## The Training Investors' Guide to Occupational Licensing

**Technical Paper** 

Mark J. Schaff\* Jan. 19, 2018

#### 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 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 <u>Georgetown University Center on Education and the</u> <u>Workforce</u>. I am grateful for the contributions of Anthony P. Carnevale, Jeff Strohl, and Neil Ridley.

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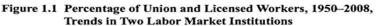
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## The Training Investors' Guide to Occupational Licensing

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.<sup>1</sup>





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	

	Licensed		Certified	
Union status	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.)

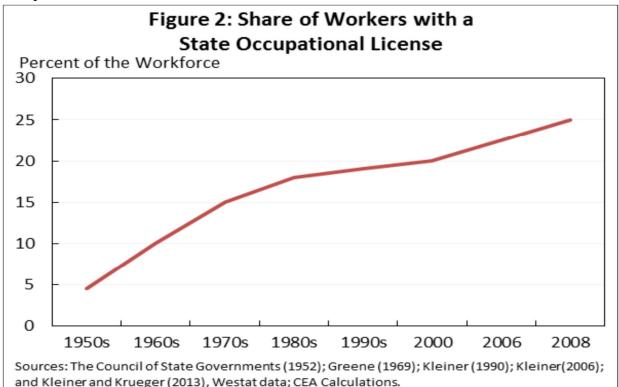
The inter-agency working Group on Expanded Measures of Enrollment and Attainment<sup>2</sup> (GEMEnA) defined an occupational license as ‰ credential awarded by a government agency that constitutes legal authority to do a specific job. Licenses are based on some combination of

<sup>&</sup>lt;sup>1</sup> 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.

<sup>&</sup>lt;sup>2</sup> About GEMEnA, at <u>http://nces.ed.gov/surveys/GEMEnA/index.asp</u>.

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

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,<sup>4</sup> 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

<sup>&</sup>lt;sup>3</sup> GEMEnA Definitions, at <u>http://nces.ed.gov/surveys/GEMEnA/definitions.asp</u>.

<sup>&</sup>lt;sup>4</sup> 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,<sup>5</sup> 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 System<sup>6</sup> (EDEPS), the õLicense Finderö of the Career OneStop, U.S. Department of Labor (USDOL),<sup>7</sup> and the *Occupational Outlook Handbook* publication of the U.S. Bureau of Labor Statistics (BLS),<sup>8</sup> 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.<sup>9</sup> 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. Gittlemen, 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*,<sup>10</sup> 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.<sup>11</sup> (See below, õTable 2, Requirements for Becoming Licensed or Certified.ö)

<sup>9</sup> EDEPS (at <u>http://www.edeps.org</u>); License Finder/Career One-Stop/USDOL (at <u>http://www.careeronestop.org/toolkit/training/find-licenses.aspx</u>); plus Brinegar, Pamela L., and Kara L. Schmitt, öState Occupational and Professional Licensure,ö 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, õMeasuring Alternative Educational Credentials: 2012,ö *Household Economic Studies*, P70-138, January, 2014, Census Bureau, Survey of Income and Program Participation (SIPP), p. 9, at <a href="http://www.census.gov/hhes/socdemo/education/data/files/p70-138.pdf">http://www.census.gov/hhes/socdemo/education/data/files/p70-138.pdf</a>, where Ewert and Kominski stated, õAbout 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.ö

<sup>&</sup>lt;sup>5</sup> Ibid., p. 4, pp. 14 -15, and pp. 62-64. As stated in the Treasury/Labor/CEA report (p. 14), õEstimates 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.ö 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, õThe Prevalence and Effects of Occupational Licensing,ö *British Journal of Industrial Relations* 48, no. 4, pp. 676-687.
<sup>6</sup> Economic Development and Employer Planning System (EDEPS), state occupational demand indicators, licensed occupations, at <a href="http://www.edeps.org">http://www.edeps.org</a>.

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

<sup>&</sup>lt;sup>8</sup> U.S. Bureau of Labor Statistics (BLS), USDOL, Occupational Outlook Handbook (OOH), 2016-17 Edition, at <u>www.bls.gov/ooh</u>.

<sup>&</sup>lt;sup>10</sup> 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;

<sup>&</sup>lt;sup>11</sup> Gittleman, Klee, and Kleiner, *op. cit.*, BLS Working Paper 476, September, 2014, Table 2, p. 39.

<b>Requirements for I</b>	Becoming Licensed o	or Certified			
<b>Definition 1</b>			<b>Definition 2</b>		
Variable	% of Licensed or	N	% of Licensed	% of Certified	N
	Certified Workers		Workers Facing	Workers Facing	
	Facing		Requirement	Requirement	
	Requirement				
<b>Requirement:</b>					
Courses or	93.0	7,211	93.4	92.1	7,133
Training					
Skills or Exam	92.0	7,183	91.9	91.8	7,111
Continuing	69.5	7,080	73.4	60.3	7,019
Education					
Level of governme	nt:				
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.ö

(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*,<sup>13</sup> as follows:

õTable 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.ö

(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.)

"Table 2<sup>12</sup>

<sup>&</sup>lt;sup>12</sup> Ibid.

<sup>&</sup>lt;sup>13</sup> 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 östringencyö 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] End 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.<sup>14</sup>

Furthermore, in his book, *Stages of Occupational Regulation Analysis of Case Studies*,<sup>15</sup> Kleiner provided three state examples each of õswitchers in occupational regulationö for electricians and plumbers. According to the Kleiner examples, electricians õswitchedö from no regulation to statewide occupational licensing within Louisiana in 2004, within Massachusetts in 2007, and within Tennessee in 2000.<sup>16</sup> Also with the Kleiner examples, plumbers õswitchedö from no occupational licensure to statewide licensing within Alaska in 2005, within North Dakota in 1993, and within Tennessee in 2006.<sup>17</sup> The units of analysis from the Economic Development and Employer Planning System (EDEPS)<sup>18</sup> and the Integrated Postsecondary Education Data System (IPEDS)<sup>19</sup> 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 õswitcherö states for electricians and plumbers. As shown in Appendix I, the trend lines for linked electrician training completers in

<sup>&</sup>lt;sup>14</sup> Klee, Mark A., õHow Do Professional Licensing Regulations Affect Practitioners? New Evidence,ö 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 östock measure of trainingö as ö. . . a coarse measure of the respondent¢s investment in human capital.ö (*Ibid.*, p. 15.)
<sup>15</sup> 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.

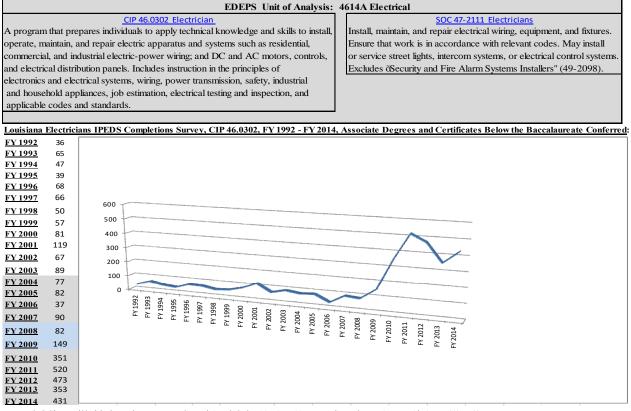
<sup>&</sup>lt;sup>16</sup> *Ibid.*, p. 144.

<sup>&</sup>lt;sup>17</sup> *Ibid.*,p. 145.

<sup>&</sup>lt;sup>18</sup> Economic Development and Employer Planning System (EDEPS), Units of Analysis, at www. Edeps.org.

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

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.



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.

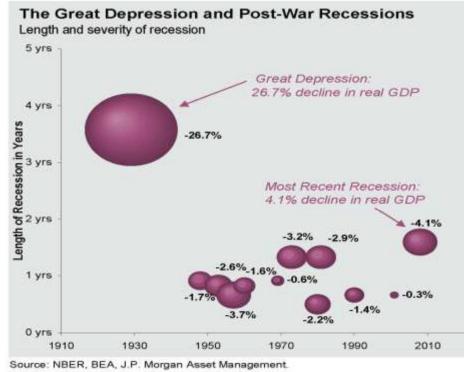
IPEDS = Integrated Postsecondary Education Data System. CIP = Classification of Instructional Programs. FY = Fiscal Year, July 1 through June 30.

Note #4: although the Natonal 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 <u>http://nces.ed.gov/ipeds/Home/UseTheData</u>; and EDEPS at <u>www.edeps.org</u>.

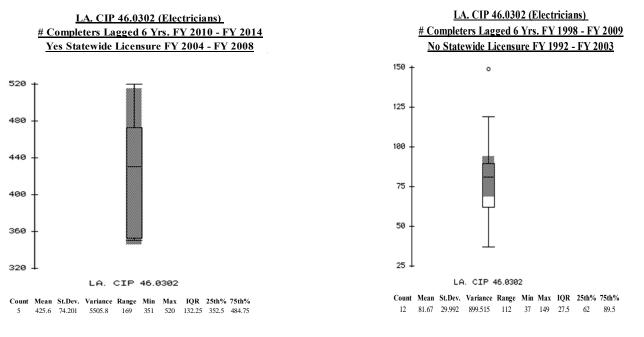
SOC 47-2111 Electricians							
Top 10 Industries By Employment, U.S.		Occupati	ation Employment		% of Occupation		
					in Indust	ustry	
Industry Code	Industry Title	2012	2022	Pct. Chg.	2012	2022	
				2012-22			
Total employment is presented for comparison purposes.	Total employment	583,500	698,200	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, Rureau of Labor Statistic	cs, National Industry-Occupation Employment Matrix; and EDEPS.						

Calendar	Employment, Louisiana,	
Year	NAICS 238210	Employment, Louisiana, NAICS 238210
CY 1992	10659	
CY 1993	11242	
CY 1994	12203	
CY 1995	12913	
CY 1996	13878	18000
CY 1997	14582	16000
CY 1998	16071	14000
CY 1999	16975	12000 -
CY 2000	17670	10000
CY 2001	17027	
CY 2002	15974	
CY 2003	15585	
CY2004	14166	
CY 2005	14796	2000
CY 2006	16203	
CY 2007	16354	CY 1992 CY 1998 CY 1998 CY 1998 Series1 CY 1998 CY 1998 CY 1992 CY 199
CY 2008	16232	CY 1996 CY 1996 CY 1998 CY 1998 CY 1998 CY 2000 CY 2000 CY 2000 CY 2010 CY 2002 CY 200
CY 2009	15706	
CY 2010	14275	
CY 2011	13849	
CY 2012	14270	
CY 2013	15481	
CY 2014	16798	



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.



Dependent variable is: CIP 46.0302 (Note: LA. refers to Louisiana)	(Electricians) LA. # Completers Lagged 6 Years			
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	<u>t-ratio</u>	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 Licensing Required (Yes=1, No=0)	270.748	62.18	4.35	0.0008

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

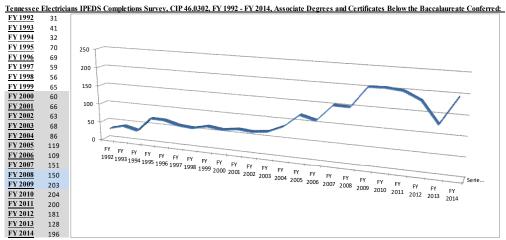
where: Y<sub>t</sub> is the annual linked training program completers (CIP 46.0302, electricians) lagged 6 fiscal years (FY) X<sub>1t</sub> is the national industry employment for electrical contractors and other wiring installation contractors (NAICS 238210), the industry of occupational employment concentration for electricians, by calendar years X<sub>2t</sub> 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<sub>3</sub> 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:

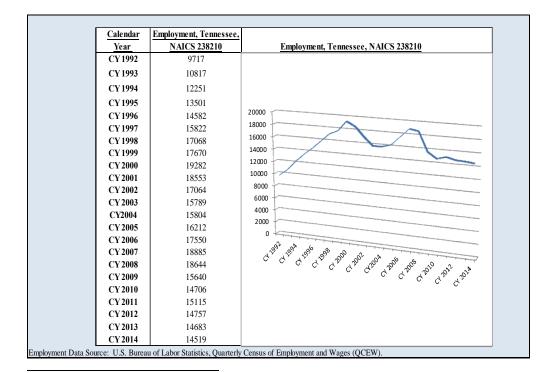
Occupational licensing . . . is an institution whose effects are not immediately apparent, but rather reveal their efficacy over some time. Specifically, occupational licensing usually does not regulate current practitioners, implements new exams, and develops educational and location-specific requirements 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.<sup>20</sup>



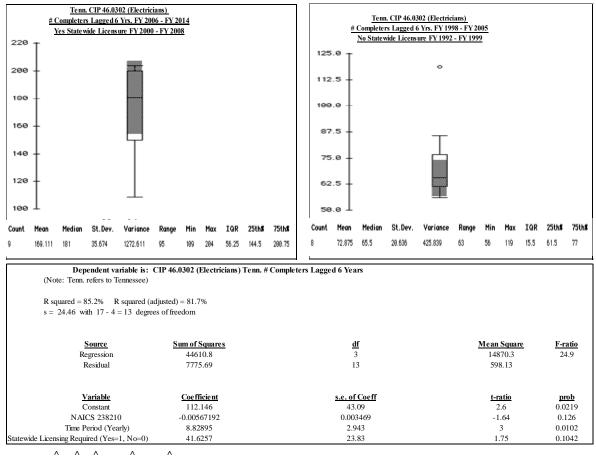
Note #1: shaded (grey and blue), background area represented years during which electricians in Tennessee were a licensed occupation statewide, i.e., FY 2000-FY 2014. Note #2: the blue shaded, background area represented the period of the Great Recession, as determined by the National Bureau of Economic 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 Natonal 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 FY1992 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 <u>http://nces.ed.gov/ipeds/Home/UseTheData</u>; and EDEPS at <u>www.edeps.org</u>.



<sup>&</sup>lt;sup>20</sup> Kleiner, Morris, Stages of Occupational Regulation Analysis of Case Studies, op. cit., Upjohn Institute, 2013, p. xvi.



Yt = a + b1X1t + b2X2t + b3X3t

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

X1t 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

X2t is the time period (yearly)

X3t 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)

b3 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 õAö clusters),<sup>21</sup> 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, õState Regulation of Selected Non-Health Occupations and Professions: 1991,ö

<sup>&</sup>lt;sup>21</sup> EDEPS at <u>http://www.edeps.org</u>, Frequently Asked Questions #7, *What are the Units of Analysis?* õ... :A' 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,ö and table 8.31, Status of Mandatory Continuing Education for Selected Professions: 1991,ö as reported by Brinegar and Schmitt in their 1992 paper, *State Occupational and Professional Licensure*, for the Council of State Governments;<sup>22</sup>

(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,

õOccupations Analyzed in the United States Using Multivariate Techniquesö;

(6) Morris M. Kleiner, *Stages of Occupational Regulation Analysis of Case Studies*, W. E. Upjohn Institute for Employment Research, Kalamazoo, Michigan, 2013, Appendix B, õAdoption of Occupational Regulations by State Statute for Electricians,ö and õUniversally Licensed Occupations,ö 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, õPercentage of Workers Who Require Specific Education and Testing to Become Licensed or Certifiedö;

(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, õCharacteristics of Licensed and Certified Workers,ö and õRequirements of Becoming Licensed or Certified,ö respectively, and Table 4, õMost Common Occupations for Credentialed Workers: Definition 2ö; (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, õHow 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, õuniversally licensed occupations (i.e., licensed in all states),ö 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, õHighly Licensed Occupations,ö 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,

<sup>&</sup>lt;sup>22</sup> Brinegar, Pamela L., and Kara L. Schmitt, , õState Occupational and Professional Licensure,ö 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.)<sup>23</sup>

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, õEstimates 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.ö<sup>24</sup>

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).<sup>25</sup>

Occupational Title	2015 Annual Averages		2015 Annual Averages Total Employed U.S. 5- &
& 2-digit, 5-digit, & 6-digit SOC Codes	Total Employed U.S.	Percent with License	6-Digit SOC as Percent of Related 2-Digit SOC
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

<sup>&</sup>lt;sup>23</sup> Thorton, Robert J., and Edward J. Timmons, öThe de-licensing of occupations in the United States, *Monthly Labor Review*, May, 2015, pp. 1-19, at <u>http://www.bls.gov/opub/mlr/2015/article/the-de-licensing-of-occupations-in-the-united-states.htm</u>. Furthermore, in his 2013 paper entitled, õHow Do Professional Licensing Regulations Affect Practitioners? New Evidence,ö Mark A. Klee, *op. cit.*, p. 12, also remarked about the unlikelihood of repeal of an established, occupational license in a state.
<sup>24</sup> U.S. Department of the Treasury Office of Economic Policy, U.S. Department of Labor, and the White House Council of Economic Advisors

<sup>&</sup>lt;sup>24</sup> 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.

