A TEST OF THE DECENTRALIZATION HYPOTHESIS: AN ANALYSIS OF ANNUAL EMPLOYMENT GROWTH IN INDIANA METROPOLITAN AND NON-METROPOLITAN LABOR MARKETS

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ABSTRACT

Manufacturing employment growth since the 1960s has tended to favor less developed low-density locations. Behind this decentralization are changes in the relationships between labor, capital, material and market. Using detailed industry data covering the 1988-1995 period, this study investigates manufacturing employment decentralization for Indiana metropolitan and non-metropolitan labor markets. Results reveal that not only did manufacturing employment decentralize but so did employment in wholesale, retail, and service industries. Nonetheless, for some manufacturing and non-manufacturing industries the pull of agglomeration economies remains a strong force tying them to historical locations in metropolitan areas.

INTRODUCTION

The decentralization of manufacturing jobs began in the 1920's, intensified during the years of deindustrialization in the 1970's, and continued into the 1990's (Fuchs [1962]; Nelson and Cosson [1989]; Nelson and Dueker [1988]; Lonsdale and Saler [1973]). Much of the development since the 1970's has taken place in low density areas, resulting in population and manufacturing gaining jobs at a faster pace than metropolitan areas. Much of that rural renaissance disappeared, however, when formerly non-metropolitan counties were deemed metropolitan by the census in 1983. Researchers found that a new form of development, termed exurban, started to emerge in the United States in low density sites extending more than 50 miles from the edge of most urban development and more than 100 miles from the center of the largest central cities in the U.S. (Nelson and Dueker [1988]).

Behind this decentralization are changes in the relationships between labor, capital, material and market. Modern technology allows for greater substitution of labor by machines. This has resulted in larger plants that are horizontal v. vertical, consequently requiring extensive tracts of land more readily available outside of developed areas. At the same time, transportation costs for both freight and labor has declined. This is especially true for ground transportation. The highway network has made more markets accessible than has any other conveyance. Moreover, excellent highways have increased the supply of suitable manufacturing sites, making such sites relatively cheap. In addition, relatively easy access has allowed manufacturing firms to be located relatively long distances from major labor markets, since workers are

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willing to travel considerable distances. Researchers have also found that manufacturing plants locate away from urban areas to take advantage of a willing and reliable work force, the absence of labor unions and existence of right-to-work laws, readily available buildings and sites, and community livability. In short, manufacturing plants have become more and more "footloose." (Wheat [1973, 1986]; Carlino and Mills [1987]; Dunne, Roberts, and Samuelson [1989])

The nature of manufacturing decentralization has important implications with respect to the future prosperity of many economies, particularly in Great Lake states where manufacturing plays such a dominant role. Understanding trends in the spatial pattern of manufacturing activity also has implications for economic development policy. Research on manufacturing employment growth during the 1963 – 1987 period, for instance, found that counties with airports (even small airports), relatively higher percentages of farm population, and relatively higher percentages of high school graduates had higher manufacturing growth rates. Conversely, manufacturing growth rates were negatively associated with relatively higher union membership, property taxes, and manufacturing as percent of employment. (Blair and Premus [1987]; Blackley [1986])

This paper looks at spatial dimensions of Indiana manufacturing and non-manufacturing employment growth for eleven Indiana MSAs and for Indiana's non-metropolitan labor markets. The research extends the spatial analysis of manufacturing employment in several ways. First, by using more recent data from 1988 to 1995, the analysis updates earlier studies that ended in the mid 1980s. Second, the study uses 4-digit SIC data so that much more detail can be obtained about spatial patterns of manufacturing industries. Third, the study also looks at the spatial growth of non-manufacturing sectors. The growth of these non-manufacturing sectors has become more important to local economies given that manufacturing increasingly relies on various service industries such as finance, marketing, legal, accounting, etc. and because non-manufacturing sectors such as health care have become important sources of export income even for smaller economies. The study finds that while low density non-metropolitan areas have a strong pull for manufacturing and non-manufacturing industries, agglomeration economies still play an important role to many industries.

The paper is organized as follows. The next section of the paper describes the data, as well as characteristics of Indiana's metropolitan and non-metropolitan labor markets. Manufacturing employment growth decentralization is then investigated. This is followed by an investigation into the decentralization of non-manufacturing employment growth. A final section summarizes major results and discusses policy implications of the study.

DATA AND BASIC CHARACTERISTICS OF MSAS

The data for all of the analysis done in this study are taken from ES202 data files. Nearly all employers are required to file unemployment insurance ES202 reports to their respective states on a quarterly basis. An employer needs to report to the appropriate state agency if that employer had a paid employee for 20 or more weeks during the year or paid an employee $1,500 or more during any quarter. Firms exempt from the reporting requirement include agricultural enterprises with fewer than 10 employees and sole proprietorships, including those that employ unpaid

family members. The data used in the study come from the ES202 files for the years 1988 to 1995 and are at the 4-digit standard industrial classification (SIC) level.

