, which encompassed the largest amount of direct expenditures for higher education as a percent of the national gross domestic product (GDP) of all countries included in the 2013 Organization for Economic Cooperation and Development (OECD) survey.⁸² Consequently, the U.S., with the largest GDP economy in the world, also ranked first in direct higher education expenditures as a percent of GDP among OECD nations in 2013, with at least 13% of the resulting training output of U.S. graduates supporting the labor market institution of occupational licensing.

Public and Private Direct Expenditures on Education Institutions as % of Gross Domestic Product, 2013, Higher Education Institutions			
Direct Expenditures, 2013	Public (a)	Private	Total
OECD Average (b)	1	0.6	1.5
United States	1 (c)	1.6	2.6 (c)

(a) "Excludes expenditures that could not be reported by level of education."

(b) "Refers to the mean of the data values for all reporting Organization for Economic Cooperation and Development (OECD) countries, to which each country reporting data contributes equally. The average includes all current OECD countries for which a given year's data are available, even if they were not members of OECD in that year."

(c) "Postsecondary non-higher-education included in higher education."

"NOTE: Public direct expenditures on education include both amounts spent directly by governments to hire education personnel and to procure other resources, and amounts provided by governments to public or private institutions. Unless otherwise noted, public direct expenditures also include public subsidies to households for payments to education institutions and direct expenditures on education institutions from international sources. Private direct expenditures exclude public subsidies that are used for payments to education institutions."

Source: U.S. Department of Education, *Digest of Education Statistics 2016*, Table 605.20.

⁸⁰ National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Use The Data, Compare Institutions, Finance, Provisional Release Data FY 2015, Title IV participating institutions, at <https://nces.ed.gov/ipeds/datacenter/login.aspx>.

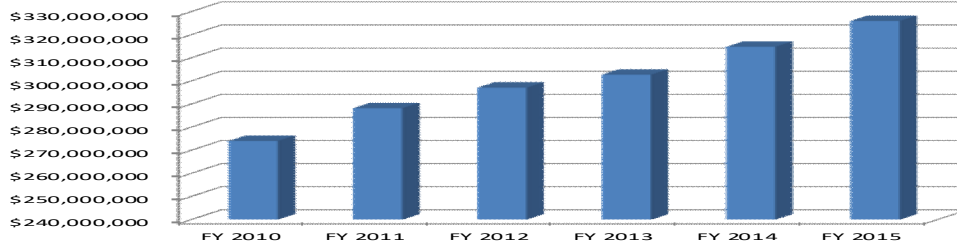
⁸¹ The Treasury/Labor/CEA summary reported, "Estimates suggest that over 1100 occupations are regulated in at least one State, but fewer than 60 are regulated in all 50 States, showing substantial differences in which occupations States choose to regulate." See U.S. Department of the Treasury Office of Economic Policy, U.S. Department of Labor, and the White House Council of Economic Advisors (CEA), *Occupational Licensing: A Framework for Policymakers*, July, 2015, p. 4.

⁸² U.S. Department of Education, NCES, *Digest of Education Statistics 2016*, Table 605.20, Public and Private Direct Expenditures on Education Institutions as a Percentage of Gross Domestic Product, by Level of Education and Country: Selected Years, 2005 through 2013, Higher Education Institutions, Direct Expenditures, 2013, at https://nces.ed.gov/programs/digest/d16/tables/dt16_605.20.asp?current=yes.

Expenses of Public Postsecondary U.S. Educational Institutions, Using GASB Standards

FY 2010 = \$274,033,938,000
 FY 2011 = \$288,211,203,000
 FY 2012 = \$297,090,595,000
 FY 2013 = \$302,693,012,000
 FY 2014 = \$314,784,839,000
 FY 2015 = \$325,940,906,000

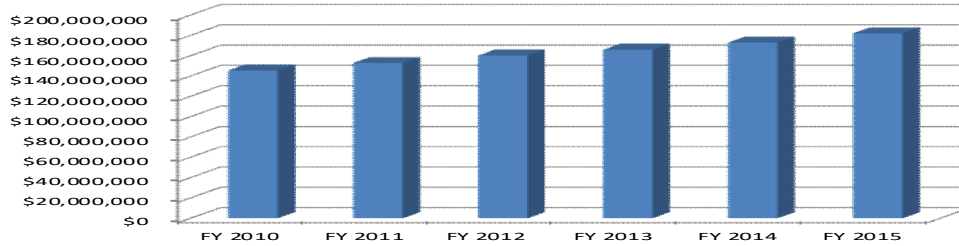
Source: U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Finance Component (Provisional Data), Title IV U.S. Postsecondary Education Institutions, Current Dollars, IPEDS Trends Generator, Institutional Expenses, at <https://nces.ed.gov/ipeds/trendgenerator>, Accessed June, 2017.



Expenses of Private, Not-for-Profit Postsecondary U.S. Educational Institutions, Using FASB Standards

FY 2010 = \$145,461,000,000
 FY 2011 = \$152,835,962,000
 FY 2012 = \$160,175,558,000
 FY 2013 = \$165,862,436,000
 FY 2014 = \$172,849,742,000
 FY 2015 = \$181,992,656,000

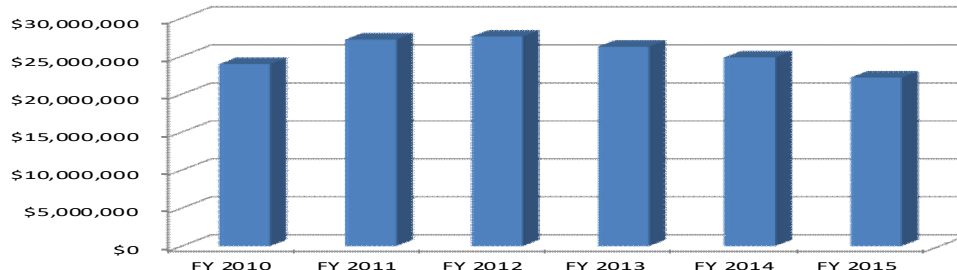
Source: U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Finance Component (Provisional Data), Title IV U.S. Postsecondary Education Institutions, Current Dollars, IPEDS Trends Generator, Institutional Expenses, at <https://nces.ed.gov/ipeds/trendgenerator>, Accessed June, 2017.



Expenses of Private, For-Profit Postsecondary U.S. Educational Institutions, Using FASB Standards

FY 2010 = \$23,981,751,000
 FY 2011 = \$27,224,673,000
 FY 2012 = \$27,622,640,000
 FY 2013 = \$26,278,086,000
 FY 2014 = \$24,874,016,000
 FY 2015 = \$22,216,232,000

Source: U.S. Department of Education (USDOE), National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Finance Component (Provisional Data), Title IV U.S. Postsecondary Education Institutions, Current Dollars, IPEDS Trends Generator, Institutional Expenses, at <https://nces.ed.gov/ipeds/trendgenerator>, Accessed June, 2017.



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