STUART, Alfred Wright, 1932-
THE SUBURBANIZATION OF MANUFACTURING IN A SMALL METROPOLITAN AREA: ROANOKE, VIRGINIA.
The Ohio State University, Ph.D., 1966
Geography
THE SUBURBANIZATION OF MANUFACTURING IN

A SMALL METROPOLITAN AREA:

ROANOKE, VIRGINIA

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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* * * * *

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1966

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ACKNOWLEDGEMENTS

The field work on which this study is based was supported by the Roanoke Department of City Planning. Particular thanks are extended to Mr. Werner Sensbach, past Director of City Planning. Also especially helpful was Mr. Jack Goodykoontz of the Roanoke Chamber of Commerce.

Material assistance was rendered during the writing phase by the Department of Geology and Geography of the University of Tennessee. The sympathetic support of Professors Harry Klepser, Loyal Durand, Jr., and Lillian Stimson is gratefully acknowledged.

The author's interest in the subject of Industrial Geography grew out of studies under the late Professor Alfred J. Wright. The guidance, counsel, and interest of Professors Henry Hunker, Earl Brown, and Lawrence Hoffman, members of the dissertation reading committee, were instrumental in giving this study whatever merit it may have.
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CHAPTER I

PURPOSE AND SCOPE

The purpose here is to study the suburbanization of manufacturing activities, primarily in the context of the small metropolitan area. The Roanoke, Virginia SMSA\textsuperscript{1} is used for a case study in order to determine possible differences in suburbanization between small and large metropolitan areas and to reveal some of the economic effects of industrial suburbanization in the smaller urban area.

Suburbanization

Suburbanization is an evolutionary process which, operating through time, results in net growth of any activity in the outer fringes of an urban area at a rate either relatively or absolutely greater than that in the inner parts. Decentralization, deconcentration, and dispersion also have been used to describe suburban movements but these terms are inadequate because they do not indicate clearly that the

\textsuperscript{1}Standard Metropolitan Statistical Area. The abbreviation SMSA is used throughout the following text.
movements in question are intra-urban in scope. Following Kitagawa and Bogue, the term is used here to indicate movement from a point near the center of an area toward the periphery, rather than the literal meaning of going from the central city into the adjacent suburban political units. That is, any relocation from one point in a metropolitan area to another point more distant from the center (the CBD) is suburbanization, whether or not corporate limits are crossed. Furthermore, suburbanization includes not only existing activities which are relocated within the area but also those activities which choose suburban sites as initial locations. This can be called

2Edgar M. Hoover, The Location of Economic Activity (New York: McGraw-Hill Book Co., Inc., 1948), p. 170; the first known use of the term suburbanization in the present sense is that of Hoover, who recognized the ambiguity of the other terms. Dispersion and the other rejected terms denote a centrifugal movement but they do not indicate the scope of movement, unless spatial limits are arbitrarily attached. Confusion results when terms in the general vocabulary are given meanings which are not inherent in the word. Suburbanization implies not only movement away from the center but also that such movement is confined within the limits of the urban area.


4Central business district. The abbreviation will be used throughout the text.

5Leo G. Reeder also recognized that shifts within corporate areas should be included if an important component of suburbanization is not to be overlooked. He distinguished between an inner zone and an outer zone within the City of Chicago. "Industrial Location Trends in Chicago in Comparison to Population Growth," Land Economics, XXX (1954), p. 182.
suburbanization because it does involve net change in favor of
the outer fringes and implies a rejection of more central
alternatives.

The degree of suburbanization is indicated by the relative proportions of an activity as between a central city or its inner parts and the outer portions of the total area.

The lateral expansion of urban land uses is suburbanization and it is fundamental to the problems of the contemporary American city. Suburbanization is implicit in the following statement by Fiser:

Our urban expansion has resulted in a sprawling metropolitan region made possible by the private automobile, the extension of power and telephone connections, all-weather roads, the lowly septic tank, and other technological changes.

The symptoms of discomfort are known to all of us; the traffic congestion of our central cities caused by increased dependence on the private automobile for movement; . . . the deterioration of large industrial, commercial, and residential areas of our central cities; the decline of the central business districts; . . . . These are a few of the irritations we have come to refer to as the problems of our metropolitan areas.

The changing urban pattern described by Fiser is dynamic areal differentiation and is the proper object of study for the geographer. According to Ackermann, " . . . study of the evolution of space content on the earth's surface is [geography's] fundamental research frontier." 7


7Edward A. Ackermann, Geography As A Fundamental Research Discipline, Department of Geography Research Paper No. 53 (Chicago: The University of Chicago, 1953), p. 28.
Manufacturing

Many urban functions are included in the suburbanization process but the focus of the present study is on manufacturing activities. Manufacturing companies are large job sources, contribute heavily to local tax revenues, are important land users, and have profound influences on other parts of the urban land use pattern. Woodbury noted that "... industry [manufacturing] is a mainstay of most urban centers, and therefore, its broad patterns of distribution and change are significant considerations in urban growth, planning, and redevelopment." Further reason to study the suburbanization of manufacturing is the number of serious problems which develop from it. As noted by Black, they include the loss of jobs and tax revenues by the central city and the development of industrial blight.

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8 Many definitions of manufacturing exist but the most appropriate and widely used is contained in the Standard Industrial Classification Manual (Bureau of the Budget Washington: Government Printing Office, 1957, p. 43.). It emphasizes "... the mechanical or chemical transformation of inorganic substances into new products, ... [this taking place in units] usually described as plants, factories or mills, which characteristically use power driven machines and materials handling equipment." Whenever the term industry is used it is used to indicate manufacturing activities only.


Recent statistical evidence of suburbanization is summarized in Table 1. It shows that population and manufacturing are heavily represented beyond the corporate limits of central cities and that the suburbanization of population and manufacturing is apparently related to the size of the area. This relationship will be examined in following sections. First, it is appropriate to review the literature on industrial suburbanization.

Previous Research

Empirical studies

The pioneering study of manufacturing suburbanization on a national level in the U.S. was made by Creamer\(^\text{11}\) and later continued by Woodbury.\(^\text{12}\) Together they analyzed events in the 1899-1947 period. A suburbanization trend was noted between 1899 and 1939 but during 1939-1947 the general tendency was for centralization to balance suburbanization in the nation's 33 largest industrial areas and in other counties containing cities with populations of at least 100,000 persons. Apparently, full capacity production and the shortage of building materials during the war effort inhibited any inclination to relocate plants. Kitagawa and Bogue were prompted to study


\(^{12}\text{Woodbury, op. cit., pp. 231-288.}\)
### TABLE 1

**CENTRAL CITY PROPORTIONS OF STANDARD METROPOLITAN STATISTICAL AREA POPULATION AND MANUFACTURING EMPLOYMENT, FOR THE UNITED STATES**

<table>
<thead>
<tr>
<th>SMSA Population Range (000)</th>
<th>Central City Proportion of Population (1960)</th>
<th>Proportion of Manufacturing Employment (1958)</th>
</tr>
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<tbody>
<tr>
<td>3,000-</td>
<td>56.1%</td>
<td>63.6%</td>
</tr>
<tr>
<td>1,000-2,999</td>
<td>42.6</td>
<td>52.2</td>
</tr>
<tr>
<td>500-999&lt;sup&gt;b&lt;/sup&gt;</td>
<td>52.7</td>
<td>62.5</td>
</tr>
<tr>
<td>350-499</td>
<td>49.7</td>
<td>66.6</td>
</tr>
<tr>
<td>250-349</td>
<td>48.2</td>
<td>55.9</td>
</tr>
<tr>
<td>150-249&lt;sup&gt;b&lt;/sup&gt;</td>
<td>54.0</td>
<td>69.8</td>
</tr>
<tr>
<td>100-149&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60.7</td>
<td>76.6</td>
</tr>
<tr>
<td>ALL&lt;sup&gt;c&lt;/sup&gt;</td>
<td>50.8%</td>
<td>60.8%</td>
</tr>
</tbody>
</table>


<sup>b</sup> One area excluded because of incomplete data.

<sup>c</sup> SMSAs with populations of less than 100,000 are not included.
the national trends more exhaustively. Their statistical analyses of data for the 1929-1947 period failed to reveal the variables which controlled the intensity of suburbanization and, in fact, they noted a trend toward centralization in a large number of metropolitan areas. It was noticed that there was an apparent correlation between the degree of population suburbanization and the suburbanization of manufacturing. This was attributed to accidental factors, mainly that of having the corporate limits close to the outer edges of the heavily built-up area. When this occurred both types of suburbanization were to be expected. They found no significant relationships between the degree of suburbanization of industry and the following variables: (1) age and size of the metropolitan area, (2) density of the central city, (3) per cent of the labor force in manufacturing, (4) proportion of employment in durable goods manufacturing, (5) specialization in any particular industry.

Zelinsky extended the analysis through 1954 and observed a rapid increase in suburbanization during 1947-1954. Value added by manufacturing in the central cities dropped from 70 per cent of metropolitan area totals in 1929 to 56 per cent in 1954, despite a number of annexations. He noted a definite size

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13 Kitagawa and Bogue, op. cit.
14 Ibid., p. 120.
16 Ibid., p. 260.
relationship, with suburbanization increasing as the size of the central city increased. In fact, he suggested that only in large metropolitan areas (those with central cities with populations of at least 200,000) were centripetal and centrifugal forces in rough balance while in smaller areas the centripetal forces were dominant.\textsuperscript{17}

Hawley noted the tendency for high rates of manufacturing suburbanization to occur in areas where the population was also exhibiting a tendency to become more suburbanized.\textsuperscript{18}

A characteristic shared by all of the above cited studies is that they are based on U.S. Census data for the nation as a whole. The generality of such data places very real limitations on the value of such studies. For example, Kitagawa and Bogue admitted that, "by observing data for the 1929-39 and 1939-47 periods, it was demonstrated that national trends are very poor indicators of what may be expected to happen in a particular S.M.A."\textsuperscript{19} Implicit in such a conclusion is the need for more empirical studies of particular urban areas or limited groupings of areas if the causative forces behind suburbanization are to be identified and understood.

\textsuperscript{17}Ibid., p. 266. This is a curious conclusion because it implies stability or centralization whereas suburbanization was shown to be the trend. Zelinsky may have intended to say that at a size larger than the balance point centrifugal forces dominate but he neglected to do so.