The data were purchased from MIG, Inc. who provides estimates where disclosures do not allow the actual data to be shown. Many data problems surfaced as we started to use these data. We literally spent hours and hours of time and substantial amounts of money cleansing the data of obvious errors. Most of the errors at the 4-digit SIC level appear to be reclassification of industries perhaps because of changes in the nature of work from year to year by one or more firms or simple coding errors. We also sought the assistance of local economic development officers to help us reconcile data problems. These officials, in some instances, went to local firms to solicit their input on data missclassifications. We believe that the obvious errors in the data have been corrected. Nonetheless, it would be highly presumptive of us to say the data are error free.

Data in Tables 1 and 2 provide information on the basic characteristics of the 11 Indiana MSA's used in this study, as well as the non-metropolitan counties. The 11 MSA's studied differ in both size and character. In terms of employment they range from Bloomington, which is the smallest, with 38,372 workers to Indianapolis, which is the largest, with 610,583 workers.

Table 1
Employment by Industry and MSA

MSAs

Industry Categories	Bloomington	Elkhart	Evansville	Terre Haute	Muncie	Lafayette	Indianapolis	Fort Wayne	Gary	Kokomo	South Bend	Non-Metro	Total
Agriculture	515	675	1286	579	779	749	7022	2210	2124	632	597	8108	25279
Mining	185	35	1804	551	33	47	846	285	62	34	22	3852	7761
Construction	2209	3426	7607	2780	1851	3049	36399	10151	14633	1209	5817	27909	117043
Manufacturing	9340	54770	30509	12666	11070	18551	124793	68785	54521	19299	22190	218337	644835
Transportation, Comm. P.U.	1673	2675	4891	2888	3694	2013	41139	13122	14946	1339	5456	30689	124528
Wholesale	1373	5210	7423	2353	1739	1885	43951	13693	9881	1120	7136	31502	127270
Retail	11497	13789	27560	15210	10902	14738	140751	43427	47594	9128	22983	125632	483215
Finance, Ins., Real Estate	2060	2829	5791	2206	1735	3534	53100	13436	8695	1413	6673	31281	132756
Services	9520	13245	32651	12601	11262	14042	162579	46666	53667	7035	32750	101863	497884
Total	38372	96654	119525	51838	43069	58611	610583	211775	206127	41214	103624	579178	2160573

Figures presented in this Table are averages over the 1988-1995 period.

The 11 MSA's also vary considerably in terms of their character. Indianapolis is the state capital but also has grown considerably in recent years and has a sizeable non-government sector. Bloomington, West Lafayette, Muncie, and Terre Haute are generally thought of as college towns but also have significant non-educational employment. Elkhart is the recreational vehicle capital of the world and is much more dominated by manufacturing than any of the MSA's. Kokomo, and South Bend have automobile manufacturing plants. Gary is still dominated by the steel industry in spite of massive declines in employment starting in the late 1970's.

Many of the MSA's have witnessed major changes over the past four to five decades. For example, South Bend, once largely dominated by heavy manufacturing, has more recently evolved into a regional retail and medical service center, in part servicing Elkhart, which has continued to specialize in manufacturing.

Table 2
Percentage of Employment by Industry and MSA

MSAs

Industry Categories	Bloomington	Elkhart	Evansville	Terre Haute	Muncie	Lafayette	Indianapolis	Fort Wayne	Gary	Green Bay	South Bend	Non-Metro	Total
Agriculture	1.3%	.7%	1.1%	1.1%	1.8%	1.3%	1.2%	1.0%	1.0%	1.0%	.6%	1.4%	1.2%
Mining	.5%	.0%	1.5%	1.1%	.1%	.1%	.1%	.1%	.0%	.1%	.0%	.7%	.4%
Construction	5.8%	3.5%	6.4%	5.4%	4.3%	5.2%	6.0%	4.8%	7.1%	5.3%	5.6%	4.8%	5.4%
Manufacturing	24.3%	56.7%	25.5%	24.4%	25.7%	31.7%	20.4%	32.5%	26.5%	25.8%	21.4%	37.7%	29.8%
Transportation, Comm. P.U.	4.4%	2.8%	4.1%	5.6%	8.6%	3.4%	6.7%	6.2%	7.3%	8.8%	5.3%	5.3%	5.8%
Wholesale	3.6%	5.4%	6.2%	4.5%	4.0%	3.2%	7.2%	6.5%	4.8%	6.5%	6.9%	5.4%	5.9%
Retail	30.0%	14.3%	23.1%	29.3%	25.3%	25.1%	23.1%	20.5%	23.1%	21.4%	22.2%	21.7%	22.4%
Finance, Ins., Real Estate	5.4%	2.9%	4.8%	4.3%	4.0%	6.0%	8.7%	6.3%	4.2%	6.5%	6.4%	5.4%	6.1%
Services	24.8%	13.7%	27.3%	24.3%	26.1%	24.0%	26.6%	22.0%	26.0%	24.6%	31.6%	17.6%	23.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Figures in the above Table are based on averages over the 1988-1995 period.

