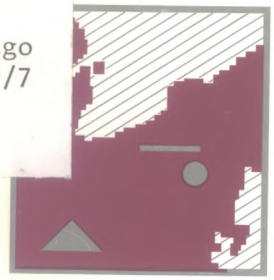

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Why Has Illinois Manufacturing Fallen Behind the Region?

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William A. Testa*

The flight of manufacturing from the Great Lakes region to the Sunbelt has been a prominent feature of the economic landscape over the past 25 years. The once-robust Illinois manufacturing sector has not only fallen behind the nation, but it has markedly lagged neighboring states and the Great Lakes region during the 1970s and 1980s. Much of the job loss of the larger region reflects changing industrial structure in America towards defense and high tech goods and also a migration of U.S. population toward warmer and sparsely-populated regions. But Illinois' poor performance cannot be entirely explained by these broad changes in the the economic landscape. The broad forces of change have impacted both Illinois and its neighbors alike. Yet Illinois has lost manufacturing, even in relation to its neighbors.

In this study, we closely examine the performance of Illinois manufacturing employment against the backdrop of neighboring states. By doing so, we find that Illinois competitive performance has been poor. The state's industry composition does not account for it. Neither does Illinois' large urban concentration residing in the Chicago area. Increasingly, it appears that competitive factors have been detrimental to manufacturing in Illinois.

Illinois Manufacturing Performance—Overview

Using manufacturing employment as a yardstick, lagging job growth in Illinois reaches back to at least 1960 (Table 1). Employment declined by 23 percent from the second quarter of 1960 through the fourth quarter of 1988. In the remainder of the Great Lakes region (Wisconsin, Michigan, Indiana, and Ohio), employment losses were far less profound. Even excluding the stellar performance of Wisconsin, Illinois job losses are staggering relative to Michigan, Indiana, and Ohio. Moreover, Illinois' losses have been persistent. The Illinois economy did not keep pace with the region's job growth in manufacturing from 1960 to 1973; and during the regional declines of the post-OPEC era, Illinois' losses were decidedly sharper than the region. In examining shorter time intervals, care must be taken to account for differences in industry structure as it affects the busi-

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Table 1

Percent Change in Manufacturing Employment

	Illinois	G.L. (4)**	G.L. (3)***
1960 Q2 - 1988 Q4	−23.0	−2.1	−5.7
1960 Q2 - 1973 Q4	+10.8	+18.3	+18.6
1973 Q4 - 1988 Q4	−30.6	−17.3	−20.5
1960 Q2 - 1969 Q4	+13.9	+18.7	+19.7
1969 Q4 - 1973 Q4	−2.7	−.3	−1.0
1973 Q4 - 1975 Q1*	−9.7	−12.4	−13.8
1973 Q4 - 1980 Q1*	−7.6	−6.4	−8.7
1975 Q1 - 1980 Q1	+2.3	+7.0	+5.9
1980 Q1 - 1982 Q4	−22.1	−21.0	−21.4
1982 Q4 - 1988 Q4	+.1	+11.8	+11.0
1986 Q4 - 1987 Q4*	+1.4	0	−.6
1987 Q4 - 1988 Q4*	+1.5	+1.3	+.7

*Periods in which Illinois outpaces rest of region. Note that the rest of the region peaked in 1979 Q1, reflecting the auto industry downturn.
**Represents the states of Indiana, Michigan, Ohio, and Wisconsin.
***Excludes Wisconsin from the group.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics (790 series).

ness cycle. The performance episodes reported in Table 2 correspond to peaks and troughs (quarterly) of the national business cycle. By failing to recognize the different cyclical behavior of the Illinois economy, one could erroneously conclude that Illinois has outperformed its neighbors during certain periods. On closer inspection, however, these high-performance episodes in Illinois are largely confined to national recessionary conditions such as the 1973-75 period. Table 2 takes note of those yearly periods in which quarter to quarter growth in Illinois exceeded the remainder of the region (e.g. second quarter in one year to second quarter in another). With the exception of periods ending in the years 1966-67 and 1987-88, recessionary events overlie Illinois' superior performance in manufacturing job growth (decline). The Illinois manufacturing sector, then, has been less cyclically sensitive than the remainder of the region.

In understanding its less cyclical nature, the Illinois economy concentrates in nondurables goods industries in relation to the Great Lakes region (Table 3). Illinois is more concentrated in the printing and publishing and food processing industries while less concentrated in automotive industries.

Table 2

Manufacturing Employment: Performance and Conditions

	Above-Average		General Conditions	
	G.L. (4)	G.L. (3)	Recessionary	Value of Dollar
1960-61	*	*	R	high
1961-69	(1966-67)	(1966-67)		high
1969-70	*	*	R	high
1970-73				declining
1973-75	*	*	R	low
1975-80				low
1980-82	1980,82(Q3+4)	1979-80,82(Q3+4)	R	rising
1982-86				high
1987-88	*	*		declining, low

NOTE: "Above-average" performance indicates a terminal year in which quarter-to-quarter job growth (decline) over a four quarter period (e.g. first quarter 1979 to first quarter 1980) exceeded that of the region.