\textsuperscript{18}Amos H. Hawley, The Changing Shape of Metropolitan America (Glencoe, Illinois: The Free Press, 1956), chap. VII.

\textsuperscript{19}Kitagawa and Bogue, \textit{op. cit.}, p. 120.
Vernon's study of the internal economic functions of thirteen of the nation's largest metropolitan areas is of the limited grouping variety and is a major contribution to the understanding of industrial suburbanization. After noting a steady decline in the central city's share of manufacturing production workers, from 66.1 to 55.5 per cent between 1929 and 1954, Vernon explains the causation of both suburbanization and the persistence in the central city of an important remnant. Primary factors inducing suburbanization were the obsolescence of existing plants, the need to convert to more laterally expansive plant lay-outs, the consequent need for large vacant sites which were cheaper and more abundant in the suburbs, the difficulty or high cost of enlarging old sites through the purchase and clearance of adjacent occupied land, the flexibility offered by motor trucks and automobiles, the greater mobility of various external economies, and the growing availability of rental space in the suburbs for the use of small plants.

The plants which continue to be attracted by the large central city are characteristically small, associated with the need for speedy communication and transportation, and have


\[^{21}\text{Ibid., pp. 53-54.}\]
small outputs of unstandardized products. The attractions are in the form of rental loft space, immediate contact with clients, and a host of external economies which reduce the risks (by holding down fixed overhead costs) involved in highly competitive, volatile markets.\textsuperscript{22} Small concerns tend to be pulled toward the center while larger plants are attracted to the fringes, even into the suburbs. The large plant is more nearly self-contained and less concerned with external economies and the large-volume, standardized product is shipped to widespread markets to customers with whom face-to-face contact is seldom required. These plants are relatively free to avoid the high costs involved in a central city location. While presented in the context of thirteen of the largest metropolitan areas, the findings of the Vernon study strongly parallel those of the New York Metropolitan Region Study, of which Vernon was director.\textsuperscript{23}

Gottmann, in his classic study of Megalopolis, borrows heavily from the New York Metropolitan Region Study for his discussion of industrial suburbanization.\textsuperscript{24} He views suburbanization as being caused largely by general urban congestion but also notes a strongly centralized and dynamic manufacturing

\textsuperscript{22}Ibid., pp. 28-37.


\textsuperscript{24}Jean Gottmann, \textit{Megalopolis} (New York: The Twentieth Century Fund, 1961), pp. 482-495.
element which prefers the advantages of the central city to those of a less congested situation.\textsuperscript{25} Baltimore, where only 10.5 per cent of manufacturing employment is in plants with fewer than 40 employees, provides a caution against the automatic extrapolation to other metropolitan areas of New York City's role as an incubator for small, new industries.\textsuperscript{26} New York may be peculiar in its relative role as a seed ground for new products and processes. The relatively small proportion of plants with fewer than 40 employees is further significant because it is the larger plant that is most likely to grow and be driven to the suburbs by congestion.

Gottman also observed that industrial suburbanization was less the rule in the smaller and less congested cities of Megalopolis, such as Lancaster and Scranton, Pennsylvania, than in the large metropolitan areas.\textsuperscript{27}

Pred, in a study of ten of the largest U.S. metropolitan areas, found common causative patterns in industrial suburbanization among them.\textsuperscript{28} He stressed historical periods in suburbanization, relating primarily to changes in transportation and distribution technology.\textsuperscript{29}

\begin{thebibliography}{9}
\bibitem{25} Ibid.
\bibitem{26} Ibid., pp. 486-487.
\bibitem{27} Ibid., pp. 483-484.
\bibitem{29} Ibid.
\end{thebibliography}
Analysis of individual metropolitan areas have also contributed to the understanding of manufacturing suburbanization. Reeder and Reinemann viewed industrial suburbanization as an evolutionary process in Chicago, resulting from general congestion and the need for more site space.

Black, writing about Detroit, blames suburbanization on the exhaustion of land zoned for industry, cramped sites of growing firms, increasing desirability for expansive one-story plants, the increasing use of cars by workers, and increased traffic-parking congestion.

Hunker noted a pronounced suburbanization trend in Columbus, Ohio and explained it in terms of a shortage of good industrial sites in the central city. He also inferred a decline in the downtown area's function as a "cradle" for new industry.

Suburbanization has also received attention in Australia and New Zealand. Logan, writing about Sydney and Melbourne, Australia, observed the growing importance of suburban industries,

Reeder, op. cit.

Martin W. Reinemann, "The Pattern and Distribution of Manufacturing in the Chicago Area," Economic Geography, XXXVI (1960), pp. 139-144.

Black, op. cit., pp. 219-220.

Henry L. Hunker, Industrial Evolution of Columbus, Ohio (Columbus: Bureau of Business Research, The Ohio State University, 1958), p. 229.

Ibid., p. 76.
resulting from the establishment of new plants in the suburbs as well as from the relocation of existing plants from the central city. As did Vernon, he concluded that the larger suburban plant is more self-sufficient and less reliant on external economies than is the smaller central city plant. Logan viewed suburbanization as the result of a set of cost substitutions, between the higher costs caused by increased distance from the business center and the lower land costs of the suburbs. The large plant, being less sensitive to the advantages of the business center, derives the optimum balance of costs by selecting a low cost, suburban site.

Auckland, New Zealand was analyzed by Linge and he cited inadequate space as the primary factor behind industrial suburbanization. Other disadvantages of the inner zone of Auckland are the poor quality of resident labor, general urban congestion, high property values, unfavorable environment, and the suburban movement of linked industries. Advantages of the inner zone derived from the availability of small rental properties and various external economies. Linge noted a direct relationship

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36 Ibid., p. 151.
38 Ibid., pp. 30-34.
39 Ibid., p. 34.
between the size of a plant and the relative advantages of a suburban plant. Again, the reasoning is that the larger plant is less dependent than the small one on external economies and the availability of rental quarters. 40

A major insight contributed by Linge is that the relocation to a suburban site hinges on management's decision as to just when the firm has reached such a size and strength that it is sufficiently self-contained to benefit from the advantages of a suburban location. That is, suburbanization is the result of internal managerial judgements, concerning competitive relationships and corporate financial strength, as well as pushes and pulls of the external environment. 41 This factor largely accounts for the outsider's difficulty in estimating the temporal point at which locational inertia will be overcome and a relocation decision will follow. 42

New plants, as opposed to resident relocations, are the dominant element in suburbanization in Auckland, with fully two-thirds of the suburban manufacturing employment occurring

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40 Ibid., pp. 34-35.
41 Ibid., p. 38.
42 An external factor which is probably more relevant to the New Zealand manufacturer than to his U.S. counterpart is the supply of labor in the immediate neighborhood. Linge indicates that the relocatee to the suburbs cannot expect his previous employees to follow him from the central city. He must find most of his workers in the suburban neighborhood. This implies a lower degree of labor mobility in New Zealand, probably related to lower per capita use of automobiles than in the U.S.
in new plants. The new plant, unencumbered by locational inertia, can be expected to be more responsive to the growing disadvantages of the central city and be the most active component of industrial suburbanization.

In addition to the literature in which there is some focus on the suburbanization process, as such, there are many industrial land use studies which document the changing patterns of intra-metropolitan manufacturing location. They also contain evidence of some of the problems posed by industrial suburbanization but scant attention is given to the causative forces behind the process. It will be shown later in the present study that the failure of planners to understand the workings of suburbanization can lead them to formulate unwise policy recommendations.

44 The following studies exemplify this type of study:


Minneapolis City Planning Commission Land for Industrial Growth (Minneapolis: 1960), Publication no. 116, Industrial Study Series no. 3.


Minneapolis City Planning Commission, Industry Square (Minneapolis:
Location theory

Suburbanization is an empirical problem and receives only minor consideration, as such, in the literature on location theory. Pertinent to the subject are the discussions of the forces which lead industries to either concentrate or disperse.

Weber's classic study of industrial location theory included a discussion on agglomerative and disagglomerative forces. He stressed various external economies and linkage as advantages leading to concentration for plants in functionally related industries and for industrially unrelated plants as well. Rising land and labor costs resulting from increasing competition for these factors in concentrations give rise to disagglomerative forces which, in effect, set a ceiling on concentration in a given area. Weber was concerned primarily with the distinction between concentration and dispersion, not...
specifically intra-area locational patterns. However, he did anticipate the suburbanization response to disagglomerative forces by suggesting that the rising costs of concentration could be partly avoided by moving to the periphery of the agglomeration. Extending this logic, it would appear that the degree and extent of partial escape from disagglomerative forces offered by suburbanization is directly dependent on the relative mobility of the various advantages of agglomeration within a given concentration. The question becomes: how far from the center of concentration can an establishment locate and still derive significant advantages from agglomeration? Mobility involves not only such things as roads and utilities but, more directly, the ease of access to external economies and the local market, and the degree of intra-area labor mobility. The increased mobility of the advantages might allow the industrialist to avoid the high land costs resulting from the intense competition for land in the center of the area but would not necessarily alleviate rising labor costs resulting from competition within the growing concentration. The partial nature of the suburbanization solution and the technological and economic limits on mobility act to put a spatial ceiling on the degree of agglomeration that is possible in any given context.

47 Ibid., p. 132.
Alonso adapted Von Thunen's approach to the urban area. The higher land rents charged in the center of the urban area are thought to reflect the increased cost of transportation to the center from a peripheral point. The producer can reduce transport costs by locating centrally but land rents increase to the extent that the transport cost saving is absorbed. Such an approach is meaningful to the industrialist only if he actually needs contact with the central area and if rent differentials do in fact absorb transport savings. Certainly, most manufacturers do not derive the same benefits from a central location that a retail or service establishment might.

Like Weber, Hoover also follows a least-cost approach to locational analysis, emphasizing locational variations in transfer costs and production costs. While his considerations are more empirical than most of the literature on location theory he is also concerned mainly with broad forces, rather than with changing patterns within a given concentration. As noted earlier, however, he apparently originated the use of the term suburbanization in the present context and did comment on its probable causation. Hoover explains suburbanization in terms of the wider use of motor vehicles, urban congestion, and rising land values in central cities, and the shift toward single-story production facilities. He also relates suburbanization, including that


49 Hoover, op. cit.

of manufacturing, to urban blight and other problems of the central city.  

