ECONOMIC DISPARITIES IN METROPOLITAN AREAS

by

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The analysis of business fluctuations usually involves a careful examination of national data. The measurement of fluctuations in this manner reduces the analysis to an examination of data which are weighted summations of the economic activity of a nation's component regions. Several studies demonstrate that activity in the United States deviates, sometimes markedly, from that of the nation as a whole [1, 2, 3, 4 and 6]. Regional differences in growth and industrial composition are most often cited as likely explanations of this phenomenon.

To date little empirical work has focused on the differences in urban economic fluctuations. Because cities are more homogeneous economically than more broadly defined regions there is reason to believe that the causes of urban differentials in business fluctuations may be different than those of regional differences. To be sure, the analysis of interurban relationships is a special form of interregional analysis. Urban areas are highly specialized and concentrated regions, but the same principles of analysis apply to urban areas as to more broadly defined regions. Within a larger region, cities are focal points of exchange and consequently, transmit and/or magnify impulses either generated or received by a given region. Any insights benefiting policy application can be implemented more easily on the metropolitan level than on some larger regional level involving a number of governmental units.

The purpose of the present study is to investigate the causes of interurban differentials in economic activity. Differences in urban activity will be viewed relative to national activity, i.e., since national economic activity is the weighted average of regional activity, including urban regions, urban differences can be viewed as variances from this average.

The investigation centers on the following standard metropolitan statistical areas (SMSA): Atlanta, Chicago, Denver, Detroit, Kansas City, Los Angeles-Long Beach, New York, Pittsburgh, and Seattle-Everett over the years 1954 through 1968. Business fluctuations are measured in terms of the cycles in total non-agricultural employment using National Bureau of Economic Research techniques.[1] Urban variances from national activity are measured by computing the coefficient of correlation between the reference cycle relatives[2] of each urban area and the nation over each national cycle. This coefficient serves as an indicator of cyclical similarity and is referred to as the Degree of Cyclical Similarity (DCS). In essence, the coefficient measures how closely the economic activity of a city conforms to that of the nation.[3] The interpretation is that a high coefficient indicates a relatively high similarity between the economic activity of an urban area and that of the nation and vice versa.

Differences in industrial composition, gorwth, and city size are investigated as possible explanatory variables of differing degrees of cyclical similarity. *A priori* each is capable of explaining interurban differentials in economic activity. In terms of industrial composition, those areas characterized by a heavy concentration in durable good industries would tend to be more unstable than those characterized by non-durable good industries since the production of durable goods tends to be more unstable than the production of non-durable goods. Interurban differentials might also be explained by differences in growth. Those regions which were growing at a relatively fast rate would tend to exhibit stronger expansions and weaker contractions than the non-growth regions. Several reasons can account for this behavior. New capital equipment would tend to characterize relative growth regions and, hence, these regions would tend to exhibit greater stability for a given industrial mix. Further, the process of growth itself has a cumulative effect in the sense that it induces the further growth of a region's infrastructure and residentery industries by stimulating inward migration. Finally marginal firms and high cost produc-

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tion facilites would tend to characterize those areas with relatively low growth rates. Such areas would experience weaker expansions but stronger contractions than relatively high growth areas.

City size may also be important in explaining cyclical differentials. The importance of this factor lies in what it indicates concerning the na-ure of economic characteristics of various size cities. There is, on the average, a difinite positive relation between size of a city and its degree of self-containment [5]. That is, the smaller a city the greater the relative importance of trade in explaining its economic activity. Interurban linkage occurs only through trade[4] and hence, a given urban area "feels" economic impulses generated in another area only if interurban trade occurs. All other things the same,a smaller urban area's economic activity relative to that of a larger area would more closely resemble that of the overall economy because it is less self-contained and more subject to influences generated outside its boundaries.[5]

