Employment Growth and Income Inequality: Accounting for Spatial and Sectoral Differences

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Abstract:
This paper revisits the inequality-growth relationship accounting for sectoral differences and focusing on US counties. For 8 two-digit industries of the NAICS classification, we estimated a conditional growth model where employment growth depends on regional income inequality and a number of control variables. Spatial econometrics techniques are used to account for spatial dependence. Results indicate that there is no association between employment growth and family income inequality for the Agriculture, Forestry, Fishing and Hunting sector and the Real Estate, Rental and Leasing sector. However, income inequality consistently shows a negative impact on employment growth in the construction sector, and results are mixed for other sectors such as: Manufacturing; Retail Trade; Professional Scientific and Technical Services; Accommodation and Food Services; Educational Services. In several sectors, mixed results were obtained when differentiation is made between urban and rural samples.

Keywords: employment growth, inequality, spatial dependence
JEL Classification: R0, R11, O15, D30

1. Introduction

The goal of this research is to investigate the relationship between employment growth and income inequality, while accounting for sectoral differences at the U.S. county level. There are several reasons to suspect that a sectorally disaggregated analysis might shed some additional light on the relationship between income inequality and employment growth. Indeed, the sectoral composition of regional workforce plays a crucial role in the performance of regional economies (see Howell and Wolff, 1991; Mangan and Trendle, 2002). In particular, the composition of the regional workforce in terms of skills types has important implications for its employment growth.

Commonly in the literature, the effect of workforce composition is captured by indirect measures such as education attainment or earnings. However, the use of educational attainment to account for the composition of a labor force may be misleading because of problems such as variations in the quality of schooling over time and across regions. Earnings are not an accurate proxy either. For instance, Berg (1970) provided empirical evidence that salaries are not necessarily closely related to education, and educational attainment of workers may not necessarily correspond to the skill requirement of their jobs. Some jobs require relatively short education but are highly paid, while others require several years of schooling but pay less.

It is likely that the effective provision of the workforce composition goes beyond educational attainment and earnings, and could be captured in terms of regional income inequality. Indeed, regional economies are characterized by different levels of skill diversity and this translates into income inequality. Economies dominated by low skills sectors are likely to have low income inequality because workers are getting paid similar wages. The same applies for economies dominated by high skill sectors. However, economies that are highly diversified in terms of type of skills may exhibit high inequality. Changes in the composition of the labor force will be mostly reflected in terms of income inequality level. Indeed, Howell and Wolff (1991) empirically show evidence that changes in occupational pattern result in decreasing inequality in cognitive skills and earnings. Also, Schweitzer (1997) shows that a larger portion of the variation in earnings is associated with the changing composition of the workforce, rather than with changing returns to human capital investments. Income inequality and sectoral employment growth are therefore potentially related through the labor force composition.

Apart from income inequality, localization and urbanization externalities may also determine sectoral performance in various different ways. As far as localization externalities are concerned, the concentration of industries can create agglomeration economies in different forms. Industrial concentration allows knowledge spillovers across firms and regions and thereby promotes growth (see Marshal, 1890; Arrow, 1962; Romer 1986). McCann (2001) addresses these effects in the following three points: (1) within a context of industrial concentration, tacit information is more accessible to clustered firms than if they were spatially dispersed; (2) industrial concentration creates a pool of local skilled labor which could constitute significant labor cost reduction for firms; (3) local inputs are more efficiently allocated as their costs are spread across firms. With regard to urbanization externalities, Jacobs (1969) stipulates that industrial diversity in cities is conducive to growth because it allows a more dynamic exchange of innovative ideas. The diversity of firms stimulates competition and forces them to innovate. Firms located in a diversified environment could benefit from economies of scale and experience higher productivity.

In addition to the agglomeration economies created through localization and urbanization externalities, spatial dependence might play a role in the inequality-growth relationship, as well. Indeed, several studies have shown evidence of a spatial dimension to growth through spillover effects of technology or human capital (Rey and Montouri, 1999; Parent and Riou, 2005; Ertur and Koch, 2007; Novotny, 2007). Growth in a specific region may impact the pace of growth of its neighbors and vice versa, through spillover and feedback effects. Similarly, it is likely that regions with similar inequality rates might be spatially clustered and exhibit spatial dependence. Novotny (2007) has shown evidence of spatial dimensions in inequality of countries across the world. At the regional level, Rey (2001) also observed evidence of spatial dependence in income inequality using US data.

This research revisits the inequality-growth relationship, accounting for sectoral composition, agglomeration economies and also for the role of space. Unlike previous studies, we consider a relatively low level of spatial aggregation (counties) and consider disaggregated industries at the 2 digit level. We construct a model where regional employment growth depends on the initial level of employment, initial income inequality, and on variables capturing agglomeration economies, specifically localization, urbanization, competition and diversity with some control variables. We use U.S. county level data from 1990 to 2008 and consider 8 two-digit sectors from the NAICS classification.

The rest of the paper is organized as follow. The next section reviews the literature on inequality and growth. Section 3 describes the empirical application and estimation procedures. Results are presented in section 4, and section 5 concludes the paper.

