

*The Education Premium for Employment: Is it the Same Everywhere?*

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The education premium for employment is well-known. Better educated individuals have lower rates of unemployment than people with lower levels of education. Among regional economics researchers, it is also well-known that unemployment rates vary substantially across regions and cities. Several regional characteristics, including specifically, primary industry concentration and industrial diversity have been repeatedly shown to affect regions' employment growth and unemployment rate. Less well understood is whether the education premium for employment is the same in all regions and cities and whether regional industrial concentration and diversity play a role in the known education premium for employment. Do regional industrial concentration and diversity moderate the effects of educational attainment on employment prospects; i.e., is the positive relationship between educational attainment and the likelihood of being employed stronger or weaker depending on the industrial concentration and/or industrial diversity of a local economy? In this research, we find that the size of the education premium for employment does vary across local economies. In addition, we find that the local economy's industrial concentration and diversity moderate the effect of educational attainment on individuals' employment prospects. This study shows that the industrial development policies that local economies pursue have consequences not only for employment growth generally, but also for the employment advantage for better educated workers.

Keywords: industry composition, education premium, metro areas, regional employment

## **Introduction**

The labor market advantages for better educated workers are numerous. It is well-known that people with higher levels of education have lower rates of unemployment than people with lower levels of education<sup>1</sup>. In addition to lower unemployment rates, better educated workers generally earn more and have greater access to workplace benefits compared to workers with lower levels of education (Cheeseman-Day and Newburger, 2002; Olson, 1995). Moreover, better educated workers continue to have an employment advantage over less educated workers during recessions (Allegretto and Lynch, 2010). In the current, post-recession period, while many cities continue to struggle with high unemployment rates, the disparity in unemployment rates between workers with high and low levels of education remains large (Theodossiou and Hipple, 2010)<sup>2</sup>. However, some research suggests that the employment advantage for better educated workers is not equally strong across all regions and cities (Krolick, 2004; Layne, 2012).

Also well known among regional economics researchers is that unemployment rates vary substantially across regions and cities (Elhorst, 1995). Several regional characteristics are known to influence a region's unemployment rate. Specifically, industrial concentration and industrial diversity have been repeatedly shown to affect regions' employment growth and unemployment rate, even after controlling for other regional characteristics (Izraeli and Murphy, 2003). Regions and cities with greater industrial diversity have greater economic growth and lower unemployment rates (Elhorst, 2003). Regions and cities with heavy concentrations in the manufacturing sector have been shown to have slower employment growth and larger employment declines (Owyang et al, 2006; Drucker, 2009). In addition, most employment growth within industries comes from small firms and establishments, those with fewer than 500 employees (Dalton et al., 2011). Just as workers' individual characteristics, such as their educational attainment, are important to their employment prospects, the characteristics of the city in which they live, particularly its industrial

concentration and diversity, are important as well. Understanding the importance of industrial composition to local economies, many regional policymakers strive to grow or attract specific industries in order to promote local economic growth (Barkely and Henry, 2005).

Less well understood is whether regional industrial composition plays a role in the education premium for employment. Do regional industrial concentration and diversity moderate the effect of educational attainment on employment prospects; i.e., is the positive relationship between educational attainment and the likelihood of being employed stronger or weaker depending on the industrial concentration and/or industrial diversity of a city? In the current economic environment, it is important to understand not only how regional industrial composition affects overall employment prospects within a region, but also whether these regional characteristics play a role in the employment disparity between better educated and less educated workers. Understanding these, possibly contradictory, effects of industrial composition will help regional policymakers to craft economic development policies that benefit all residents.

In this paper, we examine whether the local economy's industrial composition affects the education premium for employment. We will answer four main questions. First, does residents' likelihood of being employed vary across metro and micro areas and what proportion of a resident's overall likelihood of being employed is contingent on where they live? Second, do the industry sector in which a metro or micro area is most concentrated (its primary industry concentration), the establishment size structure of the primary industry concentration, and the number of moderate to strong industry concentrations in a metro area (its industrial diversity) each affect the employment prospects for all residents in that metro or micro area? Third, does the effect of educational attainment on employment prospects vary across metro and micro areas? And fourth, do metro area industrial concentration and industrial diversity each moderate the positive effects of educational attainment on employment prospects? In addition to answering these main research questions, we

will provide descriptive analyses of the differences in social and economic characteristics, primary industry concentrations, and industrial diversity across metro areas. In this research, we confirm that a resident's likelihood of being employed does vary across metro and micro areas and that a local economy's primary industry concentration and industrial diversity each affect the resident's employment prospects. In addition, we find that the size of the education premium for employment also varies across local economies. Finally, this research shows that the local economy's industrial concentration and diversity moderate the effect of educational attainment on individuals' employment prospects.

## **Methodology**

This paper uses data from the 3-year, 2009-2011 American Community Survey (ACS). The ACS is the largest, nationally representative demographic survey in the United States, with an annual sample size of about 3 million addresses. The analysis sample includes 942 metro and micro areas in the United States, excluding Puerto Rican municipalities. Unlike the single year ACS data files, the 3-year ACS refers to the collection period 2009 through 2011, not a single reference day or year. The analysis sample includes the total civilian labor force, employed and unemployed, who are aged 25 years and over. In the ACS, an individual's employment status is asked for the week before the time the questionnaire is completed or the person is interviewed. Because ACS interviews in the three-year file were conducted over a 36-month period, the week of employment status does not refer to the same week for all individuals.<sup>3</sup> We restrict the analysis sample to people aged 25 years and older to capture only those members of the labor force who are most likely to have finished their education. We include women and men who are white alone, black or African American alone, Asian alone, and Hispanic or Latino<sup>4</sup>.

In this paper, our dependent variable is the log odds of a respondent being employed at the time of the survey. Because our primary research questions relate to the effect of local economy industrial composition on the education premium for employment, our primary independent variables focus on educational attainment and industrial composition. The first captures the effect of a respondent's education level using two categories: (1) less than a bachelor's degree and (2) bachelor's degree or higher level of education. Our reference category is less than a bachelor's degree. We measure local economy industrial composition in two main ways: primary industry concentration and industrial diversity. The second independent variable captures the effect of the metro or micro area's primary industry concentration. Primary industry concentration is defined as the industry sector for which the local economy has the largest location quotient value.<sup>5</sup> We measure primary industry concentration in six categories with the Manufacturing industry as the reference category. See Table 1 for a list of the six industry groups and the individual industries included in each group. We also include in the model a characteristic of the primary industry concentration, its establishment size structure. We measure the primary industry concentration's establishment size structure as the percent of the industry's establishments within the metro or micro area that are small establishments, i.e., having fewer than 500 employees.<sup>6</sup> The last primary independent variable captures the effect of the diversity of a metro or micro area's industrial composition. Industrial diversity is defined as the number of moderate to strong industry concentrations held by a local economy and is measured in four categories: (1) unspecialized - no moderate concentrations, (2) unipolar - one moderate concentration, (3) bipolar - two moderate concentrations, and (4) diverse - three or more moderate concentrations. We define a moderate concentration as an industry with a location quotient value of 1.25 or greater. The category denoting unipolar local economies is our reference category.