In discussing concentration, Hoover develops possible positive features of the central city such as industrial linkage, specialized labor pools, the structure of transfer costs, and external economies. He makes it quite clear, however, that these advantages do not dictate a "downtown location" but that for many activities it is sufficient to be somewhere near the urban concentration. As in Weber's, it is implicitly stated in Hoover's discussion that the outer limits on suburbanization are set by the relative mobility of the various advantages of agglomeration.

Isard also considers congestion, leading to urbanization diseconomies, as the primary force in deglomeration. The forces of deglomeration and agglomeration are a function of the intensity of activities rather than geographic position. Implicit is the conclusion that both agglomeration and deglomeration operate more strongly as the size (intensity) of an area increases. Thus there is the suggestion of an apparent paradox: the larger the concentration the greater will be its appeal as

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52 Ibid., pp. 116-120.
53 Ibid., p. 121.
55 Ibid., pp. 139-140.
an industrial location and, at the same time, the costs of operating there will be higher and, consequently, the motivation will be greater for the producer to mitigate these high costs through the selection of a suburban site, from which he can still enjoy the advantages of agglomeration.

Thus, Weber, Hoover, Alonso, and Isard seem to agree with the previously cited conclusion of Logan that suburbanization involves a cost substitution decision between a central site, with maximum costs and maximum access to concentration advantages, and a suburban site, with reduced costs and reduced access to concentration advantages. The historic trend for decisions to be resolved in favor of the suburbs suggests that the mobility of concentration advantages has increased more rapidly than has the spread of the disadvantages (e.g., the high land values of the central city).

To this point the discussion of location theory relevant to suburbanization has emphasized a least-cost approach and, as indicated above, the theoretical analyses seem to mesh well with empirical studies. Another school of thought focuses on the problem of locating with primary regard for markets and competitors, with a view toward maximizing revenues through the achievement of locational monopolies. Operating and transfer costs are ignored or play a secondary role, just as these locational strategies tend to be neglected in the least-cost approach.

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Without making a detailed comparison of the two approaches, however, it would seem that the locational strategies (maximum revenue) approaches would be relevant to suburbanization only if intra-metropolitan area plants have important internal markets and, furthermore, only if distribution costs vary within this local market to the extent that marketing strategies are possible. Given the wide variations in costs possible between alternative sites and the minor time-space frictions of travel (distribution time and costs) within an urban area, in comparison with regional or national market areas, a least-cost approach appears to be the most realistic one to follow in the analysis of suburbanization.

**Purpose of the study**

Empirical studies of suburbanization point up the need for detailed area studies and indicate a relationship between area size and the intensity of suburbanization. Since these studies have concerned large metropolitan areas almost exclusively, the nature and intensity of suburbanization in the small metropolitan area remains to be examined.

Location theory provides for suburbanization in the consideration of concentrating versus deconcentrating forces, again postulating a size-intensity relationship. The overlap between the conclusions of empirical studies and of location theory is considerable.

In both types of studies it is surprising the extent to which the effects of industrial suburbanization are neglected. Passing references are made to urban blight, loss of jobs, and
loss of taxes without specific measurements of these effects being attached.

Therefore, there is need for study directed at the small metropolitan area and at attempts to provide some measure of the effects of suburbanization. Previous studies indicate the desirability of empirical research of individual urban areas. As a result, the approach taken in the present work is to select a small metropolitan as a case study, in which the relative comparability of findings from large area studies can be examined. The case study is necessarily detailed and will allow the measurement of at least some of the community effects of industrial suburbanization.

The Small Metropolitan Area

The 88 Standard Metropolitan Statistical Areas in the 100,000-249,000 population range accounted for over 20 million people in 1960 and 1.3 million manufacturing employees in 1958. They represent important components of American population and industry, even if not at the same levels as do the larger urban centers. Suburbanization and the consequent re-structuring of land use patterns alone are sufficient reason to study any area in which these trends are evident. But even more compelling is this question: to what extent are the understandings derived from the study of large metropolitan areas appropriate to the solution of problems in the small area?

Furthermore, there is the possibility that the economic vitality of the small urban area is less secure than that of the large one and that the margin of error in planning for the
future is consequently less. Thompson postulates an urban size "ratchet", beyond which, because of diversification, greater political influence, greater fixed capital, larger local consumer market, and greater likelihood of indigenous innovation, an urban area cannot, or will not be allowed to, decline seriously or even fail to grow. The area which has not achieved the critical ratchet size is more vulnerable and may eventually decline in the same way as many small rural towns already have. While this conclusion may be unduly pessimistic, it is not to be dismissed lightly and suggests the need for more concern for the problems of the small metropolitan area.

Selection of the Study Area

Criteria

Several criteria need to be satisfied for the selection of an area for a case study. The area must have manufacturing activity, suburbanization must be occurring, and the SMSA must be small. The 100,000-249,000 population size range was selected because it was felt that anything smaller might have too small

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58 Hunker and Wright, for example, noted that the problem of providing adequate sites and buildings for industry is especially difficult for smaller communities. Henry L. Hunker and Alfred J. Wright, Factors of Industrial Location in Ohio, Bureau of Business Research, Research Monograph No. 119 (Columbus: The Ohio State University, 1963) pp. 130-131.
a manufacturing complex or that it might not be diverse enough. Ideally, all manufacturing industries should be represented but even in the size range chosen a few might well be missing. Any area with unusual specialization in a few industry types or in which industry is strongly related to some locationally confining natural resource is to be avoided. Additionally, it was desirable to have an area which was free of spatial overlap with surrounding urban centers and the consequent confusion of trends.

Even with the application of the above criteria, however, the selection process is not complete because only the clearly nonrepresentative areas are excluded. An admittedly arbitrary choice remains to be made. The final choice in this case was made on the basis of personal knowledge of the area and access to it.

The Roanoke, Virginia SMSA

The Roanoke SMSA was selected for study because it satisfied all of the above mentioned criteria. Specifically, it has the following characteristics:

1) The SMSA population was 157,764 in 1960, with 97,110 persons resident in the central City of Roanoke. 59

2) Manufacturing activities employed 15,270 persons in 1964, spread among 18 of the 20 major industries recognized by

Source cited in Table 2.
the Standard Industrial Classification. The largest industry employed only 15.7 per cent of those engaged in manufacturing.\(^{60}\)

3) During 1954-63, manufacturing employment in the SMSA increased by 14.7 per cent but in the suburban ring portion it doubled. The suburban ring increased its share of the SMSA total from 23.7 to 41.4 per cent while the central city was undergoing an absolute loss of over 1,200 jobs.\(^{61}\) During this period the relevant political boundaries remained stable.

4) The SMSA occupies the Roanoke Valley, which is enclosed by hilly topography and has a clear spatial break with other urban centers. The next nearest SMSA is about 60 miles distant.

5) The author worked as a planner for the City of Roanoke for 18 months and was thus able to obtain a close familiarity with the area.

Finally, it should be mentioned that, under Virginia law, independent cities, such as Roanoke, are completely separate political units and do not share tax jurisdictions or service responsibilities with surrounding counties. Under this circumstance the loss of an industrial resident to the suburban ring is a more serious matter than it might be if there were some sharing of tax sources. Because of this arrangement, counties are reluctant to have territory annexed and can be counted upon to oppose vigorously any attempts at annexation. City limits do not change often in Virginia and, in fact, the City

\(^{60}\) Sources cited in Tables 8 and 10.

\(^{61}\) Source cited in Table 6.
of Roanoke has not annexed since 1949, losing another attempt in 1960. The relative stability of political limits somewhat simplifies the research task and it can make more acute the solution of any problems which the central city may experience as a result of industrial suburbanization.

Organization of the Study

Even though the general forces behind industrial suburbanization seem to be well understood, they must be analyzed anew in the case study before comparisons with other areas can be made. The first step is to characterize both the physical and the cultural setting of the area, at least of those aspects which might reasonably be expected to influence industrialization. Following this, the development history of industry is analyzed, in order both to set the pattern that is now changing and to identify any early tendencies to suburbanize. The focus then shifts to the contemporary era with a detailed description of the individual events of industrial suburbanization. This prepares the way for the discussion of causative forces, presented in the context of the various location factors which are relevant to the intra-urban framework. The results of studies of other areas will be compared with the evidence in Roanoke whenever possible.

Finally, some of the direct effects of suburbanization on the community are considered. Of primary concern is whether or not suburbanization is causing the wage-level composition
of industry in the central city to decrease relative to that in the suburban ring.

Data Sources and Methods

Data sources for this study include standard reference works of the U.S. Bureau of the Census, as well as those of other Federal agencies, and employment information from the Virginia Employment Commission. Published inventories of industrial firms and their employments provided detailed employment data. Original information was gathered from questionnaires and through interviews with major industrial officials. Supplemental data on the study area were obtained from various historical sources, planning reports, and personal observation. The literature sources on other metropolitan areas have already been cited.

In any study of manufacturing location one must choose one or several criteria of locational significance. Value added by manufacturing is probably the single most representative criterion but the availability of these data is very incomplete within small areas. Only employment data are reported in such detail as to be adequate for an intra-urban study and they must, by necessity, form the primary locational measure. This, however, is not totally undesirable since factories are viewed

62 Interviews concentrated on officials of plants which were relocated within the area. A few others were made with officials of non-relocated plants in order to redress this potential bias. All interviews were confidential so no documentation of interview information is included in the study.
in this study primarily as job sources. Qualitative refinement is given to employment data through the use of wage level information. Site size and number of establishments are other criteria which are used as appropriate.

The classification of industries is drawn exclusively from the product-based system of the Standard Industrial Classification because it is a workable system and it permits maximum comparability with other studies.63

Focus of Study

The following statements summarize those aspects of suburbanization which will be emphasized in this work:

1) Manufacturing activity is tending to locate toward or in the outer fringes of metropolitan areas because of congestion and higher land values in the central city, the need for larger sites, and the increased mobility of the various advantages which the urban area offers to industry. Thus, the fundamental causes of suburbanization are the same in the small metropolitan and in the large urban center.

2) Suburbanization is detrimental to the central city because of the loss of job sources, the lowering of industrial wage levels relative to the suburbs, and the possible formation of industrial slums.