<sup>&</sup>lt;sup>25</sup> 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 <u>http://www.bls.gov/cps/certifications-and-licenses-table-5.htm</u>; 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/cpsat11.htm.

listing of 15 õhighly licensed occupationsö (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:<sup>26</sup>

Occupational Title and #	of Observations	Occupational Title and # of Observations		
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	<b>Respiratory Therapists</b>	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;<sup>27</sup> 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).<sup>28</sup> 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.

<sup>27</sup> 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 <u>http://www.bls.gov/cps/certifications-and-licenses-table-5.htm</u>.

 <sup>&</sup>lt;sup>26</sup> Furth, Salim, Institute for Economic Freedom and Opportunity at The Heritage Foundation, *Understanding the Data on Occupational Licensing*, September 28, 2016, Table 1, öHighly Licensed Occupations,ö p. 4.
 <sup>27</sup> Current Population Survey (CPS), Labor Force Statistics, Data on certifications and licenses, Table 5, Certification and licensing status of the

<sup>&</sup>lt;sup>28</sup> 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, õRelated Fields of Training and Occupations,ö pp. 10-11; and Hudson, Lisa, National Center for Education Statistics (NCES), and Stephanie Ewert, Census Bureau, õThe Relationship Between Education and Work Credentials,ö *Data Point*, U.S. Department of Education, NCES 2015-556, June, 2015, at <u>http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2015556</u>.

*EDEDS - I	a commis Davalonment and Employer Diaming St	stom et unus edens erz sitterer (**********************************	ted Postsecondary Education Data System, National Center for Education Statistics (NCES)
	conomic Development and Employer Planning Sy nalysis: Source - EDEPS* for Natio		IPEDS** Training Programs Linked to National Licensed Occupations (U.S.):
Code 5218A	Title Accounting	Standard Occupational Classification (SOC) Code and Title 13-2011 Accountants and Auditors	Related Classification of Instructional Program (CIP) Code and Title 52.0301 Accounting
	<u>`</u>		
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       Aherrative and Complementary Medicine and Medical Systems, General         51.3399       Aherrative and Complementary Medicine and Medical Systems, Other         51.3399       Aherrative and Complementary Medicine and Medical Systems, Other         51.3301       Direct Entry Midwifery         51.3304       Direct Entry Midwifery         51.3304       Honespathie Medicine/Noneopathy         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 Buiking Sciences/Technology 04.0901 Architectural Technology/Technican 04.0201 Architecture 04.0909 Architecture and Related Services, Other 04.0401 Environmental Design/Architecture 04.0401 Interior Architecture 04.0401 Real Estate Development
1211A	Barbering/Cosmetology	<u>39-5011 Barbers</u> 39-5012 Hairdressers, Hairstylists, and Cosmetologists	12.0402 BarberingBarber 12.0413 Cosmetology, Barber/Styling, and Nail Instructor 12.0401 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	<u>22.0101 Law</u>
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	<u>51.1201 Medicine</u> <u>51.1901 Osteopathic Medicine/Osteopathy</u>
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
		29-1123 Physical Therapists	
5151A	Physical Therapy		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           51.0209         Communication Disorders Sciences and Services, Other           51.0201         Communication Disorders Sciences and Services, 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 Track Drivers 53-3033 Light Track or Delivery Services Drivers	49.0205 Truck and Bus Driver/Commercial Vehicle Operator and Instructor
5129A	Veterinary Medicine	29-1131 Veterinarians	\$1.2509       Comparative and Laboratory Animal Medicine         \$1.2507       Large Animal/Food Animal and Equine Surgery and Medicine         \$1.2508       SmallCompanion Animal Surgery and Medicine         \$1.2511       Veterinary Infectious Diseases         \$1.2512       Veterinary Medicine         \$1.2504       Veterinary Medicine         \$1.2505       Veterinary Medicine         \$1.2505       Veterinary Physiology         \$1.2503       Veterinary Physiology         \$1.2504       Veterinary Physiology         \$1.2505       Veterinary Physiology         \$1.2506       Veterinary Physiology         \$1.2507       Veterinary Physiology         \$1.2508       Veterinary Physiology         \$1.2500       Veterinary Physiology         \$1.2501       Veterinary Preventive Medicine, Epidemiology, and Public Health         \$1.2501       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.<sup>29</sup> The following example of the straightforward SOC/CIP training link for the licensed occupation of dental hygienist (licensed by 50 states in 2016)<sup>30</sup> 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 Hygiene <sup>34</sup>				
Program of Study and Training Related to National Licensed Occupation	National Licensed Occupation			
CIP 51.0602 Dental Hygiene/Hygienist	SOC 29-2021 Dental Hygienists			
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.	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.			

<sup>&</sup>lt;sup>29</sup> 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, õHow Do Professional Licensing Regulations Affect Practitioners? New Evidence, ö 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/ooh), all certified public accountants must be licensed by their state 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, õLicensure is not required for entry-level positions . . . . ö (See OOH/BLS at http://www.bls.gov/ooh). Ship pilots were excluded from the listing of national licensed occupations, because õa license or endorsement as a Pilot is route-specific .... ö (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 RNøs were included among the national licensed jobs; the nurse practitioners were not added to avoid redundancy.

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

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.<sup>32</sup> 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.<sup>33</sup> 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.<sup>34</sup> 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.<sup>35</sup>

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.<sup>36</sup> FY 2015 training for national licensed occupations dominated the doctoral education programs at 59% of the total U.S. doctorate completers,<sup>37</sup> 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%).<sup>38</sup>

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

https://www.nsf.gov/statistics/srvygrads/#sd), oThe 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.ö Director Finamore also provided the major 2015 NSCG parameters: reference period - week 2/1/15; response unit ó individuals with at least a bachelor@s degree; sample size ó approximately 135,000 individuals; population size ó 58 million individuals approximately (see Key Survey Information at https://www.nsf.gov/statistics/srvygrads/#sd).

<sup>34</sup> The Hamilton Project, The Brookings Institution, *Putting Your Major to Work: Career Paths after College*, interactive tool at <a href="http://www.hamiltonproject.org/charts/median\_earnings">http://www.hamiltonproject.org/charts/median\_earnings</a> for largest occupations. Also, see Rotrosen, Anna, <u>Diane Whitmore Schanzenbach</u>, <a href="http://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college">http://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college</a>, at <a href="https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college">https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college</a>, May 11, 2017.
<sup>35</sup> Borcoman, Gabriela, Senior Program Director, Texas Higher Education Coordinating Board (THECB), statewide employment of 6-digit CIP

<sup>&</sup>lt;sup>32</sup> As described by Program Director John Finamore of the National Center for Science and Engineering Statistics (at

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

<sup>&</sup>lt;sup>35</sup> 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, õThe graduates in this sample graduated sometime between September 2014 and August 2015, were employed in 4<sup>th</sup> quarter of 2015 and they were not enrolled in Texas higher education in Fall 2015 semester.ö Email communication to author on 5/19/2017.

<sup>&</sup>lt;sup>36</sup> Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <u>http://nces.ed.gov/ipeds/Home/UseTheData</u>, and EDEPS at <u>www.edeps.org</u>. See also Appendix II.
<sup>37</sup> *Ibid.* 

<sup>&</sup>lt;sup>38</sup> *Ibid*.

programs linked to the national licensed occupations of cosmetologists and registered nurses.<sup>39</sup> 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.<sup>40</sup> 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*.<sup>41</sup>

PEDS Training Programs Linked to National Licensed Occupations, U.S.: Program Completers by Degree Level (2014	4 - 2015) United State	5								
Definition #1)	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
JBSET U.S. POSTSECONDARY TRAINING PROGRAM COMPLETERS, 2014-15, LINKED BY RELATED PROGRAM AND OCCUPATIONAL DEFINI	TIONS,									
TO OCCUPATIONS LICENSED BY 45 OR MORE STATES OR BY FEDERAL AGENCY OR NATIONAL LICENSING	GAUTHORITY= 38,235	122,979	103,004	11,747	206,353	1,094	64,950	423	105,834	654,61
Source: Economic Development and Employer Planning System (EDEPS at www.edeps.org. Units of Analysis, Supply Indicators, Training Prog	gram Completers),									
and U.S. Department of Labor (USDOL)State Labor Market Information (LMI) Bureaus, Census of Licensed Occu	upations, 2014-16.									
TOTAL U.S. POSTSECONDARY TRAINING PROGRAM COMPLETE		440,551	1,014,023	35,312	1,894,934	38,219	758,708	17,625	178,547	4,863,223
urce: U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS), Completions component (	4 ,									
Note: These completions data were collected from Title IV institutions in the United States										
NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/tganswer.aspx?ksil=4&qid=24 (ac	ccessed 4/16/17).									
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	G AUTHORITY,									
AS PERCENT OF TOTAL U.S. POSTSECOND ARY TRAINING PROGRAM COMPLETE	ERS, 2014-2015= 8%	28%	10%	33%	11%	3%	9%	2%	59%	13%
70%		Cert1 = Po	stsecondary	award. ce	rtificate. or	diploma o	f less than	1 academi	c vear	
60%			stsecondary stsecondary			1				nic years
		Cert2 = Po		award, ce		1				nic years
60%	ccupations.	Cert2 = Po Assc = Ass	stsecondary	award, ce ree	rtificate, or	diploma o	f at least 1	but less th	an 2 acadei	
	1	Cert2 = Po $Assc = Ass$ $Assc+ = Po$	stsecondary ociateøs deg	award, ce ree award, ce	rtificate, or ertificate, or	diploma o diploma o	f at least 1 of at least 2	but less th	nan 2 acader nan 4 acader	,
60% 50% 40% 40% 30% 40% TPEDS Training Programs Linked to National Licensed Or as % of Total U.S. Postsecondary Education Program Co Title IV Institutions, FY 2015	1	Cert2 = Po $Assc = Ass$ $Assc+ = Po$	stsecondary ociateøs deg stsecondary helorøs degr	award, ce ree award, ce ree or equi	rtificate, or ertificate, or valent	diploma o diploma o <b>CertB</b> =	f at least 1 of at least 2 Post-bacc	but less th but less th	han 2 acader han 4 acader ertificate	
60% 50% 40% 30% 30% 40% 30% 50% 40% 40% 40% 40% 40% 40% 40% 40% 40% 4	1	Cert2 = Po $Assc = Ass$ $Assc+ = Po$ $Bach = Bac$	stsecondary ociateøs deg stsecondary chelorøs degr ter's degree	award, ce ree award, ce ree or equi	rtificate, or ertificate, or valent	diploma o diploma o <b>CertB</b> =	f at least 1 of at least 2 Post-bacc	but less th but less th alaureate c	han 2 acader han 4 acader ertificate	·
60%	ompletions,	Cert2 = Po $Assc = Ass$ $Assc+ = Po$ $Bach = Bac$ $Mast = Mas$	stsecondary ociateøs deg stsecondary chelorøs deg cter's degree ctor's degree	award, ce ree award, ce ree or equi	rtificate, or ertificate, or valent	diploma o diploma o CertB = CertM =	f at least 1 of at least 2 Post-bacc Post-mas	but less th but less th alaureate c ter's certifi	nan 2 acaden nan 4 acaden ertificate icate	nic years

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:<sup>42</sup>

<u>CIP Code</u>	<u>Program Title</u>	<u># U.S. FY 2015 Doctorate Graduates</u> <u>from Programs Linked to</u> National Licensed Occupations	<u>% of Total U.S. FY 2015</u> <u>Doctoral Completers</u> (Regardless of Licensure)
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%

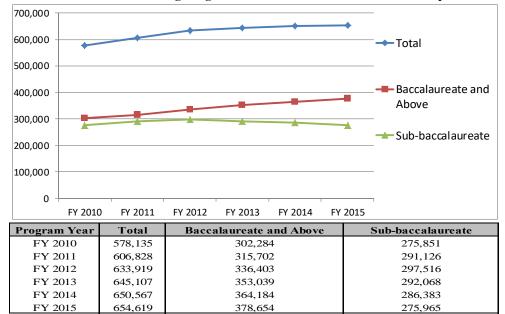
<sup>39</sup> See Appendix II, SOC 39-5012 (hairdressers, hairstylists, and cosmetologists) and the linked CIP 12.0401 (cosmetology/cosmetologist, general), and SOC 29-1141 (registered nurses) and the related CIP 51.3801 (registered nursing/registered nurse).

<sup>41</sup> 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 <u>http://nces.ed.gov/ipeds/trendgenerator</u>; and EDEPS at <u>www.edeps.org</u> (accessed April, 2017).

<sup>42</sup> *Ibid.*, and EDEPS at <u>www.edeps.org</u>.

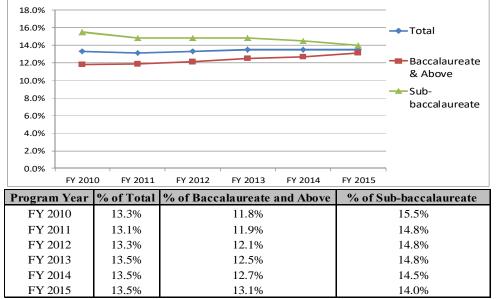
<sup>&</sup>lt;sup>40</sup> See Appendix II, SOC 29-2061 (licensed practical and licensed vocational nurses) related to CIP 51.3901 (licensed practical/vocational nurse training) and CIP 51.3999 (practical nursing, vocational nursing, and nursing assistants, other); and SOC 39-5012 (hairdressers, hairstylists,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

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.<sup>43</sup>



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

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



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 <u>www.edeps.org</u>. See also Appendix II.

<sup>&</sup>lt;sup>43</sup> Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), provisional completions data, and EDEPS at <u>www.edeps.org</u>. 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-masterøs 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.<sup>44</sup>

	Total U.S. Completers from Training Programs Linked to National Licensed Occupations (Definition #1)													
<b>Program Year</b>	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)													
<b>Program Year</b>	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),

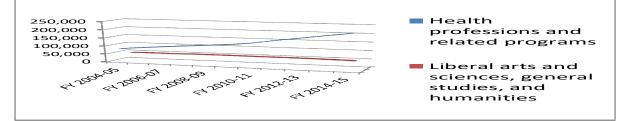
	as % of Total U.S. Postsecondary Training Program Graduates (Linked & Non-linked to National Licensed Occupations)													
<b>Program Year</b>	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total		Baccalaureate & Above	Sub-baccalaureate	
FY 2010	7.0%	32.7%	11.8%	31.0%	9.2%	3.5%	6.9%	3.1%	63.4%	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 <u>www.edeps.org</u>, 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 <u>http://nces.ed.gov/ipeds/trendgenerator</u>.

<sup>&</sup>lt;sup>44</sup> Economic Development and Employer Planning System (EDEPS at <u>www.edeps.org</u>, 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 <u>http://nces.ed.gov/ipeds/trendgenerator</u>.

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 1950¢s),<sup>45</sup> 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,<sup>46</sup> 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 bachelorøs 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

<sup>&</sup>lt;sup>45</sup> 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.

<sup>&</sup>lt;sup>46</sup> 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 <a href="https://nces.ed.gov/programs/digest/d16/tables/dt16\_322.10.asp?current=yes">https://nces.ed.gov/programs/digest/d16/tables/dt16\_322.10.asp?current=yes</a>.

U.S. Bachelor's Degrees Conferred, Title IV	FY 2004-	FY 2005-	FY 2006-	FY 2007-	FY 2008-	FY 2009-	FY 2010-	FY 2011-	FY 2012-	FY 2013-	FY 2014-	% Change
Postsecondary Institutions, Field of Study	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	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.<sup>47</sup>

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.<sup>48</sup>

	% of Total Employed or % of Tot	tal Linked Tra	ining Completers, As	J Indicated		Total U.S. Postsecondary	(
National Licensed Occupations and	Total Occupational Employment,	%	% Black or	%	% Hispanic	Training Program Completers, FY 2014,	Annual U.S. Projected Job Openings
Linked Training Programs	U.S., 2015	Women	African American	Asian	or Latino	Linked to National Licensed Occupation(s)	Due to Growth and Replacements, 2014-24
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	1
					I	Training Program Completers, FY 2015,	1
					, i	Linked to National Licensed Occupation(s)	1
Architecture (CIP 04.0201)		<u>43%</u>	4%	8%	14%	10,415	
Landscape Architecture (CIP 04.0601)		49%	3%	5%	8%	1,552	

Total U.S. Postsecondary	% of Total Employed or % of To	tal Linked Tra	ining Completers, As	Indicated		Total U.S. Postsecondary	
Training Program Completers, FY 2015,	Total Occupational Employment,	%	% Black or	%	% Hispanic	Training Program Completers, FY 2014,	Annual U.S. Projected Job Openings
Linked to National Licensed Occupation(s)	U.S., 2015	Women	African American	Asian	or Latino	Linked to National Licensed Occupation(s)	Due to Growth and Replacements, 2014-24
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	

 <sup>&</sup>lt;sup>47</sup> Citing the research report by Kleiner, Morris M., and Alan B. Krueger, , öThe Prevalence and Effects of Occupational Licensing,ö *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 Presidentøs Council of Economic Advisors (CEA), in their summary report entitled, *Occupational Licensing: A Framework For Policymakers*, July, 2015, p. 14, concluded that, öEstimates 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.ö 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.
 <sup>48</sup> U.S. Bureau of Labor Statistics (BLS), Current Population Survey (CPS), Household Data Annual Averages, Table 11, Employed persons by

<sup>&</sup>lt;sup>48</sup> 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 <u>http://www.bls.gov/cps/cpsaat11.htm</u>: and BLS, Employment Projections (EP), Table 1.2, Employment by detailed occupation, 2014, and projected 2024, at <u>http://www.bls.gov/emp/ep\_table\_102.htm</u>; 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 <u>http://nces.ed.gov/ipeds/datacenter/login.aspx</u>, accessed April, 2017.