2. The inequality-growth debate

The debate on the inequality-growth link started with Kuznets (1955) who postulated that per capita incomes and inequality have an inverted U-shaped relationship. After this path-breaking work, an avalanche of studies has investigated the relationship between income inequality and economic growth. Two conflicting findings appear. Some studies claim a negative relationship between economic growth and inequality (Alesina and Rodrik, 1994; Person and Tabellini, 1994; Clarke, 1995; Deininger and Squire, 1998) while others support the conclusion that inequality is not harmful to economic growth (Li and Zou, 1998; Forbes, 2000; Bell and Freeman, 2001; Siebert, 1998).

Aghion et al. (1999) summarize the theories which advocate for a positive link in three main points. First, more unequal economies tend to grow faster than economies characterized by a more equitable income distribution since the rich have a higher marginal propensity to save than do the poor. Their second point is about the indivisibility of investment. Indeed, due to large sunk costs required for setting up new industries or implementing new ideas, it is more efficient that wealth be concentrated in the hands of few people (individuals or a family for example). Third, providing incentives to workers will reduce differences in income and favors redistribution, but doing so lowers the rate of growth because of the trade-off between equity and efficiency. Indeed, when workers are rewarded with a constant wage independent of their output performance, they may not invest additional effort, and this may jeopardize the efficiency of the production system.

With regard to the theories which support a negative relationship between income inequality and growth, they fall into four categories according to Perotti (1996): the endogenous fiscal policy approach; the socio-political instability approach; the borrowing and investment in education approach; and the joint education/fertility approach. Aghion et al. (1999) enumerates three main reasons why inequality may have a direct negative effect on growth. First, they argue that redistribution enhances investments opportunities in the absence of well-functioning capital markets, and helps to raise aggregate productivity and growth. Indeed, the poor have a relatively higher marginal productivity of investment compared to the rich. Therefore, when income redistribution happens, income differences are narrowed and this will enhance productivity and promote growth. Second, inequality worsens borrower's incentives to invest in productive activities. Wealth redistribution increases the ability of individuals to invest and thereby promotes growth whenever the positive incentive effect outbalances the potentially negative incentive effect on lender's effort. Their third reason is linked to the macroeconomic volatility effect that inequality may provoke. Indeed, individuals have different attitudes toward risk, and they also have different access to investment opportunities. Consequently, this creates separation between investors and savers that will give rise to volatility in term of investment rate and interest rate.

Panizza (2002) casts doubt on much of the current literature in this regard by showing that the relationship between inequality and growth is not robust. That is, small differences in the method used to measure inequality can result in large differences in estimated coefficients. Partridge (2005) relates the mixed findings to differing short- and long-term responses. Using U.S. state level data, and accounting for short- and long-term responses, he observes that inequality is positively related to growth, but short run income distribution response is unclear. Mixed results are also obtained when differentiation is made between types of regions. For instance, Fallah and Partridge (2007) re-examined the inequality-growth relationship and observed opposite signs for urban and rural samples.

In order to shed some light on the ambiguity related to the correlation between inequality and economic growth, Dominicis et al. (2008) use meta-analysis techniques. Their conclusion points to the dependence of the correlation on estimation methods, data quality and sample coverage. They observed that the use of a fixed effects model and regional dummies tends to indicate a positive relationship between growth and inequality on pooled data. Also, the negative effect of inequality on economic growth tends to be more accentuated in developing countries than in developed countries. The measures of inequality, the length of growth period, and data quality also tend to have important implication on the form of the relationship between growth and inequality.

3. Empirical model

In order to examine the link between inequality and sectoral employment growth, we consider a conditional growth model in which employment growth depends on initial employment level, initial income inequality, and variables which capture agglomeration economies, demographics and other variables. As pointed out by Fallah and Partridge (2007), the use of initial period variables could mitigate potential endogeneity issues in the model. Also, the use of a reasonable number of control variables allow us first to minimize omitted variables that are sources of endogeneity bias and second, to ensure the inequality effect on growth is not wrongly confounded with other effects.

Considering the period 1990 to 2008, the sectoral conditional growth model is explicitly given as:

$$\log\left[\frac{E_t^s}{E_0^s}\right] = \alpha_0 + \alpha_1 \log\left(E_0^s\right) + \alpha_2 INEQ_0 + \alpha_3 S_0^s + \alpha_4 C_0^s + \alpha_5 D_0^s + \alpha_6 Demog + \alpha_7 Amenity + \alpha_8 States + \varepsilon, \quad (1)$$

where E_t^s is the employment in sector s at the terminal year, E_0^s is the employment in sector s at the initial year, $INEQ_0$ represents the income inequality at the initial year, S_0 represents a measure of specialization at the initial year, C_0^s is a measure of competition at the initial year, D_0^s is a measure of diversity at the initial year, $Demog$ is a vector of 1990 demographic and human capital variables, $States$ is a vector of states fixed effects, and ε is the error term. The above model is estimated using spatial econometrics techniques. To this end, we consider distance-based weight matrices to account for the spatial structure of counties. We construct a distance weight matrix for the full sample, and also one for each sub-sample (metro and non-metro).