3) The forces which act to push plants into the suburbs are stronger in large urban areas but large central cities also

63The Standard Industrial Classification Manual.
have considerable holding power for some industries and plants. The intensity of suburbanization is likely to be less in the small metropolitan area but the attractions of the small central city are relatively limited. Even if strong ties exist with the center of the small central city the reduced time-space frictions of the metropolitan area would permit a more dispersed locational pattern without losing intimate contact with customers, suppliers, and other centralized services. Therefore, the long-term trend may be for the small area to undergo considerably greater industrial suburbanization than is to be expected in the large metropolitan area. Locational inertia will act to greatly delay the full development of this trend.
CHAPTER II

THE GENERAL SETTING

Definition of Study Area

The Roanoke, Virginia SMSA is comprised of the independent City of Roanoke, the incorporated Towns of Salem and Vinton, and residual unincorporated county areas.¹ Future references to the "metropolitan area," the "Roanoke area," or simply, "Roanoke," unless otherwise stated, refer to the SMSA. The term "city" applies only to the independent City of Roanoke. Figure 1 identifies the SMSA and its political subdivisions.

Some discrepancy is involved in restricting the analysis of suburbanization to the single-county SMSA because some of the activities which focus directly on the SMSA do occur in adjacent counties. Most of the contiguous urban land use occurs in Botetourt County, which, together with the SMSA, forms the planning area for the Roanoke Valley Regional Planning Commission. A land use study shows that 95 per cent of all residential, industrial, and transportation land uses in the

Fig. 1. -- Location map for the Roanoke SMSA
two-county area occur in the Roanoke SMSA. Furthermore, Botetourt County had only 891 manufacturing employees in 1963, as opposed to the 14,752 employees of the SMSA. Some manufacturing exists in the other counties adjacent to the SMSA but it is generally located in those portions of the counties most distant from Roanoke. Figure 1 shows that there is a strong topographic break between the SMSA and other urban land uses.

Site and Situation

Site

Climate.-- The SMSA has a Humid Subtropical Climate, receiving a mean annual precipitation of 41.2 inches, evenly distributed throughout the year, and monthly mean temperatures ranging between 38.1°F and 76.6°F. It is felt that climate is a permissive factor in intra-urban industrial location decisions.

Topography.-- The shape, size, and orientation of the landforms have been important factors in shaping the development of urban land uses in the SMSA. The SMSA occupies the Roanoke Valley within the Appalachian Ridge and Valley Province. The eastern margin of the Valley is formed by the geologically

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ancient Blue Ridge Mountains. To the west of the valley rise prominent sandstone ridges of the Ridge and Valley system.5

The Roanoke Valley is one of a series of intermittently occurring valleys which form the Great Valley system along the eastern edge of the Ridge and Valley Province. The most famous expression of this system of valleys is the Shenandoah Valley, to the northeast. As Figure 1 shows, the Roanoke Valley is almost completely surrounded by slopes in excess of 20 per cent, too steep for the usual urban uses of land. The SMSA has an area of 277 square miles and 171 of those square miles are thought to have potential for or are developed for urban purposes. Topography is the primary consideration in limiting the amount of potential urban land.6

Drainage.-- The Roanoke River and its tributaries drain the Roanoke Valley. The Roanoke River enters the SMSA near Glenvar and follows a moderately meandering course through the valley before leaving through a water gap cut into the Blue Ridge Mountains. The floodplains of the river and its tributaries are generally narrow but, as will be shown later, they have served as primary paths for railroad lines and some portions have provided industrial sites.

Natural resources.-- Iron ore was an important local resource in the early days of industrial growth in the Roanoke


6A Land Use Plan for the Roanoke Valley Region.
Valley but all indications are that active mining ceased by the end of the First World War. The only local mineral materials now utilized are crushed limestone, shale for use in brick making, and quarried sandstone for buildings.

Over 100,000 acres of the SMSA are wooded and the annual cut of saw timber is between one and three million board feet, well below the annual growth. Hardwoods, especially oak and hickory, predominate among the types of timber available. Local production supplies established markets for sawlogs, veneer, and small wood products. The local furniture industry is supplied by wood cut in the SMSA and surrounding counties.\(^7\)

Water is reasonably abundant in the Roanoke Valley, with some wells in limestone strata producing up to 400 gallons per minute. Springs abound, also, with the largest, Crystal Spring, discharging about 2,775 gallons per minute. It formerly comprised the basis of the City of Roanoke's water supply but today most of the city's water comes from the large Carvin's Cove reservoir in Botetourt County.\(^8\)

The flow of the Roanoke River is modest and extremely variable between the seasons. Its capacity as an industrial water source is limited. The large facility of the American Viscose Corporation, before it closed in 1958, dumped chemical wastes into the river, causing it to become heavily polluted

\(^7\)Virginia, Division of Industrial Development and Planning, Economic Data: Roanoke County, Virginia, 1964, pp. 21-22.

\(^8\)Ibid., pp. 20-21.
during summer low-water periods. Since the river rises in near-by mountains it is very sensitive to local meteorological conditions. On several occasions, particularly in August, 1940, heavy summer rains have caused brief but severe flooding along the river floodplain.  

Summary.-- Land space has been a major factor in the location of industry but it will be seen that, within the confining limits of topography and drainage, the major determinant of industrial location patterns in the SMSA has been more the influence of other urban land-users, and vice-versa, than a strictly topographic control. Therefore, within the confines of the Roanoke Valley, topography, as such, has been a largely permissive factor. The natural availability of water, apart from the culturally-derived establishment of pipe systems, etc., is also probably permissive. Saw timber is the only sporadic local natural resource used by industry and its occurrence is beyond the edges of urban land-users and thus probably without intra-area influence on industrial location. The negligible use of other local natural resources is unequivocal evidence that Roanoke industry is not dependent on local raw materials and that, therefore, the disposition of raw material sources

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9Weather Bureau, op. cit.
is not an active determining factor in the intra-area manufacturing location pattern.  

**Situation**

Local access.-- Five passes through the mountains give access to the Roanoke Valley (Figure 1). While the mountains are not everywhere very imposing barriers to travel they were more difficult to cross in earlier times and the original establishment of transportation routes through the five major passes has secured their roles as primary access arteries. The five passes are as follows:

1) North through Cloverdale and on into the Shenandoah Valley. This route is taken by north-bound U.S. highway 11, interstate highway 81, and the Shenandoah Valley Division of the Norfolk and Western Railway.

2) Buford's Gap, through the Blue Ridge Mountains, is followed by the Norfolk and Western Railway line to Norfolk and by U.S. highway 460, also headed east.

3) The Roanoke River Gap is a precipitous gorge which is followed briefly by another eastbound line of the Norfolk

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10 It will be shown later that immediate access to local iron ore deposits did influence the location of an early blast furnace and that this decision influenced the subsequent pattern of non-industrial land uses. Thus a fossil pattern was established which is now deeply interwoven into the urban pattern.
and Western Railway. This line, formerly that of the Virginian Railway, soon leaves the gap and travels overland. The Roanoke River Gap through the Blue Ridge Mountains, as such, is not used by a primary highway.

4) Murray Gap is followed, in part, by U.S. highway 220 and, more closely, by the Winston-Salem Division of the Norfolk and Western Railway, both leading into the North Carolina Piedmont.

5) U.S. highways 11 and 460 are combined as they leave the valley in the west near Glenvar, and are paralleled by interstate highway 81. The Radford Division of the Norfolk and Western Railway, including the parallel lines of the merged Virginian Railway, also follow this route, branching later to go southwestward into Tennessee and northwestward into West Virginia and the Middle West (Figure 2).

The five passes act to focus major transportation routes, oriented in all cardinal directions, on the Roanoke Valley.

Regional relationships. -- The SMSA occupies an unusually strategic location (Figure 2). It sits astride a crossroads which, despite the mountainous site, gives direct access to the Southern Piedmont, the Middle Atlantic States, the Middle West, and the Tennessee Valley.

The focus of transportation routes on the Roanoke Valley is a result of the SMSA's location within the northeast-southwest oriented valley system of the Newer Appalachians. The east-west routes are also topographically conditioned, the Roanoke Valley being one of the more level access routes through
Fig. 2.--Regional location of the Roanoke, Virginia, SMSA
the Blue Ridge Mountains and into the intermittent valleys of the Ridge and Valley Province.

The SMSA also benefits from the strategic location of the Commonwealth of Virginia. Gottmann gives primary significance to Virginia's position "... commanding access to the South from the highly urbanized and industrialized areas of the Northeast and of the Middle West between the Great Lakes and the Ohio River. More than any other state to its west, Virginia commands the entrance to the South, as well as the South's access to the great markets of the North." Virginia's strategic location, in the South but close to the North, has been attractive to industry because of factors relating to transportation, labor, climate, and taxation policy which are implicit in such a situation.

The Roanoke SMSA shares in this strategic situation, although eastern Virginia receives more of the interchange between the Middle Atlantic States and the Southeastern States. But what Roanoke lacks in north-south proximity it more than compensates for through access to the southwest, into Tennessee, and Northwestward, into the Middle West.

Certainly, the situation of the Roanoke SMSA is one of its richest resources and it has been far more influential in the industrialization of the area than have been any local

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12Ibid., p. 408.
natural materials. While it is not the purpose of this study to examine the factors which have brought industries to the Roanoke SMSA, it does seem likely that a primary attraction, if not the dominant one, has been the area's focal situation.

General History

Before 1900

Difficulties with Indians delayed the settlement of Virginia west of the Blue Ridge Mountains until after the battle of Point Pleasant, West Virginia, where in 1764 a colonial army persuaded Indians led by Chief Cornstalk to withdraw from the area. The first town in the Roanoke Valley, Salem, was laid out in 1802. Roanoke County was formed in 1838 and received its present dimensions in 1849. In 1838 about 1,500 people lived in the new county and Salem was designated the county seat.

The site of the present City of Roanoke was settled slowly. A predecessor, the Town of Gainsborough, consisted of two frame buildings in 1825. As the town grew, the name was changed to Old Lick, in reference to a near-by salt marsh which had in the past attracted deer and other game. The Town of Big Lick was founded nearby in 1834 but growth was very modest until 1852. In 1857 the Virginia and Tennessee Railroad was completed between Bristol and Lynchburg, passing through Big Lick. A railroad depot and a tobacco processor, the area's first manufacturer, were soon established but they failed to stimulate much growth. The Town of Big Lick was incorporated in 1874 and
by 1880 it had 669 of the county's population of 13,105 persons. Up to this date the present SMSA was a heavily agrarian county, lightly populated, and in an area between Lynchburgh and Bristol which did not possess a town large enough to call a city. The decisions which were to lead to urbanization were being made in Richmond and Philadelphia.

