

SMALL BUSINESS CLUSTERS IN OKLAHOMA: MAR OR JACOBS EFFECTS? NICA, Mihai*

Abstract

One of the main factors that act as catalysts for small business creation seems to be the existence of business clusters. This study uses both standard and spatial statistics methodologies and tools to analyze the dynamics of small business clusters and the degree to which it is influenced by Marshall-Arrow-Romer or Jacobs effects. The study contributes to better understanding of the influence that industrial diversity or specialization has on the growth of the number of small businesses and, consequently, on small businesses cluster formation. Maybe the most significant finding of this study is that the evidence suggests that Marshall-Arrow-Romer effects are preponderant. Indeed, the study finds significant MAR dynamic effects for the period under scrutiny, as well as Marshall-Arrow-Romer static effects for 2005.

Keywords: SMEs, Spatial Clusters, Economic Agglomerations, Industrial Concentration, US.
JEL: M2, O18, R1.

1. Economic Agglomerations and Small Business Clusters

It is almost universally recognized that small businesses are the growth engine of any developed economy. Moreover, small business clusters may also constitute the seeds of possible future economic agglomerations (EAs) and therefore be the promoters of future regional economic growth (Rocha, 2004; van Wissen, 2004). Accordingly, many governments encourage the formation of small business clusters (Humprey & Hubert, 1995), and understanding the mechanisms that lead to the formation of small businesses clusters, their structure, and the factors that affect their growth might lead to better understanding of economic agglomerations and therefore to better policy making.

The regional growth literature recognizes several main theories of EA formation. The Marshall-Arrow-Romer (MAR) theory was named after the authors that sequentially developed and refined it (Glaeser, Kallal, Scheinkman, & Shleifer, 1992; Henderson, Kuncoro, & Turner, 1995; van Oort, 2007). According to this theory, MAR effects appear when regional specialization is the main engine of growth (due to economies of scale and knowledge externalities). MAR theory explains the development of clusters of certain types of industries, such as the Silicon Valley high-tech cluster or the Dalton, Georgia cluster of floor-covering products companies. A second type of EA leading to endogenous growth arises due to the so-called Jacobs effects (Jacobs, 1969). The theory states that an area's engine of economic growth is its local market power, and therefore the industrial composition of the economy must be divers (Glaeser et al., 1992; van Oort, 2007). In this case, the engine of growth is the competition amongst companies, which have to innovate permanently in order to survive. As such, Jacobs effects cannot explain regional specialization, but can explain the appearance of economic agglomerations¹.

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¹ For a review of the debate between MAR and Jacobs effects advocates see Glaeser et. al. (1992) and Gerben (2004).

The relative similarity between EAs and small business clusters suggests that EA formation theories could also be used to explain small business cluster formation and growth. This approach would be novel since research related to the geographic concentration patterns of small businesses at the regional or national level is generally rare and case study oriented. In order to identify the type of effects that are associated with small business clusters, measures of industrial concentration such as the Herfindahl-Hirschman Index (HHI) can be employed. Low measures of industrial concentration associated with a high NSB would suggest static Jacobs effects, while high measures of concentration associated with a high NSB would indicate static MAR effects (Drucker & Feser, 2007; Ellison & Glaeser, 1997; Henderson et al., 1995; Malpezzi, Seah, & Shilling, 2004; Porter, 2003; van Oort, 2007).

2. MAR and Jacobs Externalities

EAs formation is usually explained by pointing out to some type of externality such as spillovers (for instance physical or intellectual) or to natural advantages (Ellison & Glaeser, 1999a, 1999b; Henderson et al., 1995). An in depth study of EAs suggests that half of the existing geographic concentration appears due to intellectual spillovers while the other half due to other reasons such as natural advantages (Ellison & Glaeser, 1999a p. 316). However, when analyzing EAs which appear due to intellectual spillovers, several studies show that, while persistent regional demand and comparative advantages play a significant role in the evolution of employment, Marshall-Arrow-Romer (MAR) economies play an even more important role and that industrial diversity does not affect employment growth significantly.

Consequently, they suggest that Jacobs externalities are not so important for mature industries (Henderson *et al.*, 1995) while concentration of similar employment is likely to be a very strong predictor of future similar industry business location indicating MAR effects (Carlton, 1983; Coughlin, Terza, & Arromdee, 1991). Nevertheless, at both the city (Glaeser *et al.*, 1992) and metropolitan (Justman, 1994) level, evidence was found that diversity too can be a significant catalyst of employment growth. While no one theory prevails, there is little doubt that EAs (of either MAR or Jacobs type) are common and important for regional growth.

3. Data and Analysis

The data used in this study was obtained from the County Business Patterns database (U.S. Bureau of the Census, 2008). To facilitate the creation of maps the data of interest was combined with geographically referenced files from the Minnesota Population Center (Minnesota Population Center, 2006). The U.S. Small Business Administration Department defines the small businesses size standards for different industries based on the business size measured either by the business's average annual receipts or by its average employment (U.S. Small Business Administration, 2008). For the purpose of this study however, small businesses are defined as businesses with average employment lower than 500 employees. This approach was chosen because the main interest of the study rests with those businesses that provide local employment. A concentration/diversification measure was also needed in order to distinguish between the Jacobs and MAR effects. One of the best-known and widely used measures of concentration is the Herfindahl-Hirschman Index (HHI) usually computed as:

$$H = \sum_{i=1}^n s_i^2$$

where s_i is the market share of the firm i in the market and n is the number of firms.