The spatial lag and spatial error version of the model presented in equation (1) are given in matrix form respectively as:

$$Y = \rho WY + X\beta + \varepsilon \quad (2)$$

and,

$$Y = X\beta + \varepsilon,\ \ \varepsilon = \lambda W\varepsilon + \mu \tag{3}$$

where Y represent the dependent variable (employment growth), X is the vector of independent variables, ρ and λ are the spatial parameters, and W is the weight matrix. In equation (3) the error term μ is assumed to be distributed with mean zero and constant variance. In the paper, both models have been estimated using maximum likelihood.

4. Data

The data used in this paper are for 3,074 counties in the lower 48 US States. The employment data have been computed by Economic Modeling Specialists Inc. (EMSI)[1]. These data are disaggregated by NAICS industries and cover the period 1990 to 2008. For the analysis outlined in the following sections, we consider complete employment data. Unlike covered employment which only comprises payroll jobs covered by unemployment insurance, complete employment comprises payroll jobs plus non-covered jobs such as proprietors, partners, and others. We only focus on 8 two digit industries of the NAICS classification: Agriculture, Forestry, Fishing and Hunting; Construction; Manufacturing; Retail Trade; Real Estate, Rental and Leasing; Professional Scientific and Technical Services; Accommodation and Food Services; and Educational Services.

Several measures of income inequality are used in the literature. In this paper, we consider the Gini coefficient of family income inequality which is expressed as follows:

$$Gini = 1 - \sum_{i=0}^{m-1} \left(\frac{Y_i + Y_{i+1}}{Y} \right) \left(\frac{n_{i+1} - n_i}{N} \right)$$

where, m represents the number of income categories, Y_i is the aggregate income in group i, Y is the aggregate family income in the county, n_i is the number of families in category i, and N is the total number of families in the county.

[1] EMSI is a privately held company based in Idaho. For more information about EMSI, visit http://www.economicmodeling.com/company/

Using the employment data, we compute the variables characterizing agglomeration economies. Following up on Glaeser et al. (1992), we consider measures of specialization, competition and diversity. Specialization in an industry within a county is measured as the fraction of the county's employment that this industry captures, relative to the share of the whole industry in national employment. It is expressed as follows:

$$S_i = \frac{E_{i,s}/E_i}{E_s/E},$$

where, $E_{i,s}$ is employment in county i in industry *s*, E_i is employment in county *i*, E_s is total employment in US in industry *s*, and E is the total employment in US.

Competition of an industry in a county is measured as the number of establishments per worker in this industry in the county relative to the number of establishments per worker in this industry in the US. It is expressed as:

$$\mathrm{C}_i = \frac{F_{i,s}/E_{i,s}}{F_s/E_s},$$

where, $F_{i,s}$ is the number of establishments in county i in industry *s*, $E_{i,s}$ is employment in county i in industry *s*, F_s is the number of establishments in US in industry *s*, and E_s is total employment in US in industry *s*.

For the measure of diversity, we consider the relative index of diversity expressed as:

$$\mathrm{D}_i = \frac{1}{\sum_{s=1}^{S} \left| \frac{E_{i,s}}{E_i} - \frac{E_s}{E} \right|},$$

where, all variables are as previously defined.

The demographic variables concern the racial composition of each county. We consider the population of Black, White, Hispanics and others. Human capital data are from the Census Bureau for the year 1990. We consider the proportion of population 25 years and older that falls into the following categories: high school graduate, some college, associates degree, bachelors degree, and graduate degree. The natural amenity data are from USDA. The natural amenity scale is a measure of the physical characteristics of a county that enhance the location as a place to live (see McGranahan, 1999). Using the amenity variable allows us to account for the variability in employment growth which is driven by amenities.

5. Results

Regression results are presented for each industry. We first estimate the regression for the full sample with and without state fixed effects.[2] Next, we estimate regressions for metro and non-metro samples. Since the goal of the paper is to investigate the association between employment growth and inequality, we will only focus on this aspect. Results pertaining to the association between growth and the control variables will not be discussed.

- **Agriculture, Forestry, Fishing and Hunting**

For the full sample and the sub-samples, the correlation between employment growth and family income inequality appears to be insignificant. While the direction of the correlation is the same for all models under the full sample, opposite signs are observed for metro and non-metro sample. The diagnostic statistics point to spatial lag as appropriate spatial process, denoting the presence of spatial dependence in the employment growth process in that industry. Estimation results are presented in Table 1.

[Table 1 about here]

- **Construction**

Considering the full sample and sub-samples, the correlation between employment growth and family income inequality appears to be negative and significant. The direction of the association is consistent across all models and the magnitude of the correlation is slightly higher for models estimated with the full sample. Urban and rural locations show similar correlation between

[2] We only present results of the appropriate spatial process. Using the spatial diagnostic tests from OLS estimation, the appropriate spatial process is determined.

employment growth and family income inequality in that industry. The spatial parameters are significant in all spatial regressions. Table 2 shows results of the estimation.