This investigation of interurban cycle differentials centers on the factors of industrial composition, growth, and city size. The effects of these factors on cycle differentials are stated formally as follows:

$$DCS = f(IC_{n-c},\ G_{n-c},\ X), \tag{1}$$

where DCS is equal to the degree of cyclical similarity between an urban area and the nation; IC_{n-c} is equal to the absolute difference between the nation's index of industrial composition (IC_n) and that of a particular city (IC_c)[6], G_{n-c} is equal to the absolute difference between the nation's growth rate (G_n) and that of a particular city (G_c)[7]; and X is equal to city size. It is hypothesized that, <u>certeris paribus</u>, there is an inverse relationship between the degree of cyclical similarity and each of the factors influencing cycle differentials. That is, as IC_{n-c}, G_{n-c}, and X increase, the DCS should decrease.

The basis for specifying the relationship in this particular manner stems from the fact that this analysis seeks to investigate variances in economic activity between selected urban areas and the nation. The reasons for these variances are, according to the preceding analysis, caused by differences in the variables of industrial composition, growth, and city size. More specifically, the statement of the general hypothesis underlying the particular formulation of the theory is: If the given variable accounts for all the variation in cyclical activity, then other things constant, the smaller the value of the variable, the higher the degree of cyclical similarity.

A number of different methods could be used to test the significance of the variables in explaining differences in urban business fluctuations. One method would be to standardize each of the urban areas with respect to the nation for each of the three variables. That is, for each of the variables the standardization technique would have to provide a test of the following null hypothesis: the cyclical behavior of each particular area is independent of the other variables. This hypothesis implies that if the nation and the urban area were alike in any given variable they would exhibit identical cyclical behavior. Although the standardization technique readily lends itself to the testing of the influence of industrial composition, it is not readily adaptable to the testing of the other variables. In the interests of consistency, rank correlation and the coefficient of concordance are preferable methods to determine the significance of the aforementioned variables.

The rank correlation coefficient indicates the significance of the relationship between only two variables and thus it is a partial analysis if more than two variables are involved. The present study involves four and using only partial analysis may obscure important relationships. A general analysis requires the use of the coefficient of concordance, which measures the significance of the relationship among several variables.[8]

The partial analysis to determine the significance between the DCS and each individual variable involves the computation of the ceofficient of rank correlation between the DCS and IC_{n-c}, G_{n-c}, and X. The test provides an answer to the null hypothesis that the degree of cyclical similarity is independent of each of the variables. If the rank coefficient of correlation is significantly different than zero, it is concluded that the DCS is not independent of each variable. The expansion of the partial analysis to a general analysis involves computing the coefficient of concordance between the DCS and the other three variables. Such a test will enable a judgment as to the significance of all variables simultaneously explaining varying degrees of cyclical similarity.

Table 1 shows the degree of cyclical similarity between each selected city and the nation for each phase of the national cycles between 1954 and 1968. The figures show that during the first national cycle there was high degree of similarity between the behavior of the cities and the nation in the expansion and contraction phases. In both cases over half the cities had a DCS of over 0.90. Activity over the second national cycle appears more diverse. More than half of the cities during both the expansion and contraction phases of the cycle had a DCS of less than 0.90. Furthermore, the diversity was more pronounced during the contraction. Three cities had relatively large negative values which means they continued expanding while the nation as a whole was in the midst of a slight recession. During the third cycle, however,great similarity existed between the economic behavior of all the cities, i.e., seven of the cities had a DCS above 0.90, while all the cities were above 0.79.

Table 2 shows the industrial composition of the selected cities and the nation over the various national cycles. The figures indicate that the cities had diverse but relatively stable industrial structures.[9] Although relative growth rates among the cities were quite diverse, Table 3 shows that they were also unstable. City sizes, too, were quite diverse but very stable over the fifteen year period as indicated in Table 4.