The HHI is used extensively as a measure of diversity/concentration and has been used previously to measure concentration of many types of variables, such as employment, patents, value added so on (Henderson *et al.*, 1995; Porter, 2003). In this paper's context however, the HHI is used to measure industrial concentration rather than market concentration. As such, the number of small businesses corresponding to each industry, rather than the market share of each business within each industry, is the variable of interest. The value is interpreted as a measure of industrial concentration rather than of market concentration, since the higher the number of small businesses in an industry, the lower the HHI for that particular industry in the specific county.

Analysis

Table 1 reveals correlations between the variables of interest as well as their statistical signification².

Table 1. Correlation matrix of the variables.

	Index _98	Index _05	emp_ 98	Emp _05	Nsb _98	Nsb _05	Emp _gr	Nsb _gr
index_98	1.000	0.682 **	-0.331 **	-0.335 **	-0.374 **	-0.349 **	-0.090	0.114
index_05	0.682 **	1.000	-0.216	-0.211	-0.254 *	-0.223	0.000	0.242 *
emp_98	-0.331 **	-0.216	1.000	0.99 3**	0.984 **	0.983 **	0.119	0.407 **
emp_05	-0.335 **	-0.211	0.993 **	1.000	0.984 **	0.985 **	0.236 *	0.441 **
nsb_98	-0.374 **	-0.254*	0.984 **	0.984 **	1.000	0.997 **	0.172	0.391 **
nsb_05	-0.349 **	-0.223	0.983 **	0.985 **	0.997 **	1.000	0.198	0.466 **
emp_gr	-0.090	0.000	0.119	0.236 *	0.172	0.198	1.000	0.359 **
nsb_gr	0.114	0.242 *	0.407 **	0.441 **	0.391 **	0.466 **	0.359 **	1.000

Note: ** $p < .01$; * $p < .05$. All correlations computed between logs of variable values, except for "index_XX".

When significant, most of the relationships between the HHI indexes and the other variables are negative, which suggests that areas with higher specialization exhibit lower employment and lower NSB, a possible indication of negative MAR effects. Interestingly

² The analysis was performed with readily available free software (Anselin, 2003; R Development Core Team, 2007) Both GeoDa and R software are free to download and use and are used extensively by academia, government and the private sector.

enough, however, the relationship between the 2005 HHI and NSB growth is positive and significant. A possible explanation is that NSB growth is higher in areas with low initial NSB in general, due to a “convergence” effect. A second possible explanation is that NSB growth led to higher industrial concentration in some areas, that is, to MAR static effects.

Table 2 shows some descriptive statistics for the variables corresponding to the eighteen counties with NSB growth higher than ten percent. According to the data, only seven counties experienced either a decrease in industrial concentration or no change in industrial concentration. This indicates that most of the counties with large NSB growth experienced an increase in industrial concentration, suggesting stronger MAR effects.

Table 2. Counties with the average annual growth rate above one percent.

County	Index _98	Index _05	Emp _98	Emp _05	Nsb _98	Nsb _05	Emp _gr	Nsb _gr
McClain	0.163	0.182	4433	5455	1076	1381	0.0296	0.0357
Canadian	0.153	0.160	17871	19551	3163	3919	0.0128	0.0306
Cleveland	0.146	0.151	44316	58485	8184	9852	0.0396	0.0265
Rogers	0.149	0.149*	15937	19033	2497	2969	0.0254	0.0247
Logan	0.163	0.171	4234	6140	1050	1236	0.0531	0.0233
Bryan	0.1460	0.148	9253	10567	1221	1398	0.0190	0.0193
Coal	0.216	0.188*	859	572*	125	142	-0.0581	0.0182
Wagoner	0.166	0.189	6841	7313	1462	1658	0.0095	0.0180
Beckham	0.135	0.136	5558	6319	1248	1413	0.0183	0.0177
Roger Mills	0.137	0.137*	502	560	166	186	0.0156	0.0163
Adair	0.158	0.152*	3027	2989*	415	462	-0.0018	0.0153
Okmulgee	0.156	0.170	6608	7032	1316	1459	0.0089	0.0147
Haskell	0.159	0.156*	2073	2567	420	465	0.0305	0.0145
Kingfisher	0.147	0.154	4591	4590*	846	932	0.0000	0.0138
Woodward	0.133	0.139	6211	6797	1367	1488	0.0129	0.0121
Cherokee	0.149	0.145*	6403	8281	1339	1455	0.0367	0.0119
Mayes	0.153	0.155	9325	8823*	1439	1558	-0.0079	0.0114
Atoka	0.157	0.146*	2072	2103	454	488	0.0021	0.0103
min	0.133	0.136	502	560	125	142	-0.0581	0.0103
mean	0.155	0.157	8340	9843	1544	1803	0.0137	0.0186
median	0.153	0.153	5884	6558	1234	1405	0.0143	0.0170
max	0.216	0.189	44316	58485	8184	9852	0.0531	0.0357

Note: * denotes either no change or a decrease in the value between 1998 and 2005

Table 3 reveals the extreme values of the NSB average annual growth rate (AAGR) and 2005 NSB levels for the two digit NAICS industries at the county level. The lowest growth (the highest negative AAGR growth) corresponds to Information, while four industries (Finance and Insurance, Administrative and Support, Educational and Healthcare) exhibited positive growth in all counties. The highest overall growth corresponds to Management, followed by Construction, Administrative and Support and Mining. As for NSB, the lowest value corresponds to Education, while the highest number to Professional, followed by, not surprisingly, Healthcare.