Among major durable industry groupings, instruments and electronic components are among the few which stand out as highly concentrated in Illinois relative to the region. And while Illinois machinery industries are very prominent, a large portion of the Illinois industry falls within the agricultural machinery sector SIC 352. However, movements in agriculture and its attendant machinery have often run counter to overall cyclical swings in business activity, thereby moderating business cycle swings in Illinois relative to the region.

Illinois Manufacturing—Industry Mix or Competitive Factors?

Once the business cycle is taken into account, then, the poor performance of the Illinois economy has been pervasive over the past 25 years and more. Because this performance has been poor, even in comparison to neighboring states with which Illinois shares many locational features, it is imperative to ask whether competitive problems lie behind the faltering manufacturing sector. For this reason, a more formal analysis, one which accounts for differing industry structure between Illinois and her neighbors, can demonstrate whether and to what extent competitive factors are at work.

Table 3

Employment Concentration Indexes for Manufacturing Industries in Illinois and the Great Lakes–1986

	Illinois vs. Great Lakes	Illinois vs. U.S.	Great Lakes vs. U.S.
Durable goods			
Lumber and wood products	.4	.3	.7
Furniture and fixtures	.6	.6	1.1
Stone, clay, and glass products	.7	.8	1.1
Primary metal industries	.7	1.5	2.2
Fabricated metal products	.8	1.6	2.0
Machinery, except electrical	.8	1.4	1.7
Electrical and electronic equipment	1.1	1.2	1.1
Transportation equipment	.3	1.5	3.6
Instruments and related products	1.3	1.0	.8
Miscellaneous manufacturing	1.2	1.2	.9
Nondurable goods			
Food and kindred products	1.1	1.2	1.1
Tobacco manufactures	2.1	.1	.1
Textile mill products	.7	.1	.1
Apparel products	.8	.3	.4
Paper and allied products	.7	1.0	1.3
Printing and publishing	1.4	1.5	1.2
Chemicals and allied products	1.0	1.2	1.2
Petroleum and coal products	1.4	1.3	.9
Rubber and misc. plastic products	.7	1.3	1.9
Leather and leather products	.8	.6	.8

SOURCE: U.S. Dept. of Commece, Bureau of Economic Analysis.

Method

The following analysis is conducted over the 11 year period from 1976 to 1986. Aside from the mundane issues of data availability, this chosen period is long enough to dismiss problems of business cycle effects while capturing long term competitive trends. Employment data from the U.S. Dept. of Commerce, *County Business Patterns*, covering SIC code 3-digit manufacturing industries, was broken out into 132 individual industries. Some may consider this breakout to be too aggregative in the sense that industries with identical 3-digit SIC labels can be very different. However, the "downside" to using more disaggregated data is that U.S. Commerce Department rules about disclosure too often make 4-digit data unavailable.

The method of analysis decomposes a region's *relative* loss of employment in comparison to an overlying or neighboring region.[1] The relative loss of employment is defined as the difference between a region's (i.e. Illinois') actual employment loss (gain) and a hypothetical change in employment for the same region. The hypothetical change simulates that Illinois had the same industry structure as the comparison region (i.e. Great Lakes region) in the base year and, further, that the growth rate of each individual industry in Illinois was equal to the comparison region (i.e. Great Lakes) in the period following the base year (i.e. 1976).

(1) Relative Loss = Actual Change in Jobs 1976-86 minus Hypothetical Change in Jobs 1976-86

Formally: Relative Loss = $(G^{il} * E^{il}) - (G^{gl} * E^{il}_{g})$ (for a given industry)

where G^{il} = percent change in employment in Illinois from 1976-86 for a given industry

E^{il} = employment in Illinois in the industry for the base year 1976

G^{gl} = percent change in employment in the Great Lakes region for the industry

E^{il}_{gl} = hypothetical employment in illinois in the industry in 1976 as if the Illinois employment share for the industry had been equal to the industry's share of total manufacturing employment in the Great Lakes region

This Relative Loss is then an estimate of what *additional* job change has occurred because both Illinois industry structure and individual industry performances differed from the Great Lakes region over the 1976-86 period.

This hypothetical job loss (gain) can subsequently be decomposed into three separate components. The Relative Loss (of jobs) is equal to the sum of these distinct effects:

(2) Competitive Effect = $(G^{il} - G^{gl}) * E^{il}_{gl}$

(3) Industry Mix Effect = $(E^{il} - E^{il}_{gl}) * G^{gl}$

(4) Allocative Effect = $(G^{il} - G^{gl}) * (E^{il} - E^{il}_{gl})$

These effects are calculated identically for each of the 132 3-digit manufacturing industries and are summed over all industries to arrive at overall Competitive Effect, Industry Mix Effect, and Allocative Effect for the Illinois region. In turn, the sum of these "Effects" are equal to the aforementioned Relative Loss.[2]

To illustrate, consider the individual effects as summed over all industries for a region (e.g. Illinois). Assume that each effect is negative. Then the Competitive Effect measures what part of job loss arises because Illinois industries grew more slowly than the Great Lakes region (i.e. holding the Illinois employment structure hypothetically the same as the Great Lakes region).