In addition to the primary independent variables, we employ several control variables to account for differences between individual respondents that affect their log odds of employment, such as race

and ethnicity, gender, and age. We likewise employ several control variables to account for differences between metro areas that affect residents' log odds of employment, such as the size of the civilian workforce, the labor force participation rate, the proportion of black and Hispanic residents, the proportion of residents with a bachelor's degree or higher level of education, the minimum wage for that metro area<sup>7</sup>, and the proportion of unionized workers.<sup>8</sup> Also, to the extent that better educated workers are more likely to relocate for work opportunities (Winters, 2010), the lower unemployment rates for some metro areas may be due to those metro areas attracting a more mobile, and presumably more advantaged population. To try to control for this possible connection, we include a measure of the proportion of home-owners in the metro or micro area. Finally, the 2009-2011 survey period covers the end of the recession (January – June, 2009) and the first years of the recovery (July, 2009 – December, 2011) (Theodossiou, 2012). To account for the effect of the business cycle on individuals' overall employment prospects, we include a measure of the Gross Domestic Product (GDP) for the state in which the resident lives.<sup>9</sup>

The paper uses a two-level logistic model wherein approximately 5,299,997 respondents are nested within the 942 metro and micro areas in the 2009-2011 ACS sample. The likelihood of a person being employed is allowed to vary randomly across metro and micro areas. The total variance in individuals' likelihood of being employed is composed of variance that is due to differences across individual workers and variance that is due to differences across metro and micro areas.

Additionally, we include a series of dummy variables to account for the amount of individual level variance that is due to the six different industry groups in which people work. Using this multilevel modeling approach, we explore the different effects of individual-level characteristics, such as education level, and metro area characteristics, such as industrial composition, on individuals' likelihood of being employed.

We quantify the proportion of total variance of log odds of being employed at each context level

and how much the likelihood of being employed varies across metro and micro areas. We investigate whether differences across local economies in their industrial composition (primary industry concentration, establishment size structure, and industrial diversity) affect all residents' likelihood of being employed and whether this effect remains even after controlling for other metro or micro area characteristics that may affect individuals' employment prospects. Additionally, we quantify any reduction in local economy level variance in the likelihood of being employed that is due to differences across metro or micro areas in their industrial composition.

Moreover, we confirm the difference in individuals' likelihood of being employed across different education levels and the continued, positive effect of education on individuals' likelihood of being employed even after controlling for other personal characteristics that affect employment.

Additionally, we investigate whether the effect of educational attainment varies across metro and micro areas. In order to gauge the effect of local economy industry composition on the education premium for employment, we use a series of cross-level interactions and propose that these interactions moderate the effect of educational attainment. We interact residents' education level with local economy primary industry concentration and separately with industry diversity. We hypothesize that primary industry concentration will moderate the size of the education premium for employment by decreasing the employment advantage for better educated individuals for some primary industry concentrations. In addition, we hypothesize that industry diversity will also moderate the education premium for employment by increasing the employment advantage for better educated individuals in bipolar or diverse local economies, but decreasing this employment advantage in unspecialized local economies.

## **Descriptive Results**

Our analysis includes a sample of metro and micro areas that vary substantially in terms of the demographic and economic characteristics that affect residents' likelihood of employment. The mean percent of residents who are black or Hispanic across metro and micro areas is 20%, but ranges from a low of 1% to a high of 98% (Table 2). The civilian labor force participation rate also varies substantially, from a low of 28% to a high of 81%, with a mean participation rate of 61%. In addition, local economies differed in how well they recovered from the Great Recession since June, 2009. The mean indexed gross domestic product measured at the state level is 109, with a low of 103 and a high of 126. Of particular interest to our research is that the percent of all residents with at least a bachelor's degree varies considerably across metro and micro areas. The mean for all local economies is 15%, with the most educated local economies having 47% of their population with at least a bachelor's degree and the least educated local economies having just 4% of their population as well educated.

Metro and micro areas also vary substantially with regard to their industry compositions. Manufacturing and Agriculture are the two most common primary industry concentrations for metro and micro areas (39% and 31% respectively) (Figure 1). Primary industry concentrations in Finance or Transportation are much less common among local economies (3% and 5% respectively). For most local economies, the primary industry is dominated by small establishments. Across metro and micro areas, the mean percentage of the primary industry's establishments with fewer than 500 employees is 99.0%, with a low of 89.7% and high of 100%. Most metro and micro areas (58%) are unipolar, i.e., the local economy has only one industry concentration that is at least moderately strong (Figure 2). Diverse local economies, those with three or more industry specializations, are much less common. However, a sizable percentage of metro and micro areas are unspecialized (14%); they have no industry concentrations that are at least moderately strong. Primary industry concentrations in Manufacturing, Agriculture, or Transportation occur in metro and micro areas with all types of industry diversity (Figure 3).



However, primary industry concentrations in Finance occur only in unspecialized or unipolar local economies, and concentrations in Education or Arts do not occur in diverse local economies at all and occur much less frequently in bipolar local economies. For metro and micro areas with concentrations in Manufacturing, Agriculture, or Transportation, the influence of this concentration on the local economy is more likely to be balanced by that of other industry concentrations. Appendix A lists the primary industry concentration and industry diversity for the 50 most populous metro areas in the United States.

### **Model One – Individual Characteristics**

The first model includes independent variables to capture the effects of individual characteristics, particularly the industry in which the individual last worked, on the person's likelihood of being employed. The mean probability of being employed for a typical resident across all local economies is 79.2%, with a statistically significant variance of 0.156 (Table 3). For 95% of the local economies in our sample, the mean probability of a typical resident's likelihood of being employed falls within the range of 63.7% to 89.2%. Using a pseudo intra-class correlation measure, we see that 4.5% of the total variance in a person's likelihood of being employed can be explained by characteristics of the metro or micro area in which he lives rather than his own characteristics. The likelihood ratio test for this model, with a value of 23321.50 for three degrees of freedom, shows that the two-level logistic model produces an improvement in fit over a simple logistic model.

The industry of a person's current or most recent job has significant and strong effects on her likelihood of being employed, even after accounting for other individual characteristics (Figure 4). All of the industry group dummy variables, except Agriculture, increase the likelihood of being

employed compared to Manufacturing, but by varying amounts. Having worked in the Finance industry group rather than Manufacturing increases a typical person's probability of being employed 8.0 percentage points, to 87.2%. On the high end, having worked in the Education industry group rather than Manufacturing increases the person's likelihood of being employed by 14.6 percentage points, to 93.8%. The other individual characteristics affect a person's likelihood of being employed in the expected ways. Being black, Latino, or female rather than white, non-Hispanic or male each significantly decreases a person's likelihood of being employed, with the largest negative effect for being black (a decrease of 54.4% in the odds of being employed). However, being Asian or being older each significantly, but slightly, increases a person's likelihood of being employed. The significant, negative effect for age squared suggests that the positive effect of older age on the likelihood of being employed decreases as age increases.

Educational attainment has one of the largest effects on a person's likelihood of being employed. Having a bachelor's degree or higher level of education increases a person's odds of being employed, *on average*, 96.4%, even after accounting for other individual characteristics and the industry in which the person works. As we can see, the effect of educational attainment has a small, but statistically significant, variance of 0.018. The effect of educational attainment on a person's likelihood of being employed varies across metro and micro areas. The mean probability of being employed across all metro and micro areas for an otherwise typical resident who has at least a bachelor's degree is 88.2%. For 95% of the local economies in our sample, the mean probability of being employed for this otherwise typical resident with at least a bachelor's degree falls within the range of 85.1% to 90.7%. From the significant, negative covariance estimate for educational attainment, we can see that in local economies where residents' have a high mean probability of being employed, the positive effect of educational attainment on the likelihood of being employed is weaker.

From this first model, we can answer our first research question. We know that where a person lives matters to his likelihood of being employed. The probability of being employed varies considerably across metro and micro areas. We also know that the industry in which a person last worked influences the person's likelihood of being employed. The importance of industry to the likelihood of being employed holds even after accounting for other individual characteristics that we know strongly affect employment, such as race, ethnicity, gender, and age. Finally, and importantly we can answer our third research question. From this model we learn that where a person lives affects the strength of the education premium for employment. In some metro and micro areas, particularly those where the mean probability of being employed is low, the positive effect of educational attainment on the likelihood of being employed is stronger. In the next two models, we will explore the ability of metro area economic and demographic characteristics and metro area industry composition to explain the variation in the likelihood of being employed across local economies.