Figure 1, in the Annex, shows NSB values for each county as of 1998 (counties ordered by 1998 employment). As expected, the NSB distribution is strongly skewed³, and its shape suggests a strong positive correlation between NSB and employment. Indeed, according to Table 1, the correlation between 1998 NSB and employment is 0.984 and significant at the 0.01 level. Some of the counties with the largest NSB and employment are Oklahoma (with Oklahoma City, the state's capital, its largest city), Tulsa (with Tulsa, its largest city, which is also the second largest city in Oklahoma), Cleveland and Comanche.

Table 3. Extreme values of the annual average growth rate of the number of small businesses and 2005 number of small businesses.

Industry	NAICS	County NSB					
		AAGR		2005			
		Low	High	Low	High	Low	High
Mining	21----	-0.1309	- 0.1980	4	- 1012		
Utilities	22----	-0.1365	- 0.1401	4	- 105		
Construction	23----	-0.0990	- 0.2299	8	- 3513		
Manufacturing	31----	-0.0990	- 0.0615	6	- 2039		
Information	51----	-0.1790	- 0.0990	4	- 757		
Finance and Insurance	52----	0.0481	- 0.0603	10	- 3464		
Real estate	53----	-0.1445	- 0.1210	4	- 2127		
Professional	54----	-0.1105	- 0.1060	8	- 5450		
Management	55----	-0.0990	- 0.2971	6	- 378		
Adm. and support	56----	0.0579	- 0.2299	4	- 2310		
Educational	61----	0.1569	- 0.0694	2	- 403		
Healthcare	62----	0.0498	- 0.0677	12	- 5191		

Figure 2 reveals a map of the NSB quartiles. Agglomerations of small businesses are localized around I35 up to Oklahoma City, and then around I44 towards Tulsa and St. Louis.

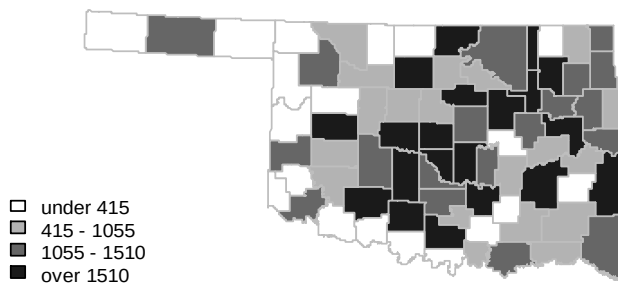


Figure 2. Spatial distribution of the number of small businesses as of 1998.

³ The distribution seems to resemble a “J” distribution (Simon, 1955)

The spatial patterns for the 2005 NSB are very similar, with the exception of the quartiles, which became 375, 944 and 1,658 (apparently, the counties with large NSB gained more businesses, whereas the other ones lost).

Figure 3 reveals that indeed the distribution (of the natural logarithm of) NSB became wider; the figure also suggests a tendency toward twin-peakedness⁴ in distribution, which seems to persist (or even accentuate) over the whole time interval.

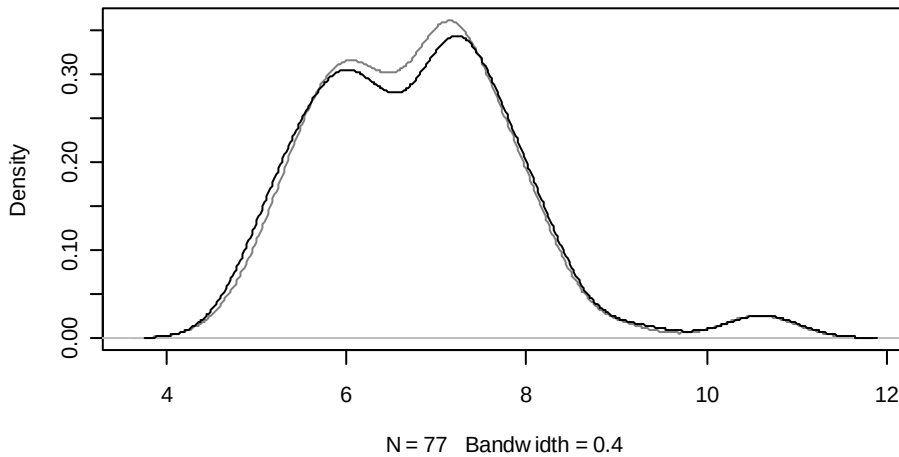


Figure 3. Logarithm of the number of small businesses density distribution, 1998 (gray) and 2005 (black).