The Mix Effect holds the industry-by-industry growth rates to be identical for Illinois and the region. Instead, these common (regionwide) growth rates are applied to the difference between actual Illinois employment in the base year for each industry and the corresponding hypothetical Illinois employment. Accordingly, job losses (gains) can be attributed solely on the basis of differences in industry composition between Illinois and the larger Great Lakes region.

The final component, the Allocative Effect, is an augmented or combination effect which arises from differences in 1) industry mix between Illinois and the Great Lakes region and 2) differences in industry growth rates between Illinois and the region. If, summing across all industries, this effect is negative, then the interpretation is that Illinois was, for example, unfortunate in that its high-growth industries tended to lie in categories in which its base period employment was low relative to the region while, at the same time, its low-growth industries tended to lie in categories in which Illinois was highly concentrated in the base period.[3]

In addition to Illinois, each state in the Great Lakes region was analyzed with this technique. The comparison region for each state was composed of the remainder of the Great Lakes region.

In order to explore the thesis that Illinois' urban characteristics have dealt it a setback with respect to manufacturing, the Chicago area was also separated from downstate Illinois and both were analyzed as individual regions.

Results

As a general result, the Illinois would (hypothetically) have had 134,000 more manufacturing jobs in 1986 (representing a 13 percent gain over its actual) if industry structure and industry growth rates had been identical to the remainder of the region in 1976 (Table 5). Surprisingly, industry mix in Illinois was a favorable circumstance—perhaps saving 22,000 jobs. In contrast, the competitive effect was strongly negative; if industry-by-

Table 4

Total Manufacturing Employment in the Great Lakes States—1976 to 1986

	1986 Employment	Change in Employment	Percent Change
	(000s)	(000s)	
Illinois	1,018	−231	−18.5
Chicago MSA	721	−144	−16.7
downstate	298	−88	−22.8
Indiana	598	−74	−11.1
Michigan	996	−42	−4.0
Ohio	1,124	−174	−13.4
Wisconsin	494	−17	−3.4
G.L. Region	4,230	−538	−11.3
U.S.	19,142	+176	+.9

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*

Table 5

Decomposing Manufacturing Job Gains (Losses) For Great Lakes States Relative to the Remainder of Region—1976 to 1986

		Hypotheticals			
State (Sub-region)	Actual Gain (or loss)	Competitive Effect	Industry Mix Effect	Combination Effect	Total Effect
	(----------thousands of jobs----------)				
Illinois	−231	−104	+22	−52	−134
Chicago area	−144	−79	+58	−24	−44
downstate	−88	−61	−32	+26	−68
Indiana	−74	+43	−20	−26	−3
Michigan	−42	+183	+48	−132	+98
Ohio	−174	+29	+7	−62	−26
Wisconsin	−17	+79	−13	−19	+47

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*

industry growth rates had equaled the remaining GL region, 104,000 jobs would not have been lost over the 1976-86 period.

Illinois job losses were exacerbated by the Allocation Effect. Because growth was low in industries which were highly concentrated in Illinois, (and any advantages sharp only in industries of low concentration) another 52,000 jobs were lost in Illinois.

Competitive disadvantage was evident in both the Chicago Metro Area (8 counties) and also in downstate Illinois. Evidently, the urban-to-rural exodus of manufacturing of the 1970s (see Carlino (1982) and Dept. of Commerce (1980)) accounts for little of the poor competitive performance of manufacturing in Illinois. Nonetheless, there is a sharp contrast in the nature of manufacturing job losses in the Chicago MSA and the remainder of Illinois. The industry mix effect was sharply favorable in the 8-county Chicago area but it was sharply unfavorable for the remainder of the state. These results for the Chicago area are consistent with oft-heard themes suggesting that, in general, large urban areas have become less hospitable locales for manufacturing activities in the 20th century (Anas and Moses 1978; ed. Leven) (Carlino 1982).

In a spatial context, a closer look at Illinois' immediate neighbors in the Great Lakes region—Indiana and Wisconsin—also gives rise to an interesting conjecture. In both states, competitive effect was strongly positive while industry mix was somewhat unfavorable. One must wonder if these states were not the beneficiary of competitive flight from Illinois during the study period.

How has Illinois Structure Changed?

Structural change has heavily impacted U.S. manufacturing during the 1980s. How has Illinois' industry structure changed in comparison to neighboring states and the nation? During the 1976-86 period of competitive loss of manufacturing jobs, an index of structural change in employment for 3-digit manufacturing industries reveals that structural change in Illinois has been more severe than each of the remaining Great Lakes states; and greater than the nation as well (Table 6). The portion of Illinois lying outside of Chicago experienced especially marked reshuffling of its manufacturing base. However, the Chicago area also exceeded both the region and the nation in its pace of structural change.