The data in Table 2 highlight the structural similarities and dissimilarities of the MSAs. All MSA's except Elkhart and Indianapolis have similar percentages of employment in construction, finance-insurance-real estate (FIRE), and wholesale trade. Indianapolis has a larger percentage of employment in FIRE and Elkhart a smaller percentage in FIRE. Indianapolis has historically been a center of insurance activity and Elkhart may rely upon South Bend for its financial services. The percentage of employment in manufacturing varies the most across metropolitan and non-metropolitan counties. Manufacturing represents about 28 percent of employment in the 11 MSA's but 57 percent of employment in Elkhart, 47 percent of employment in Kokomo, and 38 percent of employment in the non-metropolitan counties. Elkhart and Kokomo offset high percentages of manufacturing with lower percentages of employment in services.

The results highlight the importance of specialization, trade, and proximity. Kokomo and Elkhart are able to specialize more in manufacturing because of their close proximity to other MSA's that are relied upon as retail and service providers. South Bend, for example, has become the retail and service center of what has been termed the Michiana area. Elkhart, which is twenty miles from South Bend relies on South Bend for its more specialized retail and service products. Kokomo presumably relies on Indianapolis, which is about 40 miles south, for many of its retail and service products, particularly highly specialized medical services provided by the IU School of Medicine hospitals.

DECENTRALIZATION OF MANUFACTURING DURING THE LATE 1980S AND 1990S

The MSA's used in the study were grouped into various size categories based on their employment size in 1992, the median year in the data set. A non-metropolitan category was also created as the residual employment in Indiana after eliminating the Indiana MSA's. The MSA's naturally fall into five categories. At the extremes are the very small MSA's with labor forces under 50,000 workers. These include Bloomington, Kokomo, Lafayette, Muncie, and Terre Haute. At the other extreme is the only really large MSA in the study, Indianapolis, with a labor force of around 650,000. Several of the other MSA's such as Elkhart, South Bend and Evansville fall into the range of 50,000 to 149999, workers. Another group that includes Fort Wayne and Gary are in the interval 150,000 to 249,999 range.[1] The final category non-metropolitan is, as mentioned above, is employment in non-metropolitan Indiana counties.

The analysis of manufacturing growth relies on the shift-share technique. The technique starts from an identity where the change in the ith industry's employment (in this case a 4-digit standard industrial code manufacturing industry) is given as:

$$\Delta E_i = SE_i + ME_i + CE_i$$

where SE is the share effect calculated as the change in industry i's employment had industry i's proportion of total employment and growth rate in the local economy exactly matched that of industry i in the broader reference economy (in this case the United States). ME is termed the mix effect and makes an adjustment to the calculation given by the share effect to take into account that the local proportion of industry i and the national proportion of industry i may, and probably do, differ. A positive mix effect for industry i can result from either the local economy being more dominant in industry i than the national economy if industry i's national growth rate is positive or being less dominant than the national economy if industry i's national growth is negative. CE is termed the competitive effect or alternatively the regional shift effect. CE makes an adjustment to the share effect that takes into account the local growth of the ith industry relative to the national growth of that industry. Positive competitive shift results from the local industry's growth rate exceeding the national growth rate. Algebraically, the three effects are given as:

$$SE_i = te_{local}p_{i,us,o}g_{i,us}$$
$$ME_i = te_{local}(p_{i,local,o} - p_{i,us,o})g_{i,us}$$
$$CE_i = te_{local}p_{i,local,o}(g_{i,local} - g_{i,us})$$

where te_{local} is total base period employment in the local economy, where $p_{i,us,o}$ and $p_{i,local,o}$ are the base period proportions of national and local total employment represented by industry i, where $g_{i,us}$ equals $(E_{i,us,i}/E_{i,us,o})$-1, and where $g_{i,local}$ equals $(E_{i,local,1}/E_{i,local,o})$-1, these latter two terms growth rates of the ith industry locally and nationally. The version of the shift-share technique used is dynamic shift-share (Barff and Knight [1988]) and calculates the shift-share effects for each pair of years from 1988 to 1995. The results are then averaged over the seven pairs of years to convert them to annual numbers.