Equation (1) formally stated the model to explain interurban cycle differentials. The partial analysis of the model specified an inverse function between the degree of cyclical similarity and each of the other three variables. The rank correlation coefficients between the DCS and each of the other variables shown in Table 5 reveals that, although most of the coefficients are negative as expected, significant relationships existed only between the degree of cyclical similarity and city size during the expansion and contraction phases of the second national cycle. Results of the general analysis, which tests the significance between the DCS and all the other variables simultaneously, are presented in Table 6. An examination of the table reveals that the relationship was significant during the third national expansion but not during any other cycle phase.

The results show that interurban differences in the three variables were not sufficient generally to explain the differing degrees of cyclical similarity. Although significance was noted between DCS and X during the second national cycle, little importance can be attached to this result. What does appear important is that these variables, when taken as a group, did explain the differing degrees of cyclical similarity for the third national cycle.

A number of plausible reasons are possible to explain this observation. There may be an intrecate lead-lag relationship involved between the cities and the nation. Because the comparison in this study focuses on the turning points of national cycles the existence of this relationship cannot be determined.[10] If such a relationship did in fact exist it would tend to have a distorting effect on the DCS during relatively short cycles but its effect would tend to be obscured during long cycle periods. A re-examination of Table 1 shows that the diversity in the DCS between cities during the first two national cycles was much greater than the last national expansion.

If such a lead-lag relationship did exist and caused wide diversity and instability in the ranking of DCS values, significant relationships might be observed only if the ranks of the independent variables were relatively unstable. Growth was the only variable whose rankings were relatively unstable during the time period of the study. During short cycles some cities may lead and some lag the national turning points. It follows that if this lead-lag relationship is not consistent over time,the behavior of the degree of cyclical similarity tends to be random and insignificant relationships among the dependent and independent variables tend to be observed.

Table 1. DEGREE OF CYCLICAL SIMILARITY BETWEEN THE NATION AND SELECTED URBAN AREAS OVER THREE NATIONAL CYCLES, 1954 - 1968[a]

Dates of Cycle			City								
Trough	Peak	Trough	Atl.	Chi.	Den.	Det.	K.C.	L.A.	N.Y.	Pit.	Sea.
6/54	3/57	6/58									
Expansion			.99	.97	.95	-.55	-.84	.97	.57	.62	.97
Contraction			.90	.98	.81	.96	.00	.95	.05	.98	.23
Cycle			.95	.94	.89	.02	-.23	.93	.54	.72	.82
6/58	4/60	2/61									
Expansion			.95	-.11	.95	.89	.68	.92	.08	-.02	.73
Contraction			.13	.96	-.94	.93	-.76	-.49	.92	.86	.65
Cycle			.94	-.39	.84	.83	.54	.88	.34	-.10	.79
2/61	12/68										
Expansion			.99	.99	.97	.98	.99	.80	.89	.97	.94

[a]Derived from monthly employment data in Employment, Earnings, and Monthly Report of the Labor Force, 1954 through 1968 editions, which is published by the U. S. Department of Labor.

Table 2. INDEX OF INDUSTRIAL COMPOSITION FOR SELECTED CITIES OVER THREE NATIONAL CYCLES[a]

Dates of Cycle			City									
Trough	Peak	Trough	Atl.	Chi.	Den.	Det.	K.C.	L.A.	N.Y.	Pit.	Sea.	U.S.
6/54	3/57	6/58	.55	.64	.26	.85	.57	.71	.38	.87	.51	.56
6/58	4/60	2/61	.52	.59	.14	.82	.49	.64	.37	.86	.76	.54
2/61	12/68		.58	.59	.39	.83	.55	.65	.33	.84	.81	.55

[a]Derived from value added by manufacturer data in Annual Survey of Manufacturers, 1954 through 1968 editions, which is published by the U. S. Bureau of the Census.