A more rapid pace of structural change moved the Illinois manufacturing economy toward greater similarity to both the region and the nation (Table 7). The implication of this being that any future deviation of Illinois per-

Table 6

Index of Structural Change in the Manufacturing Sector—1976 to 1986

Illinois	13.1
-Chicago MSA	12.6
-downstate	19.4
Indiana	12.8
Michigan	10.1
Ohio	11.7
Wisconsin	12.8
G.L. Region	9.5
U.S.	10.7

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*
NOTE: The index of structural change is equal to $\sum_i | a_{1i} - a_{2i} | /(2 \times 100)$ where a_{1i} is equal to employment share in the terminal year in the ith industry and a_{2i} represents the base year.

Table 7

Index of Structural Differences in Manufacturing Employment—Great Lakes States vs. Region and U.S.

	Compared to Great Lakes Region		Compared to United States	
	1976	1986	1976	1986
Illinois	20.1	19.2	27.3	26.1
Chicago MSA	26.5	25.8	32.2	31.5
downstate	29.4	28.0	36.0	35.2
Indiana	23.7	21.4	32.9	30.7
Michigan	21.4	19.8	33.4	35.2
Ohio	14.2	12.0	30.2	29.7
Wisconsin	26.8	26.6	35.7	32.3
G.L. Region	*	*	22.5	23.1

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*
NOTE: The index of structural is equal to $\sum_i | a_{1i} - a_{2i} | /(2 \times 100)$; where a_{1i} is equal to employment share in the region 1 in industry i.

formance from the region (either favorable or not) will all the more likely arise from differences in competitive performance since differences in industry mix are less pronounced.

Still in all, differences in industry structure between each of the Great Lakes states and the nation are significant. The state of Illinois remains the least different from the nation in economic structure among Great Lakes states in 1986 with Wisconsin's economy indicating the greatest structural difference.

Within the Great Lakes region itself, the state economies display marked structural deviations with each other among manufacturing industries. Illinois' structural differences with the region are somewhat less pronounced; Illinois lies second to Ohio in similarity to the overall region.

Conclusions

The analysis herein places a broad perspective on manufacturing job losses in Illinois. From 1976 to 1986, the state lost 231,000 manufacturing jobs according to County Business Patterns data. Our hypothetical analysis suggests that if the Illinois economy had duplicated the Great Lakes region (in both structure and performance), the state would have lost only 97,000 jobs.

A modified "shift-share" analysis attributes the remaining 134,000 job losses to the structure and performance characteristics of the Illinois economy. Of this remainder, 52,000 jobs were lost by virtue of the fact that the Illinois economy was concentrated in those industries in which it experienced competitive problems while, at the same time, its high-growth sectors were growing from a low employment base. By implication, economic restructuring over this period has been acute in Illinois.

Considering pure competitive effect only, 104,000 jobs were lost because Illinois industries grew more slowly than their counterparts in the Great Lakes region. Industry mix in Illinois has had a slightly favorable effect (22,000 jobs).

These conclusions are admittedly modest. One of the critics of this type of analysis, so-called shift-share analysis, has stated that the findings of shift-share analysis are all too often "less than startling" (Richardson 1969). Those results are that differences in regional growth rates arise not only from differences in industry mix. Yet, it has been our purpose here to go a bit further than this. Many failings concerning shift-share analysis of a region compared to the nation have been neutralized in this study by com-

paring Illinois performance to the region at large (rather than the nation). For example, in comparing 3-digit SIC industries across regions, differences in industry definition within the Great Lakes are likely to be small. And most importantly, the growth stimulus "location-location-location" has been accounted for to some extent by choosing a regional focus. For example, the natural dispersion of population across the U.S. which has generally disfavored the Great Lakes region as whole should not be much sharper in Illinois than elsewhere.

However, the influence of Illinois' location has not been completely neutralized in the analysis. As others analysts have noted, even if the analysis does successfully compare firms within identical industries, inter-industry linkages cannot be observed. What may appear to be poor "competitive performance" of an Illinois industry may instead reflect close industry linkage to a declining industry in another state. For example, Illinois' poor performance in the steel industry (*vis a vis* its G.L. neighbors) over the 1976-86 period can partly reflect a particular steel customer base for Illinois, e.g. the farm machinery industry, which is spread throughout neighboring states and which declined markedly in the first few years of the 1980s.[4] For reasons such as these, inter-regional input-output models can perhaps offer the insights into spatial industry linkages which "shift-share" does not. Moreover, studies of industry productivity and competitiveness may offer better insights into "competitive" problems. Accordingly, the results of this study should be used guardedly, especially for individual industries.