Table 3
Shift-Share Results by Metropolitan and Non-Metropolitan Labor Markets

Employment Measure	Industry Categories	Means					Trimmed Means				
		Employment Size Category					Employment Size Category				
		<100	100-150	150-250	>250	Non-Metro	<100	100-150	150-250	>250	Non-Metro
ANNUAL CHANGE	Agriculture	2.7	4.2	8.6	20.8	24.7	2.2	3.7	6.7	17.8	16.8
	Mining	-3.0	-9.8	0.4	2.0	-6.2	-0.7	-7.6	0.3	1.1	-3.2
	Construction	4.5	7.9	9.7	44.9	27.9	3.7	6.5	9.8	40.1	25.0
	Manufacturing	2.6	0.8	0.2	0.6	11.3	0.4	0.7	1.9	2.2	8.9
	Transportation, Comm. P.U.	4.2	1.8	-1.1	27.5	13.5	0.3	1.3	0.1	24.9	3.7
	Wholesale	-0.1	1.6	2.3	15.0	13.1	0.0	1.4	1.6	13.4	12.9
	Retail	5.4	6.5	12.1	59.6	68.4	1.3	1.4	3.1	24.2	21.8
	Finance, Ins., Real Estate	1.1	2.8	1.9	23.1	6.6	0.6	2.6	2.2	19.3	8.5
	Services	3.9	7.4	12.1	48.0	39.4	2.2	3.8	7.3	31.8	24.2
SHARE EFFECT	Agriculture	1.7	3.0	5.1	13.9	7.3	1.5	2.5	4.3	11.2	5.9
	Mining	-0.9	-2.4	-2.4	-8.2	-18.5	-0.8	-2.2	-1.9	-6.7	-16.2
	Construction	0.2	0.4	0.6	2.1	2.8	0.4	0.8	1.3	4.1	4.4
	Manufacturing	0.2	0.1	0.0	-1.1	-5.6	0.1	0.0	-0.1	-0.5	-2.2
	Transportation, Comm. P.U.	1.8	2.8	5.4	14.3	10.8	1.3	2.2	3.8	9.9	6.2
	Wholesale	0.4	0.9	1.6	4.7	4.9	0.4	0.7	1.3	3.8	4.0
	Retail	2.6	6.0	11.1	32.9	31.6	0.9	2.2	3.9	11.8	11.4
	Finance, Ins., Real Estate	0.1	0.3	0.7	1.8	4.1	0.3	0.6	1.3	3.5	6.1
	Services	4.2	9.0	17.0	48.0	47.5	2.6	5.7	10.6	29.7	29.7
MIX EFFECT	Agriculture	0.0	-0.8	-1.3	-4.6	-3.5	-0.1	-0.5	-0.9	-3.2	-3.2
	Mining	-0.3	-3.7	2.3	6.6	10.6	0.7	-1.7	1.8	5.1	10.6
	Construction	0.0	0.3	1.6	1.7	0.8	0.0	0.1	1.4	1.0	0.3
	Manufacturing	1.1	1.4	-2.1	2.0	6.8	0.1	0.5	0.1	1.2	3.5
	Transportation, Comm. P.U.	0.1	-0.2	1.5	8.5	-4.6	-0.4	-0.5	-0.6	1.9	-4.8
	Wholesale	-0.2	-0.1	-0.3	0.3	-1.9	-0.1	-0.1	-0.3	0.1	-1.3
	Retail	1.1	-0.4	0.0	4.3	-3.6	0.1	-0.4	-0.3	0.7	-2.9
	Finance, Ins., Real Estate	-0.1	-0.1	-1.1	7.1	-4.8	-0.2	-0.4	-0.9	3.0	-6.7
	Services	-0.7	-2.4	-3.8	-5.2	-21.8	-0.7	-1.9	-3.4	-3.8	-15.3
COMPETITIVE EFFECT	Agriculture	1.0	1.9	4.7	11.4	21.1	0.9	1.6	3.8	8.3	12.5
	Mining	-1.9	-3.6	0.5	3.6	1.7	-0.6	-3.4	0.5	2.8	2.8
	Construction	4.2	7.2	7.5	41.0	24.6	3.5	6.2	7.6	33.5	17.5
	Manufacturing	1.3	-0.7	2.4	-0.3	10.0	0.3	0.0	2.1	1.2	8.3
	Transportation, Comm. P.U.	2.4	-0.8	-7.9	4.6	7.2	-0.5	-0.2	-4.1	3.8	2.2
	Wholesale	-0.3	0.8	1.0	10.0	10.1	-0.2	0.7	0.9	7.6	9.4
	Retail	1.7	1.0	0.9	22.4	40.5	0.4	-0.7	-0.3	14.4	14.5
	Finance, Ins., Real Estate	1.0	2.7	2.3	14.2	7.1	0.4	2.0	1.2	9.0	5.9
	Services	0.4	0.8	-1.2	5.1	13.7	0.3	0.2	-0.1	4.7	8.2

Data values are calculated as averages annual changes over the 1988-1995 time frame. Sector values represent means and trimmed means of 4-digit SIC industries in a sector. The "trimmed-mean" eliminates the 5% most extreme values at each end of the data distribution.

Table 3 provides the shift-share results for all of the industry sectors broken out by the five categories representing the four sizes of metropolitan areas and the non-metropolitan counties. Each of the numbers in the Table is an average annual figure for the industries represented by a particular sector.   As seen in the first panel in Table 3, manufacturing performed much more strongly in non-metropolitan areas than in metropolitan areas. The metropolitan areas in Indiana, especially the larger ones, had, on average, relatively anemic manufacturing employment growth over the years 1988-1995. Most of the growth that did take place in Indiana took place in the non-metropolitan areas, providing further support for the decentralization hypothesis. Indeed, the increases in the non-metropolitan counties exceeded those of the metropolitan areas by a considerable amount.   For example, the average annual change in a non-metropolitan manufacturing industry was 11.3 jobs in contrast to the next highest value of 2.6 jobs for the MSAs in the smallest group.