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

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

	% of Total Employed or % of To	tal Linked Tra	ining Completers, As	Total U.S. Postsecondary			
National Licensed Occupations and	Total Occupational Employment,	%	% Black or	%	% Hispanic	Training Program Completers, FY 2014,	Annual U.S. Projected Job Openings
Linked Training Programs	U.S., 2015	Women	African American	Asian	or Latino	Linked to National Licensed Occupation(s)	Due to Growth and Replacements, 2014-24
Physicians and Surgeons (SOC 29-1060)	1,007,000	38%	6%	18%	6%		29,000
Medicine (CIP 51.1201)		48%	6%	20%	7%	17,881	
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	

	% of Total Employed or % of To	tal Linked Tra	ining Completers, As	Indicated		Total U.S. Postsecondary	
National Licensed Occupations and	Total Occupational Employment,	%	% Black or	%	% Hispanic	Training Program Completers, FY 2014,	Annual U.S. Projected Job Openings
Linked Training Programs	U.S., 2015	Women	African American	Asian	or Latino	Linked to National Licensed Occupation(s)	Due to Growth and Replacements, 2014-24
Veterinarians (SOC 29-1131)	90,000	61%	3%	5%	3%		1,900
Veterinary Medicine (CIP 51.2401)		79%	2%	5%	6%	2,690	
						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.<sup>49</sup>

			Degrees A	warded b	y U.S. Pos	stsecondar	y Education	Institution	ıs, Level o	f Degree a	und Gender,	FY 2011 ·	- 2015				
Fiscal		Associate's	Degree			Bachelor's I	Degree		Master's Degree					Doctor's Degree**			
Year	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. Departme	nt of Educati	ion, The Cond	ition of Educ	ation, 2016,	Table 38.10,	Degrees conferre	ed by postseco	ondary instituti	ions, by level o	f degree and se	of student: s	elected years,	1869-70 throug	h 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 <u>www.edeps.org</u>, accessed April, 2017).

<sup>49</sup> 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.<sup>50</sup>

	% of Total Employed or % of To	tal Linked Tra	ining Completers, As	Indicated		Total U.S. Postse condary	
National Licensed Occupations and	Total Occupational Employment,	%	% Black or	%	% Hispanic	Training Program Completers, FY 2014,	Annual U.S. Projected Job Openings
Linked Training Programs	U.S., 2015	Women	African American	Asian	or Latino	Linked to National Licensed Occupation(s)	Due to Growth and Replacements, 2014-24
Barbers (SOC 39-5011)	116,000	22%	<u>41%</u>	6%	21%		1,700
Barbering/Barber (CIP 12.0402)		21%	40%	1%	41%	7,089	
						Total U.S. Postse condary	
						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.<sup>51</sup>

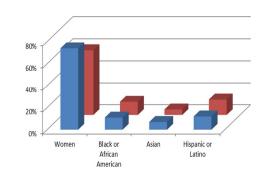
<sup>&</sup>lt;sup>50</sup> Ibid. The U.S. Bureau of Labor Statistics (BLS) did not publish 2015 Current Population Survey (CPS) employment estimates by demographic groups for 6-digit SOC occupations, where the estimated total U.S. base employment was less than 50,000. Hence, this BLS publication standard 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 <a href="http://www.bls.gov/cps/cpsat11.htm">http://www.bls.gov/cps/cpsat11.htm</a>.

<sup>\*\*</sup>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 <u>www.edeps.org</u>, accessed April, 2017).

<sup>&</sup>lt;sup>51</sup> 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 <u>https://nces.ed.gov/ipeds/datacenter/login.aspx</u>. (See footnote #52 regarding the differences between final release and provisional release completions data.)

	<u>Total</u>	Women	Black or African American	<u>Asian</u>	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%

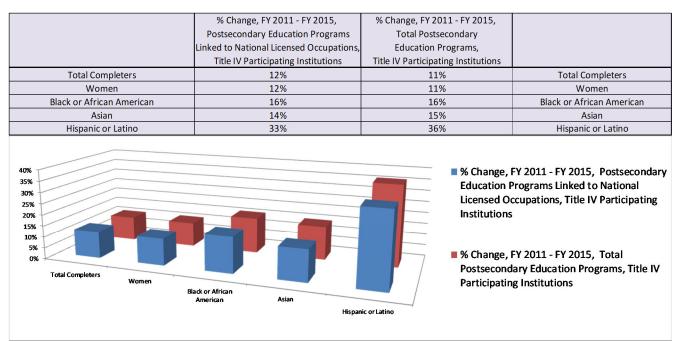
646,612* FY 2015 U.S. Completers	FY 2015 U.S. Completers (provisional	FY 2015 U.S. Completers	4,917,849* FY 2015 U.S.
(provisional data), Postsecondary Education	data), Postsecondary Education	(provisional data), Total	Completers (provisional data), Total
Programs Linked to National Licensed	Programs Linked to National Licensed	Postsecondary Education Programs,	Postsecondary Education Programs,
Occup., Title IV Participating Institutions	Occup., Title IV Participating Institutions	Title IV Participating Institutions	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/degreee 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.



Source: U.S. Department of Eduction (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.<sup>52</sup>

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.<sup>53</sup>

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 õuniversally licensed occupations (i.e., licensed in all states).ö<sup>54</sup> In addition, Salim Furth, in his Heritage Foundation

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

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

<sup>&</sup>lt;sup>54</sup> 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 õuniversally licensed occupationsö included teachers.

paper about *Understanding the Data on Occupational Licensing* (table 1), listed fifteen õhighly licensed occupationsö with more than 100 observations from the 2015 Current Population Survey (CPS), where the Furth õTable 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.ö<sup>55</sup> The twelve õuniversally licensed occupationsö from the Han/Kleiner paper, and the fifteen õhighly licensed occupationsö 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 (EMT¢s) 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 EMT¢s and paramedics were licensed in all states.<sup>56</sup>

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 EMT¢s 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 S	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 E	mergency Medical Technology	29-2041	Emergency Medical Technicians and Paramedics	51.0904	Emergency Medical Technology/Technician (EMT Paramedic)
5140A E	intergency 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 <u>www.edeps.org</u>. 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, öHow Do Professional Licensing Regulations Affect Practitioners? New Evidence,ö (Social, Economic, and Housing Statistics Division (SEHSD), U.S. Census Bureau, SEHSD Working Paper Number 2013-30, June 5, 2013, p. 12), reported, öOne 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.ö <sup>55</sup> Furth, Salim, Institute for Economic Freedom and Opportunity at the Heritage Foundation, *Understanding the Data on Occupational Licensing*, September 28, 2016, Table 1, öHighly Licensed Occupations,ö p. 4, and footnote #4, p. 13.

<sup>56</sup> U.S Bureau of Labor Statistics (BLS), U.S. Department of Labor (USDOL), *Occupational Outlook Handbook*, 2016-17 Edition, õHow To Become One, Licenses, Certifications, and Registrations," EMT¢s 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 postsecondary 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-baccalaurate 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).<sup>57</sup>

13.121       Early Childhood Education and Teaching       1.101       2.019       7.730       0       13.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.006       2.2       2.071       3.0       1.012       2.0       0       0.0       0       0.0	Program	Completers by Degree Level (2014 - 2015) United States											
3.100       Kündergarten/Preschool Education and Teaching       72       41       620       0       1206       94       244       1       16       2384         3.100       Elementary Education and Teaching       39       313       1908       22       29.461       591       8.412       122       58       46355         3.100       Elementary Education and Teaching       13       241       665       0       3200       336       5.665       62       25       00.815         3.101       Education/Teaching of individuals in Engineering Space Education Programs       116       36       60       261       23       102       60       103         3.101       Education/Teaching of individuals in Engineering Space Education Programs       0       0       0       231       4       569       10       0       103         3.101       Education/Teaching of individuals in Engineering Space 1       Education Programs       0       0       0       231       4       569       10       0       103       4       569       10       64       310       0       71       0       245       5       6       0       723       100       5       100       10       13	CIP Code	Program Title	Cert1	Cert2	Assc	Assc+	Bac	h Cert	B Ma	st Ce	artM	Doct	Total
3.100       Kündergarten/Preschool Education and Teaching       72       41       620       0       1206       94       244       1       16       2384         3.100       Elementary Education and Teaching       39       313       1908       22       29.461       591       8.412       122       58       46355         3.100       Elementary Education and Teaching       13       241       665       0       3200       336       5.665       62       25       00.815         3.101       Education/Teaching of individuals in Engineering Space Education Programs       116       36       60       261       23       102       60       103         3.101       Education/Teaching of individuals in Engineering Space Education Programs       0       0       0       231       4       569       10       0       103         3.101       Education/Teaching of individuals in Engineering Space 1       Education Programs       0       0       0       231       4       569       10       0       103       4       569       10       64       310       0       71       0       245       5       6       0       723       100       5       100       10       13	12.121	Franks Child Instant Polymorphics and Texa alders	4.1.61	2.010	7 720		12.00		20	71		10	20.152
1000         Elementary Education and Teaching         39         313         1,008         22         29,461         591         8,412         122         58         4002           31005         Secondary Education and Teaching         11         361         665         0         3500         336         5,865         62         25         10815           31017         Education/Teaching of Individuats in Earnershy Special Education Programs         0         0         0         0         0         0         0         0         0         1302         1302         0         1303         1304         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         13001         12001         1300         13001		· · · · ·					_						
3.000         Secondary Education and Teaching         11         241         665         0         3.050         64         2.0           3.101         Education/Teaching of Individuals in Early Childhood Special Education Programs         0         0         0         261         21         1.005         43         0         1.534           3.101         Education/Teaching of Individuals in Early Childhood Special Education Programs         0         0         0         0         261         21         1.005         43         0         1.534           3.101         Education/Teaching of Individuals in Secondary Special Education Programs         0         0         0         0         0         1.314         1.005         43         0         1.330           3.101         Education/Teaching of Individuals in Secondary Special Education Programs         0         0         0         0         1.314         1.005         1.666         1.518           3.101         Education/Teaching of Individuals in Secondary Special Education Programs         0         0         0         7.03         2.26         64         1.92         5         1.666         1.518           3.3021         Aduit and Continuing Education and Teaching         11         0         17         0	13.1205	Kindergarten/Freschoor Eddeation and Federining		4.	020		1,23	<u> </u>		- 1	· .	10	2,504
Note         Education/Teaching of individuals in Early Childbood Special Education Programs         116         36         59         0         425         50         644         7         0         1534           31015         Education/Teaching of individuals in Elementary Special Education Programs         0         0         0         0         261         221         1,005         43         0         1,330           31016         Education/Teaching of Individuals in Number High/Medite School Special Education Programs         0         0         0         0         132         0         140           31016         Education/Teaching of Individuals in Number High/Medite School Special Education Programs         0         0         0         0         131         0         132         0         0         140           31001         Education/Teaching Central Education and Teaching. General         48         77         120         7.127         52         8         91         2.202         4438           31001         Interve         0         703         226         66         887         5         240         91         2.202         4438           13001         Interve         0         703         226         66         887 <td>13.1202</td> <td>Elementary Education and Teaching</td> <td>39</td> <td>313</td> <td>1,908</td> <td>22</td> <td>29,46</td> <td>51 591</td> <td>8,4</td> <td>12 1</td> <td>22</td> <td>58</td> <td>40,926</td>	13.1202	Elementary Education and Teaching	39	313	1,908	22	29,46	51 591	8,4	12 1	22	58	40,926
3.017       Education/Teaching of individuals in Elementary Special Education Programs       0       0       0       0       201       211       1.005       413       0       1.380         3.010       Education/Teaching of Individuals in Secondary Special Education Programs       0       0       0       0       31       4       569       10       0       644         3.100       Education/Teaching of Individuals in Secondary Special Education Programs       0       0       0       0       31       4       569       10       0       644         3.100       Special Education and Teaching. General       48       77       120       7.107       592       13.332       472       2.08       2036         3.1001       Education/Teaching       11       0       177       0       2.6       94       1.192       5       166       1538         3.1001       Muraing Practice       0       703       2.36       66       887       5       2.48       91       2.202       4.438         3.1000       Emergency Medical Technology/Technolan (EMT Paramedic)       16.646       6.002       3.497       0       2.27       5       8       0       0       2.64.80	13.1205	Secondary Education and Teaching	11	241	685	0	3,59	0 336	5,8	65 (	52	25	10,815
3.017       Education/Teaching of individuals in Elementary Special Education Programs       0       0       0       0       201       211       1.005       413       0       1.380         3.010       Education/Teaching of Individuals in Secondary Special Education Programs       0       0       0       0       31       4       569       10       0       644         3.100       Education/Teaching of Individuals in Secondary Special Education Programs       0       0       0       0       31       4       569       10       0       644         3.100       Special Education and Teaching. General       48       77       120       7.107       592       13.332       472       2.08       2036         3.1001       Education/Teaching       11       0       177       0       2.6       94       1.192       5       166       1538         3.1001       Muraing Practice       0       703       2.36       66       887       5       2.48       91       2.202       4.438         3.1000       Emergency Medical Technology/Technolan (EMT Paramedic)       16.646       6.002       3.497       0       2.27       5       8       0       0       2.64.80											_		
1.0108       Education/Teaching of Individuals in Secondary Special Education Programs       0						-				·	·	-	
1.019       Education/Teaching of Individuals in Secondary Special Education Programs       0			· · · · ·			_	_						
3.1001       Special Education and Teaching, General       48       77       120       0       7.187       592       11.332       472       208       20.036         3.1201       Adult and Continuing Education and Teaching       11       0       17       0       26       94       1.199       5       166       15.18         1.3818       Numing Practice       0       703       236       66       687       5       248       91       2.202       4438         1.0908       Respiratory Care Therapy/Therapist       161       474       5.870       91       1.251       0       52       0       7.889         1.0904       Emergency Medical Technology/Technician (EMT Paramedic)       16.646       6.002       3.497       0       272       5       8       0       0       264380         Frogram 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       64,61         FY 2015 Definition #1 Linked Training Completer Totals=       59,500       132,885       123,746       11,926					-		_						
Adult and Continuing Education and Teaching       11       0       17       0       26       94       1.199       5       166       1.518         1.3818       Numsing Practice       0       703       236       66       887       5       248       91       2.202       44388         1.9008       Respiratory Care Therapy/Therapist       161       474       5.870       91       1.251       0       52       0       0       7.899         1.9004       Emergency Medical Technology/Technician (IMT Paramedic)       16.646       6.002       3.497       0       2.272       5       0       0       7.899         1.9004       Emergency Medical Technology/Technician (IMT Paramedic)       16.646       6.002       3.497       0       2.272       5       0       0       2.6430         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       654,61         Fy 2015 Definition #1 Linked Training Completer Totals=       59,500       132,885       123,746       11,926       264,144       3,108       97,728       1,272       108,527       802,82	13.1001			-			_						
13818       0       703       236       66       887       5       248       91       2.202       4438         10908       Respiratory Care Therapy/Therapist       161       474       5.870       91       1.251       0       5.2       0       0       2.809         10904       Emergency Medical Technology/Technician (EMT Paramedic)       166.46       6.002       3.497       0       272       5       8       0       0       2.6430         Fry 2015 Definition #1 Linked Training Completer Totals=       38.235       122.979       103.004       11.747       206.353       1.094       64.950       423       105.834       654.61         FY 2015 Expanded Definition #1 Linked Training Completer Totals=       38.235       122.979       103.004       11.747       206.353       1.094       64.950       423       105.834       654.61         FY 2015 Expanded Definition #1 Linked Training Completer Totals=       59.500       132.885       123.746       11.926       264.144       3.108       97.728       1.272       108.527       802.83         Source: US. Department of Education National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS),       10.014.023       35.312       1.894		apona seconda con granda									.=	200	
Instruct	13.1201	Adult and Continuing Education and Teaching	11	0	17	0	26	94	1,1	99	5	166	1,518
Interview Medical Technology/Technolan (EMT Paramedic)       16.646       6.002       3.497       0       272       5       8       0       26.430         Program Completers by Degree Level (2014 - 2015)       United States       Cert1       Cert2       Assc       Assc       Bach       CertM       Doct       Total         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       654.61         FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Completer Totals=       38,235       123,746       11,926       264.144       3,108       97,728       1,272       108,527       802,83         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       4,863,2         Source: U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS),        104/023       35,312       1,894,934       38,219       758,708       17,625       178,547       4,863,2         Source: U.S. Department of Education, National Center	51.3818	Nursing Practice	0	703	236	66	887	5	24	8 9	91	2,202	4,438
Interview Medical Technology/Technolan (EMT Paramedic)       16.646       6.002       3.497       0       272       5       8       0       26.430         Program Completers by Degree Level (2014 - 2015)       United States       Cert1       Cert2       Assc       Assc       Bach       CertM       Doct       Total         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       654.61         FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Completer Totals=       38,235       123,746       11,926       264.144       3,108       97,728       1,272       108,527       802,83         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       4,863,2         Source: U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS),        104/023       35,312       1,894,934       38,219       758,708       17,625       178,547       4,863,2         Source: U.S. Department of Education, National Center	51.0908	Respiratory Care Therapy/Therapist	161	474	5.870	91	1.25	1 0	5	2	0	0	7.899
Program Completers by Degree Level (2014 - 2015)       United States         Cert1       Cert2       Assce       Bach       CertM       Doct       Total         FY 2015 Definition #1 Linked Training Completer Totals=       38,235       122,979       103,004       11,747       206,353       1,094       64,495       42.3       105,834       64,61         FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Completer Totals=       59,500       132,885       123,746       11,926       264,144       3,823       122,979       103,004       11,747       206,353       1,094       64,950       42.3       105,82       88,235       122,979       103,004       11,747       206,353       1,094       64,951       1,014,023       35,312       1,894,934       38,219       758,708       17,625       178,547       4,863,2         Source: U.S. Department of Education Statistics (NCES										1			
Cert1       Cert2       Assc       Bach       Cert8       Mast       Cert8       Doct       Total         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       654,61         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       802,83         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       4,863,2         Source: U.S. Department of Education National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS),         Completions completions data were collected from Tite IV institutions in the United States, 7013 institutions,         NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/tganswer.aspx?sid=4&cqid=24 (accessed 4/16/17).         FY 2015 Definition #1 Linked Training Graduate Totals,         s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)       8%       28%       10	51.0904		16,646	6,002	3,497	0	272	5	8		0	0	26,430
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       654,61         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       802,83         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       4,863,2         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 colected from The 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).       8%       28%       10%       33%       11%       3%       9%       2%       59%       13%         FY 2015 Definition #1 Linked Training Graduate Totals, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)       8%       28%       10%       33%       11%       3%		Program Completers by Degree Level (2014 - 2015) United States											
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       802,83         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       4,863,2         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/tganswer.aspx?sid=4&qid=24 (accessed 4/16/17).       FY 2015 Definition #1 Linked Training Graduate Totals,         Source: V.S. 06 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)       8%       28%       10%       33%       11%       3%       9%       2%       59%       13%													
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       4,863,2         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, s% 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, s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure)       12%       30%       12%       34%       14%       8%       13%       7%				· · · ·	122,979	103,004	11,747	206,353	1,094	64,950	423	105,834	654,619
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, s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%		FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Compl	eter Totals=	59,500	132,885	123,746	11,926	264,144	3,108	97,728	1,272	108,527	802,830
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, s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%													
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/tganswer.aspx?sid=4&cjd=24 (accessed 4/16/17). FY 2015 Definition #1 Linked Training Graduate Totals, s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%		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	4,863,22
NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/tganswer.aspx?sid=4&cqid=24 (accessed 4/16/17). FY 2015 Definition #1 Linked Training Graduate Totals, s % 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, s % 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:	U.S. Department of Education, National Center for Education Statistics (NCES), Integrated Postsecondary Education Data S	ystem (IPEDS),										
FY 2015 Definition #1 Linked Training Graduate Totals, s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%	Completio	ns component (provisional data). Note: These completions data were collected from Title IV institutions in the United States,	7013 institutions	,									
s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%		NCES/IPEDS Trends Generator, at https://nces.ed.gov/ipeds/trendgenerator/tganswer.aspx?sid=4&cqid=24 (acc	cessed 4/16/17).										
s % 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, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%													
FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Graduate Totals, s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%		FY 2015 Definition #1 Linked Training Grad	luate Totals	,									
s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%	as % of FY	Y 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of	of Licensure	8%	28%	10%	33%	11%	3%	9%	2%	59%	13%
s % of FY 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of Licensure) 12% 30% 12% 34% 14% 8% 13% 7% 61% 17%		FY 2015 Expanded Definition #2 (including Definition #1) Linked Training Grad	luate Totals										
					200/	100/	2.48/	140/	0.0/	120/	<b>5</b> 0/	(10/	170/
	as % of FY	Y 2015 Postsecondary Education Total Graduates by Degree/Award/Certificate (Regardless of	of Licensure	12%	30%	12%	34%	14%	8%	13%	/ %	01%	1//0