Nonetheless, the consistency of results across so many industries in Illinois (see Appendix I) suggests that competitive problems are indeed responsible for much of the state's manufacturing decline. To be sure, not all competitive problems can be addressed with local policy measures. For example, changes in the value of Illinois' location for manufacturing because of shifting product markets can possibly exacerbate competitive problems. Infrastructure investment decisions made at the federal level including interstate highways are another example. Still, close examination of competitive factors by both public and private policy makers in Illinois appears to be warranted.

Footnotes

[1] This analysis follows M.M. Esteban-Marquillas, "A Reinterpretation of Shift-Share Analysis", *Regional and Urban Economics,* 2 (1972), pps. 249-255.

[2] Algebraically

$$\begin{array}{lll}
\text{Competitive Effects: } (G^{il}-G^{gl})^{*}\ E^{il}_{g1} & = & G^{il}\ E^{il}_{gl} \quad - G^{gl}\ E^{il}_{gl} \\
+ & & \\
\text{Industry Effect: } \quad (E^{il}-E^{il}_{gl})^{*}\ G^{gl} & = & + \ G^{gl}\ E^{il} - G^{gl}\ E^{il}_{gl} \\
+ & & \\
\underline{\text{Allocative Effects:}} \quad (G^{il}-G^{gl})^{*}(\ E^{il}\ -E^{il}_{gl}) & = & \underline{G^{il}\ E^{il} - G^{il}\ E^{il}_{gl} - \ G^{gl}\ E^{il} \ + G^{gl}\ E^{il}_{gl}} \\
\text{Relative Loss} & & G^{il}\ E^{il} \ - G^{gl}\ E^{il}_{gl}
\end{array}$$

[3] The interpretation on this effect is ambiguous with regard to a state's competitiveness. It seems to show (for cases in which allocation is negative) that states or regions have concentrated employment in industries for which competitive advantage is negative.

It has also been shown that the Allocation Effect is sensitive to the "weights" or beginning period values of employment used in the specification. Over the period of analysis, the region's concentration can flip from positive to negative (or vice versa). Accordingly, sign of the allocation effect can be very sensitive to the particular the specification of time period of analysis See Henry W. Herzog and Richard J. Olsen, "Shift-Share Analysis Revisited: The Allocation Effect and the Stability of Regional Structure", *Journal of Regional Science,* Vol. 17, No. 3, 1977.

Appendix II lists Illinois employment concentrations for each industry in both 1976 and 1986. It is seen that very few such reversals in industry concentration took place over the sample period.

[4] Wisconsin Steel, formerly operating in Chicago, ceased operations on March 28, 1980. Owned by International Harvester (now Navistar) until 1977, much of the mill's steel products became inputs to Harvester's farm machinery. At the time of its closing, the mill employed over 3,000 workers.

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Appendix I

Changing Employment in Illinois Manufacturing Industries—1976 to 1986

	Illinois Employment 1986	Employment Change 1976-86	Competitive Effect	Relative Loss
Food and Kindred Products				
201 Meat products	11514	-3706	-2312	-3009
202 Dairy products	4117	-4791	4667	-2117
203 Preserved fruits and vegetables	9514	2276	2361	1849
204 Grain mill products	10176	-4286	-1129	-3563
205 Bakery products	13263	-2656	491	-479
206 Sugar and confectionary products	13213	-2912	-417	-2893
207 Fats and oils	4634	-624	271	-137
208 Beverages	6367	-3683	-1036	-518
209 Misc. foods and kindred products	6916	-1449	-789	-1564
Textile Mill Products				
229 Miscellaneous textile goods	680	-707	-809	-254
231 Men's and boys suits and coats	2786	-1739	610	-169
232 Men's and boys furnishings	1334	-945	-705	-368
233 Women's and misses outerwear	4236	-3657	273	-2079
234 Women's and children's undergarments	375	-843	-543	-929
235 Misc. apparel and accessories	1082	-986	-7	-324
239 Misc. fabricated textile products	4871	-2028	-2237	-1102
Lumber & Wood Products				
243 Millwork, plywood structural members	4117	529	-560	-1254
245 Wood buildings and mobile homes	646	-518	-839	312
249 Misc. wood products	4630	-950	-596	-927
Furniture and Fixtures				
251 Household furniture	5558	-4521	-3176	-2617
252 Office furniture	2317	286	-3665	-3965
253 Public building, related furniture	1178	-102	13	53
254 Partitions and fixtures	6113	594	-167	58
259 Misc. furniture and fixtures	2989	270	114	172
Paper and Allied Products				
263 Paperboard mills	750	-725	-992	-364
264 Misc. converted paper products	15630	910	-777	-575
265 Paperboard containers and boxes	16102	-1398	553	144
Printing and Publishing				
271 Newspapers	19930	-826	-2028	-2145
272 Periodicals	10200	3827	982	3486
273 Books	8106	-399	-1205	-1380
274 Miscellaneous publishing	3417	-315	-1056	-1206
275 Commercial printing	44741	4474	-3855	-1532
276 Manifold business forms	3776	877	-127	124
277 Greeting card publishing	727	-430	-300	-448
278 Blankbooks and bookbinding	6802	-587	-745	-1193
279 Printing trade services	5490	126	-405	-325
Chemicals and Allied Products				
281 Industrial inorganic chemicals	3127	-429	766	927