The strong manufacturing growth in non-metropolitan labor markets did not result from the share effect, however. The share effect determines a local industry's growth had that local industry perfectly mimicked the national industry in both its importance and growth. Based on the share effect, the average annual employment change in non-metropolitan areas should have declined by 5.6 jobs.

The difference of the annual job growth of 11.3 the non-metropolitan areas actually enjoyed and the share effect of 5.6 jobs is accounted for by a combination of positive mix and competitive effects.   A positive mix effect results whenever a local area (in this case, non-metropolitan counties) has a higher than national proportion of relatively fast growing national industries or a lower than national proportion of relatively slow growing national industries. The strong positive mix effect for the non-metropolitan areas indicates that, on average, non-metropolitan areas have a mix of manufacturing industries that are doing relatively well.   This may simply reflect the dynamics of growth in the manufacturing sector. Newer, footloose, expanding firms with larger plants and requiring more open land may naturally locate in more open non-metropolitan areas to take advantage of site costs, labor costs, lower taxes, and the like.

 The strength in the manufacturing sector in the non-metropolitan areas lies not only with their favorable mix but even more so with their strong competitive effect. The competitive effect captures differences in industry growth rates between a local economy and the national economy. The competitive effect for the metropolitan areas tends to be small positive to small negative implying that these areas mostly held their own with respect to the United States. In effect, the growth rates of manufacturing industries in the MSA's largely mirrored those same industries in the United States so that little shift took place away from or towards the MSA's.   The competitive effect for manufacturing industries in the non-metropolitan areas is much larger than that for the metropolitan areas. The share of manufacturing in non-metropolitan areas in Indiana thus increased with respect to both the United States and the Indiana MSA's.

Standard t-tests were performed to determine the statistical significance of the much stronger performance of manufacturing in non-metropolitan versus metropolitan areas. The annual change, mix effect and competitive effect in non-metropolitan areas all were significantly higher at the 5 percent level of significance, while the share effect was significantly lower at the 5 percent level of significance. Similar results were also found using Analysis of Variance. The ANOVA tests

controlled for differences in the sizes of industries in the manufacturing sector across the various metropolitan and non-metropolitan categories. [2]

Table 4: Fastest Growing Manufacturing Industries by Location

Non-Metropolitan					Metropolitan < 50,000					Metropolitan 50,000 – 149,000					Metropolitan 150,000-249,000					Metropolitan > 250,000				
SIC	change	se	me	ce	SIC	change	se	me	ce	SIC	change	se	me	ce	SIC	change	se	me	ce	SIC	change	se	me	ce
3714	887	130	482	275	**3714**	1870	43	296	1531	**3792**	259	0	83	175	**3711**	405	1	0	404	**3714**	746	112	228	406
3053	313	12	57	242	**3715**	374	2	171	202	3334	189	-1	-74	264	3053	122	3	18	101	3089	249	79	19	150
3715	312	23	62	227	2834	362	5	11	347	3632	131	0	36	95	3823	116	4	3	109	3663	210	10	15	185
3354	272	-3	13	262	**3711**	318	0	19	299	3089	118	41	148	-71	3679	112	-6	6	112	2879	167	3	-12	176
3585	271	15	52	204	3519	213	-1	6	208	3451	107	2	11	94	3089	106	54	25	27	2731	127	1	3	124
3651	263	-14	-242	517	3632	124	0	7	118	3499	96	6	20	70	**3743**	95	4	24	67	2752	107	10	6	92
3652	212	14	39	161	3694	80	0	4	76	3083	91	0	7	83	3492	83	3	7	73	3519	97	-6	-31	134
3499	209	13	33	162	2591	80	0	0	81	3713	88	-3	-15	106	3585	80	3	7	70	3465	85	13	-5	77
3231	186	9	11	166	3599	65	14	3	47	2451	82	3	202	-122	3296	77	-1	1	77	3231	72	8	5	60
2879	186	5	0	181	**3724**	46	-9	6	49	3568	77	0	3	73	3544	70	9	23	37	3061	70	-1	3	68
3599	180	38	24	119	3841	41	0	-1	42	2851	70	-4	-9	82	2451	60	6	19	35	3599	67	37	17	13
3312	160	-59	45	172	3465	39	3	10	26	3442	65	0	3	62	3822	57	-2	0	59	3321	65	-2	-2	69
3564	157	6	16	136	2064	38	1	3	33	3365	64	-3	-9	77	3231	53	5	7	41	2399	64	-1	3	61
2521	143	-11	-100	255	3281	33	0	-1	33	**3724**	63	-22	-37	122	**3714**	52	76	101	-125	2819	62	-17	7	73
3728	142	-85	110	117	2711	32	-10	-1	43	3317	51	1	11	38	**3716**	51	-1	-8	59	2035	58	0	5	53
3087	141	-1	-1	145	3822	32	0	-6	38	3479	50	9	9	38	3479	50	4	14	31	2842	57	-2	-4	64
3648	137	4	-3	135	3089	30	31	7	-8	3444	45	9	11	25	3086	45	1	10	34	3842	56	7	-4	53
3621	134	-15	-21	170	3221	28	-1	-9	38	**3715**	45	2	14	28	3272	45	-3	0	48	3569	53	7	9	37
2752	127	10	-1	117	3081	26	2	17	8	3363	44	4	53	-13	3599	44	26	24	-6	3492	50	5	3	42
3089	122	77	178	-133	3674	25	-7	0	32	3651	44	-2	-10	57	3451	44	2	7	35	2711	49	-26	1	75
3052	117	5	-2	117	3087	24	0	2	23	2023	44	0	0	44	2759	44	-1	1	44	2051	47	-9	-3	59
3612	112	-18	23	106	3479	23	2	1	20	3471	44	0	3	41	3593	41	0	-1	42	2396	46	18	23	5
3469	112	21	-7	99	2048	22	0	0	23	3364	43	0	-8	51	3663	38	3	53	-18	2841	43	-2	-2	44
2676	111	-3	-9	122	2759	22	0	2	20	2869	41	2	-3	42	2452	38	-3	-1	42	3429	42	-9	-14	66
2096	110	5	-8	112	3496	21	0	3	18	2431	40	0	3	38	3448	37	0	2	35	3553	42	0	0	41