Table 3. GROWTH RATE OF SELECTED URBAN AREAS AND THE NATION OVER TWO NATIONAL BUSINESS FLUCTUATIONS 1954 - 1961

City	Dates of Cycle					
	Trough	Peak	Trough	Trough	Peak	Trough
	6/54	2/57	6/58	6/58	5/60	2/61
Atlanta		13.47%			8.28%	
Chicago		0.59			-5.09	
Denver		16.04			24.36	
Detroit		-16.46			2.01	
Kansas City		-1.50			5.30	
Los Angeles		16.80			11.15	
New York		1.19			0.21	
Pittsburg		0.66			-4.62	
Seattle		17.63			11.12	
United States		4.53			4.85	

Table 4. POPULATION OF SELECTED STANDARD METROPOLITAN STATISTICAL AREAS, 1950 AND 1960

(In Thousands)

Year	City								
	Atl.	Chi.	Den.	Det.	K.C.	L.A.	N.Y.	Pit.	Sea.
1950	727	5178	612	3016	849	4368	9556	2213	845
1960	1017	6221	929	3762	1093	6039	10695	2405	1107

Source: U. S. Bureau of the Census, Statistical Abstract of the United States, 1960 and 1970 editions.

Table 5. SPEARMAN'S RANK COEFFICIENT OF CORRELATION BETWEEN DCS AND SELECTED VARIABLES OVER PHASES OF THE NATIONAL CYCLES, 1954 - 1968

Dates of Cycle					
Trough	Peak	Trough	IC_{n-c}	G_{n-c}	X
6/54	2/57	6/58			
Expansion			-.40	.07	-.03
Contraction			.09	-.01	.22
Cycle			-.27	.03	-.18
6/58	5/60	2/61			
Expansion			-.06	-.15	-.65*
Contraction			-.01	-.13	-.68*
Cycle			-.11	-.32	-.53
2/61	12/68				
Expansion			-.52	-.09	-.40

*Significant at the .05 level.

Table 6. COEFFICIENT OF CONCORDANCE BETWEEN DCS, IC_{n-c}, G_{n-c}, AND X OVER PHASES OF THE NATIONAL CYCLES, 1954 - 1968

Dates of Cycle				Dates of Cycle			
Trough	Peak	Trough	Coefficient	Trough	Peak	Trough	Coefficient
6/54	2/57	6/58		6/58	5/60	2/61	
Expansion			.17	Expansion			.20
Contraction			.29	Contraction			.27
Cycle			.16	Cycle			.20
				2/61	12/68		
				Expansion			.57*

*Significant at the .05 level.

Another possible explanation of the observed relationships is that local events are of paramount importance in determining local economic activity. For example, a strike by General Motors' employees would adversely affect Detroit's economy relative to those of areas such as New York or Denver. The strike would tend to lower the DCS between Detroit and the nation over this time period regardless of IC_{n-c}, G_{n-c}, or X. However, this relationship would tend to hold true more often during relatively short periods of time than during relatively long periods of time. During extended time periods the effect of purely local events of DCS tends to be minimized. With trade the impact of changes in local economic conditions dissipates to other areas. In addition, the longer the time period under consideration, the more likely national economic forces will moderate the initial impact.

The above analysis can be extended and considered a special case by noting that local economic activity is dependent upon both local and national market forces during any time period. The relative effect of these forces during any time period. The relative effect of these forces on local economic activity depends on the relative strength of national economic movements and the time period under consideration. During periods of strong national movement local factors tend to be relatively unimportant in the determination of local economic activity. On the other hand, during periods of weak national movement local factors tend to be relatively significant in determining local economic activity. Moreover, the effect of national economic behavior is positively related to the length of time period under consideration. Given the friction which accompanies the movement of resources through economic space, movements in national activity affect local areas differently at different times. Given also that external influences filter through local economies at different rates, it becomes evident that the longer a given national movement pervades the economy the more likely local areas will exhibit similar cycle patterns. And the results indicate that it is during these periods that interurban differences in economic activity are associated with differences in the specified variables.