[Table 2 about here]

- **Manufacturing**

Under the full sample, the correlation between employment growth and family income inequality is negative and insignificant for both models with and without fixed effects. In both cases, the spatial diagnostics tests indicate a spatial lag model as the appropriate specification of the underlying spatial process. The correlation is also negative and insignificant in the spatial lag model, yet the spatial lag parameter is statistically significant. The urban and rural samples show opposite association between employment growth and family income inequality, with higher magnitude for urban sample. The regression results are presented in Table 3.

[Table 3 about here]

- **Retail Trade**

A negative and insignificant correlation is observed between employment growth and inequality when the model is estimated with full sample. The spatial lag parameter is significant, indicating a spatial dependence in the employment growth process. In sub-samples, the correlation is significant for both urban and rural samples, with similar magnitude but opposite direction. Estimation results are presented in Table 4.

[Table 4 about here]

- **Real Estate, Rental and Leasing**

For all models estimated under full sample and sub-samples, the correlation between employment growth and family income inequality is insignificant. In both cases, a spatial lag model was appropriate, and the spatial lag parameters are significant. Table 5 shows the results of these estimations.

[Table 5 about here]

- **Professional Scientific and Technical Services**

Considering the full sample, OLS estimation of the model with/ and without state fixed effects shows a negative and significant correlation between employment growth and inequality. The diagnostic statistics for both models strongly support the spatial lag model as the appropriate spatial process. However, even though the direction of the correlation remains consistent in the spatial lag model, it is no longer significant. In the sub-sample estimation, both urban and rural samples show a negative association, but the correlation is only significant for the urban sample. Estimation results are presented in Table 6.

[Table 6 about here]

- **Accommodation and Food Services**

Using OLS on the full sample, the correlation between employment growth and family income inequality is only significant when states fixed effects are accounted for. A negative association is observed. The spatial lag model indicates a negative and significant correlation of similar magnitude to the model with fixed effects. In sub-samples, the correlation appears to be insignificant for both urban and rural samples. The spatial parameters are significant across all spatial models. Table 7 shows the estimation results.

[Table 7 about here]

- **Educational Services**

Considering the full sample, a positive and significant correlation is observed between employment growth and inequality for the spatial lag model. The spatial lag parameter is also significant. With regards to sub-samples, the association is only insignificant for urban samples. Estimation results are presented in Table 8.

[Table 8 about here]

6. Conclusion

This paper investigates the association between employment growth and family income inequality for 8 two-digit industries of the NAICS classification. For each of these industries, we estimated a model where employment growth depends on family income inequality, and a number of control variables which capture potential agglomeration economies, demographic composition and natural amenities. These models are estimated using spatial econometrics techniques. Results indicate that there is no association between employment growth and family income inequality in the Agriculture, Forestry, Fishing and Hunting sector and the Real Estate, Rental and Leasing sector. However, family income inequality consistently shows a negative effect on employment growth in the construction sector. Results are mixed for the following sectors: Manufacturing; Retail Trade; Professional Scientific and Technical Services; Accommodation and Food Services; and Educational Services. The results also confirm previous conclusion of Fallah and Partridge (2007) in which mixed results were obtained when differentiating between rural and urban regions.

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Table 1: Regression Results for “Agriculture, Forestry, Fishing and Hunting”

	Full Sample			Metro	Non-Metro
	Without FE	With FE	Spatial lag	Spatial lag	Spatial lag
Variables	OLS	OLS	MLE	MLE	MLE
Constant	-0.48***	-0.53***	-0.48***	-0.45***	-0.19**
	(0.07)	(0.08)	(0.08)	(0.12)	(0.10)
Initial Employment	0.03***	0.03***	0.03***	0.05***	-0.0008
	(0.004)	(0.005)	(0.005)	(0.007)	(0.007)
Inequality	-0.06	-0.07	-0.07	-0.27	0.05
	(0.10)	(0.10)	(0.11)	(0.20)	(0.12)
Specialization	0.0001	-0.001	-0.001	0.0009	0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Competition	-0.004***	-0.003***	-0.003***	-0.003	-0.005***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
Diversity	-0.005	-0.007	-0.007	-0.01	0.009
	(0.006)	(0.006)	(0.006)	(0.008)	(0.01)
% of high school graduate	-0.0003***	-0.0002***	-0.0002***	-0.0003***	0.0002
	(0.00008)	(0.0001)	(0.00009)	(0.0001)	(0.0004)
% of some college graduate	0.0008***	0.0004***	0.0004***	0.0005***	0.002**
	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.001)
% of associate degree holders	-0.001***	-0.0003	-0.0003	-0.001**	-0.003*
	(0.0004)	0.0004)	(0.0004)	(0.0005)	(0.003)
% of bachelor degree	-0.0006***	-0.0004*	-0.0004*	-0.0004**	-0.004**
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.002)
% of graduate degree holders	0.0009***	0.0008	0.0007***	0.0009***	0.004
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.003)
Natural amenity scale	-0.02	-0.003	-0.003	-0.005**	-0.003**
	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)
% Black	-0.0001***	-0.00009*	-0.00009*	-0.00008	-0.001***
	(0.00005)	(0.00005)	(0.00005)	(0.00006)	(0.0004)
% White	0.0001***	0.001***	0.001***	0.0004	0.001***
	(0.0002)	(0.0003)	(0.0003)	(0.0005)	(0.0003)
% Hispanic	0.00001	-0.00001	-0.00005	0.00004	0.001
	(0.00003)	(0.00003)	(0.00003)	(0.00004)	(0.0007)
Metropolitan	-0.01*	-0.01*	-0.01*		
	(0.008)	(0.008)	(0.008)		
Spatial lag parameter			0.15***	0.34***	0.32***
Diagnostics tests					
I	0.05***	0.01***			
LM-error	67.52***	7.75**			
Robust LM-error	0.2	0.0017			
LM-lag	79.50***	8.85**			
Robust LM-lag	12.19***	1.10			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 2: Regression Results for "Construction"