FY 2015 Definition #2 Linked Education Completer Totals From Training Programs Not Included Under Definition #1:<sup>58</sup>

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=Associateøs degree; Assc+=Postsecondary award, certificate, or diploma of at least 2 but less than 4 academic years; Bach=Bachelorøs degree or equivalent; CertB=Post-baccalaureate certificate; Mast=Masterøs degree; CertM=Post-masterøs certificate; Doct=Doctor's degree.

<sup>&</sup>lt;sup>57</sup> 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.

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. Postsecor	ıdary Tra	aining Pro	ogram C	ompleters	s (Linked &	Non-linl	ed 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 Occupation	s (Definition #2),
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				as % of	Total U.S. P	ostsecon	dary Tra	ining Pro	gram Gi	aduates (Li	nked & N	Non-linked to National Lic	ensed Occupations)
Program Year	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total		<b>Baccalaureate &amp; Above</b>	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.<sup>59</sup>

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.<sup>60</sup>

	% of Total Employed or 9	% of Total I	inked Training Com	pleters, A	s Indicated	Total U.S. Postsecondary Training	
National Licensed Occupations and	Total Occupational	%	% Black or	%	% Hispanic	Program Completers, FY 2014, Linked	Annual U.S. Projected Job Openings
Linked Training Programs	Employment, U.S., 2015	Women	African American	Asian	or Latino	to National Licensed Occupation(s), Def. #2	Due to Growth and Replacements, 2014-24
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	
	% of Total Employed or 9	% of I otal I	Linked Fraiming Com	neters, F	indicated	Total U.S. Postsecondary Training	
National Licensed Occupations and	Total Occupational	% of Total I %	% Black or	%	% Hispanic	Total U.S. Postsecondary Training Program Completers, FY 2014, Linked	Annual U.S. Projected Job Openings
National Licensed Occupations and Linked Training Programs	· ·					Program Completers, FY 2014, Linked	Annual U.S. Projected Job Openings Due to Growth and Replacements, 2014–24
•	Total Occupational	%	% Black or	%	% Hispanic	Program Completers, FY 2014, Linked	
Linked Training Programs	Total Occupational Employment, U.S., 2015	% Women	% Black or African American	% Asian	% Hispanic or Latino	Program Completers, FY 2014, Linked	Due to Growth and Replacements, 2014-24
Linked Training Programs Respiratory Therapists (SOC 29-1126)	Total Occupational Employment, U.S., 2015	% Women 67%	% Black or African American 15%	% Asian 6%	% Hispanic or Latino 9%	Program Completers, FY 2014, Linked to National Licensed Occupation(s), Def. #2	Due to Growth and Replacements, 2014-24
Linked Training Programs Respiratory Therapists (SOC 29-1126)	Total Occupational Employment, U.S., 2015	% Women 67%	% Black or African American 15%	% Asian 6%	% Hispanic or Latino 9%	Program Completers, FY 2014, Linked to National Licensed Occupation(s), Def. #2 8,497	Due to Growth and Replacements, 2014-24
Linked Training Programs Respiratory Therapists (SOC 29-1126)	Total Occupational Employment, U.S., 2015	% Women 67%	% Black or African American 15%	% Asian 6%	% Hispanic or Latino 9%	Program Completers, FY 2014, Linked to National Licensed Occupation(s), Def. #2 8,497 Total U.S. Postsecondary Training	Due to Growth and Replacements, 2014-24

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

<sup>&</sup>lt;sup>59</sup> EDEPS at <u>www.edeps.org</u>, 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 <u>https://nces.ed.gov/ipeds/trendgenerator</u>, accessed May, 2017.

<sup>&</sup>lt;sup>60</sup> 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 <u>http://www.bls.gov/cps/cpsaat11.htm</u>: and BLS, Employment Projections (EP), Table 1.2, Employment by detailed occupation, 2014, and projected 2024, at <u>http://www.bls.gov/emp/ep\_table\_102.htm</u>; 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 <u>https://nces.ed.gov/ipeds/datacenter/login.aspx</u>, 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.<sup>61</sup>

	<u>Total</u>	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%
		1			
	<u>Total</u>	Women	Black or African American	<u>Asian</u>	Hispanic or Latino
U.S. Training Completers Linked to National Licensed Occupations (Definition 2),					
FY 2011, Demographic Information (IPEDS Final Data):					
r 1 2011, Demographic information (if EDS Final Data):	741,811	549,012	78,124	40,663	75,360
U.S. Training Completers Linked to National Licensed Occupations (Definition 2),	741,811	549,012	78,124	40,663	75,360
	741,811 794,583**	549,012 590,262	78,124 88,294	40,663 45,859	75,360 97,303
U.S. Training Completers Linked to National Licensed Occupations (Definition 2),	,		,	.,	· · · ·
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
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
U.S. Training Completers Linked to National Licensed Occupations (Definition 2), FY 2015, Demographic Information (IPEDS Provisional Data): Percent Change, FY 2011 - FY 2015:	794,583** 7%	590,262 8%	88,294 13%	45,859 13%	97,303 29%

<sup>\*</sup>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	Additional Teaching National Licensed Occupations (Definition #2)	Linked	Additional Teaching Linked Training Programs (Definition #2)	U.S. Linked Training	U.S. Linked Training	Percent Change
SOC Code	SOC Job Title	CIP Code	CIP Educational Program Title	Completers FY 2011	Completers FY 2015	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	1518	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.<sup>62</sup> 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,

<sup>&</sup>lt;sup>61</sup> 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 <u>https://nces.ed.gov/ipeds/datacenter/login.aspx</u>, accessed April, 2017.

<sup>&</sup>lt;sup>62</sup> EDEPS, licensed occupations, by U.S. and state, at <u>www.edeps.org</u>.

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.<sup>63</sup>

Program C	ompleters 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	RealEstate	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

Detailed Training Programs, Linked to Nat	ional Licensed Occupations, Lacki	ng Standardized St	ub-Baccalaureate	Output I	evels by	Certificat	tes/Degr	ee:
Program Completers by Degree Level (2013 - 2014)	United States							

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

Detailed Training Programs, Linked to National Licensed Occupations,

Lacking Standardized Sub-Baccalaureate Output Levels by Certific	ates/Degree, Perce	nt Distribution:
Program Completers by Degree Level (2013 - 2014) United States	Sub-baccalaure ate	Percent Distribution*

Program C	ompleters by Degree Level (2013 - 2014) United States	Sub-baccalaure ate	Percent Distribution*					
CIP Code	Program Title	<b>Total Completers</b>	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	RealEstate	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		
*Mou not o	aval 1000/ due to rounding							

\*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@ 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 õcarry out comprehensive cost-benefit assessments of licensing laws through both sunrise and

<sup>&</sup>lt;sup>63</sup> EDEPS, supply indicators, at <u>www.edeps.org</u>, and Appendix II, p. 42.

regular sunset reviews . . . .ö<sup>64</sup> 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.<sup>65</sup> As reported by the Employment and Training Administration, U.S. Department of Labor, under the new Workforce Innovation and Opportunity Act (WIOA), the õuse of wage records is mandatory for WIOA core program performance and eligible training provider performance reporting purposes.ö<sup>66</sup>

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.<sup>67</sup> 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.<sup>68</sup>

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

<sup>&</sup>lt;sup>64</sup> 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.

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

<sup>&</sup>lt;sup>66</sup> 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 <u>https://www.workforcegps.org/events/2016/11/02/11/48/WIOA-and-Unemployment-Insurance-UI-Confidentiality-What-States.</u>

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

<sup>&</sup>lt;sup>68</sup> For an example of the supply and demand (gap) analysis planning process for human capital investments, see Hershbein, Brad J., and Kevin Hollenbeck, 2015, öRefining Workforce Education Supply and Demand Analysis: Final Report,ö Upjohn Institute Technical Report No. 15-031, Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, <u>http://dx.doi.org/10.17848/tr15-031</u>. 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 <u>http://www.edeps.org/PlanningModels.aspx</u>.

but < 93 days, etc.), after eliminating job orders with occupational wages below the 25<sup>th</sup> 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 õfull employmentö 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:

Elasticity of supply (training output) =  $E_s = \% \hat{e}$  Quantity<sub>supplied (linked training program output U.S., 6-digit CIP)</sub>

% ê Price(annual U.S. median wage, linked national licensed occupation, 6-digit SOC)

= Q<sub>After, FY 2015</sub> Ó Q<sub>Before, FY 2011</sub>

 $(Q_{After, FY 2015} + Q_{Before, FY 2011})/2$ 

Pricewage After, CY 2015 Ó Pricewage Before, CY 2011

(Price<sub>Wage After, CY 2015</sub> + Price<sub>Wage Before, CY 2011</sub>)/2

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 õfundamental determinant of the elasticity of supply,ö as described by Economists Cowen and Tabarrok:<sup>70</sup>

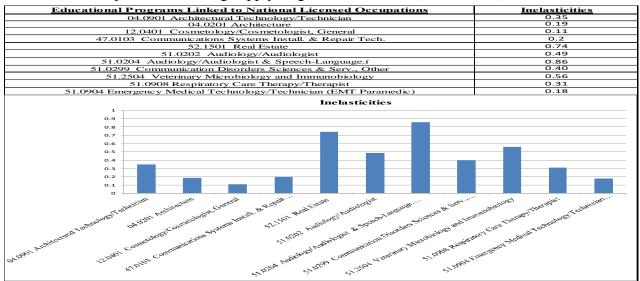
<sup>&</sup>lt;sup>69</sup> Cowen, Tyler, and Alex Tabarrok, George Mason University, *Modern Principles: Economics*, Worth Publishers, 2010, p.63.

<sup>&</sup>lt;sup>70</sup> *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.<sup>71</sup>

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.<sup>72</sup>

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.<sup>73</sup> 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).



<sup>&</sup>lt;sup>71</sup> *Ibid.* 

<sup>&</sup>lt;sup>72</sup> *Ibid.*, pp. 62-63.

<sup>&</sup>lt;sup>73</sup> 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 <u>https://nces.ed.gov/ipeds/datacenter/login.aspx</u>; 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 <u>https://www.bls.gov/oes/tables.htm</u>.

**<u>Appendix I</u>**: Additional information over time between the õswitchers of occupational regulationö<sup>74</sup> 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.

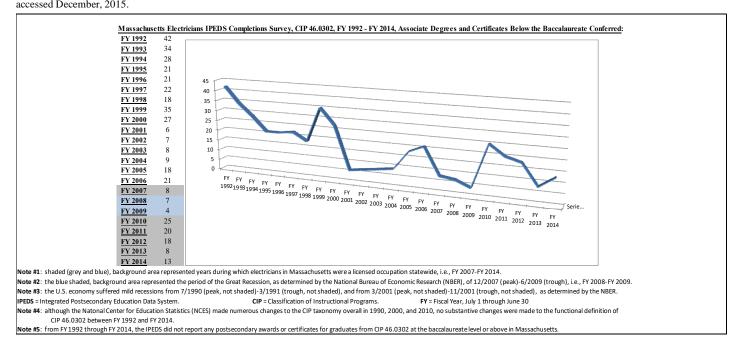
The postsecondary educational institutions, which provided CIP 46.0302 (electrician) training completers in Louisiana, Massachusetts, and Tennessee, were all sub-baccalaureate schools and colleges that included public community and technical colleges and private-for-profit, proprietary schools.