After the Civil War, a number of railroads, including the Virginia and Tennessee, were grouped together to form the Atlantic, Mississippi and Ohio Railroad, extending from Norfolk to Bristol. It soon fell into financial difficulties and in 1879 the Courts ordered the railroad sold in order to satisfy its creditors. On February 10, 1881 the railroad was purchased at auction in Richmond by Clarence H. Clark and associates, of Philadelphia, for $13,503,159. It was reorganized as the Norfolk and Western Railroad Company and was quickly expanded through the purchase of several small railroads which were chartered to build lines into the enormous West Virginia coal fields. The first shipment of coal was made on May 21, 1883, and the Norfolk and Western was on its way to becoming one of the nation's great coal carriers.

In 1881 the Shenandoah Valley Railroad, by this time also under the control of the Clark interests, was under

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13 The early history of the area was abstracted from George S. Jack's and E. B. Jacob's book History of Roanoke County, History of Roanoke City and History of the Norfolk and Western Railway Company (Roanoke: Stone Printing Co., 1912).

construction south-westward from Hagerstown, Maryland. The need for a junction for this line and for access to the coalfields was the primary motivation for Clark's interest in the Norfolk and Western.

These externally directed events did not pass unnoticed in the Roanoke Valley. Every town in the valley enthusiastically sought the impending rail junction but, in the course of an afternoon, the citizens of Big Lick decided the issue. Meeting in the street, they raised $7,875 in cash and secured an agreement from property owners to make available 800 acres of land for railroad uses as inducements to the railroad company. The offer of money and land was accepted on the next day, February 24, 1881, and Big Lick was designated not only as the new junction but also as the site for the entire system's shops, which were to employ 750-1,000 men at the beginning. This decision was the catalyst which led to rapid and sustained urbanization of the Roanoke Valley.

Fortuitous timing brought together a group of small town people who were willing to back up their hopes with ready cash and a man who measured railroad opportunities in long-term perspectives rather than as instruments of stock market speculation. Frederick J. Kimball, of the Clark group, early and correctly perceived the potential of the West Virginia coal fields. His interests coincided with the rapid growth of U.S. industry and the expanding demand for coal as the primary energy

15 Ibid.
source. He relentlessly pursued the coalfields and was the
leader in the Clark group's acquisition of the two railroads
and the small coalfield lines. Kimball became the primary
operating official of the Norfolk and Western and directed his
energies toward securing supplies of and markets for the coal.
The long-range benefits of the investment opportunity were the
goal throughout. Had Kimball and the Clark associates been
more like many of their fellow investors, the junction at Big
Lick might have ended as another interesting footnote to the
financial struggles of the great railroad speculators of the
time. As it was, Kimball "... was chiefly responsible for
its [Norfolk & Western] evolution from a weak, provincial,
agricultural railroad into the prosperous and essential coal
carrier it has long been."16

In 1882, the same year in which the town became Roanoke
and enlarged its boundaries, work began on the Roanoke Machine
Works, the new railroad repair and maintenance shops. In 1884
the works were credited with saving the local economy from the
effects of a business depression by outbidding all rivals for
a contract to build 500 freight cars for the New York, New
Haven & Hartford Railroad.17

Industrialization gained momentum in 1883 with the
establishment of a primary iron furnace, using local ores, and
other smaller plants.

16Ibid., p. 19.
17Jack and Jacobs, op. cit.
The population of the town soared past 5,000 persons and on January 31, 1884 the City of Roanoke was incorporated by act of the legislature. Growth continued in a boom atmosphere and by 1890 the city's population reached 16,159, with another 13,942 persons living in the rest of what was to become the SMSA (Table 2). The original one square mile of the former town grew by annexation until the city covered nearly six square miles in 1890. Railroad employment continued to expand, along with the primary iron and other industries. Population reached 21,495 at the turn of the century, with another 15,837 persons in the suburban ring.

This period of early growth approximates Thompson's postulated first stage of urban economic growth, the "Stage of Export Specialization," when the budding local economy is dominated by one industry. In this case the railroad and its shops provided the major "export" phase of the economy, earning the income which formed the basis for further urbanization. The primary iron industry began the broadening of the "export" economy which is the step leading into the second stage, that of the "Export Complex." However, this stage did not develop very fully because, as will be seen later, the railroad shops continued to dominate local manufacturing employment well beyond the turn of the century.

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TABLE 2

POPULATION GROWTH IN THE ROANOKE SMSA AND IN VIRGINIA, 1880-1960

<table>
<thead>
<tr>
<th>Year</th>
<th>City of Roanoke</th>
<th>Suburban Ring</th>
<th>Roanoke SMSA</th>
<th>Virginia (000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>669</td>
<td>12,436</td>
<td>13,105</td>
<td>1,513</td>
</tr>
<tr>
<td>1890</td>
<td>16,159</td>
<td>13,942</td>
<td>30,101</td>
<td>1,656</td>
</tr>
<tr>
<td>1900</td>
<td>21,495</td>
<td>15,837</td>
<td>37,332</td>
<td>1,854</td>
</tr>
<tr>
<td>1910</td>
<td>34,874</td>
<td>19,623</td>
<td>54,497</td>
<td>2,062</td>
</tr>
<tr>
<td>1920</td>
<td>50,842</td>
<td>22,395</td>
<td>73,237</td>
<td>2,309</td>
</tr>
<tr>
<td>1930</td>
<td>69,206</td>
<td>35,289</td>
<td>104,495</td>
<td>2,422</td>
</tr>
<tr>
<td>1940</td>
<td>69,287</td>
<td>42,897</td>
<td>112,184</td>
<td>2,678</td>
</tr>
<tr>
<td>1950</td>
<td>91,921</td>
<td>40,929</td>
<td>132,850</td>
<td>3,319</td>
</tr>
<tr>
<td>1960</td>
<td>97,110</td>
<td>60,654</td>
<td>157,764</td>
<td>3,967</td>
</tr>
</tbody>
</table>

The Twentieth century

Rapid growth continued into the 1900's and by 1920 the City of Roanoke contained 70 per cent of the SMSA's population of 73,237 people (Table 2). The coming in 1917 of the large (peak employment of over 6,000 in the late 1920's) American Viscose Corporation plant, greatly broadened the industrial export base. Another large plant, the Johnson-Carper Furniture Company, commenced operations in 1927 and this, along with other smaller facilities, probably put the Roanoke economy fully into the "Export Complex" stage where the earning of income from "outside" markets was spread among a number of industries. At the same time the area was also developing a broad retail-service function, moving into the stage of "Economic Maturation," in which the range and quality of business and consumer services increases.

A pause in growth was to occur after the SMSA population reached 104,495 persons in 1930. In that year the city's share of the total dropped to 66.2 per cent (Table 2), the first relative decrease in the city's history. This happened despite an annexation in 1926. It appears that the SMSA was moving toward the stage of "Regional Metropolis," in which the export of services becomes a major economic function, but the contractions of the depression of the 1930's aborted this

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20 Sources for this and other industrial events are given in the following chapter.

21 Thompson, loc. cit.

22 Population Trends, p. 51.
trend. Population growth levelled off after 1930, with the city gaining only 81 persons by 1940 and suffering another relative loss as the suburban ring gained over 7,600 people (Table 2).

Economic recovery after 1940 saw the population curve move upward again but not at the pace maintained before 1930. Annexations by the city in 1943 and 1949 temporarily checked the city's relative loss and by 1950 it contained 68.9 per cent of the SMSA's 137,407 people. The downward trend began again after 1950 and by 1960, with no intervening annexations, the city had only 61.2 per cent of the SMSA's population of 157,764 persons (Table 2). Estimates for 1962 put the city's share at barely 60 per cent.

Salem remained small, with a population of only 6,823 persons in 1950. Annexations in 1953 and 1960, however, pushed the population up to 16,058 people residing within the eight-square mile town. Vinton is also small but an annexation in 1964 probably caused the population to exceed 4,000 people.

It appears that within the last decade Roanoke has finally moved into the stage of "Regional Metropolis." As

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23 Ibid.
24 Economic Data, p. 6.
26 Ibid.
27 Ibid.
Table 3 indicates, the greatest employment growth in the SMSA took place in the trade, professional and business services, government, and finance-insurance-real estate sectors. Manufacturing and transportation-utilities, the earlier "export" activities, remained important but both showed relative decreases. The regional nature of the service sector is demonstrated by the fact that the SMSA had only 4.4 per cent of the state's population but 6.9 per cent of the state's wholesale volume in 1958.\textsuperscript{28}

Also in 1958, the average retail outlet in the SMSA averaged $126,000 in sales while the national average was only $111,000 per establishment. Per capita retail sales were also higher in the SMSA than in either the state or the nation.\textsuperscript{29} This higher level of retail sales occurred despite the fact that median family income in the SMSA stood at only 92 per cent of the national level.\textsuperscript{30}

Clearly, the retail-service sectors of the SMSA's economy must be providing an important region-serving "export" function.\textsuperscript{31} Roanoke's service region probably does not extend much beyond western Virginia. Within a radius of 100 miles or less (Figure 2) it comes into conflict with other SMSA's of

\textsuperscript{28}The Economy of the Roanoke Valley Region, p. 42.

\textsuperscript{29}Ibid., p. 44.

\textsuperscript{30}Ibid., p. 37.