	Full Sample			Metro	Non-Metro
Variables	Without FE	With FE	Spatial lag	Spatial lag	Spatial error
	OLS	OLS	MLE	MLE	MLE
Constant	-0.5***	-0.36**	-0.35**	0.18	-1.25***
	(0.13)	(0.17)	(0.17)	(0.19)	(0.20)
Initial Employment	0.11***	0.12***	0.11***	0.16**	0.21**
	(0.009)	(0.01)	(0.009)	(0.01)	(0.01)
Inequality	-1.45***	-1.46***	-1.42***	-1.24***	-1.20***
	(0.22)	(0.25)	(0.25)	(0.30)	(0.32)
Specialization	-0.10***	-0.10***	-0.10***	-0.01	-0.28***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Diversity	0.008	0.02*	0.02*	0.03***	0.08***
	(0.23)	(0.01)	(0.01)	(0.01)	(0.02)
% of high school graduate	-0.0006***	-0.0003*	-0.0003*	-0.0001	-0.003***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.003)
% of some college graduate	'0.001***	-0.0003	0.0003	0.00006	-0.003
	(0.0004)	(0.0004)	(0.0004)	(0.0002)	(0.003)
% of associate degree holders	-0.003***	-0.002***	-0.002***	-0.002***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.0007)	(0.008)
% of bachelor degree	0.0001	0.00008	0.00008	0.0003	-0.007***
	(0.0005)	(0.0006)	(0.0006)	(0.0004)	(0.007)
% of graduate degree holders	-0.0005	-0.00001	-0.00002	-0.0002	0.0005
	(0.0006)	(0.0007)	(0.0007)	(0.0004)	(0.009)
Natural amenity scale	0.03***	0.01**	0.01**	0.02	0.03***
	(0.02)	(0.006)	(0.006)	(0.0004)	(0.006)
% Black	0.00008	0.00003	0.00003	-0.00002	-0.0005
	(0.0001)	(0.0001)	(0.0001)	(0.00008)	(0.001)
% White	0.0007	0.002***	0.002***	0.002***	0.005
	(0.0005)	(0.0006)	(0.0006)	(0.0007)	(0.0009)
% Hispanic	0.0003***	0.0003***	0.0004***	0.0002***	-0.002
	(0.00007)	(0.00007)	(0.00007)	(0.00006)	(0.002)
Metropolitan	0.08**	0.06***	0.06***		
	(0.02)	(0.01)	(0.01)		
Spatial lag parameter			0.13***	0.55***	
Spatial error parameter					0.42***
Diagnostics tests					
I	0.07***	0.02***			
LM-error	171.14***	10.68***			
Robust LM-error	36.82***	0.01			
LM-lag	136.10***	15.26***			
Robust LM-lag	1.77***	4.58**			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 3: Regression Results for "Manufacturing"

Variables	Full Sample			Metro	Non-Metro
	Without FE	With FE	Spatial lag	Spatial lag	Spatial lag
	OLS	OLS	MLE	MLE	MLE
Constant	-0.85***	-0.61**	-0.61*	2.59**	-1.80***
	(0.24)	(0.32)	(0.31)	(0.30)	(0.35)
Initial Employment	0.07***	0.05***	0.04***	-0.16***	0.10***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Inequality	-0.09	-0.74	-0.70	-2.06**	1.01*
	(0.45)	(0.50)	(0.50)	(0.51)	(0.62)
Specialization	-0.28***	-0.27***	-0.26***	-0.17***	-0.27***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Competition	-0.007***	-0.007***	-0.007***	-0.08	-0.004**
	(0.001)	(0.002)	(0.002)	(0.01)	(0.002)
Diversity	-0.01	0.007	0.01	0.07***	0.07
	(0.02)	(0.02)	(0.03)	(0.02)	(0.06)
% of high school graduate	-0.0009***	-0.0007*	-0.0007*	0.00005	-0.001
	(0.0003)	(0.0004)	(0.0004)	(0.0002)	(0.002)
% of some college graduate	0.002***	0.0001	0.0001	0.0008	0.008
	(0.0007)	(0.0008)	(0.0008)	(0.0004)	(0.006)
% of associate degree holders	-0.002	-0.0001	-0.0009	0.001	-0.01
	(0.001)	(0.002)	(0.002)	(0.001)	(0.01)
% of bachelor degree	-0.0008	-0.0008	-0.0006	0.0004	0.005
	(0.001)	(0.001)	(0.001)	(0.0007)	(0.01)
% of graduate degree holders	-0.0007	-0.0001	-0.0001	-0.0008	-0.02
	(0.001)	(0.001)	(0.001)	0.0008	(0.01)
Natural amenity scale	-0.03***	0.01	0.01	0.002	-0.05***
	(0.007)	(0.02)	(0.01)	(0.007)	(0.01)
% Black	-0.0001	-0.00004	-0.00004	-0.0002	-0.0006
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.002)
% White	-0.005***	-0.005***	-0.005***	0.0004***	0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Hispanic	0.0003***	0.0003***	0.0003***	0.00005	0.01***
	(0.001)	(0.0001)	(0.0001)	(0.0001)	(0.003)
Metropolitan	0.12***	0.10***	0.09***		
	(0.03)	(0.04)	(0.03)		
Spatial lag parameter			0.16***	0.26***	0.23***
Diagnostics tests					
I	0.04***	0.01***			
LM-error	73.90***	11.56***			
Robust LM-error	1.22	0.7			
LM-lag	89.74***	15.10***			
Robust LM-lag	17.05***	4.24***			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 4: Regression Results for “Retail Trade”