FOOTNOTES

[1]National cycles are determined by the NBER with the aid of hundreds of statistical series along with comments and reports from the business community on the general economic situation. Similar information for local areas is not available on a large scale and, consequently, the application of NBER's general procedure is not possible on the urban level. To permit consistent comparison,the present study uses total non-agricultural employment to determine business cycles for both the nation and the cities. This monthly employment series is a coincidnet indicator or cyclical activity and the cycles in employment tend to correspond closely to national reference cycles determined by the NBER. The reference cycle dates determined by the NBER were, starting with the first trough, 8/54, 7/57, 4/58, 5/60, and 2/61. These turning points roughly coincide with those determined by this study and listed in Table 1.

[2]Reference cycle relatives are equal to the ratio of the specific value of a series and the reference cycle base, the latter being equal to the average of all the values over the cycle.

[3]The simple correlation coefficient does not measure degrees of dependence. Rather, it measures association or, more specifically, it is an index of the degree of covariability. The economic activity of urban areas represents variance from the national average activity. Because such activity over a time period cannot be reduced to a single and meaningful number which would enable an analysis of variance by more conventional means, such as comparison of standard deviations, the coefficient of correlation is thought to be a superior way of measuring the association over a time span.

[4]The term trade is used here to refer not only to the interregional exchange of consumer goods and services but also to the transfer and exchange of the various factors of production, intermediate goods, financial assets, etc. In general, the term refers to all those factors which can be either transferred or traded from one region to another.

[5]Of course, very small urban areas are not likely to have the industrial diversification of large areas and, consequently, may have large or small cycles depending on the nature of their industrial structure. However, the cities in the sample are large enough so that the actions of one firm would have a relatively small impact on its economic activity.

[6]The index of industrial composition is defined in the following manner: Index of Industrial Composition =

$$\sum_{i=1}^{n} \frac{\text{Value-Added}_i}{\text{Total Value-Added}} \times \sum_{i=1}^{n} \text{Durability of Output}_i$$

The durability of output will either be measured by the number one, in the case of durable goods production, or the number zero, in the case of nondurable goods production. Hence, the index would range from zero to one. Values that approach one would indicate manufacture primarily in durable goods, while value close to zero would indicate manufacture primarily in nondurable goods. The basis for the classification of industries is the Federal Reserve breakdown.

[7] Growth is defined as the rate of change between the three month centered average from each cycle's terminal trough. By using troughs cyclical influences are eliminated because rates of change are measured over similar phases of the business cycle. Hence, relative trough movements will reflect the relative strength of secular forces in different areas. Because the expansion phase was the sole component of the third national cycle in this study, the average growth rate of each city over the first two national cycles was used as the basis for the rankings over this cycle period, i.e., from 2/61 to 12/68.

[8] Unlike the Spearman Rank Correlation Coefficient, whose values vary between -1 and +1, the Kendall Coefficient of Concordance must take values between 0 and +1. The reason that this latter coefficient cannot be negative is that when more than two sets of ranks are involved the rankings cannot all disagree completely. The reader is referred to S. Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, 1956), pp. 229-239 for a more detailed explanation.

[9] Denver and Seattle were notable exceptions. It should not be concluded that both Denver and Seattle made dramatic shifts in their industrial structures. Rather, there were dramatic shifts in the proportion of total value-added reported which would account for their behavior. For example, during the '54-'58 period only 59.46 percent of Denver's total value-added was reported for specific industries, while 44.57 percent was reported during the '58-'61 period. Over the same two periods, Denver's index of industrial composition dropped from 0.26 to 0.14. This does not necessarily mean that Denver was in fact producing relatively fewer durable goods, for the drastic drop in total value-added reported could account for the change. This explanation seems more realistic in light of the fact that the industrial structures of the other cities remained virtually unchanged.

[10] Other research by the author indicates that there is no consistent lead-lag relationship between the sample cities and the nation. The interested reader is referred to "Interurban Cycle Differentials and Fiscal Behavior," National Tax Journal, XXV (March, 1972), pp. 91-97.

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