### **Model Two – Local Economy Characteristics**

Many demographic and economic characteristics of the metro or micro area in which a person lives affects his likelihood of being employed, after accounting for personal characteristics (Table 3, model 2). Of the group of local economy demographic and economic characteristics, the civilian labor force participation rate and indexed gross domestic product have the largest, statistically significant effects on an individual's likelihood of being employed. Persons living in metro or micro areas with higher rates of labor force participation or that experienced larger gross domestic product growth since 2009 have greater likelihood of being employed. However, after accounting for personal characteristics, neither the percentage of Black and Hispanic residents nor the percentage of residents with at least a bachelor's degree has an effect on a person's likelihood of

being employed. Additionally, the count of the local area's civilian labor force has the smallest, statistically significant effect on a person's likelihood of being employed.

### **Model Three – Local Economy Industry Composition**

We found that the industry composition of the metro area (primary industry concentration and industry diversity) has significant effects on an individual's likelihood of being employed (Table 3, model 3). Living in a metro or micro area with a primary industry concentration in Agriculture, Transportation, or Education rather than Manufacturing increase a typical resident's likelihood of being employed, with the largest effect for local economies with a concentration in Agriculture (Figure 5). There were no significant effects for local economies with a primary industry concentration in Finance or Arts. Living in a bipolar metro or micro area (a local economy with two industry concentrations) rather than one industry concentration also increases a person's likelihood of being employed (Figure 6). However, living in an unspecialized metro or micro area (a local economy with no industry concentrations) decreases the likelihood of being employed. Surprisingly, we found that living in a metro or micro area with a diverse industrial composition has no significant effect on a typical resident's likelihood of being employed. These two characteristics of the local economy's industry composition also help explain the variance in the typical resident's likelihood of being employed across metro and micro areas. After accounting for the local economy's demographic and economic characteristics, the variance of the constant decreases 20.5%, from 0.156 to 0.124. After accounting for the local economy's industry composition, the variance of the constant decreases 25.9% in total, to 0.116. Interestingly, we find that residents living in local economies whose primary industry is composed more of small establishments, after accounting for the other aspects of local economy industrial composition, have a lower likelihood of being employed.

We now have some answers with regard to our second research question. The industry composition of the metro or micro area in which a person resides (its primary industry concentration and industrial diversity) has substantial effects on her likelihood of being employed. In addition, differences in local economies' industry composition help explain some of the variation in the likelihood of being employed across metro and micro areas. In the last model, we explore whether the local economy's industry composition moderates the effect of educational attainment on the likelihood of being employed.

#### **Model Four – Local Economy Industry Composition and Individual Education Interactions**

The local economy's industry composition does moderate the effect of educational attainment on a person's likelihood of being employed (Table 3, model 4). Living in a metro or micro area where the primary industry concentration is Agriculture or Arts rather than Manufacturing decreases the positive effect of educational attainment on a person's likelihood of being employed (Table 3, model 4). The largest decrease due to the interaction effect of primary industry concentration is for Agriculture (Figure 7). Local economy primary industry concentrations in Transportation, Finance, or Education do not have significant interaction effects with educational attainment. However, the predicted probability of being employed for a typical resident without a bachelor's degree in metro or micro areas with one of these three primary industry concentrations is considerably higher than in local areas with a concentration in Manufacturing. Because of this, the difference in predicted probabilities of being employed for college and non-college educated residents is still smaller in metro or micro areas with industry concentrations in Transportation, Finance, or Education. Surprisingly, none of the local economy industrial diversities (unspecialized, bipolar, or diverse) has a significant interaction effect with educational attainment. However, the predicted probability of

being employed for a typical resident without a bachelor's degree in local areas with bipolar industry diversity is higher than in unipolar local areas (Figure 8). Because of this, the difference in predicted probabilities of being employed for college and non-college educated residents is still smaller in local areas with bipolar industry diversity compared with unipolar local areas. Finally, even though most of the interaction effects for primary industry concentration and industrial diversity are not statistically significant, adding these interactions to the model does help explain why the effect for educational attainment varies across metro and micro areas. The variance for educational attainment decreases in model four from 0.019 to 0.017 (Table 3, model 4).

## **Discussion**

Understanding the importance of industrial composition to local economies, many regional policymakers strive to grow or attract specific industries in order to promote local economic growth (Barkely and Henry, 2005). This research shows the strong influence of primary industry concentration and industrial diversity on the overall employment prospects for metro and micro areas. Regions that attract or grow concentrations in the Agriculture, Transportation, or Education industry groups rather than Manufacturing can look forward to improved overall employment prospects for their residents. Likewise, metro and micro areas that develop two moderate industry concentrations can expect better overall employment prospects for their residents compared to regions that have only one industry concentration or are unspecialized.

However, better-educated workers consistently enjoy a substantial employment advantage over less educated workers and there is evidence to suggest that this education premium for employment differs in strength across regions (Krolick, 2004). For these reasons, it is important to know whether regional industrial composition affects, not only the overall employment prospects for a

metro or micro area's residents, but also the differing employment prospects for better and less educated workers. In this research, we have confirmed that the size of the effect of educational attainment on employment prospects does vary across metro and micro areas. The study also shows that local economy industry composition does moderate the strength of the effect of educational attainment on employment prospects. The same metro and micro areas that attract or grow a concentration in Agriculture rather than Manufacturing can expect to see both an improvement in the overall employment prospects for their residents *and* a decrease in the employment disparity between better and less educated workers. Surprisingly, metro and micro areas that focus on growing a concentration in Arts rather than Manufacturing should not expect to see an improvement in the overall employment prospects for its residents, *but* can expect to see a large decrease in the education premium for employment. Additionally, even in cases where industrial composition does not decrease the strength of the educational attainment effect directly, it can increase the likelihood of being employed for less educated residents so much that the overall difference in likelihood of being employed across education levels is decreased. These effects of regional industrial composition on employment show that industrial development policies can have both beneficial and negative consequences for regional employment prospects because the policies may simultaneously affect various aspects of regional employment. For these reasons, policymakers should consider the effects of different types of industrial development on not just overall regional employment prospects but also other aspects of regional employment, such as the employment advantage for better-educated workers.