The average annual growth rate of the NSB for each county (counties ordered by 1989 employment) is shown in Figure 4. The figure suggests a positive correlation between initial employment and NSB growth (the left side counties, with higher initial employment, seem to tend to have positive growth, while the right side counties, with lower initial employment, tend to have negative growth). Indeed, according to Table 1, the relationship between initial employment and employment growth is not significant, while a significant positive relationship between initial employment and NSB growth exists, suggesting that NSB growth is higher in areas with large employment, but this growth does not come with employment growth. This outcome could be the result of a fragmentation in the employment market (most of the new jobs were created by new small businesses that appeared in this period which attracted employment from other small businesses, as opposed to being created by expanding business or attracting new employment). In fact, the average number of workers in small businesses decreased slightly from 6.87 in 1998 to 6.77 in 2005.

For all industries and counties, NSB growth is between - 0.0331 and 0.0357, and 2005 NSB between 142 and 43,781. According to the data (Table 3), the largest NSB as of 2005 correspond to Professional, Scientific and Technical Services (NAICS 54) with

⁴ The term was first suggested by Quah (2006) who maintains that evidence of mean reversion in growth regressions is not sufficient proof that convergence occurs, as it cannot rule out “clubbing”.

5,450 followed by Health Care and Social Assistance (NAICS 62) with 5,191, Construction (NAICS 23) with 3,513 and Finance and Insurance (NAICS 52) with 3,464. The fastest growth happened in industries with smaller NSB, such as Management (NAICS 55) and Administrative and Support (NAICS 56), but also in industries with large NSB, such as Construction, Mining (NAICS 21), Utilities (NAICS 22), Real Estate and Rental and Leasing (NAICS 53) and Professional, Scientific and Technical Services (NAICS 54).

The map of the NSB average annual growth revealed in Figure 5 suggests that counties with higher growth are either adjacent to those regions with already high NSB (around Oklahoma City and Tulsa) or in the areas with relatively low initial NSB (western and southeastern parts of the state). The number of counties corresponding to each quartile is eighteen, twenty-two, nineteen, and eighteen, with only about half of the counties experiencing growth, while the rest experienced (sometimes strong) negative growth.

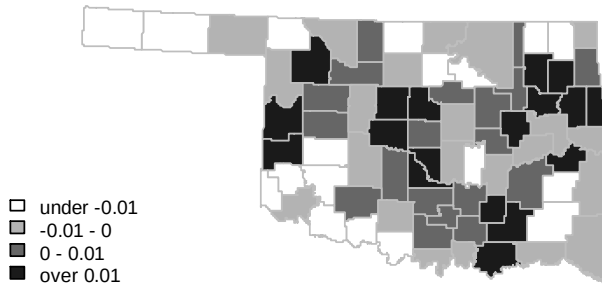


Figure 5. Spatial patterns of the average annual growth rate of the number of small businesses.

One relatively recent development in regional studies is the refinement of tools aimed at quantifying the possible spatial interaction between the variables of interest. The Local Indicator of Spatial Association (LISA) statistic (also known as the local Moran statistics), takes in consideration the spatial correlation of the variable of interest and reveals if its values are different from what would be expected in a random spatial distribution (Anselin, 1995; Baumont, Ertur, & Le Gallo, 2004; Combes et al., 2005; Goovaerts & Jacquez, 2005). Its formula is as follows:

$$LISA(i,t) = \left[\frac{z(i,t) - m_t}{s_t} \right] \times \left\{ \sum_{j=1}^J \frac{1}{J} \times \left[\frac{z(j,t) - m_t}{s_t} \right] \right\}$$

LISA can take in consideration three dimensions in the data, the area (indexed by i), its neighbors (indexed by j) and the time of the observation (t). Here z signifies the value of the variable under scrutiny, m its mean, and s its standard deviation. The statistics helps to

identify significant spatial and temporal trends in the data (Goovaerts & Jacquez, 2005; van Oort, 2007).

One application is the identification of (statistically significant) spatial clusters in the data, characterized as High-High (HH – areas with higher than expected values of the variable of interest surrounded by areas with high values of the variable), Low-Low (LL – areas with lower than expected values of the variable of interest surrounded by areas with low values of the variable), Low-High (LH – areas with lower than expected values of the variable of interest surrounded by areas with high values of the variable), and High-Low (HL – areas with higher than expected values of the variable of interest surrounded by areas with low values of the variable) clusters⁵.

For all spatial statistics analysis, a first order rook contiguity neighborhood matrix is considered (Anselin, 2003), since it has been shown that the spatial correlation of growth rates for variables such as employment is strong within close ranges of distances but drop off fast after that (Wheeler, 2001).

Figure 6 reveals 1998 NSB LISA map. Spatial clusters with high NSB situated about areas with high NSB are Canadian, Cleveland and Pottawatomie.

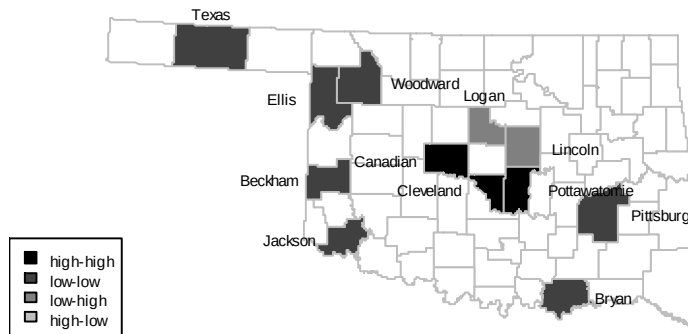


Figure 6. LISA cluster map, 1998 NSB clusters.