\textsuperscript{31}Thompson probably had in mind a larger region and metropolis for the stage of "Regional Metropolis" but the idea does seem appropriate at this lower scale of activity.
### TABLE 3

**EMPLOYMENT IN THE ROANOKE SMSA, 1956-1963**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>1956</th>
<th>Per Cent of Total</th>
<th>1963</th>
<th>Per Cent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td></td>
<td></td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>14,523</td>
<td>23.4</td>
<td></td>
<td>15,050</td>
<td>20.7</td>
</tr>
<tr>
<td>Construction</td>
<td>4,308</td>
<td>6.9</td>
<td></td>
<td>4,850</td>
<td>6.7</td>
</tr>
<tr>
<td>Trade</td>
<td>11,283</td>
<td>18.1</td>
<td></td>
<td>15,213</td>
<td>21.0</td>
</tr>
<tr>
<td>Transportation-Utilities</td>
<td>11,366</td>
<td>18.3</td>
<td></td>
<td>9,125</td>
<td>12.6</td>
</tr>
<tr>
<td>Professional-Business Services</td>
<td>5,775</td>
<td>9.3</td>
<td></td>
<td>9,675</td>
<td>13.3</td>
</tr>
<tr>
<td>Government</td>
<td>5,658</td>
<td>9.1</td>
<td></td>
<td>7,450</td>
<td>10.3</td>
</tr>
<tr>
<td>Finance, Insurance, Real Estate</td>
<td>2,091</td>
<td>3.4</td>
<td></td>
<td>3,175</td>
<td>4.4</td>
</tr>
<tr>
<td>Extractive</td>
<td>1,700</td>
<td>2.7</td>
<td></td>
<td>1,700</td>
<td>2.4</td>
</tr>
<tr>
<td>All Others</td>
<td>5,491</td>
<td>8.8</td>
<td></td>
<td>6,250</td>
<td>8.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62,195</strong></td>
<td><strong>100.0</strong></td>
<td></td>
<td><strong>72,488</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

approximately equivalent size. Whether or not these cities will maintain an equilibrium or one or several will become dominant in supplying service activities is a question for the future to answer. As Long as a rough balance is maintained the Roanoke SMSA will probably remain in an early phase of the state of "Regional Metropolis." The state of "Technical-Professional Virtuosity" postulated by Thompson as the final one is probably beyond Roanoke's reach. The balanced economy suggested by Table 3 and the limited regional service hinterland of the SMSA do not indicate any movement toward this stage.

General Suburbanization

The population data already cited show that, despite a number of annexations through 1949, urban growth has spilled well beyond the limits of the City of Roanoke. This has been paralleled by the spread of urban land uses, to the point, as shown in Figure 3, that the political sub-divisions of the SMSA have coalesced to form one continuous urban area. The overlapping of political jurisdictions poses the usual problems and, as yet, there is little indication that the SMSA is moving to solve the problem of political fragmentation. Virtually every edition of the Roanoke newspapers in 1965-66 carry stories on a continuing public debate concerning annexation, consolidation and co-operation.

One of the most significant aspects of the coalescence of political units is the flow of workers back and forth across political lines, people living in one area and working in another.
Fig. 3.--Urban growth in the Roanoke SMSA
The traditional pattern of movement has been for the central city to be the major job source for the metropolitan area. This continues to be true in the Roanoke SMSA for public utilities, trade, construction, finance, insurance, and real estate activities. Led by such employees, there was a net flow of 1,695 employed persons into the city in 1960. In entertainment, recreation, and professional services, however, there was a net flow of 348 workers from the city into the suburban ring. Even greater, though, was the net flow of 496 manufacturing workers from the city to suburban ring jobs.

Thus, while the central city still dominates the local job market, with 60.1 per cent of the SMSA's population and 66.1 per cent of the SMSA's residents working there, the net outflow in manufacturing and some other employment sectors is clear evidence of the suburbanization of the local job market. In following sections it will be shown that since 1960 the suburban ring has gained considerably more manufacturing jobs than the central city, probably accelerating this trend. General evidence of this is the fact that between March, 1960 and September, 1963 total employment in the suburban ring increased by 35 per cent, as opposed to an increase of 5.5 per cent in the

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34 Unfortunately similar data were not reported in the *Census of Population: 1950.*
central city, causing the suburban ring's share of SMSA employment to increase from 24 to 29 per cent.\textsuperscript{35}

Clearly, then the economy of the Roanoke SMSA is diffusing into the suburban ring. The particulars of this trend with respect to manufacturing form the subject of the following chapters.

\textsuperscript{35}Virginia Employment Commission, unpublished data.
CHAPTER III
HISTORICAL DEVELOPMENT OF THE MANUFACTURING COMPLEX

Changing trends in manufacturing location take place within a pattern established during the accumulation over time of a multitude of individual location decision. That which is changing developed in the past and one must go all the way back to the initial phase of urbanization to explain the total arrangement of the current industrial location pattern. Therefore, this chapter is concerned with the history of the development of Roanoke's industrial economy, emphasizing the evolution of the locational pattern. This will permit the identification of any pre-contemporary suburbanization or centralization trends and will provide a basis for measuring the intensity of suburbanization which is occurring in the contemporary era.

The pre-industrial period (before 1881)

Prior to 1880, the Roanoke area had very little in the way of manufacturing beyond home crafts and artisan-type activities. The Census of 1880 credits Roanoke County with a population of 13,105 persons but listed only 432 people employed
as "hands" in manufacturing. One hundred and five establish-
ments were recognized but these included artisans, carpenters, 
blacksmiths, and the like. Six tobacco factories, employing 
179 "hands," are the only suggestion of a bona fide manufacturing 
industry. This industry, making plug and pipe tobacco, began 
in 1858 but was gone by 1905, as the demand lessened for the 
type of tobacco grown locally. The factories were located 
largely in the Town of Big Lick, predecessor to Roanoke City, 
but do not appear to have influenced future industrial land use 

patterns.

Initial developments (1881-1930)

The early boom.-- The critical decision in formulating 
the urban land use pattern was that of the railroad to put the 
Roanoke Machine Works shops on a 60-acre site east of the center 
of Roanoke (Figure 4). Also in 1883 and in the same area, the 
Crozer Steel and Iron Company built a blast furnace, initially 
employing 125 men. A second furnace was opened in 1889, increas­
ing pig iron production to 100,000 tons annually. The Crozer 
plant had a level site adjacent to the railroad tracks and shops,

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1U.S., Census Office, Tenth Census of the United States: 
1880. Population.

2U.S., Census Office, Report on the Manufactures of the 
United States: 1880.

3Robert Wingfield, "The Tobacco Industry," Virginia 
Writers' Project (unpublished study on file in the Roanoke City 
Public Library, Roanoke, Virginia, January 28, 1942).
Fig. 4.--Manufacturing and other urban land-use, 1892
close proximity to Roanoke, and lay along a creek which presum-
ably satisfied its water needs. By 1898 the blast furnaces
employed 600 men.\(^4\)

The early East End concentration, as it came to be known
locally, grew further in 1884 with the construction of the
American Bridge Works, later known as Virginia Bridge, an iron
and steel fabricator.\(^5\) The railroad shops, pig iron mill, and
metals fabrication plant were adjacent to each other but it is
not known the degree to which any linkage was involved. The
Crozer mill was a merchant pig iron producer, shipping its output
to steel mills in the northeastern U.S., so little linkage with
the other plants was likely. The Roanoke Machine Works produced
almost entirely for the railroad. However, it is possible that
Virginia Bridge did receive some sub-contract work from the
railroad. Probably the level land in the area, direct access to
the rail tracks and close proximity to workers living in Roanoke
were the primary site selection factors.

The reasons for the Roanoke location of the railroad
shops have already been given. The Crozer Works utilized near-
by iron ore deposits, some of which were along the eastbound
line of the railroad. A Roanoke site gave access to these
deposits and, at the same time, put the plant on the main rail
line heading into the northeastern steel centers. Unlike the

\(^4\) Jack and Jacobs, \textit{op. cit.}

\(^5\) The name of this establishment was to change back to
American Bridge later.
other two facilities, the Virginia Bridge Works was a completely local enterprise and the choice of an East End site, disregarding possible linkage, may have been fortuitous.

The East End concentration of heavy industry apparently acted to block the eastward growth of the city. Even today this industrial zone is on the eastern margin of the City of Roanoke. Although on the outer edges of the young city, the East End district was within the city limits.

The attractions of the local iron ore deposits resulted in the establishment of another merchant pig iron mill in the area. In 1890 the Roanoke Iron Company, known locally as the West End furnace, built a large blast furnace on a 41 acre site west of the corporate limits of the city. By 1907 it was employing 200 men to produce 150 tons of pig iron a day. As Figure 4 shows, this mill was somewhat remote from the built-up area of the city at that time. A degree of inaccessibility to city labor is suggested by the appearance on a site map of a number of workers' houses, presumably company-owned. The site was probably selected because it was large, lay astride the Roanoke River, and was along the main line of the railroad. Ores came from several mines a mile or two south of the blast furnace.

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6 Roanoke, Roanoke Chamber of Commerce, untitled brochure, 1907.

7 Map #1558, Roanoke City Engineering Department, 1914.

Real estate interests encouraged the industrial development of an area known as Norwich, just across the river from the West End furnace. By 1892 five apparently small factories were operating there, including a carriage factory, lock manufacturer, iron company, engine works, and planing mill. This early suburbanization attempt was abortive, however, inasmuch as all five of the Norwich establishments failed during the national economic depression of 1892-1893.

In 1887-1891 a steam-trolley line was constructed from the city's CBD into the East End district, improving access to the existant heavy industries. Paralleling this event was the establishment in the district of a cannery, coal-gas producer, engine works, brewery, and others. Within the city and scattered about the CBD, food processors, a tobacco factory, and printers enjoyed easy access to labor, transportation, and consumers. Bottling works, a distillery, and a carriage factory were also found within the city but more distant from the CBD. Three brick yards chose sites on the Roanoke River floodplain, possibly to be close to their raw materials. These various

\[^{9}\text{Iva J. Geary, "The Bridgewater Carriage Works," Virginia Writers' Project (unpublished study on file in the Roanoke City Public Library, 1936). Geary explains the relocation of the Bridgewater works from the city's CBD to Norwich as the result of a conscious attempt to establish an industrial district in then-surburban Norwich.}\]
\[^{10}\text{Roanoke, City Directory, (On file, Roanoke Chamber of Commerce, 1892).}\]
\[^{11}\text{Geary, op. cit.}\]
\[^{12}\text{City Directory, 1892.}\]
small facilities represented ubiquitous industries which probably existed largely to serve the growing local market. Their establishment during this period indicates the evolution of a bona fide urban economy, with a mixture of "basic" and "non-basic" components. Despite the limited area of the city the small plants apparently found it necessary to stay within the city and, in some cases, near the CBD. The large "basic" plants had more demanding site requirements and this, along with their probable disregard for the local market, necessarily lead them to adopt more peripheral locations. Even they were limited in their locational freedom by considerations of labor access. The two heavy industrial areas, one on the east and the other on the west, tended to restrict the subsequent spread of urban land use to the north and south across the river (Figure 4).