## References

- Allegretto, S. and Lynch, D. 2010. "The Composition of the Unemployed and Long-Term Unemployed in Tough Labor Markets" *Monthly Labor Review*. 133(10).
- Barkley, D.L., and M.S. Henry. 2005. "Targeting Industry Clusters for Regional Economic Development: An Overview of the REDRL Approach". Regional Economic Development Research Laboratory. Research Report 01-2005-03. Available at: [http://cherokee.agecon.clemson.edu/redrl\\_rpt15.pdf](http://cherokee.agecon.clemson.edu/redrl_rpt15.pdf).
- Cheeseman-Day, J. and Newburger, E.C. 2002. "The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings," *Current Populations Reports* P23–210 (U. S. Census Bureau).
- Dalton, S., Friesenhahn, E., Spletzer, J., and Talan, D. 2011. "Employment Growth by Class Size: Firm and Establishment Data". *Monthly Labor Review*. 134(12).
- Drucker, J. 2009. "Trends in Regional Industrial Concentration in the United States". Center Economic Studies working paper, CES09-06. Available at: [www.ces.census.gov](http://www.ces.census.gov)
- Elhorst, J.P. 1995. "Unemployment Disparities between Regions in the European Union" in Armstrong H.W. and Vickerman R.W. (eds.) *Convergence and Divergence among European Unions*. Pion: London
- Elhorst, J.P. 2003. "The Mystery of Regional Unemployment Differentials; A Survey of Theoretical and Empirical Explanations". *Journal of Economic Surveys* 17(5).
- Izreali, O. and Murphy, K. J. 2003. "The Effect of Industrial Diversity on State Unemployment Rate and Per Capita Income". *The Annals of Regional Science*. 37:1-14.
- Krolik, T.J. 2004. "Educational Attainment of the Labor Force and Jobless Rates, 2003". *Monthly Labor Review*. 127(7).
- Layne, C. 2012. "Metro Area Industry Composition and Employment Prospects for Workers of Varying Skill Levels". Presented at Association of Public Policy Analysis and Management Fall 2012 Research Conference. Available at: <http://www.census.gov/people/io/files/Metro%20Area%20Industry%20Composition%20and%20Employment%20Layne.pdf>
- Olson, C. A. 1995. "Health Benefits Coverage Among Male Workers" *Monthly Labor Review*. 118(3).
- Owyang, M.T., Piger, J.M., Wall, H.J., and Wheeler, C.H. 2006. "The Economic Performance of Cities: A Markov-Switching Approach" Federal Reserve Bank of St. Louis working paper, 2006-056C. Available at: [www.research.stlouisfed.org/wp/2006/2006-056.pdf](http://www.research.stlouisfed.org/wp/2006/2006-056.pdf)
- Theodossiou, E and S. F. Hipple. 2010. "Unemployment Remains High in 2010" *Monthly Labor Review*. 134(3).
- U.S. Census Bureau. 2011. "American Community Survey: Multiyear Accuracy of the Data (2009-2011 ACS 3-year and 2007-2011 ACS 5-year)". Available at: [http://www.census.gov/acs/www/Downloads/data\\_documentation/Accuracy/MultiyearACS\\_AccuracyofData2011.pdf](http://www.census.gov/acs/www/Downloads/data_documentation/Accuracy/MultiyearACS_AccuracyofData2011.pdf)
- Winters, J.V. 2010. "Human Capital Externalities and Employment Differences Across Metropolitan Areas of the U.S." MPRA Paper No. 22434. Available at: [www.mpra.ub.uni-muenchen.de/22434](http://www.mpra.ub.uni-muenchen.de/22434)



**Table 1: Industry Groups**

<b>Industry Groups</b>	<b>Census Industry Codes</b>	<b>NAICS Industry Sectors</b>
Manufacturing	1070-3990	31-33
Agriculture, forestry, fishing, and hunting, and mining; Construction	0170-0490; 0770	11 and 21; 23
Wholesale trade; Transportation and warehousing and utilities	0570-0690; 4070-4590, 6070-6390	42; 48-49 and 22
Information; Finance and insurance, and real estate, and rental and leasing; Professional, scientific, and management, and administrative, and waste management services	6470-6780; 6870-7190; 7270-7790	51; 52-53; 54-56
Educational services, and health care and social assistance; Public administration	7860-8470; 9370-9590	61-62; 92
Retail trade; Arts, entertainment, and recreation, and accommodation and food services; Other services, except public administration	4670-5790; 8560-8690; 8770-9290	44-45; 71-72; 81

**Table 2: Metro Area Demographic and Economic Characteristics**

Universe: all residents in metro area, except where otherwise stated

<b>Characteristics</b>	<b>Number of Areas</b>	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Standard Deviation</b>
Percent who are Black or African American or Hispanic or Latino*	942	20.2	1.2	98.4	18.2
Civilian labor force percent (metro area civilian residents age 16 years or older)*	942	61.4	27.7	81.3	6.3
Percent with a Bachelor's degree or higher education (all metro area residents)*	942	14.7	4.0	46.6	5.6
Percent who are Home owners*	942	59.0	26.5	75.9	6.8
Civilian labor force (metro area civilian residents age 16 years or older)*	942	156,444	4,862	9,820,472	540,159
Percent of primary industry's establishments that are small sized	939	99.0	89.7	100.0	1.5
Percent who are covered by a union (employed state residents)	50	12.2	4.1	26.1	5.4
Minimum wage (state)	50	6.4	0.0	8.7	2.4
Gross domestic product index (state)	50	108.6	102.8	126.0	4.2

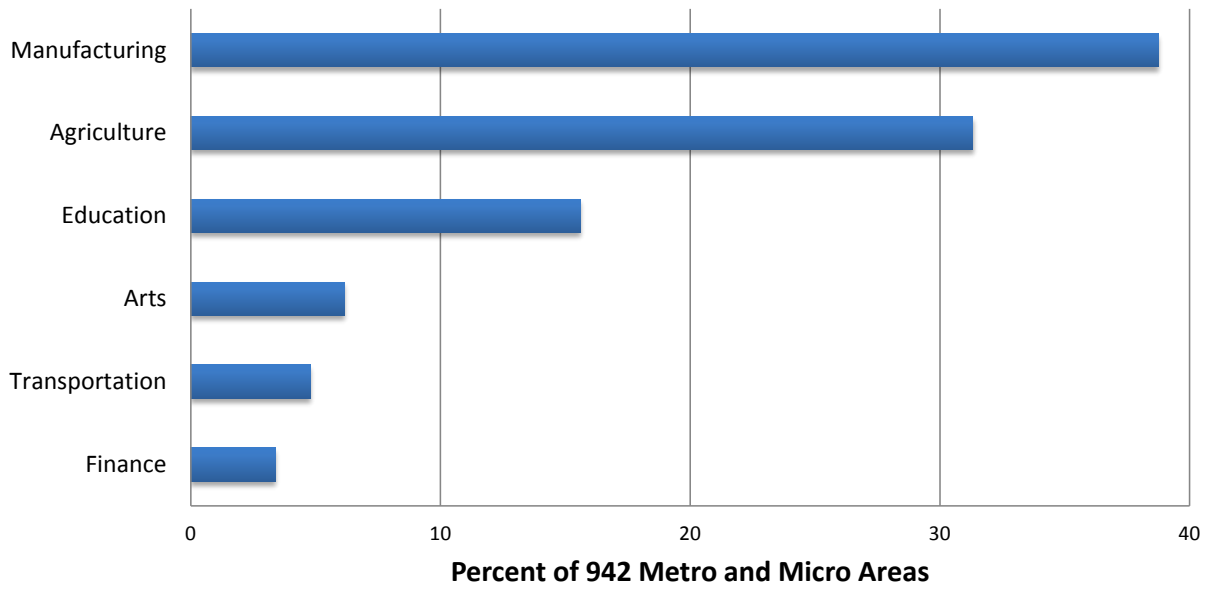
\* Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Table 3: Model Results for Log Odds of Being Employed**