Appendix I

Changing Employment in Illinois Manufacturing Industries—1976 to 1986

	Illinois Employment 1986	Employment Change 1976-86	Competitive Effect	Relative Loss
282 Plastics materials and synthetics	2931	−52	974	996
283 Drugs	12071	−1802	−1471	−2037
284 Soap, cleaners, and toilet goods	11930	331	31	203
285 Paints and allied products	6132	−1762	−959	−1745
286 Industrial organic chemicals	4740	218	522	490
287 Agricultural chemicals	717	−778	−627	−391
289 Miscellaneous chemical products	6743	138	−472	−430
Petroleum and Coal Products				
291 Petroleum refining	5221	−1250	87	−546
295 Paving and roofing materials	681	−2463	−862	−2082
299 Misc. petroleum and coal products	1188	−133	−264	−337
Rubber and Plastics Products				
301 Tires and inner tubes	4747	−530	−5692	6071
304 Rubber and plastic hose and belting	887	863	−186	920
306 Fabricated rubber products, nec	2371	−1379	−3596	18
307 Misc. plastics products	37544	6248	−9800	−9940
Leather and Leather Products				
314 Footwear, except rubber	1126	−3478	−1167	−1030
Stone, clay, and glass products				
321 Flat glass	1750	0	−112	−112
322 Glass and glassware, pressed or blown	3502	−5667	−1820	−2629
323 Products of purchased glass	1223	−640	−1853	−1649
326 Pottery and related products	1801	−418	691	1036
327 Concrete, gypsum, and plaster products	6145	−674	295	361
329 Misc. nonmetallic mineral products	10166	−1805	−1329	−1923
Primary Metals Industries	51319	−36053	−11644	3042
Fabricated Metal Products				
341 Metal cans and shipping containers	6006	−3551	−461	−2501
342 Cutlery, hand tools, and hardware	12781	−3676	−907	−1308
343 Plumbing and heating, except electric	3960	−1116	727	928
344 Fabricated structural metal products	15915	−3237	−1775	−977
345 Screw machine products, bolts, etc.	14484	−2309	−934	−1863
346 Metal forgings and stampings	25377	−3263	−1116	1288
347 Metal services, nec	9083	1583	−2004	−1914
348 Ordnance and accessories, nec	3140	−610	−41	−165
349 Misc. fabricated metal products	21196	−6388	−5528	−7145
Machinery, except electrical				
351 Engines and turbines	7070	−8237	−5467	−3233
352 Farm and garden machinery	10257	−27243	−3655	−23304
353 Construction and related machinery	26783	−29863	−1917	−18499
354 Metalworking machinery	26916	−3468	−2138	−912
355 Special industry machinery	11047	−1967	−253	−33
356 General industrial machinery	22434	−1936	4177	4662
357 Office and computing machines	7421	−79	1207	1182

Appendix I

Changing Employment in Illinois Manufacturing Industries—1976 to 1986

	Illinois Employment 1986	Employment Change 1976-86	Competitive Effect	Relative Loss
358 Refrigeration and service machinery	11374	-499	1822	2002
359 Misc. machinery, except electrical	17992	3061	-298	949
Electric and Electric Equipment				
361 Electric distributing equipment	9124	-972	-908	-1340
362 Electrical industrial apparatus	8679	-3274	-2032	531
363 Household appliances	11066	-9167	-3886	-5119
364 Electric lighting and wiring equipment	19700	661	585	887
365 Radio and TV receiving equipment	3179	-14388	-5102	-13262
366 Communication equipment	37434	-1447	1123	55
367 Electronic components and accessories	23352	27	-1715	-1698
369 Misc. electrical equipment supplies	4932	-617	1727	3170
Transportation Equipment	42347	-1786	11364	17937
Instruments and Related Products				
381 Engineering scientific instruments	1259	-2491	-1658	-2112
382 Measuring and controlling devices	16262	-2390	-1626	-2947
383 Optical instruments and lenses	1843	419	-813	-524
384 Medical instruments and supplies	6497	-3692	-2966	-5052
385 Ophthalmic goods	1188	180	238	362
386 Photographic equipment and supplies	4359	-4320	-546	-4274
387 Watches, clocks, and watchcases	1465	-285	-115	-212
Miscellaneous Manufacturing Industries				
391 Jewelry, silverware, and plated ware	1115	-2	113	112
393 Musical instruments	824	-3299	-894	-2394
394 Toys and sporting goods	5719	-4399	-333	-2492
395 Pens, pencils, office and art supplies	2056	-625	-76	-455
399 Miscellaneous manufactures	11847	-3457	-1503	-3373
399A Auxiliaries	102579	-5270	-14888	-16230