Change = average annual change in employment 1988-1995
se = average annual share effect
me = average annual mix effect
ce = average annual competitive effect

Table 4 provides information on the manufacturing industries that had the largest employment changes during the 1988-1995 time frame. Three patterns stand out very dramatically. First, non-metropolitan areas had much greater depth of positive changes than did metropolitan areas. In contrast to increases of the non-metropolitan areas, the magnitude of the increases for all of the metropolitan size categories drops off very quickly. For example, the tenth largest increase in the non-metropolitan areas is an average annual change of 186 jobs. The tenth largest change

in the metropolitan areas ranges from an annual change of 46 jobs to an annual change of 77 jobs.

Second, transportation related industries played an extremely important role for both metropolitan and non-metropolitan areas. (see also INcontext [2001]) These industries are highlighted in bold in Table 4. SIC 3711 – Motor Vehicles and Car Bodies, SIC 3713 – Truck and Bus Bodies, SIC 3714 – Motor Vehicle Parts and Accessories, SIC 3715 – Truck Trailers, SIC 3716 – Motor Homes, SIC 3724 – Aircraft Engines and Engine Parts, SIC 3743 – Railroad Equipment, and SIC 3792 – Travel Trailers and Campers surface in the top twenty-five fastest growing manufacturers in one or more of the metropolitan and non-metropolitan areas. Indeed SIC 3714, Motor Vehicles Parts and Accessories, is the top ranked manufacturing growth industry in non-metropolitan areas, in metropolitan areas < 50,000, and in metropolitan areas > 250,000. SIC 3715, Truck Trailers, has the third highest ranking in non-metropolitan areas and the second highest ranking in metropolitan areas < 50,000. The dominance of the transportation industry also influenced the strong performance of other manufacturing industries, especially the group of metal related industries that are in the SIC 3400 category and are major suppliers to the SIC 3700 industries. These are industries such as 3471 – Plating and Polishing, 3452 – Screw Machine Products, 3442 – Metal Doors and Sashes. For the most part, the growth of these industries took place in MSA's in the 50,000-149,000 and 150,000 to 249,000 size categories.

Finally, the same transportation sector industries that did well in non-metropolitan areas also did well in the three smaller size categories of metropolitan areas. Much of this reflects the pull of localization economies leading firms to locate in close proximity to other firms in the same industry to take advantage of specialized labor, suppliers, and knowledge flows. Examples of industries that had strong competitive effects related to the localization economies of existing concentrations are Motor Vehicles in Kokomo; Refrigerators in Bloomington; Travel Trailers, Metal Doors, Recreational Vehicles, and Musical Instruments in Elkhart; Primary Metals, Metal Stampings, Blast Furnaces in Gary; and Radio and TV Equipment in Indianapolis.