	Model 1	Model 2	Model 3	Model 4
	Coefficient	Coefficient	Coefficient	Coefficient
<b>Industry of Most Recent Job</b>				
Agriculture	-0.001	1.85E-04	-0.001	-0.001
Transportation	0.873 ***	0.873 ***	0.873 ***	0.872 ***
Finance	0.584 ***	0.584 ***	0.583 ***	0.583 ***
Education	1.384 ***	1.384 ***	1.384 ***	1.384 ***
Arts	0.654 ***	0.654 ***	0.653 ***	0.653 ***
<b>Individual Characteristics</b>				
Bachelor's Degree or Higher	0.675 ***	0.666 ***	0.667 ***	0.698 ***
Black	-0.786 ***	-0.785 ***	-0.785 ***	-0.785 ***
Hispanic	-0.122 ***	-0.121 ***	-0.122 ***	-0.122 ***
Asian	0.017 *	0.018 *	0.017 *	0.017 *
Female	-0.156 ***	-0.156 ***	-0.156 ***	-0.156 ***
Age	0.011 ***	0.011 ***	0.011 ***	0.011 ***
Age Squared	-4.47E-04 ***	-4.47E-04 ***	-4.47E-04 ***	-4.47E-04 ***
<b>Local Economy Characteristics</b>				
Percent Black and Hispanic Residents in Local Area		-0.001	-0.002 ***	-0.002 ***
Civilian Labor Force Participation Rate in Local Area		0.026 ***	0.027 ***	0.027 ***
Percent of Residents with Bachelor's Degree or Higher in Local Area		-0.003	-0.003	-0.003
Percent of Workers Covered by a Union in Local Area		-0.005 ***	-0.005 ***	-0.005 ***
Minimum Wage in Local Area		-0.014 ***	-0.015 ***	-0.015 ***
Percent Home Owners in Local Area		0.006 **	0.007 ***	0.007 ***
Civilian Labor Force in Local Area		-9.41E-08 ***	-6.07E-08 **	-6.17E-08 **
Indexed Gross Domestic Product in Local Area		0.020 ***	0.019 ***	0.019 ***
Percent Small Business in Primary Industry Concentration			-0.046 ***	-0.047 ***
<b>Local Economy Primary Industry Concentration</b>				
Agriculture			0.224 ***	0.312 ***
Transportation			0.122 **	0.152 *
Finance			0.115	0.182 *
Education			0.219 ***	0.228 ***
Arts			-0.002	0.159 *
<b>Local Economy Industry Diversity</b>				
Unspecialized Local Area			-0.059 *	-0.062
Bipolar Local Area			0.095 ***	0.105 **
Diverse Local Area			0.113	-0.065
<b>Local Economy Industry Composition and Individual Education Interaction</b>				
Agriculture Industry Concentration				-0.070 **
Transportation Industry Concentration				-0.024
Finance Industry Concentration				-0.046
Education Industry Concentration				-0.007
Arts Industry Concentration				-0.118 **
Unspecialized Local Area				0.003
Bipolar Local Area				-0.008
Diverse Local Area				0.154
<b>Constant</b>	1.335 ***	1.125 ***	0.979 ***	0.939 ***
	<b>Estimate</b>	<b>Estimate</b>	<b>Estimate</b>	<b>Estimate</b>
Variance of Constant	0.156	0.124	0.116	0.115
Psuedo ICC Level 2	4.53%	3.63%	3.40%	3.38%
Proportionate Reduction in Constant Variance		20.51%	25.89%	26.28%
<b>Variance of Bachelor's Degree or Higher</b>	0.018	0.018	0.019	0.017
<b>Covariance of Constant and Bachelor's Degree or Higher</b>	-0.024	-0.031	-0.032	-0.031

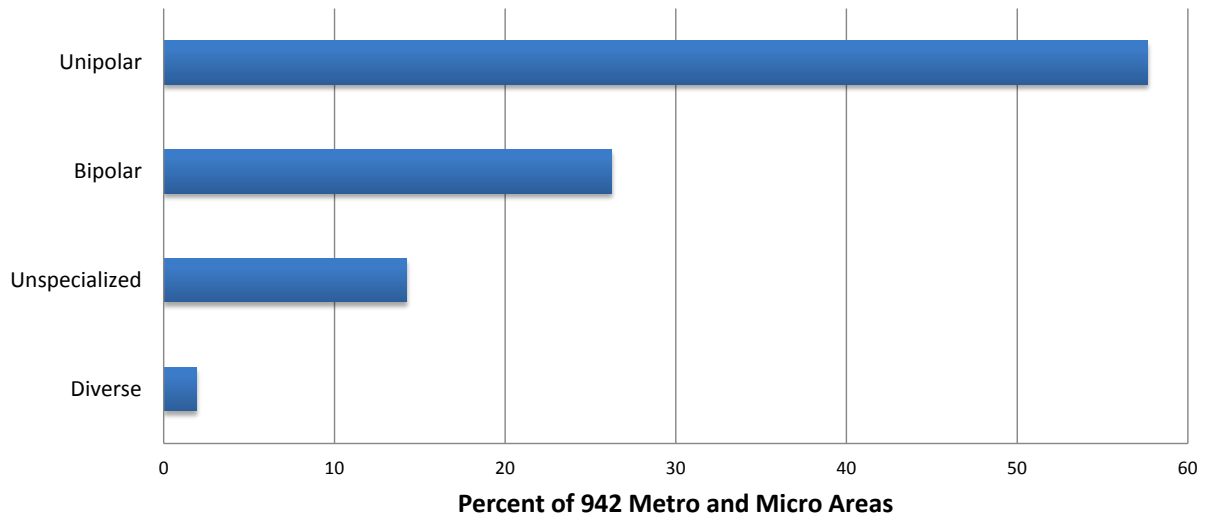
\*\*\* p-value < 0.001, \*\* p-value < 0.01, \* p-value < 0.05

**Figure 1: Primary Industry Concentration**



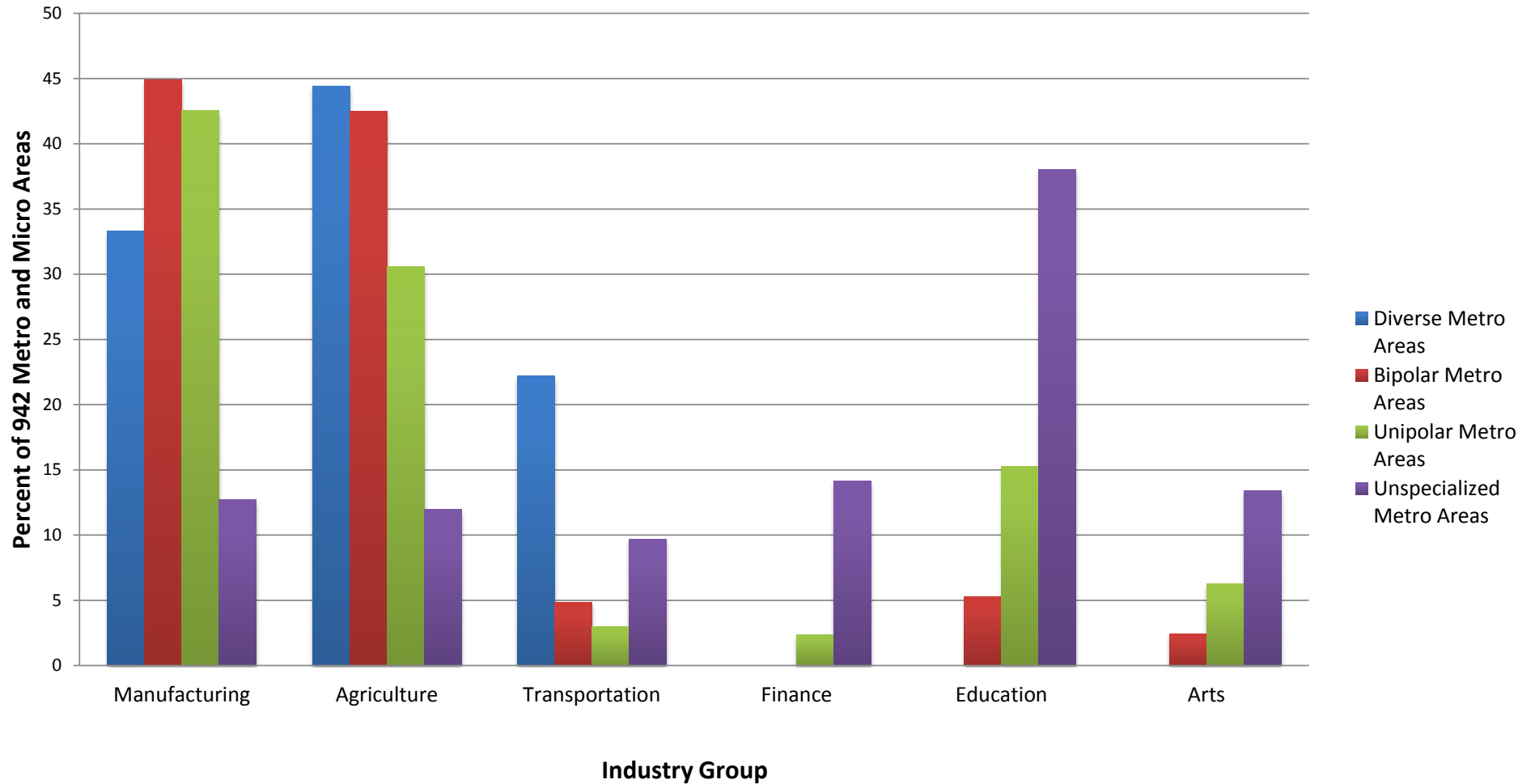
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 2: Industry Diversity**