	Full Sample			Metro	Non-Metro
Variables	Without FE	With FE	Spatial lag	Spatial error	Spatial lag
	OLS	OLS	MLE	MLE	MLE
Constant	-1.71**	-1.80**	1.70***	-1.27***	-1.77***
	(0.12)	(0.15)	(0.15)	(0.24)	(0.16)
Initial Employment	0.13***	0.13***	0.12***	0.12***	0.14***
	(0.008)	(0.008)	(0.008)	(0.01)	(0.01)
Inequality	0.49***	0.64	0.10	-1.11**	1.09***
	(0.20)	(0.20)	(0.20)	(0.36)	(0.23)
Specialization	-0.09***	-0.13***	-0.12***	-0.12**	-0.21***
	(0.003)	(0.003)	(0.003)	(0.05)	(0.04)
Competition	-0.02**	-0.02*	-0.01*	-0.02	-0.01
	(0.01)	(0.01)	(0.01)	(0.03)	(0.01)
Diversity	0.05***	0.06***	0.06***	0.02*	0.14***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
% of high school graduate	-0.0004***	-0.0003**	-0.0003**	-0.0003**	-0.0008
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0008)
% of some college graduate	0.0003	0.0004	0.0002	0.0003**	0.0003
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0002)
% of associate degree holders	-0.002***	-0.002***	-0.002***	-0.002**	-0.01**
	(0.0008)	(0.0009)	(0.0008)	(0.0009)	(0.005)
% of bachelor degree	'0.0002	'0.00001	'0.00003	0.00001	0.0004
	(0.0004)	(0.0005)	(0.0005)	(0.0004)	(0.005)
% of graduate degree holders	-0.0006	-0.0001	-0.0001	-0.00001	-0.005
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.006)
Natural amenity scale	0.02***	0.03***	0.03***	0.02***	0.02***
	(0.003)	(0.005)	(0.005)	(0.007)	(0.004)
% Black	-0.00007	-0.0001	-0.0001	0.00003	0.002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.004)
% White	0.0009**	0.001***	0.001***	0.005***	-0.001**
	(0.0004)	(0.0005)	(0.0005)	(0.0009)	(0.0006)
% Hispanic	0.0004***	0.0004***	0.0004***	0.0003***	-0.002
	(0.00006)	(0.00006)	(0.00006)	(0.00007)	(0.001)
Metropolitan	0.03**	0.008**	0.004**		
	(0.01)	(0.01)	(0.01)		
Spatial lag parameter			0.20***		0.35***
Spatial error parameter				0.57***	
Diagnostics tests					
I	0.08***	0.01***			
LM-error	223.87***	6.83***			
Robust LM-error	35.84***	13.48***			
LM-lag	227.56***	39.61***			
Robust LM-lag	39.52**	46.26***			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 5: Regression Results for “Real Estate and Rental and Leasing”