Also interesting for our topic is the map of NSB growth clusters revealed in Figure 7. There are eight HH, five LL, one LH and two HL clusters. The high growth (HH) clusters are located around the largest cities (Oklahoma City and Tulsa), with the largest cluster (comprised of five counties) around Oklahoma City. Industrial concentration is the main variable of interest. According to Figure 8 there are four counties within HH clusters (corresponding to spatial clusters of high industrial concentration – MAR spatial clusters), three in LL clusters (Jacobs spatial clusters), one in LH clusters (isolated Jacobs cluster), and two in HL clusters (isolated MAR clusters). The largest cluster (HH) is

⁵ This cluster classification is suggested by Anselin (2003).

comprised of three counties, Mayes, Delaware, and Ottawa. The counties with the lowest industrial concentration are Custer, Pawnee and Washington.

The picture did change a little between 1998 and 2005. According to Figure 9, there are also four HH, and three LL clusters, albeit different, and four LH clusters. Unfortunately, the results are not robust when it comes to randomization, but the pattern appearing here seems to comprise the counties appearing most often as significant clusters. Only Custer, Mayes, and Pittsburg appear in both figures, holding their classification as LL, HH, and LH clusters.

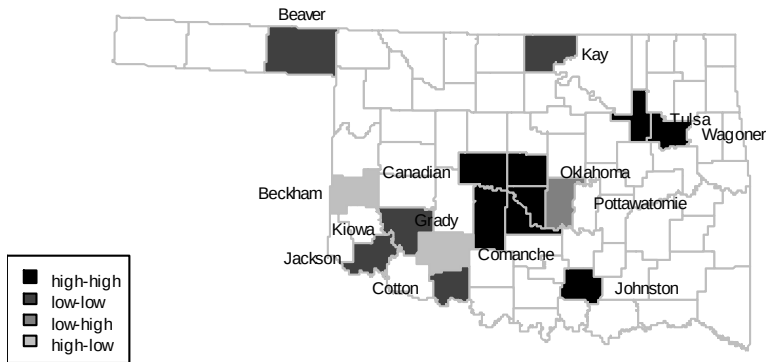


Figure 7. LISA cluster map, NSB growth clusters.

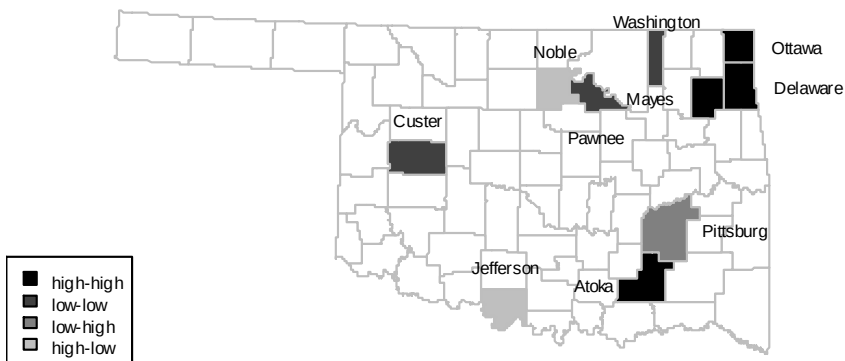


Figure 8. LISA cluster map, HHI clusters as of 1998.

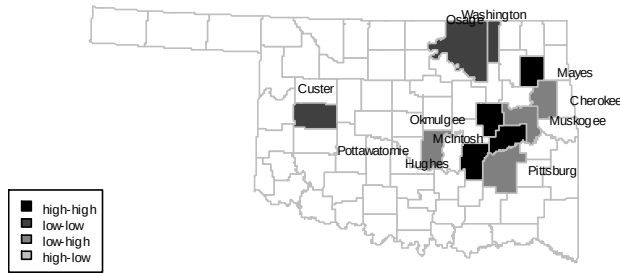


Figure 9. LISA cluster map, 2005 HHI clusters.

4. Effects

Table 4 reveals the results from regressions having the 1998 and 2005 NSB as dependent variable (except for INDEX, all variables are in log of values). These regressions reveal the extent of MARS or Jacobs static effects. Due to the danger of multicollinearity, combinations of variables that exhibit a correlation coefficient higher than 0.6 were avoided.

The Table 4. Static effects 1998 and 2005.

	nsb_98		nsb_05							
	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Intercept	10.7447	9.44	-0.6208	-3.62	-0.61	-4.07	-0.5759	-3.75	-0.6082	-4.00
c_nsb_1	-	-	-	-	-	-	0.0796	1.41	-	-
c_nsb_2	-	-	-	-	-	-	0.0338	0.93	-	-
c_nsb_3	-	-	-	-	-	-	0.0517	0.78	-	-
c_ind_1	-	-	-	-	-	-	-	-	-0.0060	-0.12
c_ind_2	-	-	-	-	-	-	-	-	0.0141	0.26
c_ind_3	-	-	-	-	-	-	-	-	0.0164	0.17
c_ind_4	-	-	-	-	-	-	-	-	-0.1475	-2.26
nsb_98	-	-	1.0471	81.7	1.01	18.0	1.9249	2.56	2.1101	2.77
index_98	-27.1052	-3.49	2.0460	2.51	1.94	2.53	1.0419	96.8	1.0443	101.2
emp_98	-	-	-	-	0.03	0.63	-	-	-	-
AIC	226.2435		-145.7382		-144.1582		-143.0716		-143.3054	
BP	2.42 (0.11)		6.32 (0.04)		5.76 (0.12)		7.79 (0.16)		9.14 (0.17)	
RESET	0.53 (0.58)		2.74 (0.07)		2.55 (0.08)		1.85 (0.16)		2.28 (0.11)	

Note: *p* values in parenthesis.