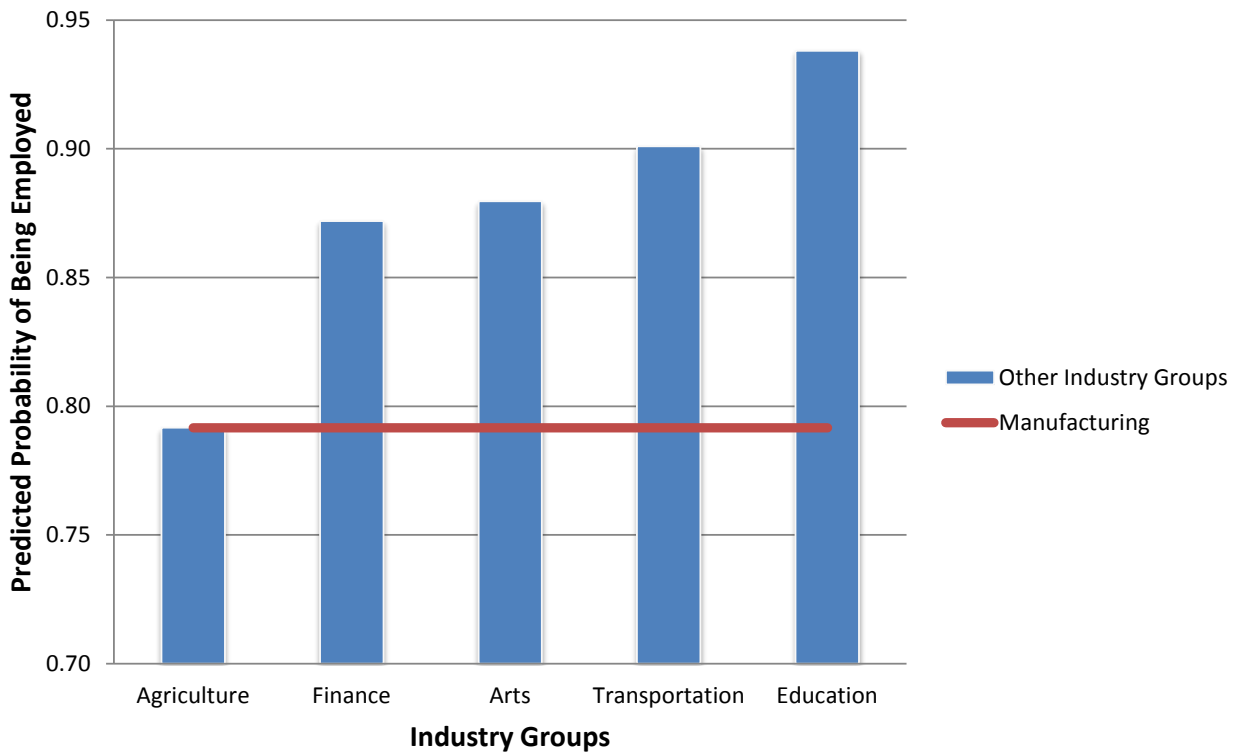
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 3: Distribution of Primary Industries for Unspecialized, Diverse, Bipolar, and Unipolar Metro and Micro Areas**



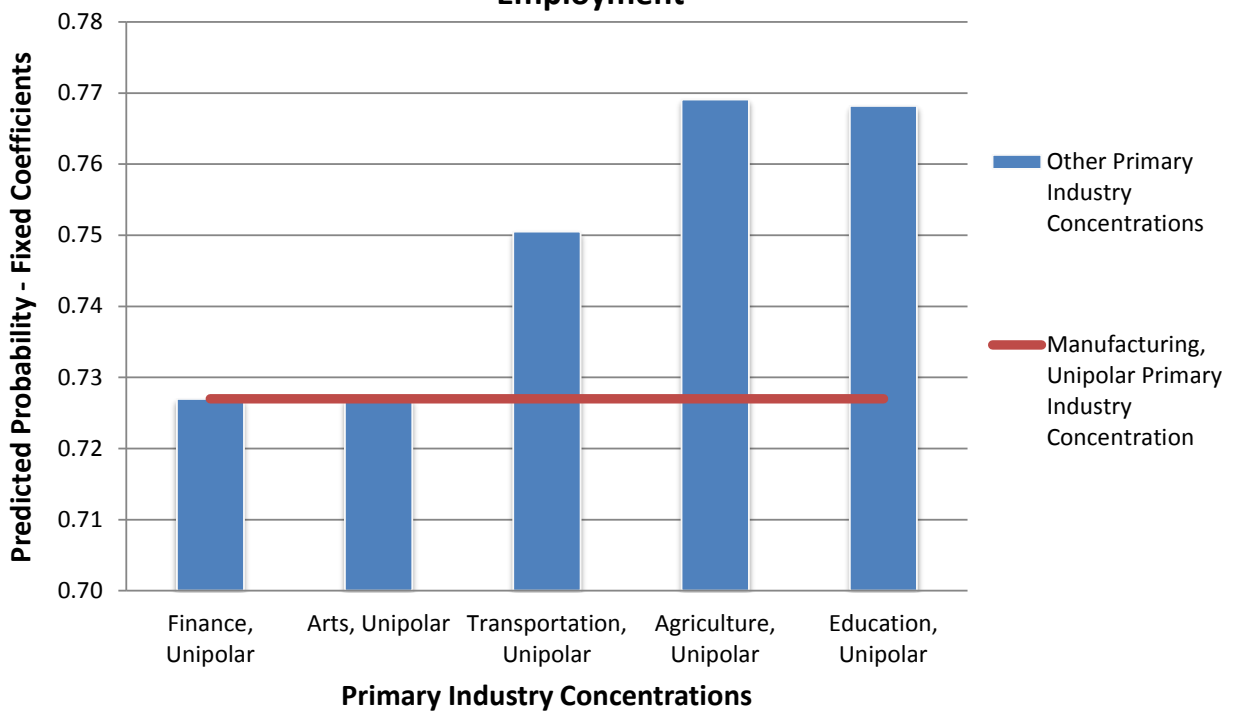
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 4: Effect of Individual Industry on Employment**