	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 20
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
	Tot		3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Note #1: sha	aded (grey and blue), background area represented years during which electricia	ns in Louisiar	a were a lice	nsed occupat	ion statewid	e, that is, FY	2004 throug	h FY 2014.																
Note #2: the	e blue shaded, background area represented the period of the Great Recession,	as determine	l by the Nati	onal Bureau o	of Economic P	Research, of	December, 20	007 (peak),	through Jur	ne, 2009 (tr	ough), i.e., F	Y 2008 th	rough FY 20	09.										
Note #3: the	e U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), th	rough March,	1991 (troug	h, not shade	d), and from	March, 200	1 (peak, not s	haded), thr	ough Nove	mber, 2001	(trough, no	t shaded),	as determi	ned by the N	lational Bur	eau of Econo	mic Researd	۱.						
PEDS = Integ	grated Postsecondary Education Data System.																							
CIP = Classifi	ication of Instructional Programs.																							
FY = Fiscal Ye	ear, July 1 through June 30.																							
Note #4: alt	though the Natonal Center for Education Statistics (NCES) made numerous chan	ges to the CIP	taxonomy o	verall in 199	J, 2000, and	2010, no sul	bstantive cha	nges were r	nade to the	functional	definition of	CIP 46.03	02 during F	1992 throu	igh FY 2014									
Note #5: fro	om FY 1992 through FY 2014, the IPEDS did not report any postsecondary awar	ls or certificat	es for gradu	ates from CIF	46.0302 at	the baccalau	reate level or	above in Lo	uisiana.															
Louisiana H	Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 201	4, Certificat	es Belowth	e Baccalau	eate Confe	rred:																		
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 2
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	/	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
	Tota		62	46	38	67	66	50	57	81	119	67	89	77	82	37	90	82	149	351	520	473	353	431
	aded (grey and blue), background area represented years during which electricia												FV 20	~										
	e blue shaded, background area represented the period of the Great Recession,																							
Note #3: the	e U.S. economy suffered mild recessions from July, 1990 (peak, not shaded), th	rough March,	1991 (troug	h, not shade	d), and from	March, 200	1 (peak, not s	haded), thr	ough Nove	mber, 2001	(trough, no	t shaded),	as determi	ned by the N	lational Bur	eau of Econo	omic Researc	1.						
	grated Postsecondary Education Data System.																							
PEDS = Inter	• • •																							
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PEDS = Inte; CIP = Classifi FY = Fiscal Ye	ication of Instructional Programs. ear, July 1 through June 30.																							
IPEDS = Inte CIP = Classifi FY = Fiscal Ye Note #4: alt	ication of Instructional Programs. ear, July 1 through June 30. though the Natonal Center for Education Statistics (NCES) made numerous chan									functional	definition of	CIP 46.03	02 during F	r 1992 throu	ugh FY 2014									
IPEDS = Inte CIP = Classifi FY = Fiscal Ye Note #4: alt	ication of Instructional Programs. ear, July 1 through June 30.									functional	definition of	CIP 46.03	02 during F	1992 throu	ugh FY 2014									
PEDS = Inteş CIP = Classifi FY = Fiscal Ye Note #4: alti Note #5: fro	ication of Instructional Programs. ear, July 1 through June 30. though the Natonal Center for Education Statistics (NCES) made numerous chan	ls or certifica	es for gradu	ates from CIF	P 46.0302 at	the baccalau	reate level or	above in Lo		functional	definition of	CIP 46.03	02 during F	r 1992 throu	igh FY 2014									
PEDS = Inteş CIP = Classifi FY = Fiscal Ye Note #4: alti Note #5: fro	cation of Instructional Programs. ear, July 1 through June 30. though the Natonal Center for Education Statistics (NCES) made numerous chan om FY 1992 through FY 2014, the IPEDS did not report any postsecondary awar	ls or certifica	es for gradu Degrees a	ates from CIF	946.0302 at tes Below tl	the baccalau	reate level or meate Confe	above in Lo	uisiana.	functional			02 during F <u>FY 2003</u>		igh FY 2014 <u>FY 2005</u>	<u>FY 2006</u>	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	<u>FY 2012</u>	FY 2013	<u>FY 20</u>
PEDS = Inteş CIP = Classifi FY = Fiscal Ye Note #4: alti Note #5: fro	cation of Instructional Programs. ear, July 1 through June 30. though the Natonal Center for Education Statistics (NCES) made numerous chan om FY 1992 through FY 2014, the IPEDS did not report any postsecondary awar	ls or certificat 4, Associate <u>FY 1992</u>	es for gradu Degrees a	ates from CIF nd Certifica	946.0302 at tes Below tl	the baccalau he Baccalau	reate level or meate Confe	above in Lo e <b>rred</b> :	uisiana.								<u>FY 2007</u> 90	<u>FY 2008</u> 82	<u>FY 2009</u> 149	<u>FY 2010</u> 351	<u>FY 2011</u> 520	<u>FY 2012</u> 473	<u>FY 2013</u> 353	<u>FY 20</u> 431
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PEDS = Integ CIP = Classifi FY = Fiscal Ye Note #4: alth Note #5: fro Louisiana H Note #1: sh: Note #1: sh: Note #2: the Note #3: the	Eation of Instructional Programs. sar, July 1 through June 30. though the Natonal Center for Education Statistics (NCES) made numerous chan nor Y 1929 through 27 2014, the IPEDS did not report any postsecondary awar Electricians IPEDS Completions Survey, CIP 46.0302, FY 1992 - FY 201 aded (grey and blue), background area represented years during which electric be bue shaded, background area represented the period of the Great Recession,	Is or certificat 4, Associate FY 1992 1 36 ns in Louisiar as determined	Degrees a <u>FY 1993</u> 65 a were a lice l by the Nati	ates from CIF nd Certifica FY 1994 47 nsed occupat onal Bureau	e 46.0302 at tes Below th FY 1995 39 tion statewid of Economic F	the baccalau he Baccalau FV 1996 68 e, that is, FY Research, of	reate level or reate Confe FY 1997 66 2004 throug December, 20	above in Lo erred: <u>FY 1998</u> 50 h FY 2014. 007 (peak),	uisiana. <u>FY 1999</u> 57 through Jur	FY 2000 81	<u>FY2001</u> 119 ough), i.e., F	FY 2002 67	FY 2003 89 rough FY 20	<u>FY 2004</u> 77 09.	<u>FY 2005</u> 82	<u>FY 2006</u> 37	90	82						
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accessed December, 2015.

<sup>&</sup>lt;sup>74</sup> 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.)

	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
	Tota	13	9	12	5	3	6	3	4	5	0	0	0	0	0	0	0	0	1	25	20	18	8	13
lote #1: shaded ( er	ey and blue), background area represented year	during which	h electriciar	ns in Massaci	husetts were	a licensed o	occupation s	tatewide. the	at is. FY 200	7 through F	Y 2014.													
	aded, background area represents the period of											ine. 2009 (t	rough), i.e.,	FY 2008 thro	ough FY 200	9.								
	nomy suffered mild recessions from July, 1990																ational Bure	au of Econo	mic Researc	h.				
	ostsecondary Education Data System.					1					_													
IP = Classification of	Instructional Programs.																							
Y = Fiscal Year, July																								
	e Natonal Center for Education Statistics (NCES	made nume	rous chane	es to the CIP	taxonomy o	verall in 199	90. 2000. ar	d 2010. no s	ubstantive	changes we	re made to t	hefunction	definition	of CIP 46.03	02 during F	r 1992 throu	eh FY 2014							
	92 through FY 2014, the IPEDS did not report ar																							
	ctricians IPEDS Completions Survey, CIP																							
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 201
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
	Tota	29	25	16	16	18	16	15	31	22	6	7	8	9	18	21	8	7	3	0	0	0	0	0
										~~	•													
	ey and blue), background area represented year									7 through F	Y 2014.													
lote #2: the blue sh	aded, background area represents the period of	the Great Re	cession, as	determined l	by the Natio	nal Bureau o	f Economic	Research, fro	om Decemb	7 through F er, 2007 (pe	Y 2014. Bak), through	n June, 2009												
lote #2: the blue sh lote #3: the U.S. ec	aded, background area represents the period of onomy suffered mild recessions from July, 1990	the Great Re	cession, as	determined l	by the Natio	nal Bureau o	f Economic	Research, fro	om Decemb	7 through F er, 2007 (pe	Y 2014. Bak), through	n June, 2009					ational Bure	au of Econo	mic Researc	h.				
lote #2: the blue sh lote #3: the U.S. ec PEDS = Integrated Pe	aded, background area represents the period of onomy suffered mild recessions from July, 1990 ostsecondary Education Data System.	the Great Re	cession, as	determined l	by the Natio	nal Bureau o	f Economic	Research, fro	om Decemb	7 through F er, 2007 (pe	Y 2014. Bak), through	n June, 2009					ational Bure	au of Econo	mic Researc	h.				
lote #2: the blue sh lote #3: the U.S. eco PEDS = Integrated Po IP = Classification of	aded, background area represents the period of onomy suffered mild recessions from July, 1990 ostsecondary Education Data System. Instructional Programs.	the Great Re	cession, as	determined l	by the Natio	nal Bureau o	f Economic	Research, fro	om Decemb	7 through F er, 2007 (pe	Y 2014. Bak), through	n June, 2009					ational Bure	eau of Econo	mic Researc	h.				
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lote #2: the blue sh lote #3: the U.S. ec PEDS = Integrated Pe IP = Classification of Y = Fiscal Year, July 2 lote #4: although th	aded, background area represents the period of nomy suffered mild recessions from July, 1990 ostsecondary Education Data System. Instructional Programs. through June 30. e Natonal Center for Education Statistics (NCES	the Great Re (peak, not s made nume	cession, as naded), thro rous chang	determined l ough March, es to the CIP	by the Nation , 1991 (troug taxonomy o	nal Bureau o gh, not shad overall in 199	f Economic ed), and fro 90, 2000, ar	Research, fro m March, 20 d 2010, no s	om Decemb 01 (peak, n substantive	7 through F er, 2007 (pe ot shaded), changes we	Y 2014. eak), through through No re made to t	n June, 2009 vember, 200	01 (trough, r	not shaded),	as determi	ned by the N			mic Researc	h.				
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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.

UnitID	Institution Name	FY 1992	FY1993	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	FY2011	FY 2012	FY 2013	FY 20
448664	Miller-Motte Technical College-Madison	0	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	0	5	-	8	13	10	1
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	haded (grey and blue), background area represented years of											2000/1	and the second second	Fit 2000 the										
	ne blue shaded, background area represented the period of														-			<i>(</i> -						
	ne U.S. economy suffered mild recessions from July, 1990 (p	peak, not sha	aded), throu	gn March, 1	1991 (troug	n, not shade	d), and from	March, 200	1 (peak, no	t shaded), ti	hrough Nov	ember, 2001	L (trough, no	ot shaded),	as determine	ed by the Na	tional Burea	u of Econon	nic Research					-
	egrated Postsecondary Education Data System.																							
	fication of Instructional Programs.																							
	fear, July 1 through June 30.																							-
	though the Natonal Center for Education Statistics (NCES) r											efunctional	definition of	CIP 46.030	2 during FY 1	1992 throug	n FY 2014.							
	om FY 1992 through FY 2014, the IPEDS did not report any								ureate level	or above in 1	Tennessee.													-
	e Electricians IPEDS Completions Survey, CIP 46.030								FR: 40.00		THEADOL				-	THERE	-	-	111 40.00				-	
<u>UnitID</u>	Institution Name	FY 1992	FY1993	FY 1994	FY 1995	_	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	FY2011	FY 2012	FY 2013	
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	C
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	1
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	3
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	(
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	1
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	1
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	1
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-Morristown	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	0	25	13	34	18	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	19
lote#1: s	haded (grey and blue), background area represented years of	during which	electricians	in Tennesse	e were a lice	nsed occupa	ation statewi	de, that is, F	Y 2000 thro	ugh FY 201	4.													
lote#2: tl	he blue shaded, background area represented the period of	the Great Re	cession, as o	determined l	by the Natio	nal Bureau o	of Economic I	Research, of	December,	2007 (peak	), through Ju	une, 2009 (ti	rough), i.e.,	FY 2008 thr	ough FY 200	9.								
lote#3: t	ne U.S. economy suffered mild recessions from July, 1990 (p	peak, not sha	aded), throu	gh March, 1	1991 (trougi	n, not shade	d), and from	March, 200	1 (peak, no	t shaded), tl	hrough Nov	ember, 2001	L (trough, no	ot shaded),	as determine	ed by the Na	tional Burea	u of Econon	nic Research					
PEDS = Int	egrated Postsecondary Education Data System.																							
IP = Classi	fication of Instructional Programs.																							
۲ = Fiscal	'ear, July 1 through June 30.																							
lote#4: a	though the Natonal Center for Education Statistics (NCES) r	nade numero	ous changes	to the CIP t	axonomy ov	rerall in 1990	), 2000, and	2010, no su	bstantive c	hanges were	e made to the	e functional	definition of	F CI P 46.030	2 during FY 1	1992 throug	h FY 2014.							
Note#5: fi	om FY 1992 through FY 2014, the IPEDS did not report any	postseconda	ary awards o	or certificate	s for gradua	tes from CIP	46.0302 at	the baccalau	reate level	or above in 1	Tennessee.													
Fennesse	e Electricians IPEDS Completions Survey, CIP 46.030	2, FY 1992	- FY 2014,	Associate	Degrees a	nd Certific:	ates Below	the Baccal	aureate Co	nferred:														
UnitID	Institution Name	FY 1992	FY1993	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	FY2011	FY 2012	FY 2013	FY 20
	Total	31	41	32	70	69	59	56	65	60	66	63	68	86	119	109	151	150	203	204	200	181	128	196
	haded (grey and blue), background area represented years o	during which	electricians	in Tennesse	e were a lice	nsed occupa	ation statewi	de. that is. F	Y 2000 thro	ueh FY 2014	4.													
ote#1: s	he blue shaded, background area represented the period of											une, 2009 (t	rough), i.e.,	FY 2008 thr	ough FY 200	9.								
		nask natchs	aded) throu	eh March. 1	1991 (trough	n. not shade	d), and from	March. 200	1 (peak. no	t shaded), th	hrough Nov	ember. 2001	L (trough, no	ot shaded).	as determine	d by the Na	tional Burea	u of Econor	nic Research					
ote#2: t	e U.S. economy suffered mild recessions from July, 1990 (a												1											
lote#2: tl lote#3: tl	ne U.S. economy suffered mild recessions from July, 1990 (perated Postsecondary Education Data System.	Jeak, not sha	Jacay, anoa																					
lote#2: tl lote#3: tl PEDS=Int	egrated Postsecondary Education Data System.	peak, not she	lacaj, anos																					
lote #2: tl lote #3: tl PEDS = Int IP = Classi		Jeak, Not sha																						_

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

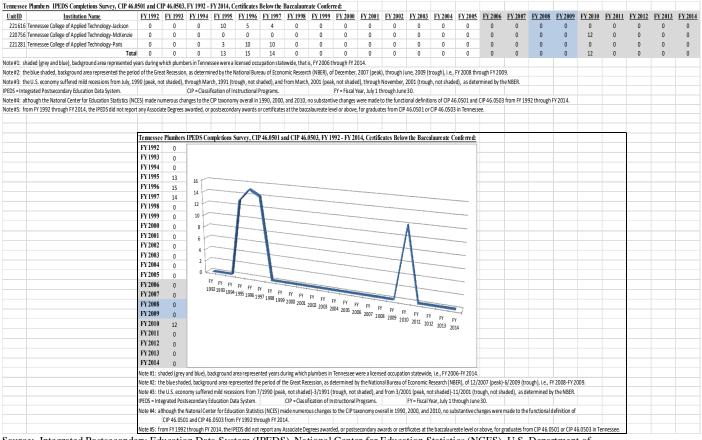
With respect to the training for plumbers (CIP 46.0501 and CIP 46.0503) in Alaska, North Dakota, and Tennessee, only one postsecondary education institution in each state produced low output levels of graduates following the Great Recession.