Note: Industries for which Illinois employment fell below 1000 in 1976 are excluded.
Source: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*

Appendix II

Changing Employment in Illinois Manufacturing Industries

	1986 Employment	Concentration Relative to Great Lakes States 1976	1986	Concentration Relative to United States 1976	1986
Food and Kindred Products					
201 Meat products	11514	116	108	76	67
202 Dairy products	4117	72	49	81	57
203 Preserved fruits and vegetables	9514	86	111	57	91
204 Grain mill products	10176	172	164	193	190
205 Bakery products	13263	137	155	108	120
206 Sugar and confectionary products	13213	268	275	236	294
207 Fats and oils	4634	193	230	187	261
208 Beverages	6367	91	89	77	69
209 Misc. foods and kindred products	6916	165	158	93	87
Textile Mill Products					
229 Miscellaneous textile goods	680	63	44	30	22
231 Men's and boys suits and coats	2786	149	214	68	88
232 Men's and boys furnishings	1334	79	66	9	9
233 Women's and misses outerwear	4236	190	228	28	24
234 Women's and children's undergarments	375	151	63	20	9
235 Misc. apparel and accessories	1082	131	142	55	50
239 Misc. fabricated textile products	4871	71	62	59	50
Lumber & Wood Products					
243 Millwork, plywood structural members	4117	51	53	32	36
245 Wood buildings and mobile homes	646	38	30	30	19
249 Misc. wood products	4630	135	130	103	101
Furniture and Fixtures					
251 Household furniture	5558	92	72	52	38
252 Office furniture	2317	56	37	80	61
253 Public building, related furniture	1178	77	85	97	101
254 Partitions and fixtures	6113	139	147	164	165
259 Misc. furniture and fixtures	2989	119	134	159	139
Paper and Allied Products					
263 Paperboard mills	750	61	42	33	28
264 Misc. converted paper products	15630	119	125	113	130
265 Paperboard containers and boxes	16102	128	143	133	157
Printing and Publishing					
271 Newspapers	19930	112	112	87	85
272 Periodicals	10200	193	244	140	179
273 Books	8106	148	138	127	131
274 Miscellaneous publishing	3417	154	124	152	107
275 Commercial printing	44741	162	160	172	162
276 Manifold business forms	3776	127	134	109	136
277 Greeting card publishing	727	134	104	125	70
278 Blankbooks and bookbinding	6802	229	211	224	190
279 Printing trade services	5490	188	186	182	178
Chemicals and Allied Products					
281 Industrial inorganic chemicals	3127	78	99	52	59
282 Plastics materials and synthetics	2931	76	101	28	44

Appendix II

Changing Employment in Illinois Manufacturing Industries

	1986 Employment	Concentration Relative to Great Lakes States 1976	1986	Concentration Relative to United States 1976	1986
283 Drugs	12071	130	127	142	132
284 Soap, cleaners, and toilet goods	11930	162	177	154	181
285 Paints and allied products	6132	149	139	192	207
286 Industrial organic chemicals	4740	90	106	50	73
287 Agricultural chemicals	717	82	58	40	31
289 Miscellaneous chemical product	6743	128	131	134	146
Petroleum and Coal Products					
291 Petroleum refining	5221	176	201	94	113
295 Paving and roofing materials	681	158	69	166	48
299 Misc. petroleum and coal products	1188	168	144	188	177
Rubber and Plastics Products					
301 Tires and inner tubes	4747	65	169	74	137
304 Rubber and plastics hose and belting	887	61	74	90	72
306 Fabricated rubber products, nec	2371	34	27	59	45
307 Misc. plastics products	37544	98	90	122	123
Leather and Leather Products					
314 Footwear, except rubber	1126	97	61	45	26
Stone, clay, and glass products					
321 Flat glass	1750	91	95	118	180
322 Glass and glassware, pressed or blown	3502	112	85	121	86
323 Products of purchased glass	1223	81	46	85	48
326 Pottery and related products	1801	62	82	74	98
327 Concrete, gypsum, and plaster products	6145	93	105	63	61
329 Misc. nonmetallic mineral products	10166	132	128	157	171
Primary Metals Industries					
331 Blast furnace and basic steel products	21553	77	73	129	149
332 Iron and steel foundries	7838	60	48	130	105
333 Primary nonferrous metals	551	73	52	28	30
334 Secondary nonferrous metals	1382	143	119	166	155
335 Nonferrous rolling and drawing	10937	114	119	112	127
336 Nonferrous foundries	7500	69	83	119	169
339 Misc. primary metal products	2128	72	77	98	144
Fabricated Metal Products					
341 Metal cans and shipping containers	6006	174	172	203	216
342 Cutlery, hand tools, and hardware	12781	109	112	159	166
343 Plumbing and heating, except electric	3960	88	109	142	154
344 Fabricated structural metal products	15915	85	86	74	75
345 Screw machine products, bolts, etc.	14484	142	145	271	286
346 Metal forgings and stampings	25377	65	69	168	183
347 Metal services, nec	9083	104	97	136	153
348 Ordnance and accessories, nec	3140	118	127	78	66
349 Misc. fabricated metal products	21196	123	108	164	143
Machinery, except electrical					
351 Engines and turbines	7070	83	62	190	141
352 Farm and garden machinery	10257	214	149	365	224