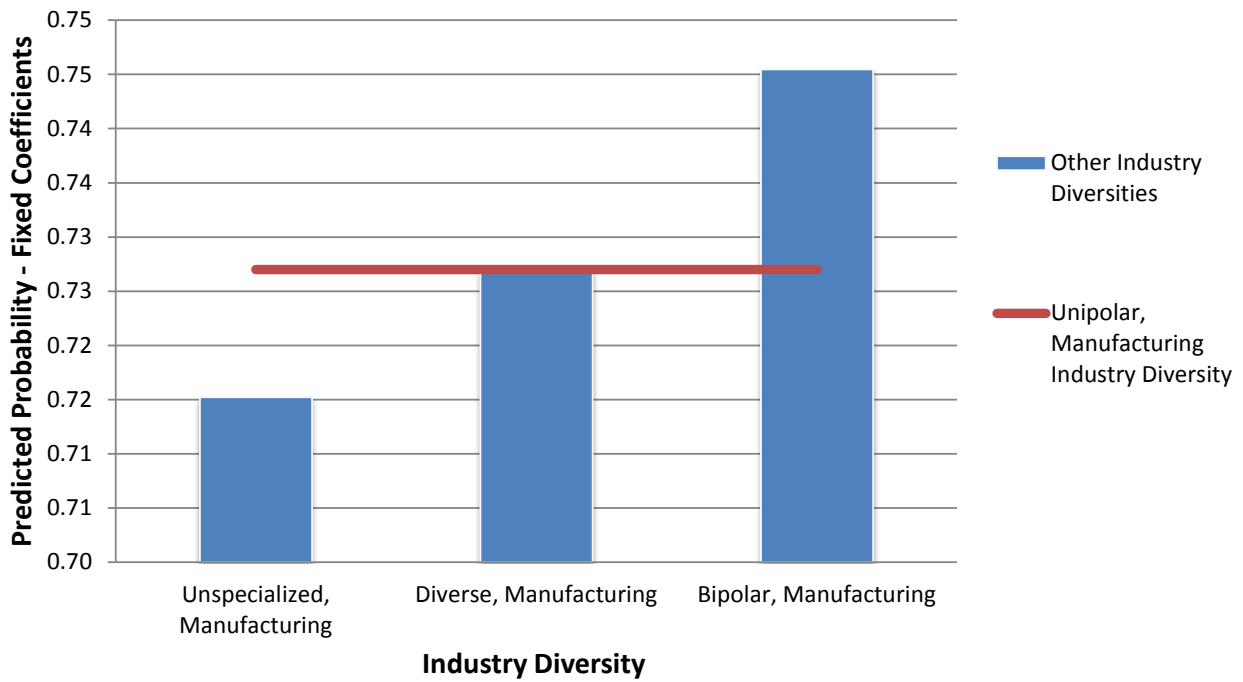
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 5: Effect of Local Area Primary Industry Concentration on Employment**



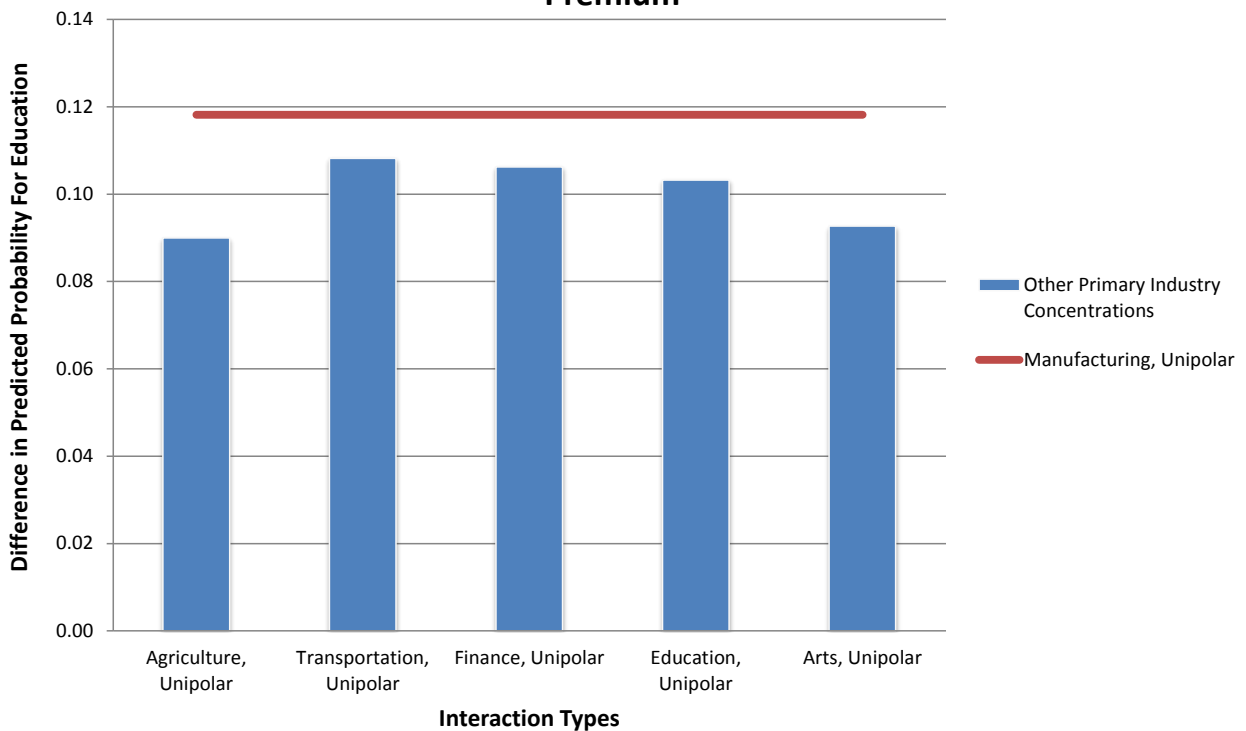
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 6: Effect of Local Area Industry Diversity on Employment**



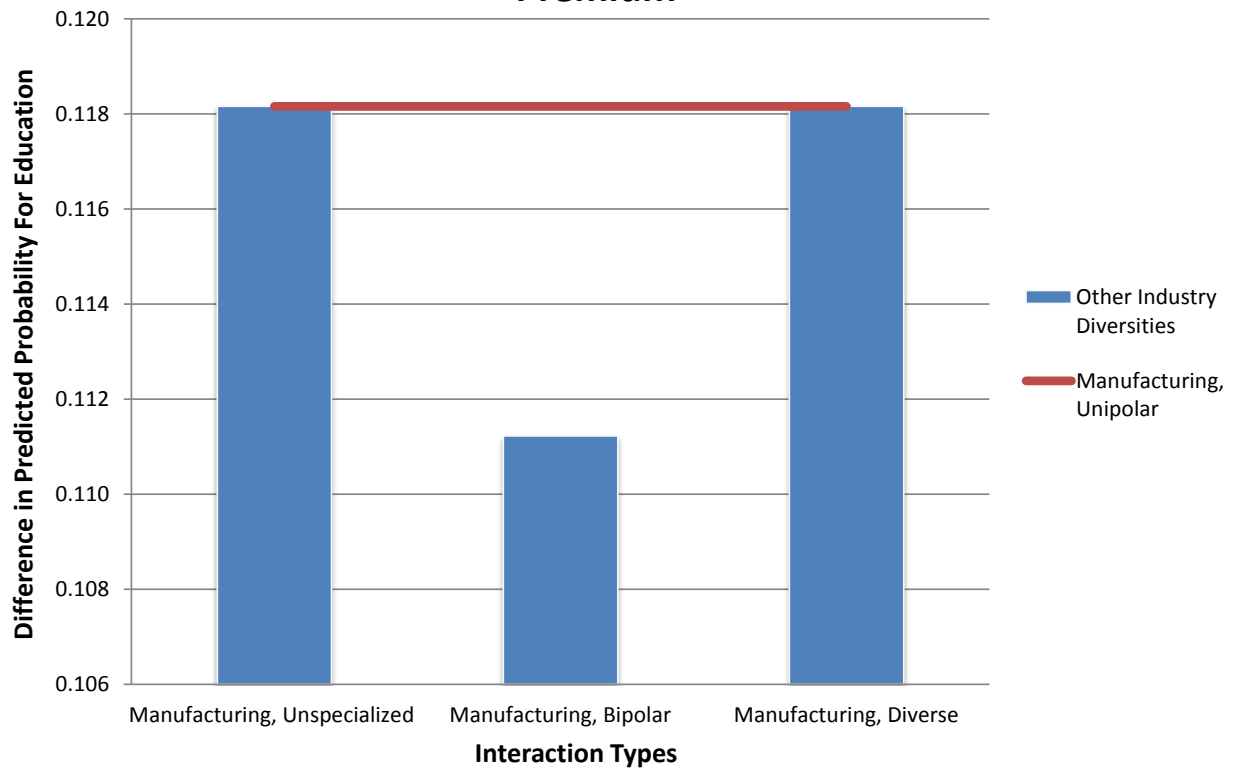
Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 7: Effect of Primary Industry Concentration on the Education Premium**