	ibers IPEDS Completions Survey, CIP 46.0501 and			EV 100/			07 23/ 10	00 13/ 1000	EV 1000 ET	1 15/ 3003	EV 20.02	EV 300 *	EVADO	EV MAA	EV 2007	EV AGOS	EVAnce	EV Anto	EVANT	EV 201 2	EV 2012	EN AG
UnitID	Institution Name	FY 1992			FY 1995				FY 2000 FY 2			FY 2004		FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2
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	(
434584	Ilisagvik College	0	0	0	0	0 0	0	0	0 0	0	2	0	0	0	0	0	0	0	0	0	0	
		iotal 0	0	0	0	0 0	0	0	0 0	0	2	0	0	0	0	0	0	0	0	0	0	
	ded (grey and blue), background area represented years																					
	blue shaded, background area represented the period of																					
	U.S. economy suffered mild recessions from July, 1990 (	peak, not shade					March, 20				rough, not sl	naded), as d	etermined b	y the Natior	nal Bureau of	f Economic I	Research.					
	rated Postsecondary Education Data System.			ification of In					Year, July 1 through													
Note #4: alth	ough the Natonal Center for Education Statistics (NCES)	made numerou	s changes to	the CIP taxor	nomy overall	in 1990, 2000, and	2010, no s	ibstan tive chai	nges were made to th	functional de	finition of CII	9 46.0501 ar	id CIP 46.05	603 during F	Y 1992 throi	ugh FY 2014						
	n FY 1992 through FY 2014, the IPEDS did not report any								alaureate level or abo	e in Alaska.												
Alaska Plum	bers IPEDS Completions Survey, CIP 46.0501 and	CIP 46.0503,	FY 1992 -	FY 2014, Ce	rtificates B	elow the Baccala	ireate Con	erred:														
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996 FY 19	97 FY 19	98 FY 1999	FY 2000 FY 2	01 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
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	
434584	Ilisagvik College	0	0	0	0	0 0	0	1	0 0	0	2	0	0	3	3	0	0	3	11	1	24	
	0 0	otal 0	0	0	0	0 8	22	9	5 4	6	2	0	0	3	3	0	0	3	11	1	24	
										0	2	0	0	5	5	Ū	0	5		1	24	
	ded (grey and blue), background area represented years							-														
Note #2: the	blue shaded, background area represented the period of	the Great Rece	ssion, as det	ermined by th	e National B	ureau of Economic	Research, o	December, 20	07 (peak), through J	ne, 2009 (trou	igh), i.e., FY 2	2008 throug	n FY 2009.									
Note #3: the	U.S. economy suffered mild recessions from July, 1990 (	peak, not shade	ed), through	March, 1991	(trough, not	t shaded), and fror	March, 20	1 (peak, not s	haded), through Nov	mber, 2001 (t	rough, not si	naded), as d	etermined b	y the Nation	nal Bureau of	f Economic I	Research.					
IPEDS = Integr	rated Postsecondary Education Data System.		CIP = Class	ification of In	structional P	rograms.		FY = Fiscal	Year, July 1 through	une 30.												
Note #1: alth	ough the Natonal Center for Education Statistics (NCES)	mada numarou	c channes to	the CIP taxor	omy overall	in 1990 2000 and	2010 no si	hstan tiyo cha	anes were made to th	functional de	finition of CI	2 / 6 / 501 ar		03 during F	V 1007 throu	ugh EV 2014						
												40.0301 8	10 CH 40.03	ios during i	1 1552 (110)	ugii i i 2014						
	n FY 1992 through FY 2014, the IPEDS did not report any									e in Alaska.												
Alaska Plum	bers IPEDS Completions Survey, CIP 46.0501 and	CIP 46.0503,	FY 1992 -	Y 2014, AS	sociate Deg	rees and Certific	ates Below	the Baccalau	reate Conferred:							_						
UnitID	Institution Name	FY 1992	FY 1993	FY 1994	FY 1995	FY 1996 FY 19	97 FY 19	98 FY 1999	FY 2000 FY 2	01 FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	F
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	
434584	Ilisagvik College	0	0	0	0	0 0	0	1	0 0	0	4	0	0	3	3	0	0	3	11	1	24	
	0 0	otal 0	0	0	0	0 8	22	9	5 4	6	4	0	0	3	3	0	0	3	11	1	24	
Noto #1 - char	ded (grey and blue), background area represented years		umborc in Al		concod occu	nation statewide t			2014									-		-		
Note #3: the I IPEDS = Integr Note #4: alth Note #5: from	blue shaded, background area represented the period of U.S. economy suffered mild recessions from July, 1990 ( rated Postsecondary Education Data System. ough the Natonaci Center for Education Statistics (NCES) i n FY 1992 through FY 2014, the IPEDS did not report any	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I IPEDS = Integr Note #4: althi Note #5: from	U.S. economy suffered mild recessions from July, 1990 ( rated Postsecondary Education Data System. ough the Natonal Center for Education Statistics (NCES) #	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I IPEDS = Integr Note #4: althu Note #5: from Plumbers IPED 92 0	U.S. economy suffered mild recessions from July, 1990 ( rated Postsecondary Education Data System. ough the Natonal Center for Education Statistics (NCES) in FY 1992 through FY 2014, the IPEDS did not report any	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the l           IPEDS = Integr           Note #4: althin           Note #5: from           Plumbers IPED:           02         0           03         0	U.S. economy suffered mild recessions from July, 1990 ( rated Postsecondary Education Data System. ough the Natonal Center for Education Statistics (NCES) in FY 1992 through FY 2014, the IPEDS did not report any	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: alther           Note #5: from           Plumbers IPED:           12         0           13         0           14         0	U.S. economy suffered mild recessions from July, 1990 ( nated Postscendary Education Data System. ough the Natanal Center for Education Statistics (NCES) i n Pr 1992 through PY 2014, the IPEOS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: althin           Note #5: from           Plumbers IPED           02         0           03         0           04         0           05         0	U.S. economy suffered mild recessions from July, 1990 ( rated Postsecondary Education Data System. ough the Natonal Center for Education Statistics (NCES) in FY 1992 through FY 2014, the IPEDS did not report any	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: althin           Note #5: from           Plumbers IPED:           22         0           23         0           24         0           25         0           26         0	U.S. economy suffered mid recessions from July, 1990 ( atted Postcendary Education Data System. ough the Nataroll Center for Education Statistics (NCES) i n Pr 1992 through PY 2014, the IPEDS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 25	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: althu           Note #5: from           Plumbers IPED:           12           0           13           0           14           0           15           0           15           0           16           0           17	U.S. economy suffered mild recessions from July, 1990 ( nated Postscendary Education Data System. ough the Natanal Center for Education Statistics (NCES) i n Pr 1992 through PY 2014, the IPEOS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: althu           Note #5: from           Plumbers IPED:           2           0           4           0           5           0           6           0           7	U.S. economy suffered mild recessions from July, 1990 ( rated Potsteendary Education Data System. ough the National Center for Education Statistics (NCES) n FY 1992 through FY 2014, the IPEDS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 20	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: althu           Note #5: from           2         0           3         0           4         0           5         0           6         0           7         8           8         22	U.S. economy suffered mid recessions from July, 1990 ( atted Postcendary Education Data System. ough the Nataroll Center for Education Statistics (NCES) i n Pr 1992 through PY 2014, the IPEDS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 25	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
Note #3: the I           IPEDS = Integr           Note #4: alth           Note #5: fron           Plumbers IPED           2         0           3         0           4         0           5         0           6         0           7         8           8         22           9         9	U.S. economy suffered mild recessions from July, 1990 ( rated Postcendary Education Data System. upd the Netanal Center for Education Statistics (NCES) in Pr 1992 through PP 2014, the IPEDS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 25 20 25 20 26 20	peak, not shade made numerou postsecondary	ession, as det ed), through CIP = Class s changes to r awards or c	ermined by th March, 1991 ification of In the CIP taxor ertificates for	e National B (trough, noi structional P nomy overall graduates fr	ureau of Economic t shaded), and from rograms. in 1990, 2000, and rom CIP 46.0501 a	Research, o March, 200 2010, no si d CIP 46.05	December, 20 11 (peak, not s FY = Fiscal Ibstantive char 03 at the bacc	07 (peak), through J haded), through Nov Year, July 1 through nges were made to th alaureate level or abo	mber, 2001 (t une 30. functional de	rough, not sl	naded), as d	etermined b	ĺ								
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Note #3: the!           IPED5 = integr           IPED5 = integr           Note #4: shift           Note #4: shift           Note #4: shift           Note #5: from           Plumbers IPED           12         0           13         0           14         0           15         0           16         5           11         4           12         6           13         4           14         0           15         0           16         3           17         8           18         0           19         0           10         1           11         1           12         1           13         24           3         24           3         24           3         24           3         24           3         24           3         24           3         24           3         24	U.S. economy suffered mild recessions from July, 1990 ( nated Postcendary Education Data System. ough the Natanal Center for Education Statistics (NCES) in n Pr 1992 through PY 2014, the IPEOS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 20 20 20 20 20 20 20 20 20 20 20 20 20	peak, not shade made numerou postsecondary <b>D3, FY 1992 -</b> <b>D3, FY 1993 -</b> <b>D3, FY 1995 -</b> <b>D4, FY 1995 -</b> <b>D4</b>	ssion, as det 40, htmough 5 s changes to 8 s changes to 8 wards or c FY 2014, A FY 2014, A 2008 2004 aska were a memined by	emined by th March, 1991 entitiestion of In ficiation of In file of the CPI Exact entiticates for one entiticates for one enti	e National B (trough, no trony overall graduates fn graduates fn grad	ureau of Economic shaded), and fror rograms. in 1990, 2000, and room CIP 46.0501 a ertificates Belov Fr pr 2009 2010 2 wide, Le, FY 2005 wide, Le, FY 2005	Research, o 0 March, 20 2010, no s 2010, no	December, 22 (2) 11 (pesk, not has 2007 (pesk), 64 2007 (pesk), 65 2007 (pesk), 65 200	07 (peak), through 1 haddel), through No Yer, July 1 through ges were made to th Jaureate level or abc erred: ////////////////////////////////////	mber, 2001 (t) me 30. u in Alaska. v 2008-FY 2	Pige 1990 Pige 1	naded), as d	etermined b	ĺ								
Note #3: the         IPED5 = Integr           IPED5 = Integr         Note #4: shift           Note #4: shift         Note #5: from           Plambers         IPED           2         0           13         0           44         0           55         0           17         8           88         22           9         9           10         5           11         4           12         6           13         4           4         0           15         0           16         3           1         1           1         1           3         2,4           9         0           13         2,4           4         shaded (grey an           the Use shorts         the Use shorts	U.S. economy suffered mid recessions from July, 1990 ( atted Postecundary Education Data 5 system. ough the Nataral Center for Education Satistics (NCES). n Pr 1992 through PY 2014, the IPEDS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and ciP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and CIP 46.0501 and ciP 47.0501 and ciP 45.0501 and CIP 46.0501 and ciP 47.0501 and ciP 46.0501 and ciP 46.0501 and ciP 46.0501 and ciP 47.0501 and ciP 46.0501	peak, not shad made numerou postsecondary 03, FY 1992 - 03, FY 1992 - 03, FY 1992 - 00 02, FY 1992 - 02 02, 2001 2002 1 plumbers in A eccession, as det ed)-3/1991 (tr	ssion, as det 40, through c (IP = Class s changes to awards or c FY 2014, A FY 2014, A 2005 2004 ais ka were a ermined by bugh, not sh	emined by th March, 1997 fraction of In free Textures for the CIP textures extended to the CIP textures	e National B e National P e Nat	ureau of Economic shaded), and fror rograms. in 1990, 2000, and mor CP 46.0501 a ertificates Below Fr Fr Fr 2009 2010 2 wide, i.e., FY 2005- normic Research (N peak, not shaded) action of instructor	Research, 00 March, 20 2010, no si d CP 46.05 d CP 46.05 the Bacca Y Fr y Fr y 1 Fr y 2014. DBR), of 12, 012	December, 22 UI (peak, of the back of the	07 (peak), through 10 haddel), through No Yer, July 11 through No Yer, July 11 through ges were made to th Jaureate level or abc erred: 	mber, 2001 (tr me 30. e in Alaska. Y 2008-FY 2004 W the NBER.	Pige 1990 Pige 1	naded), as d	etermined b	ĺ								
Note #3: the I           IPED5 = integr           IPED5 = integr           Note #4: shith           Note #4: shith           Note #4: shith           Note #5: from           13: 0           4: 0           15: 0           16: 0           17: 8           8: 22           19: 9           10: 5           11: 4           2: 6           13: 4           4: 0           12: 6           13: 4           4: 0           14: 0           15: 0           16: 3           17: 3           18: 0           19: 0           10: 11           2: 11           2: 11           2: 11           2: 11           2: 11           2: 11           2: 11           3: 24           4: 3           3: 24           4: 3           11: 1           2: 11           3: 12: 11           3: 13: 24           4: 3           3: 40+00 E           10: 10: 10 </td <td>U.S. economy suffered mild recessions from July, 1990 ( nated Postcendary Education Data System. ough the Natanal Center for Education Statistics (NCES) in n Pr 1992 through PY 2014, the IPEOS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 20 20 20 20 20 20 20 20 20 20 20 20 20</td> <td>peak, not shad made numerou postsecondary 03, FY 1992 - 03, FY 1992 - 03, FY 1992 - 00 02, FY 1992 - 02 02, 2001 2002 1 plumbers in A eccession, as det ed)-3/1991 (tr</td> <td>ssion, as det 40, through c (IP = Class s changes to awards or c FY 2014, A FY 2014, A FY 2013, 2004 FY ry 2003, 2004 als ka were a emmined by bugh, not sh</td> <td>emined by th March, 1997 fraction of In free Textures for the CIP textures extended to the CIP textures</td> <td>e National B e National P e Nat</td> <td>ureau of Economic shaded), and fror rograms. in 1990, 2000, and mor CP 46.0501 a ertificates Below Fr Fr Fr 2009 2010 2 wide, i.e., FY 2005- normic Research (N peak, not shaded) action of instructor</td> <td>Research, 00 March, 20 2010, no si d CP 46.05 d CP 46.05 the Bacca Y Fr y Fr y 1 Fr y 2014. DBR), of 12, 012</td> <td>December, 22 UI (peak, of the back of the</td> <td>07 (peak), through 10 haddel), through No Yer, July 11 through No Yer, July 11 through ges were made to th Jaureate level or abc erred: </td> <td>mber, 2001 (tr me 30. e in Alaska. Y 2008-FY 2004 W the NBER.</td> <td>Pige 1990 Pige 1</td> <td>naded), as d</td> <td>etermined b</td> <td>ĺ</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	U.S. economy suffered mild recessions from July, 1990 ( nated Postcendary Education Data System. ough the Natanal Center for Education Statistics (NCES) in n Pr 1992 through PY 2014, the IPEOS did not report any S Completions Survey, CIP 46.0501 and CIP 46.050 20 20 20 20 20 20 20 20 20 20 20 20 20	peak, not shad made numerou postsecondary 03, FY 1992 - 03, FY 1992 - 03, FY 1992 - 00 02, FY 1992 - 02 02, 2001 2002 1 plumbers in A eccession, as det ed)-3/1991 (tr	ssion, as det 40, through c (IP = Class s changes to awards or c FY 2014, A FY 2014, A FY 2013, 2004 FY ry 2003, 2004 als ka were a emmined by bugh, not sh	emined by th March, 1997 fraction of In free Textures for the CIP textures extended to the CIP textures	e National B e National P e Nat	ureau of Economic shaded), and fror rograms. in 1990, 2000, and mor CP 46.0501 a ertificates Below Fr Fr Fr 2009 2010 2 wide, i.e., FY 2005- normic Research (N peak, not shaded) action of instructor	Research, 00 March, 20 2010, no si d CP 46.05 d CP 46.05 the Bacca Y Fr y Fr y 1 Fr y 2014. DBR), of 12, 012	December, 22 UI (peak, of the back of the	07 (peak), through 10 haddel), through No Yer, July 11 through No Yer, July 11 through ges were made to th Jaureate level or abc erred: 	mber, 2001 (tr me 30. e in Alaska. Y 2008-FY 2004 W the NBER.	Pige 1990 Pige 1	naded), as d	etermined b	ĺ								

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

	ota Plumbers IPEDS Completio											-		11/ 0000		-	111 0000		1110000	111.000	111 4040	-			
<u>nitID</u>	Institution Name		FY 1992	FY 1993	FY 1994		FY 1996	FY 1997					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 20
	North Dakota State College of Scien	nce	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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	<b>m</b>	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
	aded (grey and blue), background a																								
	e blue shaded, background area rep																								
	e U.S. economy suffered mild reces								haded), and	from March	, 2001 (peak,	not shaded)	), through	November, 2	2001 (trough	, not shade	d), as deten	nined by th	e NBER.						
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	hough the Natonal Center for Educ															ns of CIP 46	.0501 and 0	1P 46.0503	from FY 199	2 through P	(2014.				
ote #5: fro	om FY 1992 through FY 2014, the IF	PEDS di	id not repo	rt any postse	condary awa	ards or certil	ficates at the	baccalaurea	ite level or a	bove for gra	duates from (	CIP 46.0501 (	or CIP 46.0	0503 in Nort	h Dakota.										
orth Dak	ota Plumbers IPEDS Completio	ons Su	rvey, CIP	46.0501 and	I CIP 46.05	03, FY 199	2 - FY 2014	l, Certificat	tes Below	the Baccala	ure ate Conf	erred:													
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 2
200305	North Dakota State College of Scien	nce	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
	1	Total	21	22	17	19	17	26	0	14	25	20	17	0	21	14	11	13	7	5	9	5	5	6	6
te #1: sh	aded (grey and blue), background a																								
	e blue shaded, background area rep													) through lu	ne 2009 (tr	nugh)ie P	Y 2008 thre	ugh FY 200	9						
	e U.S. economy suffered mild reces																								
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	grated Postsecondary Education Da									and 2010	FY = Fiscal Ye				naldafia''''		05.01 en 1 (	10 46 05 02		) Albenualt D	(2014				
	hough the Natonal Center for Educ															ns or CIP 46	.0201 aud (	ir 40.0503	om FY 199	∠ un ougn P	2014.				
ute #5: fro	om FY 1992 through FY 2014, the IF	reus di	iu not repo	r cany postser	Londary awa	nus or certil	icates at the	Daccalautea	ite level of a	uuve tor gra	uudtes from (	.ir 46.0501 (	UI UP 46.0	JOUS IN NOR	n Dakota.										
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	DI I INDOGO			16.0501		0.0. 171400			<b>D</b>	10.57	( R )	d <b>D</b> -													-
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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 2
	1	Total	21	23	17	19	17	26	0	14	25	20	17	0	21	14	11	13	7	5	9	5	5	6	ſ
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ote #3: th EDS = Inte ote #4: alt	e U.S. economy suffered mild reces grated Postsecondary Education Da	ssions fi ata Syst cation S	ted the peri rom July, 1 tem. Statistics (N	od of the Gre 990 (peak, no CES) made nu	at Recession ot shaded), 1 CIP = Classif Imerous cha	i, as determ hrough Ma ication of In inges to the	ined by the N rch, 1991 (tr structional P CIP taxonon	lational Bure ough, not sh Programs. ny overall in 2	eau of Econ haded), and 1990, 2000	omic Resear from March , and 2010,	ch (NBER), of I 1, 2001 (peak, no substantiv	December, 20 not shaded) e changes we	007 (peak ), through ere made f	November, 2	2001 (trough onal definitio	, not shade	d), as deten	nined by th	e NBER.	2 through P	(2014.				
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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.