	Full Sample			Metro	Non-Metro
	Without FE	With FE	Spatial lag		Spatial lag
Variables	OLS	OLS	MLE	OLS	MLE
Constant	-1.43***	-1.01***	-0.98***	-1.51***	-1.48***
	(0.20)	(0.25)	(0.24)	(0.17)	(0.28)
Initial Employment	0.07***	0.06***	0.06***	0.12***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inequality	-0.10	-0.42	-0.36	-0.40	0.21
	(0.34)	(0.39)	(0.39)	(0.31)	(0.49)
Specialization	0.07**	0.07**	0.06*	0.05*	0.13***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
Competition	0.01**	0.02**	0.02**	0.06***	0.001
	(0.0007)	(0.04)	(0.0007)	(0.02)	(0.0008)
Diversity	0.14***	0.14***	0.16***	0.02**	0.22***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.04)
% of high school graduate	-0.00008	0.0001	0.00008	-0.0002	0.002*
	(0.0002)	(0.0003)	(0.0003)	(0.0001)	(0.001)
% of some college graduate	-0.0003	-0.0004	-0.0005	-0.00007	0.006
	(0.0005)	(0.0006)	(0.0006)	(0.0002)	(0.005)
% of associate degree holders	-0.0001	-0.0001	-0.001	-0.0006	-0.01
	(0.0007)	(0.0001)	(0.001)	(0.0007)	(0.01)
% of bachelor degree	0.0001	0.0002	0.0002	0.0007	0.005
	(0.0008)	(0.0009)	(0.0009)	(0.0004)	(0.01)
% of graduate degree holders	-0.00006	-0.00005	-0.00001	-0.0003	-0.005
	(0.0001)	(0.001)	(0.001)	(0.0004)	(0.01)
Natural amenity scale	-0.01	-0.009	-0.01	-0.002	0.001
	(0.02)	(0.009)	(0.009	(0.005)	(0.009)
% Black	0.0002	0.0001	0.0001	0.00007	0.007***
	(0.0001)	(0.0001)	(0.0001)	(0.00009)	(0.001)
% White	0.002***	0.002***	0.002***	0.001**	0.007***
	(0.0001)	(0.0001)	(0.001)	(0.0007)	(0.001)
% Hispanic	0.0003***	0.0003***	0.0003***	0.0002***	0.01***
	(0.0001)	(0.0001)	(0.0001)	(0.00005)	(0.002)
Metropolitan	0.01	0.01	0.008		
	(0.03)	(0.03)	(0.02)		
Spatial lag parameter			0.12***		0.20***
Diagnostics tests					
I	0.02***	0.07***		-0.003	
LM-error	20.34***	1.75		0.74	
Robust LM-error	0.10	3.65**		0.08	
LM-lag	25.66***	5.67***		1.8	
Robust LM-lag	5.43***	7.57***		1.14	

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 6: Regression Results for "Professional Scientific and Technical Services"

	Full Sample			Metro	Non-Metro
Variables	Without FE	With FE	Spatial lag	Spatial error	Spatial lag
	OLS	OLS	MLE	MLE	MLE
Constant	-2.97***	-2.49***	-2.71***	-2.16***	-2.95***
	(0.22)	(0.30)	(0.22)	(0.30)	(0.31)
Initial Employment	0.28***	0.26***	0.25***	0.23***	0.23***
	(0.01)	(0.01)	(0.15)	(0.01)	(0.02)
Inequality	-0.74**	-1.20***	-0.52	-1.17***	-0.40
	(0.37)	(0.42)	(0.37)	(0.50)	(0.50)
Specialization	-0.12***	-0.12***	-0.10***	-0.16***	-0.05
	(0.04)	(0.04)	(0.43)	(0.06)	(0.06)
Competition	0.16***	0.16***	0.17***	0.09**	'0.18***
	(0.01)	(0.01)	(0.01)	(0.03)	(0.02)
Diversity	0.06***	0.08***	0.06***	-0.007	0.21***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
% of high school graduate	-0.0008***	-0.0005***	-0.0009***	-0.006***	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0002)	(0.001)
% of some college graduate	-0.000009	-0.0004	-0.0001	0.0002	0.007
	(0.0006)	(0.0007)	(0.0006)	(0.0004)	(0.005)
% of associate degree holders	-0.001	-0.001	-0.001	-0.001	-0.02
	(0.001)	(0.001)	(0.001)	(0.001)	(0.01)
% of bachelor degree	-0.0001	-0.0005	-0.0004	-0.0001	-0.01
	(0.0009)	(0.001)	(0.0009)	(0.0006)	(0.01)
% of graduate degree holders	-0.0005	-0.00007	-0.0006	0.0002	0.01
	(0.001)	(0.001)	(0.001)	(0.0007)	(0.01)
Natural amenity scale	0.02***	0.01	0.02	0.01***	0.02***
	(0.006)	(0.009)	(0.006)	(0.008)	(0.008)
% Black	0.0004**	0.0002	0.0003**	0.0002	0.004***
	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.001)
% White	0.001*	0.003***	0.001***	0.0003***	0.002*
	(0.0008)	(0.001)	(0.0008)	(0.0001)	(0.001)
% Hispanic	0.0005***	0.0005***	0.0005***	0.0002***	0.005
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.003)
Metropolitan	0.05*	0.02	0.04		
	(0.03)	(0.03)	(0.03)		
Spatial lag parameter			0.27***		0.28***
Spatial error parameter				0.33***	
Diagnostics tests					
I	0.04***	1.23***			
LM-error	65.32***	4.96**			
Robust LM-error	4.14**	4.71**			
LM-lag	82.66***	19.03***			
Robust LM-lag	21.48***	18.78***			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 7: Regression results for "Accommodation and Food Services"