Source: U.S. Census Bureau, American Community Survey, 2009 - 2011

**Figure 8: Effect of Industry Diversity on the Education Premium**



Source: U.S. Census Bureau, American Community Survey, 2009 - 2011



## Appendix A: Industry Diversity and Industry Concentration for 50 Most Populous Metro Areas

Source: U.S. Census Bureau, American Community Survey, 2009-2011

Metro Area	Industry Diversity	Primary Industry Concentration Value	Primary Industry Concentration
Los Angeles-Long Beach-Santa Ana, CA	Unspecialized	1.20	Information, Finance, and Professional Services
New York-Northern New Jersey-Long Island, NY-NJ-PA	Unipolar	1.31	Information, Finance, and Professional Services
Chicago-Joliet-Naperville, IL-IN-WI	Unspecialized	1.20	Manufacturing
Dallas-Fort Worth-Arlington, TX	Unspecialized	1.23	Information, Finance, and Professional Services
Houston-Sugar Land-Baytown, TX	Bipolar	1.48	Agriculture, Mining, and Construction
Detroit-Warren-Livonia, MI	Unipolar	1.62	Manufacturing
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	Unspecialized	1.16	Information, Finance, and Professional Services
Minneapolis-St. Paul-Bloomington, MN-WI	Unipolar	1.27	Manufacturing
Atlanta-Sandy Springs-Marietta, GA	Unipolar	1.30	Wholesale Trade, Transportation, and Utilities
Boston-Cambridge-Quincy, MA-NH	Unipolar	1.30	Information, Finance, and Professional Services
Seattle-Tacoma-Bellevue, WA	Unspecialized	1.20	Information, Finance, and Professional Services
San Francisco-Oakland-Fremont, CA	Unipolar	1.46	Information, Finance, and Professional Services
San Jose-Sunnyvale-Santa Clara, CA	Bipolar	1.84	Manufacturing
Riverside-San Bernardino-Ontario, CA	Unipolar	1.29	Wholesale Trade, Transportation, and Utilities
Phoenix-Mesa-Glendale, AZ	Unspecialized	1.22	Information, Finance, and Professional Services
St. Louis, MO-IL	Unspecialized	1.07	Information, Finance, and Professional Services
Cincinnati-Middletown, OH-KY-IN	Unipolar	1.37	Manufacturing
Cleveland-Elyria-Mentor, OH	Unipolar	1.38	Manufacturing
Portland-Vancouver-Hillsboro, OR-WA	Unspecialized	1.22	Manufacturing
San Diego-Carlsbad-San Marcos, CA	Unspecialized	1.21	Information, Finance, and Professional Services
Miami-Fort Lauderdale-Pompano Beach, FL	Unspecialized	1.24	Wholesale Trade, Transportation, and Utilities
Milwaukee-Waukesha-West Allis, WI	Unipolar	1.55	Manufacturing
Pittsburgh, PA	Unspecialized	1.10	Wholesale Trade, Transportation, and Utilities
Indianapolis-Carmel, IN	Unspecialized	1.20	Manufacturing
Kansas City, MO-KS	Unspecialized	1.18	Information, Finance, and Professional Services
Washington-Arlington-Alexandria, DC-VA-MD-WV	Unipolar	1.53	Information, Finance, and Professional Services
Charlotte-Gastonia-Rock Hill, NC-SC	Unspecialized	1.25	Information, Finance, and Professional Services
Denver-Aurora-Broomfield, CO	Unipolar	1.38	Information, Finance, and Professional Services
Providence-New Bedford-Fall River, RI-MA	Unspecialized	1.10	Education, Healthcare, and Public Administration
Baltimore-Towson, MD	Unspecialized	1.24	Education, Healthcare, and Public Administration
Columbus, OH	Unspecialized	1.19	Information, Finance, and Professional Services
Austin-Round Rock-San Marcos, TX	Unspecialized	1.18	Information, Finance, and Professional Services
Louisville/Jefferson County, KY-IN	Unipolar	1.34	Wholesale Trade, Transportation, and Utilities
Tampa-St. Petersburg-Clearwater, FL	Unipolar	1.27	Information, Finance, and Professional Services
Nashville-Davidson—Murfreesboro—Franklin, TN	Unspecialized	1.06	Arts, Entertainment, and Other Services
Rochester, NY	Unipolar	1.33	Manufacturing
Hartford-West Hartford-East Hartford, CT	Unspecialized	1.21	Information, Finance, and Professional Services
Virginia Beach-Norfolk-Newport News, VA-NC	Unspecialized	1.12	Education, Healthcare, and Public Administration
San Juan-Caguas-Guaynabo, PR	Unspecialized	1.15	Education, Healthcare, and Public Administration
Grand Rapids-Wyoming, MI	Unipolar	1.78	Manufacturing
San Antonio-New Braunfels, TX	Unspecialized	1.10	Agriculture, Mining, and Construction
Wichita, KS	Unipolar	1.94	Manufacturing
Salt Lake City, UT	Unspecialized	1.17	Wholesale Trade, Transportation, and Utilities
Buffalo-Niagara Falls, NY	Unspecialized	1.16	Education, Healthcare, and Public Administration
Worcester, MA	Unipolar	1.39	Manufacturing
Allentown-Bethlehem-Easton, PA-NJ	Unipolar	1.39	Manufacturing
Tulsa, OK	Unspecialized	1.20	Manufacturing
Raleigh-Cary, NC	Unipolar	1.32	Information, Finance, and Professional Services
Sacramento—Arden-Arcade—Roseville, CA	Unspecialized	1.19	Education, Healthcare, and Public Administration
Akron, OH	Unipolar	1.56	Manufacturing

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<sup>1</sup> Historical data on employment and unemployment rates by educational attainment can be found at the Bureau of Labor Statistics: <http://www.bls.gov/webapps/legacy/cpsatab4.htm>

<sup>2</sup> Recent data on employment and unemployment rates by educational attainment can be found at the Bureau of Labor Statistics: <http://www.bls.gov/news.release/empsit.t04.htm>

<sup>3</sup> Official estimates of national, state, and local employment and unemployment rates are produced by the Bureau of Labor Statistics.

<sup>4</sup> In this analysis, “alone” means the person reported only one race. Each of the “alone” race groups do not include persons who identify as Hispanic or Latino. The Hispanic or Latino ethnic group includes people of any race who identify as Hispanic or Latino.

<sup>5</sup> Location quotients measure the level of concentration of an industry within a metro or micro area by comparing the share of that local area’s total workforce that is employed in that industry to the share of the nation’s total workforce that is employed in that industry. A metro or micro area with a location quotient greater than 1.0 for a particular industry is understood to have a concentration in that industry. For more information on location quotients see: Blakely, E. J., and N. Green Leigh. 2010. Planning Local Economic Development: Theory and Practice (4th ed.). Thousand Oaks: Sage.

<sup>6</sup> For most specific manufacturing industries, the Small Business Administration defines the size limit for small businesses as fewer than 500 employees. For more information on the definition for small businesses see: <http://sba.gov/size>

<sup>7</sup> The minimum wage rate is for the state where the resident resides. Minimum wage data are collected from the Wage and Hour Division of the Department of Labor.

<sup>8</sup> The proportion of workers covered by a union is for the state where the resident resides and is collected from the Current Population Survey.

<sup>9</sup> The state level GDP data is measured for 2009 to 2011 using index values and collected from the Bureau of Economic Analysis.

The index value compares a region’s GDP in one time period (2011) to the GDP at a base time period (2009) to provide an accessible measure of GDP change over time.