The overall fit of the regressions seems good, since none of the RESET tests is significant. According to the BP test, only Model 2 exhibited heteroscedasticity, and a White correction was performed in this case. The negative relationship occurring between

the base year NSB and industrial concentration is expected since it also appeared in Table 1. A second specification where employment in the base year was added (not shown) led to the coefficient of the concentration variable losing its statistical significance while preserving its sign while the base year employment coefficient was positive and highly significant. AIC increased drastically, and the BP and RESET tests were significant. Moreover the variance inflation factor was relatively low (1.1232), and therefore the specification was disregarded. The strong significant negative relationship between NSB and industrial concentration imply that areas with large NSB tend to be industrially diverse, therefore suggesting Jacobs static effects for 1998.

For the 2005 regression, the best specification seems to correspond to Model 2 (as suggested by AIC). One interesting observation is that the 2005 NSB is positively related to the 1998 NSB, a possible indication of agglomeration tendencies. MAR static effects seem to exist also, since there is a significant positive relationship between industrial concentration and NSB. Overall, the relationship between variables remains the same regardless of the presence of a spatial cluster. Only in Model 5 (which seems over fitted) the coefficient corresponding to cluster four (concentration) is significant. This result suggests that a possible significant difference exists between the average NSB growth for HH, HL, LH and the two LL clusters. If this is true, then the NSB corresponding to the counties that are members of LL clusters tends to be lower than for the rest of the counties.

The approach to assessing dynamic MAR or Jacobs effects reduces to assessing the relationship (if any) between NSB growth and past industrial concentration in the area. Table 5 reveals the results of growth regressions, having average annual NSB growth as the dependent variable.

Table 5. Dynamic effects 1998 to 2005.

	Model 1		Model 2		Model 3		Model 4	
	Coef.	t value	Coef.	t value	Coef.	t value	Coef.	t value
Intercept	-0.0887	-3.6227	-0.0876	-4.0738	-0.0823	-3.7558	-0.0869	-4.0058
c_nsb_1	-	-	-	-	0.0114	1.4148	-	-
c_nsb_2	-	-	-	-	0.0048	0.9329	-	-
c_nsb_3	-	-	-	-	0.0074	0.7867	-	-
c_ind_1	-	-	-	-	-	-	-0.0009	-0.1254
c_ind_2	-	-	-	-	-	-	0.0020	0.2614
c_ind_3	-	-	-	-	-	-	0.0023	0.1794
c_ind_4	-	-	-	-	-	-	-0.0211	-2.2603
nsb_98	0.0067	3.6725	0.0017	0.2183	0.0060	3.8974	0.0063	4.2970
index_98	0.2923	2.5126	0.2768	2.5321	0.2750	2.5599	0.3014	2.7766
emp_98	-	-	0.0042	0.6319	-	-	-	-
AIC	-445.4084		-443.8283		-442.7418		-442.9757	
BP	6.3234	0.0424	5.7601	0.1239	7.7975	0.1678	9.1434	0.1657
RESET	4.7959	0.0111	4.2007	0.0189	0.5118	0.6017	3.7282	0.0291

Note: The dependent variable is the average annual growth rate of the number of small businesses. *p* values in parenthesis “c_nsb_n” and “c_ind_n” denote dummy variables indicating the counties belonging in spatial clusters n is 1 for HH clusters 2 for LL clusters 3 for LH clusters and 4 for HL clusters

A first interesting observation is that none of the models suggests NSB convergence. Indeed, in all cases the coefficient of the initial NSB is positive, indicating that areas with larger NSB tend to grow faster, and therefore that areas with lower initial NSB are not catching up.

Based on AIC, the overall best model seems to be Model 1. Since the BP test indicated heteroscedasticity, a White corrected estimation was performed and the resulting t values are posted in the table. The results indicate dynamic MAR effects, since the relationship between the HHI in the base year and average annual NSB growth is positive and significant. In addition, similar to the results revealed in Table 4, the NSB growth corresponding to the counties that are members of LL clusters is lower than for the rest of the counties.

Finally, because several tests indicated positive significant spatial correlation several spatial regressions (Anselin, 1988) were also run. The results were very similar to those obtained above and therefore are not presented here.

5. Conclusion

A first interesting conclusion is that the results suggest a relatively strong NSB growth divergence process. Corroborated with the observed twin-peakedness in the distribution, the general conclusion seems to be is that two “clubs” exists in the distribution, and that the distance between them (the distance between their peaks) increases in time. A more in-depth analysis could reveal if the process is a normal consequence of a population decrease in some areas or an indication of an endemic phenomenon.

Another interesting conclusion is that the overall industrial concentration (as revealed by the HHI for all industries) seems to increase slightly during the period under scrutiny. Indeed, the positive and significant relationship between the overall industrial concentration in the base year and in the 2005 suggests that counties with relatively strong initial industrial concentration tend to become even more specialized.