DECENTRALIZATION AND NON-MANUFACTURING INDUSTRIES

Table 3 also provides information on the shift-share results for the non-manufacturing industries. The largest average annual changes transpired in the >250,000 metropolitan category (Indianapolis) and in non-metropolitan areas. In part, this is accounted for by the larger average size of industries in these two breakouts. Indeed, as shown in Table 5 once industry size is taken into account, there are no statistically significant differences across any of the shift-share effects for the Construction; TCPU; and FIRE sectors.[3] Nevertheless, statistically significant differences for Wholesale, Retail, and Services remain even after controlling for industry size effects. For instance, after controlling for industry size, the competitive effect for wholesale was larger in non-metropolitan areas than in any of the metropolitan size categories. This in part reflects the advantages the non-metropolitan areas have with respect to manufacturing, the increased tendency of manufacturers to rely on others for many functions that were previously performed in-house, and the popularity of just-in-time inventory practices. The advantage of non-

Table 5

Differences in Mean Shift-Share Effects for Non-Metropolitan and Metropolitan Areas

Sector	Employ-ment Change	Difference in Non-Metropolitan Mean versus: (Not controlling for industry employment size				Difference in Non-Metropolitan Mean versus: (Controlling for industry employment size			
		<50000	50,000-149,000	150,000-249,000	>25000	<50000	50,000-149,000	150,000-249,000	>25000
Manuf-acturing	Change	8.7	10.5a	11.0a	10.7c	8.3c	10.1b	10.8b	10.5c
	Share	-5.8a	-5.7a	-5.6a	-4.6b	-6.5a	-6.3a	-6.1a	-4.8a
	Mix	5.7a	5.4a	8.9a	4.8	9.1a	8.3a	11.1a	6.0a
	Competitive	8.7	10.7a	7.7a	10.4b	5.7a	8.1b	5.7	9.3b
Construc-tion	Change	23.5a	20.0b	18.2b	-16.9c	3.9	3.8	-1.6	7.9
	Share	2.6	2.3	2.2	0.7	-2.8	-2.6	-2.4	0.6
	Mix	0.7	0.5	-.09	-0.9	1.0	1.0	1.9	0.4
	Competitive	20.4a	17.4b	17.1b	-16.4c	5.5	5.1	-1.4	7.8
TCPU	Change	9.2	11.6	14.6	-14.0	-2.5	0.9	-.6	4.7
	Share	9.0b	8.0c	5.4	-3.5	3.3	2.7	2.9	1.1
	Mix	-4.6	-4.4	-6.0c	-13.1a	-8.4a	-7.9a	-7.7a	-10.1a
	Competitive	4.8	8.0	15.1	2.6	2.7	6.0	14.2	4.3
Wholesale	Change	13.2a	11.5a	10.8a	-1.8	5.0b	4.7b	5.4b	1.7
	Share	4.4a	4.0a	3.2a	0.2	3.1a	2.9a	2.4a	0.7
	Mix	-1.7a	-1.7a	-1.6a	-2.2a	-2.1a	-2.2a	-1.9a	2.0a
	Competitive	10.4a	9.3a	9.1a	0.1	3.9b	3.9b	4.8b	2.9
Retail	Change	63.0a	61.9a	56.3a	8.8	8.8	11.8c	17.7b	17.2b
	Share	28.9a	25.6a	20.5b	-1.3	3.8	4.5	2.8	-3.8
	Mix	-4.6a	-3.2b	-3.6b	-7.8a	-6.9a	-5.2a	-5.1a	-7.5a
	Competitive	38.8a	39.5a	39.5a	18.6c	19.3a	21.6a	25.7a	21.1a
FIRE	Change	5.5	3.8	4.7	-16.5b	3.0	1.6	3.1	-14.1
	Share	4.0	3.9	3.4	2.3	3.2	3.2	2.9	3.1
	Mix	-4.7	-4.6	-3.7	-11.9a	-3.8	-3.8	-3.1	-12.7a
	Competitive	6.1	4.4	4.8	-7.2	3.3	2.0	3.0	-4.7
Services	Change	35.5a	32.0a	27.3a	-8.6	14.9a	14.7a	15.0a	3.1
	Share	43.4a	38.5a	30.6a	0.5	24.9a	23.0a	19.5a	10.0a
	Mix	-21.1a	-19.4a	-18.0a	-16.6a	-21.4a	-19.6a	-18.2a	-16.4b
	Competitive	13.3a	12.9a	14.8a	8.5c	11.4a	11.3a	13.7a	-.9.6a

a. Significant difference at the .01 level
b. Significant difference at the .05 level
c. Significant difference at the .10 level
Industry size was controlled for using a generalized linear model with fixed effects representing non-metropolitan areas and the four metropolitan size categories and average industry size as a covariate.
Tests were not performed on the Agriculture and Mining sectors because of the few observations in many of the size category breakouts.

metropolitan areas with respect to wholesale industries further results from the advantage of these areas with respect to retail. After controlling for industry size, the competitive effects for retail were statistically larger in non-metropolitan areas than in any of the other metropolitan size categories. This retail advantage is very likely the result of the tremendous residential development that is taking place in undeveloped, outlying areas. It may also reflect the decisions of mega-store retailers, such as Wal-Mart, to locate in less populated, less served areas. Finally, service employment also decentralized during the 1988 – 1995. Non-metropolitan areas had significantly

greater competitive effects after controlling for industry size than all of metropolitan size categories, except the largest representing Indianapolis. The non-metropolitan competitive effect was larger than that of Indianapolis, but the level of significance was slightly above the usual 5 percent level. As in the case of wholesale industries, the much stronger growth of services in non-metropolitan Indiana areas largely reflects other advantages. To some extent, the service employment growth is a response to the residential development that has taken place in non-metropolitan areas. It is also likely a response to the decentralization of manufacturing. Manufacturers increasingly rely upon outside suppliers for business related services such as advertising, legal and accounting. Manufacturers also rely more heavily on temporary labor provided by outside agencies.