Manufacturing in Roanoke County was confined to the Town of Salem, which also enjoyed an industrial boom in the late 1880's. The depression of 1892-1893 apparently revealed the truly boom quality of this development and every one of the factories failed. Table 4 documents the city's early dominance of local industry, showing that the City of Roanoke contained nearly 93 per cent of all area manufacturing employment in 1899. It may be coincidental, but it is an interesting fact that the most suburban elements of manufacturing, those in Norwich and Salem, all failed during the 1892-1893 depression. In any case, the depression ended the early boom period and demonstrated the economic vitality of the young industrial complex in the City of Roanoke.
TABLE 4

DISTRIBUTION OF MANUFACTURING EMPLOYMENT WITHIN
THE ROANOKE SMSA, 1880-1963

<table>
<thead>
<tr>
<th>Year</th>
<th>Central City</th>
<th>Suburban Ring</th>
<th>SMSA Total</th>
<th>Suburban Ring Proportion of SMSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>.</td>
<td>.</td>
<td>432</td>
<td>.</td>
</tr>
<tr>
<td>1899</td>
<td>2,893</td>
<td>227</td>
<td>3,120</td>
<td>7.3%</td>
</tr>
<tr>
<td>1919</td>
<td>7,740</td>
<td>681</td>
<td>8,421</td>
<td>8.1</td>
</tr>
<tr>
<td>1925</td>
<td>6,998</td>
<td>6,313</td>
<td>13,311</td>
<td>47.4</td>
</tr>
<tr>
<td>1939c</td>
<td>2,392</td>
<td>5,350</td>
<td>7,742</td>
<td>69.1</td>
</tr>
<tr>
<td>1947</td>
<td>5,832</td>
<td>5,455</td>
<td>11,287</td>
<td>48.3</td>
</tr>
<tr>
<td>1954</td>
<td>9,724</td>
<td>3,035</td>
<td>12,759</td>
<td>23.8</td>
</tr>
<tr>
<td>1958</td>
<td>9,139</td>
<td>5,123</td>
<td>14,262</td>
<td>35.9</td>
</tr>
<tr>
<td>1960</td>
<td>8,520</td>
<td>5,045</td>
<td>13,565</td>
<td>37.2</td>
</tr>
<tr>
<td>1961</td>
<td>7,845</td>
<td>5,780</td>
<td>13,625</td>
<td>42.4</td>
</tr>
<tr>
<td>1962</td>
<td>8,435</td>
<td>6,080</td>
<td>14,515</td>
<td>41.9</td>
</tr>
<tr>
<td>1963</td>
<td>8,471</td>
<td>6,281</td>
<td>14,752</td>
<td>42.6</td>
</tr>
<tr>
<td>1964</td>
<td>8,643</td>
<td>6,627</td>
<td>15,270</td>
<td>43.4</td>
</tr>
</tbody>
</table>


bMajor annexations occurred in 1926, 1943, and 1949.

cPrior to 1939 railroad shop employees were classified as manufacturing. In that year they were removed from manufacturing statistics and placed under transportation. Restored to the data the suburban ring would then have 5,350 of 10,140 employees, or 52.8 per cent in 1939.
Growth and adjustment (early 1900's).-- Steady growth along several fronts lead to proportionate increases in industrial employment. By 1909 non-railroad manufacturing accounted for nearly 1,500 of the area's 3,989 manufacturing employees. In 1914 non-railroad manufacturing passed the railroad shops for the first time, with 3,200 of the 5,496 manufacturing employees. Wartime activity caused railroad shops to temporarily re-establish their dominance, employing 58 per cent of the city's total of 8,600 manufacturing employees in 1919.

The development of a heavy industrial base, dominated by primary and fabricated metals, which used male labor almost exclusively was not to go unnoticed for long by female-labor oriented industries. During the First World War, the Marshall Field interests, of Chicago, apparently realized that Roanoke had a substantial surplus of female labor and, consequently, established two textile-apparel mills within the central part of the City of Roanoke. Known as Puritan Mills and Roanoke Mills, these facilities are still operating today on their original CBD sites but the Marshall Field interest was sold in the 1930's.


15 Ibid.

16 "Roanoke Industrial Survey" (Technical Advisory Corporation, New York, 1928, mimeographed).
The availability of female labor was also a factor in causing the American Viscose Corporation to build a large rayon fiber plant in Roanoke, construction on the first unit beginning in 1916. Gottman credits this decision with leading the way to the beginning of the important chemical industry not only in the state but throughout the southeastern United States.\(^17\) It can be conjectured that the availability of female labor along with good transportation facilities, giving access to both the market for rayon fiber and to the sources of spruce pulpwood, were primary factors in the selection of the Roanoke location. The factors which probably controlled the selection of a site were the need for a large area, over 200 acres, proximity to a stream into which affluent could be emptied, availability of a rail siding, and access to labor. These considerations resulted in the placement of the plant on the floodplain of the Roanoke River, adjacent to the southeastern limits of the City of Roanoke. The plant was, therefore, suburban\(^18\) but it is noteworthy that the immediate proximity to the city was reinforced by the extension of the city's trolley system to the plant's entrance.\(^19\)

\(^17\) Gottman, *Virginia at Mid-Century*, pp. 405-407.

\(^18\) Doubtlessly, the requirement of such a large site, when coupled with water and rail needs, precluded the selection of a central city site.

\(^19\) Virginia Writers' Project, *Roanoke, Story of County and City* (Roanoke: Virginia Conservation Commission, 1942).
The southeastern section of the city began to fill up with residences of Viscose employees.\textsuperscript{20} Apparently, however, even the 1920 population of 73,237 people was not great enough to meet the demand for labor because Viscose maintained a large dormitory for single girls who were recruited from rural counties.\textsuperscript{21}

The Viscose plant caused the suburban ring, as it then existed, to contain nearly 48 per cent of the SMSA's 13,311 manufacturing wage earners in 1925. Only 718 of the suburban ring's employees were not in the Viscose facility.\textsuperscript{22} They were employed mostly in 17 small establishments in Salem, including a fabricator of machines, elevator works-foundry, tannery, and others.\textsuperscript{23}

The timing of the Viscose decision was fortunate because it came just before the Roanoke economy was to receive a major set-back. The primary iron industry, represented by the Crozer and West End furnaces, became involved in traumatic events in the national iron and steel industry. The period of "friendly competition" during 1900-1921 was based on steadily rising demand for steel and, as long as this demand existed, small

\textsuperscript{20}In 1926 the city succeeded in moving its limits to the edges of the Viscose property but failed in an attempt to annex the plant itself. John Nolen, \textit{Comprehensive City Plan} (Roanoke: City Planning and Zoning Commission, 1929) p. 20.

\textsuperscript{21}Virginia Writers' Project, \textit{op. cit}.

\textsuperscript{22}Because of Viscose's dominance of Suburban ring manufacturing the Census of Manufactures reported data for the SMSA only as a whole after 1925 and until 1939.

\textsuperscript{23}U.S., Bureau of the Census, \textit{1925 Census of Manufactures}. 
merchant pig iron mills could find a market for their output. The move toward vertical integration by the major steel companies spelled ultimate ruin for most of the merchant mills but this did not become apparent until steel consumption plummeted in 1921, ending the period of "friendly competition." The primary iron industry in southwest Virginia and in parts of Tennessee and Kentucky never recovered from this blow. The Roanoke mills were shut down and are not known to have produced another ton of pig iron after 1921. The iron industry was through but not before it had permanently affected the pattern of urban land development and helped give foundation to an economy which was now able to absorb losses and generate sustaining growth.

The timing of events in the national economy was fortunate for Roanoke, not only bringing Viscose in to accelerate industrial momentum, but also in allowing the primary iron industry to persist long enough for the local economy to become more diversified and less vulnerable. A number of small towns developed around blast furnaces in southwest Virginia but their economies did not have time to diversify substantially before the iron industry left them and they remain today as small, rural towns.

To be sure, Roanoke had advantages that the towns did not possess,

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but the initial impetus provided by the iron works was a major factor in gaining momentum in industrialization.

As noted in the previous chapter, the Johnson-Carper Furniture Company established a plant in Roanoke in 1927, employing 300 persons. This was the first truly suburban factory in the area, locating on a site on the rural-urban fringe, one mile north of the city limits (Figure 5). Several reasons may be surmised for this choice of site. First, the product was medium-priced bedroom furniture for the national market, suggesting that immediate access to the local market was not necessary. Second, the vacant land was probably inexpensive, off-setting the need for the company to provide its own water and sewage treatment facilities. Third, the site was on the main line of the Norfolk and Western Railway, offering rail service in all major directions. Fourth, the company today receives shipments of wood from individual suppliers and probably did the same in the beginning. The suburban site was probably easier to reach than one in the central city. Finally, a city bus line was extended to the site, giving the plant access to the city's labor force.

By 1929 the SMSA had 103 establishments employing 12,237 wage earners. The ubiquitous food industry had grown to rank with textiles-chemicals, fabricated metals, furniture, and the

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26 "Roanoke Industrial Survey."

27 U.S., Bureau of the Census, Fifteenth Census of the United States: 1930, Manufactures, III.
Fig. 5.--Manufacturing and other urban land-use, 1928
railroad shops as dominant elements in the manufacturing complex but Viscose and the railroad shops alone accounted for nearly three-quarters of all manufacturing employees. The decline in employment from the 13,311 wage earners of 1925 cannot be explained except to suggest that it may have been a harbringer of events which would lead to the coming national depression.

The end of the 1920's left the SMSA with the following zones of manufacturing activity (Figure 5):

1) East End, containing the Norfolk and Western Railroad Shops, Virginia Bridge, and a number of smaller plants.

2) Viscose was a concentration in itself on the floodplain of the Roanoke River.

3) Norwich contained several small facilities, mainly a foundry and a wood processor, and anchored a string of other small plants along the floodplain between it and Viscose.

4) The CBD, with printers, food processors, and other ubiquitous industries, along with several textile-apparel mills.

5) Third Street, S.E., along a rail line leading from the CBD south to the tracks which followed the river. On it were a number of foundries, metal fabricators and planing mills.