Appendix II

Changing Employment in Illinois Manufacturing Industries

	1986 Employment	Concentration Relative to Great Lakes States 1976	1986	Concentration Relative to United States 1976	1986
353 Construction and related machinery	26783	169	169	272	231
354 Metalworking machinery	26916	79	83	163	187
355 Special industry machinery	11047	92	99	105	124
356 General industrial machinery	22434	84	104	127	152
357 Office and computing machines	7421	131	169	47	36
358 Refrigeration and service machinery	11374	79	95	106	118
359 Misc. machinery, except electrical	17992	86	93	102	116
Electric and Electric Equipment					
361 Electric distributing equipment	9124	149	146	137	177
362 Electrical industrial apparatus	8679	63	62	96	94
363 Household appliances	11066	111	94	197	167
364 Electric lighting and wiring equipment	19700	151	170	179	216
365 Radio and TV receiving equipment	3179	172	62	287	101
366 Communication equipment	37434	220	251	134	105
367 Electronic components and accessories	23352	189	187	107	78
369 Misc. electrical equipment supplies	4932	37	44	66	59
Transportation Equipment					
371 Motor vehicles and equipment	24622	26	34	44	61
372 Aircraft and parts	7399	23	41	14	24
373 Ship and boat building and repairing	543	48	20	10	6
374 Railroad equipment	8424	271	359	370	644
375 Motorcycles, bicycles, and parts	175	120	31	157	27
Instruments and Related Products					
381 Engineering scientific instruments	1259	116	59	115	53
382 Measuring and controlling devices	16262	169	163	165	146
383 Optical instruments and lenses	1843	204	133	99	56
384 Medical instruments and supplies	6497	171	118	134	79
385 Ophthalmic goods	1188	203	315	57	88
386 Photographic equipment and supplies	4359	275	239	128	81
387 Watches, clocks, and watchcases	1465	134	135	81	177
Miscellaneous Manufacturing Industries					
391 Jewelry, silverware, and plated ware	1115	132	160	30	44
392 Musical instruments	824	151	74	229	109
394 Toys and sporting goods	5719	157	160	136	128
395 Pens, pencils, office and art supplies	2056	181	188	127	125
399 Miscellaneous manufactures	11847	166	157	155	156
399A Auxiliaries	102579	123	118	138	149

Note: Industries selected if Illinois employment exceeded 1,000 in 1976.

Appendix III

Among the many criticisms of shift-share analysis, the results have often proven to be sensitive to the beginning and end point choices of the period of study. Accordingly, the analysis herein was conducted over two alternative time periods, 1976 to 1983 and 1979 to 1986. The interim years of 1979 and 1983 correspond roughly to regional peak and trough for manufacturing employment. County Business Patterns employment data are measured in the week including March 12 of the calendar year.

As the following tables show, the study results hold up well using differing time periods which are within 1976 and 1986. In particular, the competitive effect for Illinois—both the Chicago area and the rest of the state—displays a negative sign. Similarly, the remaining states of the Great Lakes region are positive in sign for the competitive effect.

Appendix III

Decomposing Manufacturing Job Gains (Losses) For Great Lakes States Relative to the Remainder of Region—1976 to 1983

State (Sub-region)	Actual Gain (or loss)	Hypotheticals: Competitive Effect	Industry Mix Effect	Combination Effect	Total Effect
	(thousands of jobs)				
Illinois	−252	−54	+45	−51	−60
Chicago area	−160	−25	+59	−41	−7
downstate	−93	−41	−13	+12	−42
Indiana	−110	+62	−22	−22	+18
Michigan	−185	+79	+13	−93	−1
Ohio	−240	+43	−4	−51	−12
Wisconsin	−51	+67	+1	−25	+42

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*

Appendix III

Decomposing Manufacturing Job Gains (Losses) For Great Lakes States Relative to the Remainder of Region—1979 to 1986

State (Sub-region)	Actual Gain (or loss)	Hypotheticals: Competitive Effect	Industry Mix Effect	Combination Effect	Total Effect
	(thousands of jobs)				
Illinois	−341	−93	+34	−13	−75
Chicago area	−214	−54	+50	−13	−4
downstate	−127	−19	−17	−23	−59
Indiana	−153	+16	−28	−4	−16
Michigan	−236	+97	+33	−95	+36
Ohio	−291	+64	−1	−52	+11
Wisconsin	−89	+63	−8	−18	+37

SOURCE: U.S. Dept. of Commerce, Bureau of the Census, *County Business Patterns.*

Federal Reserve Bank of Chicago

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