SUMMARY AND CONCLUSIONS

This study has investigated the manufacturing decentralization hypothesis by analyzing employment trends of four-digit SIC industries for Indiana's metropolitan and non-metropolitan labor markets over the period 1988 – 1995. The study extends earlier analysis by considering a more recent time period, labor markets in a rust-belt state, and non-manufacturing employment. Shift-share results indicate that during the 1988- 1993 period manufacturing employment growth was relatively weak in Indiana's metropolitan areas, regardless of their size. Manufacturing, however, experienced strong growth in non-metropolitan areas. The shift-share competitive effect was significantly larger in non-metropolitan areas than in any of the various size categories for metropolitan areas. This was the case even after controlling for differences in industry size in metropolitan and non-metropolitan areas.

Not only did manufacturing employment decentralize but also so did employment in other sectors such as wholesale, retail, and services. Shift share competitive effects were significantly higher for non-metropolitan than for any of the metropolitan size categories for wholesale and retail industries and higher than all metropolitan size categories for services, except for services in the Indianapolis MSA. In part, the decentralization of non-manufacturing jobs is a response to the decentralization of manufacturing, which has increasingly outsourced various functions, thereby relying more heavily on wholesale and service sectors. In part, the decentralization of non-manufacturing jobs reflects the decentralization of households. Much of the tremendous residential development that has taken place in recent periods has been in outlying, non-metropolitan areas. Growth in retail and service industries is, to some extent, a response to that decentralization.

Investigation of the detailed 4-digit SIC data suggests that the trend towards decentralization is somewhat more complex than the more aggregate numbers might suggest. Perhaps the best example of this is with respect to Indiana transportation SICs. By itself, the transportation sector was the greatest source of manufacturing employment growth in the State of Indiana during the 1988- 1995 period. Moreover, of the three industries with the largest annual change in employment in non-metropolitan areas two of those are transportation SICs. Nonetheless, many of the transportation industries expanded very strongly in metropolitan areas. For example, in the smallest MSA size category of <50,000 four of the fastest growing industries are in the SIC 3700 group. Similarly in the 50,000 – 149,999 and 150,000 – 249,999, four of the fastest growing industries are transportation related. Moreover, many of

the traditional strongholds of MSA's such Elkhart, Kokomo, South Bend, and Gary continued to experience positive gains, presumably due to localization economies.

Though decentralization appears to be a powerful force that cannot probably be offset by any economic development policies that Indiana's MSA's can enact, the MSA's not only are holding their own in certain traditional industries but also presumably are playing an important role in servicing the non-metropolitan areas. For example, location quotients computed for the MSA indicate that MSA's such as South Bend, Fort Wayne, Gary, and Indianapolis provide a wide range of medical services to non-metropolitan households.[4]   In South Bend, about one-quarter of employment in health related industries goes to providing health care services to those outside the South Bend MSA.   Similarly, in Indianapolis about one-half of the health care service employment provides services for non-Indianapolis residents.   The MSA's also appear to export to non-metropolitan areas a wide array of business services, such accounting, legal, advertising, finance, engineering, and temporary help services.   Some of these activities, for instance, health care have significant economies of scale, are extremely specialized, and require significant market size to make them feasible. Market sizes for these specialized services require the larger [5]populations of the MSA's as well as the surrounding non-metropolitan population. Much the same holds for various specialized retail goods. Again these specialized retail activities cannot survive in small markets such those in the non-metropolitan areas. The upshot is that in spite of the evidence of decentralization in manufacturing as well as decentralization in some of the other sectors such as wholesale, retail and services, the MSA's still remain viable economies by maintaining some traditional manufacturing industries and by supplying specialized non-manufactured goods and services to the less populated, less dense non-metropolitan areas.

END NOTES

1. An alternative distribution of sizes maintains the two extreme categories (smaller MSA's and Indianapolis) but combines MSA's in the 50,000 – 249,999 range into one category rather than two. Making this change has relatively any impact on the results reported below.
2. The tests were performed using a generalized linear model with fixed effects represented by non-metropolitan and the four MSA size categories and a covariate represented by average industry employment.
3   TCPU contains Transportation, Communications, and Public Utilities; FIRE includes Finance, Insurance, and Real Estate.
4   Location quotients are computed for industry i as the ratio of the percentage of local employment in industry i to the percentage of national employment in industry i.   Location quotients larger than one imply some part of local production is going outside the local area. For example, a location quotient of 1.5 would suggest that one-third (0.5/1.5) of local employment is related to goods or services sold to consumers outside the local area.

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