Overall, the results suggest sufficient evidence of MAR static effects for 2005, and are inconclusive for 1998. The results also suggest sufficient evidence of MAR dynamic effects, with the base year spatial clusters having little if any influence on NSB growth. Finally, the results also indicate a strong tendency toward more geographical concentration of NSB around already formed small business clusters (around EAs).

References

- Anselin, L. (1988). *Spatial Econometrics: Methods and Models*. Dordrecht, Netherlands: Kluwer.
- Anselin, L. (1995). Local Indicators of Spatial Association-LISA. *Geographical Analysis*, 27, 93-115.
- Anselin, L. (2003). *GeoDa 0.9 User's Guide*. Spatial Analysis Laboratory, University of Illinois, Urbana-Champaign, IL.
- Baumont, C., Ertur, C., & Le Gallo, J. (2004). Spatial Analysis of Employment and Population Density: The Case of the Agglomeration of Dijon 1999. *Geographical Analysis*, 36(2), 146.

- Carlton, D. W. (1983). The Location and Employment Choices of New Firms: An Econometric Model with Discrete and Continuous Endogenous Variables. *The Review of Economics and Statistics*, 65, 440-449.
- Combes, P. P., Duranton, G., & Overman, H. G. (2005). Agglomeration and the adjustment of the spatial economy. *Papers in Regional Science*, 84(3), 311-349.
- Coughlin, C. C., Terza, J. V., & Arromdee, V. (1991). State Characteristics and the Location of Foreign Direct Investment Within the United States. *The Review of Economics and Statistics*, 73, 675-683.
- Drucker, J. M., & Feser, E. (2007). Regional Industrial Dominance, Agglomeration Economies, and Manufacturing Plant Productivity.
- Ellison, G., & Glaeser, E. L. (1997). Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach. *Journal of Political Economy*, 105(5), 889-927.
- Ellison, G., & Glaeser, E. L. (1999a). Geographic concentration in U.S. manufacturing industries: A dartboard approach. *The Journal of Political Economy*, 105, 889-927.
- Ellison, G., & Glaeser, E. L. (1999b). The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration? *The American Economic Review*, 89, 311-316.
- Fujita, M., & Mori, T. (2005). Frontiers of the New Economic Geography. *Papers in Regional Science*, 84(3), 377-405.
- Gerben, P. (2004). Agglomeration externalities: Marshall versus Jacobs. *Journal of Evolutionary Economics*, 14(5), 593.
- Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(2), 1126-1152.
- Goovaerts, P., & Jacquez, G. M. (2005). Detection of temporal changes in the spatial distribution of cancer rates using local Moran's I and geostatistically simulated spatial neutral models. *Journal of Geographical Systems*, 7(1), 137-159.
- Henderson, V., Kuncoro, A., & Turner, M. (1995). Industrial Development in Cities. *The Journal of Political Economy*, 103(5), 1067-1090.
- Humphrey, J., & Hubert, S. (1995). *Principles for Promoting Clusters and Networks of SMEs*: UNIDO, Small and Medium Enterprises Branch.
- Jacobs, J. (1969). *The Economy of Cities*. New York: Random House.
- Justman, M. (1994). The Effect of Local Demand on Industry Location. *The Review of Economics and Statistics*, 76, 742-753.
- LeSage, J. P. (1990). Forecasting Metropolitan Employment Using an Export-Base Error Correction Model. *Journal of Regional Science*, 30, 307-323.
- Malpezzi, S., Seah, K.-Y., & Shilling, J. D. (2004). Is It What We Do or How We Do It? New Evidence on Agglomeration Economies and Metropolitan Growth. *Real Estate Economics*, 32(2), 265-295.
- Martin, R. (1999). The New Economic Geography: Challenge or Irrelevance? *Transactions of the Institute of British Geographers*, 387-391.
- Minnesota Population Center. (2006). Historic Counties for the 2000 Census of Population and Housing: Minnesota Population Center, Minneapolis, Minnesota. (Publication. Retrieved May 1, 2008: <http://www.nhgis.org/mapping/boundary-file-availability>)

- Porter, M. E. (2003). The Economic Performance of Regions. *Regional Studies*, 37(6/7), 545.
- Quah, D. T. (2006). Growth and Distribution. Unpublished Manuscript. LSE Economics Department.
- R Development Core Team. (2007). R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing.
- Rocha, H. O. (2004). Entrepreneurship and Development: The Role of Clusters. *Small Business Economics*, 23(5), 363-400.
- Simon, H. A. (1955). On a Class of Skew Distribution Functions. *Biometrika*, 42(3/4), 425-440.
- U.S. Bureau of the Census. (2008). County Business Patterns (Publication. Retrieved May 15, from U.S. Department of Commerce: <http://www.census.gov/epcd/cbp/view/cbpview.html>
- U.S. Department of Commerce. (2001). *Concentration Ratios in Manufacturing, 1997*: U.S. Census Bureau.
- U.S. Department of Justice. (2008). Herfindahl-Hirschman Index. Retrieved may 23, 2008, from <http://www.usdoj.gov/atr/hhi.htm>
- U.S. Small Business Administration. (2008). *Table of Small Business Size Standards Matched to North American Industry Classification System Codes*.
- van Oort, F. G. (2007). Spatial and sectoral composition effects of agglomeration economies in the Netherlands. *Papers in Regional Science*, 86(1), 5-30.
- van Wissen, L. (2004). A Spatial Interpretation of the Density Dependence Model in Industrial Demography. *Small Business Economics*, 22(3/4), 253-264.
- Wheeler, C. H. (2001). A Note on the Spatial Correlation Structure of County-Level Growth in the U.S. *Journal of Regional Science*, 41(3).
- Williamson, R. B. (1975). Predictive Power of the Export Base Theory. *Growth & Change*, 6(1), 3.