Source: Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics (NCES), U.S. Department of Education (USDOE), Use the Data, at <u>http://nces.ed.gov/ipeds/Home/UseTheData</u>, accessed October, 2016; and EDEPS at <u>www.edeps.org</u>, 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 õswitcherö states of Alaska, North Dakota, and Tennessee, were all sub-baccalaureate graduates, FY 1992-FY 2014, as reported by IPEDS.

CIP Code 52.0301 Accounting	Program Title			(2014 - 20 Assc 5.926		ited States Bach 51,837	CertB 548	Mast 19.429	CertM 37	Doct 52	Total 81,195
Program Completers by Deg	gree Level (2014 - 2015) United Sta Program Title		Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
52.1304 Actuarial Science Program Completers by Deg		15 ates	2	0	0	1,101	0	408	C	0	1,526
49.0102 Airline/Commercial/Pro	Program Title fessional Pilot and Flight Crew	Cert1 286	Cert2 95	<b>Assc</b> 499	Assc+ 0	Bach 867	CertB 0	Mast 0	CertM	Doct 0	Total 1,747
Program Completers by Deg	Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
	al Medicine mentary Medicine and Medical Systems,	0 66	28	0	26	101	37	1,516	2	112	1,792
	mentary Medicine and Medical Systems, Other	16	0	0	0	173	8	12		0	209
51.3305 Ayurvedic Medicine/Ayu 51.3401 Direct Entry Midwifery	ırveda	28	1	0	0	0	0	1	0	0	30
51.3306 Holistic Health 51.3304 Homeopathic Medicine,	Homeopathy	63 0	81	113	0	203	8	39	C	0	507
51.3303 Naturopathic Medicine/ 51.3302 Traditional Chinese Med	licine and Chinese Herbology	0	0	0	0	0	0 23	0 192		406	406 229
CIP Code 4.0902 Architectural and Buildin	Program Title	Cert1	Cert2	Assc 20	Assc+	Bach 235	CertB 19	Mast 229	CertM	Doct 14	Total 524
4.0901 Architectural Technolog 4.0201 Architectural		134	79	340	0	211 5.813	0	4,301	0	0	764
4.9999 Architecture and Related 4.0401 Environmental Design/A	d Services, Other	42	7	9	0	199 612	3	94	4	0	358
4.0501 Interior Architecture 4.1001 Real Estate Developmen		3	0	8	0	400	0	214	C	0	625 239
Program Completers by Deg			Cert2	Assc	Assc+		CertB		CertM	Doct	Total
12.0402 Barbering/Barber 12.0413 Cosmetology, Barber/St		756	7,071 622	9 24	237 63	0	0	0	0	0	8,073 2,035
12.0401 Cosmetology/Cosmetol Program Completers by Deg	ogist, General	3,399 ates	64,949	750	7,975	0	0	0	C	0	77,073
51.0101 Chiropractic	Program Title	Cert1 0	<b>Cert2</b> 0	Assc 0	Assc+ 0	Bach 0	CertB 0	Mast 0	CertM	Doct 2,544	<b>Total</b> 2,544
Program Completers by Deg	Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
47.0103 Communications System Program Completers by Deg CIP Code	ns Installation and Repair Technology (ree Level (2014 - 2015) United Sta Program Title	137 ates Cert1	63 Cert2	168 Assc	35 Assc+	0 Bach	0 CertB	0 Mast	CertM	0 Doct	403 Total
51.0602 Dental Hygiene/Hygien Program Completers by Deg	ist	78	86	5,862	<b>Assc+</b> 95	2,134	0	97			8,352
CIP Code 51.0401 Dentistry	Program Title	Cert1 0	Cert2 0	Assc 0	Assc+	Bach 0	CertB 0	Mast	CertM 67	Doct 5,867	Total 5,934
Program Completers by Deg CIP Code	ree Level (2014 - 2015) United Sta Program Title	tes Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
52.1701 Insurance Program Completers by Deg			10	4	5	848	38	86			2,347
CIP Code 4.0601 Landscape Architecture	Program Title	Cert1 12	Cert2 3	Assc 12	Assc+ 0	Bach 795	CertB 12	Mast 712	CertM	Doct 6	Total 1,552
CIP Code 22.0101 Law	ree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2	Assc 0	Assc+	Bach	CertB 0	Mast 0	CertM	<b>Doct</b> 40,630	Total 40,630
Program Completers by Deg	ree Level (2014 - 2015) United Sta Program Title		Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
	ional Nursing and Nursing Assistants, Other	5,226 627	41,804 4,986	2,220 159	658 138	23 150	0	0	3	0	49,934 6,070
Program Completers by Deg CIP Code	ree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
51.1201 Medicine 51.1901 Osteopathic Medicine/C		0	0	0	0	0	0	0	C	18,551 5,355	18,551 5,355
Program Completers by Deg CIP Code 41,0299 Nuclear and Industrial R	pree Level (2014 - 2015) United Sta Program Title adiologic Technologies/Technicians, Other	Cert1	Cert2	Assc 0	Assc+	Bach	CertB 0	Mast	CertM	Doct 0	Total
15.1401 Nuclear Engineering Tec 41.0205 Nuclear/Nuclear Power	chnology/Technician	0	35	130 125	0	168 18	0	0		0	333 170
Program Completers by Deg		tes Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
51.3801 Registered Nursing/Reg Program Completers by Deg	ree Level (2014 - 2015) United Sta	1,272 ates	906	85,176	2,243	125,265	73	15,349		724	231,193
CIP Code 51.2306 Occupational Therapy/T	Program Title Therapist	Cert1 0	Cert2 0	Assc 169	Assc+ 0	Bach 874	CertB 26	Mast 5,823	CertM	<b>Doct</b> 351	Total 7,243
Program Completers by Deg CIP Code 51.1701 Optometry	pree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2	Assc 0	Assc+	Bach 0	CertB 0	Mast 0	CertM	Doct 1,549	Total 1.566
Program Completers by Deg	ree Level (2014 - 2015) United Sta Program Title		Cert2	Assc	Assc+	Bach	CertB		CertM		Total
51.2001 Pharmacy Program Completers by Deg	ree Level (2014 - 2015) United Sta			0		991	0				15,341
51.2308 Physical Therapy/Therap	Program Title Dist	Cert1 5	Cert2 0	Assc 286	Assc+ 0	Bach 427	CertB 62	Mast 150	CertM 46	Doct 10,618	Total 11,594
CIP Code 51.0912 Physician Assistant	ree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2 124	Assc 161	Assc+ 135	Bach 626	CertB 0	Mast 7.025	CertM 18	Doct 17	Total 8,106
Program Completers by Deg	ree Level (2014 - 2015) United Sta Program Title		Cert2	Assc	Assc+	Bach	CertB	7,025 Mast	CertM	Doct	8,106
51.2101 Podiatric Medicine/Podi Program Completers by Deg	iatry gree Level (2014 - 2015) United Sta	0	0	0	0	0	0	0	C	574	574
52.1501 Real Estate	Program Title	Cert1 1,256	Cert2 327	Assc 243	Assc+ 0	Bach 604	CertB 64	Mast 816	CertM	Doct 0	Total 3,310
Program Completers by Deg CIP Code	pree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
	and Speech-Language Pathology/Pathologist	05	0 31 0	0 142 8	0	262 4,531 107	12 6 0	126 2,600 93		199	1,000 7,517 250
51.0299 Communication Disorder 51.0201 Communication Science 51.0203 Speech-Language Patho	s and Disorders, General	1 0 72	0	8 12 68		4,946	1	93 1,928 3.073	1	47	250 6,935 4,840
Program Completers by Deg			Cert2	Assc	Assc+		CertB	3,073 Mast	CertM	Doct	4,840 Total
14.3801 Surveying Engineering 15.1102 Surveying Technology/S		23 109	2	4 207	0	26 184	0	12	0	1	68 612
CIP Code	ree Level (2014 - 2015) United Sta Program Title	Cert1	Cert2	Assc	Assc+	Bach	CertB	Mast	CertM	Doct	Total
Program Completers by Deg	mmercial Vehicle Operator and Instructor aree Level (2014 - 2015) United Sta		47	2	0	0	0	0			20,193
CIP Code 51.2509 Comparative and Labor	Program Title atory Animal Medicine	Cert1 0	Cert2 0	<b>Assc</b>	Assc+ 0	Bach 0	CertB 0	Mast 41			Total 41
51.2508 Small/Companion Anim		0	0	0	0	0	0	3	C	0	3
51.2511 Veterinary Infectious Dis 51.2401 Veterinary Medicine		0	0	0		0	0	0	C	2,815	5 2,815 28
51.2504 Veterinary Microbiology 51.2505 Veterinary Pathology an		0	0	0		0	0	3	C	23	28 26 4
	edicine, Epidemiology, and Public Health	0	0	0	0	0	0	0 10	1	0	11
51.2501 Veterinary Sciences/Vete	ermary Clinical Sciences, General	0	0	0	0	8	16	173	0	212	409

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

**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).<sup>75</sup> Also, for national survey data from the American Community Survey (ACS), the Hamilton Project (Brookings Institution) interactive website, õPutting 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.<sup>76</sup>

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;<sup>77</sup> 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.<sup>78</sup>

Source: Texas Wage Record Follow-U	) Data, Detailed CIP Graduates by Detailed Industry,		NAICS Industry Code and Title,
Texas Higher Education Coordinating H	Board (THECB)		Texas Employment, 4th Qrtr., 2015,
CIP Training Program Code and Title*	Degree Level	# THECB Graduates**	6-12 Months Post-Training
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,	Sub-Total THECB Graduates from CIP 51.0602 Employed (4th qrtr., 2015) in NAICS 6212 Post-Training =	401	
and were not enrolled during the Fall, 2015,	THECB Total Graduates from CIP 51.0602 Employed (4th qrtr., 2015) in all Industries Post-Training =	503	**Graduates working without
semester in Texas higher education.	Texas Industry Employment Concentration of Texas CIP 51.0602 Training Output in NAICS 6212 =	80%	continuing their education.

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

<sup>&</sup>lt;sup>76</sup> The Hamilton Project, The Brookings Institution, *Putting Your Major to Work: Career Paths after College*, interactive website at <a href="http://www.hamiltonproject.org/charts/median\_earnings">http://www.hamiltonproject.org/charts/median\_earnings</a> for largest occupations. Also, see Rotrosen, Anna, Diane Whitmore Schanzenbach, <a href="http://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college">http://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college</a>, May 11, 2017.

<sup>&</sup>lt;sup>77</sup> Economic Development and Employer Planning System (EDEPS at <u>www.edeps.org</u>), industry distribution of occupational employment, accessed April, 2017.

<sup>&</sup>lt;sup>78</sup> 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.<sup>79</sup>

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.

NAICS 6212, Office	e of Dentists
۸	٨
٨	٨
Linked Empirically to NAICS 6212 based on O/I Employment Distribution	Linked Empirically to NAICS 6212 based on Texas Wage Record Follow-Up Reports
(Note: O/I employment distribution refers to the occupational/industry employment profile.)	(Source: Texas Higher Education Coordinating Board)
(Source: U. S. Bureau of Labor Statistics and EDEPS at www.edeps.org)	Λ
Λ	٨
SOC 29-2021, Dental Hygienists <====> Linked Taxonomically t	to CIP 51.0602 <====> CIP 51.0602, Dental Hygiene/Hygienist
(Note: taxonomic links refer to the matching of the SOC work functions to the conc	comitant CIP subject content, and the research literature review.)
٨	٨
Λ	٨
Dental Hygiensits Linked by Survey Data to Dental Hygiene/Hygienist training programs, b	based on Principal Job by Field of Study for Highest Degree, from the 2015 NSCG.
(NSCG = National Survey of College Graduates of the National Science Foundation.)	٨
NSCG Principal Job = 611130 Health Technologists and Technicians <==> Linked E	<u>Empirically</u> <==> <u>NSCG Field of Study for Highest Degree = 617840 Health/Medical Technologies</u>
(e.g. dental hygienist, health record technologists/technicians, licensed	٨
practical nurses, medical or laboratory technicians, radiological technicians)	٨
Λ	۸
٨	۸
Dental Hygiensits Linked by Survey Data to Dental Hygiene/Hygienist training programs, base	ed on the SOC related to Field of Degree (college major) from the American Community Survey (ACS).
(Source: The Hamilton Project, The Brookings Institution, interactive website at http://www.h	namiltonproject.org/charts/median_earnings_for_largest_occupations.)
ACS/SOC = 29-2021, Dental Hygienists <====> Linked Empirically <===> ACS	Field of Degree (college major) for bachelor's degree holders = 6104 Medical Assisting Services

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.

<sup>&</sup>lt;sup>79</sup> EDEPS, *op. cit.*, occupational distribution of industry employment (i.e., staffing pattern), accessed April, 2017.