	Full Sample			Metro	Non-Metro
	Without FE	With FE	Spatial lag	Spatial lag	Spatial lag
Variables	OLS	OLS	MLE	MLE	MLE
Constant	-0.26*	-0.1958	-0.22	0.71***	-0.44***
	(0.15)	(0.18)	(0.17)	(0.25)	(0.18)
Initial Employment	0.05***	0.045***	0.04***	-0.01*	0.04***
	(0.01)	(0.01)	(0.009)	(0.01)	(0.01)
Inequality	0.35	-0.53*	-0.52**	-0.45	0.05
	(0.25)	(0.28)	(0.27)	(0.42)	(0.30)
Specialization	-0.21***	-0.16***	-0.15***	-0.30***	-0.15***
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Competition	0.001	0.001	0.001	-0.10***	0.002***
	(0.02)	(0.001)	(0.001)	(0.01)	(0.001)
Diversity	0.05***	0.06***	0.06***	0.04**	0.11**
	(0.02)	(0.016)	(0.02)	(0.01)	(0.02)
% of high school graduate	-0.0002	-0.00004	-0.00002	-0.0001	0.00008
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.001)
% of some college graduate	0.0003	0.0002	0.0001	0.0003	-0.001
	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.003)
% of associate degree holders	-0.004***	-0.003*	-0.003***	-0.002***	-0.01**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.007)
% of bachelor degree	0.0008	0.0001	0.0001	0.0003	0.001
	(0.0006)	(0.0007)	(0.0006)	(0.0005)	(0.0006)
% of graduate degree holders	-0.001	-0.0001	-0.0001	-0.0004***	0.0004
	(0.0007)	(0.0008)	(0.0007)	(0.0006)	(0.0008)
Natural amenity scale	0.038***	0.032***	0.03***	0.02***	0.03***
	(0.022)	(0.007)	(0.006)	(0.006)	(0.005)
% Black	0.0001	-0.00002	-0.00001	0.00003	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.001)
% White	0.00001	0.003***	0.002***	0.002*	0.001***
	(0.0006)	0.001	(0.0007)	(0.001)	(0.001)
% Hispanic	0.0003***	0.0003***	0.0002***	0.0002***	0.002
	(0.0001)	(0.0001)	(0.00009)	(0.00009)	(0.001)
Metropolitan	0.1425***	0.097***	0.09***		
	(0.02)	(0.021)	(0.02)		
Spatial lag parameter			0.19***	0.46***	0.52***
Diagnostics tests					
I	0.1***	0.18***			
LM-error	329.80***	10.74***			
Robust LM-error	2.71***	3.38*			
LM-lag	373.07***	20.28***			
Robust LM-lag	45.98***	12.92***			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.

Table 8: Regression Results for “Educational Services”

	Full Sample			Metro	Non-Metro
Variables	Without FE	With FE	Spatial lag	Spatial error	Spatial lag
	OLS	OLS	MLE	MLE	MLE
Constant	0.001	-0.20	-0.06	0.49**	-1.14
	(0.02)	(0.23)	(0.18)	(0.28)	(0.24)
Initial Employment	-0.003	0.01**	-0.005	-0.01	-0.01***
	(0.004)	(0.004)	(0.004)	(0.008)	(0.005)
Inequality	0.10	0.67*	0.19***	-0.37**	0.28
	(0.3)	(0.4)	(0.34)	(0.54)	(0.44)
Specialization	-0.04***	-0.03***	-0.03***	-0.01***	-0.04***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Competition	0.000007	0.00000004	0.00001	0.008	-0.00004
	(0.0002)	(0.0002)	(0.0001)	(0.01)	(0.0002)
Diversity	0.1***	0.08***	0.09***	0.08***	0.001
	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)
% of high school graduate	0.00005	0.0002	0.0001	0.0001	0.0001
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)
% of some college graduate	-0.0004	-0.0002	-0.0002	0.0003	-0.001
	(0.0005)	(0.0006)	(0.0005)	(0.0005)	(0.004)
% of associate degree holders	0.001	-0.0004	0.0003	0.0004	-0.01
	(0.001)	(0.003)	(0.001)	(0.001)	(0.01)
% of bachelor degree	0.0005	0.001	0.0005	0.0005	0.02**
	(0.0008)	(0.0009)	(0.0008)	(0.0007)	(0.01)
% of graduate degree holders	-0.0002	-0.0008	-0.0004	-0.0003	-0.002
	(0.001)	(0.001)	(0.0009)	0.0008	(0.01)
Natural amenity scale	0.01**	0.0008	0.007	0.009	0.007
	(0.005)	(0.009)	(0.005)	(0.008)	(0.007)
% Black	-0.00002	-0.0002	-0.0004	-0.0001	0.001
	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.002)
% White	-0.002***	-0.002*	-0.001***	-0.006***	-0.001
	(0.0008)	(0.001)	(0.0001)	(0.001)	(0.002)
% Hispanic	-0.0001	-0.00002	-0.0001	0.0001	-0.005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.002)
Metropolitan	0.09***	0.09***	0.09***		
	(0.03)	(0.02)	(0.02)		
Spatial lag parameter			0.21***		0.23***
Spatial error parameter				0.19***	
Diagnostics tests					
I	0.02***	0.002***			
LM-error	17.27***	0.11			
Robust LM-error	2.70*	0.13			
LM-lag	23.78***	0.07			
Robust LM-lag	9.21***	0.08			

Standard errors are shown in parentheses. Significance at the 1, 5 and 10% level is signaled by ***, ** and *, respectively.