Annex on line

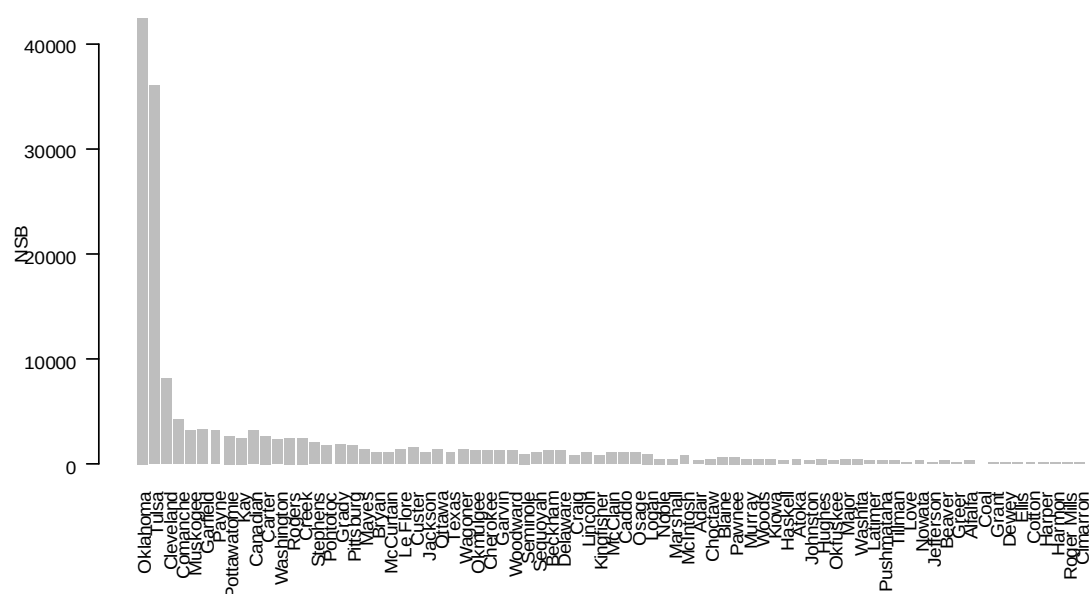


Figure 1. Number of small businesses as of 1998.

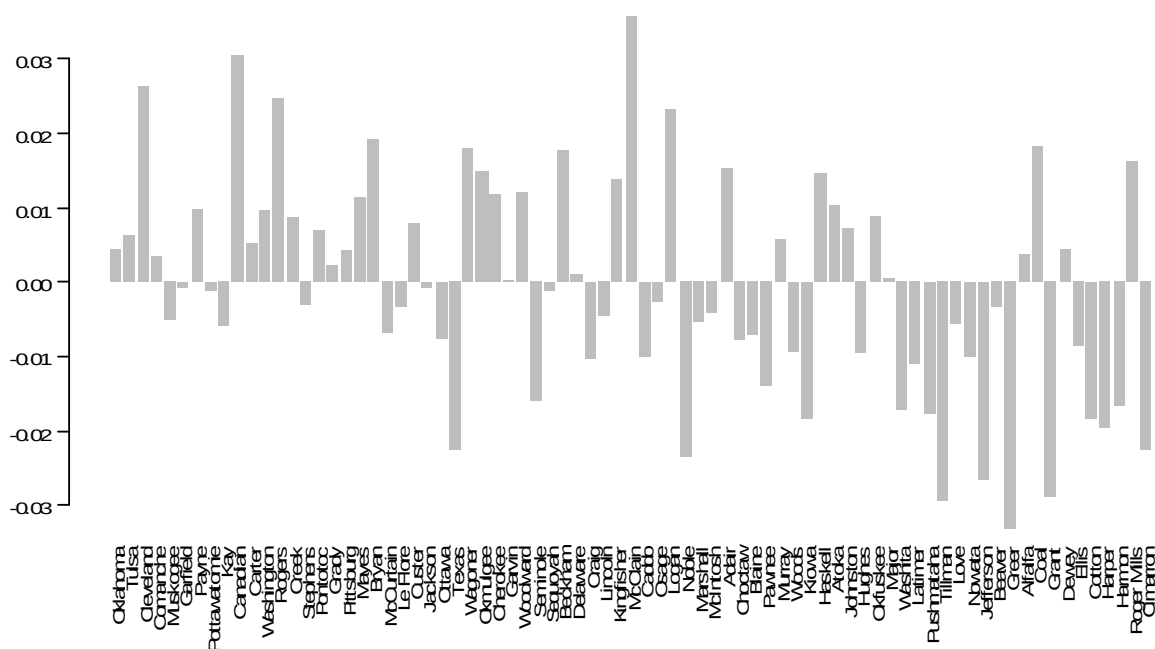


Figure 4. Average annual growth rate of the number of small businesses.