SOC Code	Largest % National Occupational	Second Largest % National Occupational	Total % National Occupational Employme
and Title	Employment 2014 in Detailed NAICS Industry	Employment 2014 in Detailed NAICS Industry	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
29-1041 Optimensis	48.0	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	28.8	71.7
29-1181 Audiologists	25.1	24.9	50.0
29-1181 Audologsts 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	40.9	16.9	64.6
53-3032 Heavy and Tractor-Trailer Truck Drivers	32.9	13.3	46.2
53-3032 Light Truck or Delivery Services Drivers	16.7	7.6	24.3
29-1131 Veterinarians	74.3	16.2	90.5
	55.2	10.2	90.5
25-2011 Preschool Teachers, Except Special Education			
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

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

48.4 4 20.0 1 Principality invokant technic unis and Parameters 1 48.4 4 20.0 1 20.0 1 1 20.0 1 1 1 20.0 1 1 1 20.0 1 1 1 1 20.0 1 1 1 1 20.0 1 1 1 1 20.0 1 1 1 1 20.0 1 1 1 1 20.0 1 1 1 1 20.0 1 1 1 20.0 1 1 1 20.0 1 1 1 20.0 1 1 1 20.0 1 1 20.0 1 1 1 20.0 1 1 20.0 1 1 20.0 1 1 20.0 1 1 20.0 1 20.0 1 1 20.0 1 20.0 1 1 20.0 1 20.0 1 1 20.0 1 2

### 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.	Diagnosing	y/treating practitioners	RNs, pharmacists the rapists, physical structure in the rapists of the rapists of the rapists of the rapid structure in the rapid structu		Health technolo technicia (dent hyg,hl	ans	Teachers: Sec compute									
NSCG PUBLIC 2015: Principal Job by	(dent,optom,phys	icians,psych,pod,surgn,vet)	nurse	•	tech,LPN,la	ab/rad	math or sci	ences	Teachers: Sec	condary -	Surveyors, carto	graphers,				
Field of Study for Highest Degree.			practition	ners	tech)				social scie	nces	photogramm	netrists	Archited	ts	Actuarie	s
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 %
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,podi atry,veterinary)			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	2,320	02070	221,041	3.3070	3,005	1.0070										
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%	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	0.40%	52,874	7.30%	57.926	. 19.30%			· · ·			
Special education			5,525	0.20%	004	0.1070	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%

	Principal Job (for National Licensed Occupations)															
	,		Teachers: Pre-ki	ndergarten					Teachers: S	pecial						
National Survey of College Graduates.	Accountant	ts, auditors, and other	and						educatio	n -						
NSCG PUBLIC 2015: Principal Job by	finan	icial specialists	kindergar	rten			Teachers: Secon	dary - other	primary and se	condary					Total (All NSCG	Primary Job
Field of Study for Highest Degree.					Teachers: Ele	mentary	subject	s			Lawyers, ju	dges	Logical S	ikip	Categori	ies)
Field of Study for Highest Degree						• • •		••••				••••				
(Linked to National Licensed Occupations) Environmental science or studies	Weighted Count 5.808	Column % 0.20%	Weighted Count 36	Column % 0.00%	Weighted Count 432	Column % 0.00%	Weighted Count	Column %			Weighted Count 87	Column % 0.00%	Weighted Count 23.994		Weighted Count 181,315	
									125	0.00%	87	0.00%		0.20%		
Geography	2,375		378	0.10%	777	0.00%	138	0.00%	188	0.00%			38,578	0.30%	178,653	
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		318	0.10%									11,891	0.10%	97,895	
Health/medical technologies	815	0.00%	429	0.10%	211	0.00%							45,077	0.40%	229,932	0.40%
Medicine (dentistry,optometry,osteopathic,podi																
atry,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		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:	Principal J	lob (for Nat	ional Lice	nsed Occup	ations)											
National Survey of College Graduates,	ng pract (dent,opt	ing/treati titioners tom,phys sych,pod,	pharm dietio thera	Ns, acists, cians, pists, an asst,	technolo techn	alth gists and icians yg,hlth rd	Seco	chers: indary - nputer,	Teac	hers:	Surv	veyors,				
NSCG PUBLIC 2015: Principal Job by	surgi	n,vet)	nu	rse	tech,LPI	lab/rad	math or	sciences	Secor	ndary -		raphers,				
Field of Study for Highest Degree			practit	tioners	teo	ch)			social s	ciences	photogra	ammetrists	Arch	itects	Actu	aries
Field of Study for Highest Degree (Linked to National Licensed Occupations)	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		3	0.90%		
Civil engineering			-	0.1070	- 1	0.10%	5	0.30%		1.0070	5	9.40%	8	2.40%		
Audiology and speech pathology	38	2.60%	291	7.40%	5	0.70%		0.0070	. 1	0.20%		0.1070		2.1070		
Health/medical assistants	4	0.30%	106	2.70%	38	5.10%				0.2070	-			-		
Health/medical technologies	4	0.10%	100	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%		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							
Physical education and coaching	1	0.10%	3	0.10%	1	0.10%	6	0.30%	3	0.60%						
Pre-school/kindergarten/early childhood			1	0.00%	1	0.10%	1	0.10%								
teacher education Secondary teacher education			5	0.00%	1	0.10%	163	8.70%	. 82	. 17.10%						
Special education			5	0.10%	1	0.10%	183	1.00%	6							
Law/Prelaw/Legal Studies		0.20%	7	0.10%	. 3	0.40%	4	0.20%	7			· · · · ·	. 1	0.30%		
Total (All NSCG Fields of Study for Highest Degree	1 444	100.00%	3 928	100.00%		100.00%	1,863	100.00%		100.00%	53	100.00%	334		81	100.00%
Source: Scientists and Engineers Statistical Data Syste															01	100.0078

SESTAT Table Output:	Principal	ob (for Na	tional Licer	ised Occup	ations)											
SESTAT Table Output.		ntants.	lional Lice	iseu Occup	auonsy											
		rs, and	Teache	rs: Pre-					Teachers	s: Special						
National Survey of College Graduates,		her	kinderga	rten and					educ	ation -						
	fina	ncial					Tea	chers:	prima	ry and					Total (A	II NSCG
NSCG PUBLIC 2015: Principal Job by	spec	ialists	kinder	garten	Teac	hers:	Second	ary - other	seco	ndary					Prima	ry Job
Field of Study for Highest Degree					Eleme	entary	su	bjects			Lawyer	rs, judges	Logica	al Skip	Categ	gories)
Field of Study for Highest Degree																
		Column		Column		Column				Column				Column		Column
(Linked to National Licensed Occupations)	Count	%	Count	%	Count	%	Count	Column %	Count	%		Column %	Count	%	Count	%
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		2				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						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						12	0.10%	61	0.10%
Mathematics teacher education	3	0.10%			9	0.90%	4		4	0.70%			110	0.80%	491	0.50%
Science teacher education			2	0.70%	8	0.80%	5		3		1	0.10%	88 48	0.60%	407 197	0.40%
Social science teacher education	2	0.10%	1	0.30%	3	0.30%	8		4	0.70%					-	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 Syste	em (SESTA	T), Table O	utput for Na	tional Surve	y of College	Graduates,	NSCGPU	BLIC 2015, at	https://ncse	sdata.nsf.gov	//sestat/sest	at.html, access	d March, 2	017.		

# 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 <u>www.edeps.org</u>).

(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,  $4^{th}$  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 <u>http://www.hamiltonproject.org/charts/median\_earnings\_for\_largest\_occupations</u>, ( 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 <u>https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college</u>, 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	Х	X	X	Х	X
		l.				
15-2011 Actuaries	52.1304 Actuarial Science	Х		Х		Х
53-2011 Airline Pilots, Copilots, & Flight Engineers	49.0102 Airline/Commercial/Professional Pilot & Flight Crew	Х				Х
53-2012 Commercial Pilots			-			
29-1199 Health Diagnosing & Treating Practitioners, AO	51.3301 Acupuncture & Oriental Medicine	Х				
(AO = All Other)	51.3300 Alternative & Complementary Medicine & Med. Systems, Gen.	Х				
	51.3399 Alternative & Complementary Medicine & Med. Systems, Other	Х				
	51.3305 Ayurvedic Medicine/Ayurveda	Х				
	51.3401 Direct Entry Midwifery	Х				
	51.3306 Holistic Health	Х				
	51.3304 Homeopathic Medicine/Homeopathy	Х				
	51.3303 Naturopathic Medicine/Naturopathy	Х				
	51.3302 Traditional Chinese Medicine & Chinese Herbology	Х				
		1	1			
17-1011 Architects, Except Landscape & Naval	04.0902 Architectural & Building Sciences/Techn.	Х				
	04.0901 Architectural Technology/Technician	Х				
	04.0201 Architecture	Х	Х	X	Х	Х
	04.9999 Architecture & Related Services, Other	Х				
	04.0401 Environmental Design/Architecture	Х				
	04.0501 Interior Architecture	Х				
	04.1001 Real Estate Development	Х				
39-5011 Barbers	12.0402 Barbering/Barber	X				
39-5012 Hairdressers, Hairstylists, & Cosmetologists	12.0413 Cosmetology, Barber/Styling, & Nail Instructor	Х				
	12.0401 Cosmetology/Cosmetologist, Gen.	Х	Х			
			-			
29-1011 Chiropractors	51.0101 Chiropractic	Х				
			-			
27-4013 Radio Operators	47.0103 Communications Systems Installation & Repair Techn.	Х				
29-2021 Dental Hygienists	51.0602 Dental Hygiene/Hygienist	Х	Х	Х	Х*	Х
					(* 69 Res	pondents)
29-1021 Dentists, General	51.0401 Dentistry	X	X * *	Х		
			(* * 77 Graduates)			

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, cont.)	Linked CIP Code and Title (Definition #2, cont.)	Research Literature Review	THECB Wage Records	2015	2015	2015
41-3021 Insurance Sales Agents	52.1701 Insurance	Х				
			_			
17-1012 Landscape Architects	04.0601 Landscape Architecture	Х				
23-1011 Lawyers	22.0101 Law	Х	Х	Х		
		T	1			
29-2061 Licensed Practical & Licensed Vocational Nurses	51.3901 Licensed Practical/Vocational Nurse Training	Х	Х	Х		
	51.3999 Practical Nursing, Vocational Nursing & Nursing Assist., Other	Х	Х			
29-1060 Physicians and Surgeons	51.1201 Medicine	Х	Х	Х		Х
	51.1901 Osteopathic Medicine/Osteopathy	Х	Х	Х		Х
51-8011 Nuclear Power Reactor Operators	41.0299 Nuclear & Industrial Radiologic Technologies/Techn., Other	Х				
	15.1401 Nuclear Engineering Technology/Technician	Х				
	41.0205 Nuclear/Nuclear Power Technology/Technician	Х				
29-1141 Registered Nurses	51.3801 Registered Nursing/Registered Nurse	Х	Х	Х	Х	Х
	-					
29-1122 Occupational Therapists	51.2306 Occupational Therapy/Therapist	Х	Х	Х	X*	Х
					(* 96 Resj	ondents)
29-1041 Optometrists	51.1701 Optometry	Х	X * *	Х		
		T	(* * 76 Graduates)			
29-1051 Pharmacists	51.2001 Pharmacy	Х	Х	Х	Х	Х
	1					
29-1123 Physical Therapists	51.2308 Physical Therapy/Therapist	Х	Х	Х		Х
29-1071 Physician Assistants	51.0912 Physician Assistant	Х	Х	Х		
			1			
29-1081 Podiatrists	51.2101 Podiatric Medicine/Podiatry	Х		Х		
			1			
13-2021 Appraisers and Assessors Real Estate	52.1501 Real Estate	Х				
41-9022 Real Estate Sales Agents						
00 1101 Audiolo inte	51 0000 A. Latan/A. Lat.	V	]			
29-1181 Audiologists	51.0202 Audiology/Audiologist	X	V			
29-1127 Speech-Language Pathologists	51.0204 Audiology/Audiologist & Speech-Language Pathology/Pathologist	X	X			
	51.0299 Communication Disorders Sciences & Services, Other	X	X7		v	
	51.0201 Communication Sciences & Disorders, General	X	X		Х	
	51.0203 Speech-Language Pathology/Pathologist	Х	Х			

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, cont.)	Linked CIP Code and Title (Definition #2, cont.)	Research Literature Review			2015	2015
17-1022 Surveyors	14.3801 Surveying Engineering	X	THE OD WASCHWOID	X	-010	2010
	15.1102 Surveying Technology/Surveying	X				
			1			
53-3022 Bus Drivers, School or Special Client	49.0205 Truck & Bus Driver/Commercial Vehicle Op. & Instructor	Х	Х			
53-3021 Bus Drivers, Transit & Intercity				-		
53-3032 Heavy & Tractor-Trailer Truck Drivers						
53-3033 Light Truck or Delivery Services Drivers						
		1	1			
29-1131 Veterinarians	51.2509 Comparative & Laboratory Animal Medicine	Х				
	51.2507 Large Animal/Food Animal & Equine Surgery & Medicine	Х				
	51.2508 Small/Companion Animal Surgery & Medicine	Х				
	51.2511 Veterinary Infectious Diseases	Х				
	51.2401 Veterinary Medicine	Х	X**	Х		
	51.2504 Veterinary Microbiology & Immunobiology	Х	(* * 90 Graduates)			
	51.2505 Veterinary Pathology & Pathobiology	Х				
	51.2503 Veterinary Physiology	Х				
	51.2510 Veterinary Preventive Medicine, Epidemiology, & Public Health	Х				
	51.2501 Veterinary Sciences/Veterinary Clinical Sciences, Gen.	Х				
25-2011 Preschool Teachers, Ex. Special Ed.	13.1210 Early Childhood Education & Teaching	X	]	Х		
25-2012 Kindergarten Teachers, Ex. Special Ed.	13.1209 Kindergarten/Preschool Education & Teaching	X		X		
		1				
25-2021 Elem. School Teachers, Ex. Special Ed.	13.1202 Elementary Education & Teaching	Х	Х	Х		Х
	1					
25-2032 Career/Techn. Ed. Teachers, Second. School	13.1205 Secondary Education and Teaching	Х	Х	Х		Х
25-2031 Sec. School Teachers, Ex. Special & Career/Techn. Ed.						
		, w	1	X.		
25-2051 Special Ed. Teachers, Preschool	13.1015 Ed./Teaching Individuals in Early Childhood Special Ed. Programs	X		X		X
25-2052 Special Ed. Teachers, Kindergarten & Elem. School	13.1017 Ed/Teaching Individuals in Elementary Special Ed. Programs	X		X		X
25-2053 Special Ed. Teachers, Middle School	13.1018 Ed./Teaching Individuals in Jr. High/Middle School Special Ed. Progr			X		X
25-2054 Special Ed. Teachers, Secondary School	13.1019 Ed./Teaching Individuals in Secondary Special Ed. Programs	X	v	X		X
25-2059 Special Ed. Teachers, AO	13.1001 Special Education & Teaching, General	Х	Х	Х		Х
25-3011 Adult Basic & Sec. Ed. & Literacy Teachers & Instruct.	13.1201 Adult & Continuing Education & Teaching	X	1			
25 JULT HUIL DASIC & SW. LA. & LITTACHETS & IIISUAU.	15.1201 Huart & Continuing Education & Teating	Λ	1			
29-1171 Nurse Practitioners	51.3818 Nursing Practice	X	Х	Х		
29-1126 Respiratory Therapists	51.0908 Respiratory Care Therapy/Therapist	Х	Х			
29-2041 Emergency Medical Technicians & Paramedics	51.0904 Emergency Medical Technology/Technician (EMT Paramedic)	X	X			
27 2041 Emergency moderal recimicians of 1 arallouids	siloso remoissing monour romoiogy romineran (Emiri additodit)	Λ	Δ	l		

## <u>Appendix IV</u>: 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,<sup>80</sup> 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.)<sup>81</sup> 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.<sup>82</sup> 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) "Evolution available that could not be reported by level of advantion "				

(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."

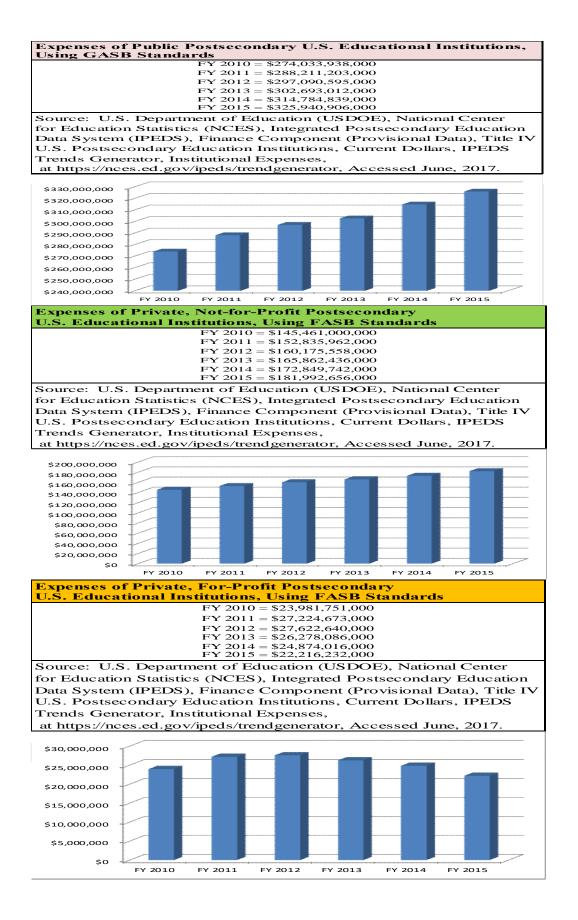
"NOTE: Public direct expenditures on education include both amounts spent directly by governments to hire education personnel and to procure other resources, and amounts provided by governments to public or private institutions. Unless otherwise noted, public direct expenditures also include public subsidies 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.

<sup>&</sup>lt;sup>80</sup> 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 <u>https://nces.ed.gov/ipeds/datacenter/login.aspx</u>.
<sup>81</sup> The Treasury/Labor/CEA summary reported, õEstimates suggest that over 1100 occupations are regulated in at least one State, but fewer than

<sup>60</sup> are regulated in all 50 States, showing substantial differences in which occupations states choose to 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.ö 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.

<sup>&</sup>lt;sup>82</sup> 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 <u>https://nces.ed.gov/programs/digest/d16/tables/d16\_605.20.asp?current=yes</u>.



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http://www.hamiltonproject.org/charts/median\_earnings\_for\_largest\_occupations. Also, see Rotrosen, Anna, <u>Diane Whitmore Schanzenbach</u>, <u>Greg Nantz</u>, and <u>Ryan Nunn</u>, *Where will your degree take you? Career paths after college*, at <u>https://www.brookings.edu/research/putting-your-major-to-work-career-paths-after-college</u>, May 11, 2017.

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