6) Johnson-Carper Furniture, another concentration in itself.

7) The Town of Salem, with most of its plants on the floodplain of the river and along the railroad.

Except for the ubiquitous industries and the textile-apparel mills in the CBD, a characteristic common to all of the
districts was their orientation to the railroads. This was to be expected for several reasons. First, the railroads had selected right-of-ways along level routes and these areas possessed a number of apparently attractive industrial sites. Secondly, the railroads themselves were the primary transportation medium and compelled their users to locate as near-by as possible.

But, from the point of view of this study, the salient characteristic of the pattern is the clustering in or immediately adjacent to the City of Roanoke. Only the large Viscose and Johnson-Carper facilities apparently had the degree of self-containment and national market orientation that enabled them to take advantage of large sites distant from the center of the city and, yet, expect the workers to come to them. And, as Figure 5 indicates, the city was expanding to encompass these plants, in fact if not yet in legal jurisdiction. The heavy capital investment in rail lines and buildings had long ago given the railroad shops powerful locational inertia. Apparently the Salem labor market could sustain a few plants but otherwise labor and the other advantages offered by an urban area were too immobile to permit manufacturers to occupy suburban ring sites, irrespective of any variations in property values. Nor was the availability of railroad transportation in rural parts of the metropolitan area sufficient inducement for plants to locate...

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28In 1904 the Virginian Railway had been built from Hampton Road, Virginia into the West Virginia coalfields. The line through Roanoke followed the river closely and paralleled that of the N. & W. for a considerable part of the way. Lambie, loc. cit.
there. The railroads may have strongly influenced the development of the industrial location pattern but only within the most urbanized portions of the SMSA. At this time suburbanization was possible only for the large plant, if at all.

**Depression and war years (1930-1945)**

The Great Depression temporarily checked industrial growth in Roanoke, as elsewhere. Most plants reduced employment, some went out of business, and a few were absorbed by other firms. It was during this period, in 1936, that the Virginia Bridge Company was purchased by a subsidiary of U.S. Steel and renamed American Bridge.

Suburbanization is an expansionist process, not one to be expected during periods of economic adversity but it apparently occurred in Roanoke because of the city's relatively greater losses during the Depression. This was a purely statistical type of suburbanization because it indicated intra-area variations in employment contractions, not the taking of suburban sites by moved plants.\(^{29}\) By 1939 the city's share of manufacturing

\(^{29}\) This occurred because the suburban ring was dominated by two large, recent facilities which may have had more economic vitality than the older plants of the central city, despite the latter's greater diversity. The trend toward suburbanization in the 1930's observed by Kitagawa and Bogue, and others may have been of this variety and did not represent actual placement of plants in the suburbs at all. The pause in suburbanization which appears in the national statistics during 1939-1947 may have represented the utilization during the war of the relatively greater excess capacity of the central city plants which their greater decline in employment during the Depression implies to have existed. If this is the case then the validity of using
production workers stood at low ebb, 47 per cent, including the 2,398 employees of the Norfolk and Western Railway shops.\textsuperscript{30}

The location pattern changed little except for the establishment of a few small plants in the city along the railroad tracks where they headed west out of the CBD. Of greater locational significance was the enactment, in 1932, of the city's first zoning ordinance which tended to freeze the fundamental industrial location pattern. Considerable acreage was zoned for "light" and "heavy" industries but, as often happened in a number of cities at this time, other land uses were permitted to occupy this land, and much of it became fragmented by incompatible land uses and never had industrial potential.\textsuperscript{31} A few plants which lay beyond areas zoned for industry were allowed to remain there but they faced potential problems whenever they felt the need to enlarge their sites.

The pace of industrialization began to quicken in the war period after 1940. The Viscose plant never regained the

\footnotesize{\textsuperscript{30}From this point on the Census of Manufactures practice of excluding railroad shop employees from the manufacturing statistics will be followed. The number cited above is included to provide a better basis for comparison with the 1925 data. The railroad shop employment was obtained from the Agricultural and Industrial Development Department, Norfolk and Western Railway, in a letter to the author dated July 28, 1964.}

\footnotesize{\textsuperscript{31}Roanoke, City Planning Commission, Toward a New Zoning Ordinance for Roanoke, 1962.}
peak level of employment experienced in the late 1920's, increasing the surplus of female labor. This fact and the revival of industrial demand in the national economy brought four textile-apparel mills to the area and two of them were built on sites in the suburbs.

Kenrose Manufacturing Company and Roanoke Garment Company, apparel mills, both chose near-CBD sites in the city and occupied existing structures. Burlington Industries, on the other hand, put a weaving mill in Vinton and a hosiery mill in Salem. The Vinton facility, which employed 550 people in 1964, was probably too large to depend on the Vinton labor market. Its site was, and is, very close to the limits of the City of Roanoke, within close proximity of the southeastern section of the city where many of the Viscose workers lived. The smaller Salem plant was probably able to satisfy its labor needs in the Town of Salem. Burlington chose to build its own plants, rather than use existing structures. The fact that both the Salem and the Vinton plants were components of a large, nationwide corporation probably helped give them the degree of internal financial and

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34McCrea, op. cit.
managerial strength which Linge postulated as being a prerequisite to suburbanization.  

Census data for the 1939-1947 period indicate a net gain by the SMSA of 1,927 production workers and 35 establishments but these data obscure some cross-currents of change. Reorganization of the process led to a reduction of about 1,500 employees at the Viscose plant. Other suburban ring plants, however, added 887 jobs, substantially diminishing the effects of the Viscose reduction. Meanwhile the City of Roanoke had a healthy increase of 2,540 manufacturing employees. This gain and the apparent centralization which accompanied it (central city up to 51.7 per cent of the SMSA total, railroad shops included) was due, in large measure, to the city's annexation in 1943 of 4.09 square miles of Roanoke County.

Post-war growth (1945-1950)

The additions already cited for the 1939-1947 period probably occurred mostly in the post-war portion of that period. Substantial growth did occur in the 1945-1950 period, with at least 28 plants beginning operations then. Seventy-one per

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35 Linge, loc. cit.
37 McCrea, op. cit.
39 Brief histories of these and other plants are contained in a special edition of the Roanoke Times, January 13, 1952.
cent (20 establishments) of these plants selected sites in the City of Roanoke but this overstates the relative significance of an apparent centralization trend. The two largest plants in the group, Eaton, Yale and Towne Manufacturing Company, and the Rowe Furniture Company, were both sited in the Town of Salem, once again suggesting the relatively greater attraction of the suburbs for large plants.

Eaton, Yale and Towne has two other post-war plants in Tennessee and a third in Alabama. This, and the fact that 60 per cent of the Salem plant's employment was female in 1962, suggests that the company came to the SMSA in search of low wage labor. Site selection was apparently a matter of acreage, price, and chance. Rowe Furniture was started in Salem primarily because of the availability there of a small building, long since outgrown. The SMSA location was chosen because of proximity of a key supplier and general access to most materials used in the construction of upholstered furniture. The prior location in Roanoke of the Johnson-Carper furniture plant and its apparent success may have influenced this location decision.

Another new plant was to have a transient existence but it was a pioneer in developing what was to become an important new industrial district. This was the Thaden-Jordan Furniture Company which located on Mason's Creek (Figure 6), along a spur

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40 Based on the transcript of interviews made by the Roanoke City Planning Director with primary officials of both companies, August 14-15, 1962.
of the Norfolk and Western Railway which extended north from
the mainline in Salem to an old sand mine. This track had
been in place since the late 1800's but it and the level, probably
inexpensive, sites along it were not utilized by industry until
this time.

The other plants which began operations during this period
were small and tended to concentrate in existing industrial
districts. A new trend was represented by the five plants,
including Thaden-Jordan, which located in unincorporated portions
of Roanoke County but all five were in close proximity to the
Town of Salem, not in relatively remote parts of the county.

In 1949 the City of Roanoke won its last successful
annexation suit, obtaining nearly 12 square miles of land from
the unincorporated county. The annexed area included the Viscose
and Johnson-Carper sites. This event was to fix as constant
the political limits in the context of which suburbanization
could be observed from the statistical data.

Readjustment in the 1950's (1950-1960)

The decade of 1950-1960 was a period of uneven growth
and even turbulence in the Roanoke economy. Manufacturing

\[41\] Thaden-Jordan was a producer of moulded plywood furni-
ture. Its demise in the 1950's probably represented the failure
of this innovation to meet with consumer approval, especially in
the face of competition from lightweight plastic furniture. The
Jordan in the name was that of Donald Jordan, president of Johnson-
Carper, and this may well suffice to explain the decision to
locate in Roanoke. The original name of the Rowe plant was Rowe-
Jordan and that probably also represented the activities of the
same Mr. Jordan.

\[42\] Population Trends, p. 13.
employment increased only 3.1 per cent in the SMSA during 1950-1953, while the Korean War was stimulating a 15 per cent increase in the nation as a whole. After a 10 per cent decline in employment during the 1954 recession, local employment grew rapidly into 1957, reaching a record level of 15,575 manufacturing employees in January of that year.

Four new plants gave considerable impetus to the growth experienced in the 1954-1958 era. Their coming brought new industries as well as plants to the local scene and, by fortunate timing, put the economy in a stronger position to receive a double shock in 1958.

First in size among the new plants was the Industrial Controls facility of the General Electric Corporation. Initially employing over 1,700 people, this plant was built in 1955 on an 80-acre site in the new Mason's Creek Valley industrial district in Salem (Figure 6). The need for such a large site with public utility connections (water and sewerage from the City of Roanoke), a rail siding, and proximity to housing and community facilities appear to have dictated the choice of this

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43 Roanoke's Economic Resources, pp. 5-6.
45 The discussion of General Electric and the other three new plants is based on the transcript made of a series of interviews with the principal local official of each plant by the Roanoke City Planning Director, August 14-15, 1962.
site. The final choice between this and any alternatives was probably based on unknown considerations of price and chance.

The General Electric plant designs and fabricates control systems, many of which are automated, largely for the primary metals industry. The market for this product is national and international but because of the nature of the product the geographic distribution of sales varies from year to year.

The reasons for the Roanoke location of the plant are not known for certain but five can be surmised. First, General Electric has followed a policy of dispersion to small cities and towns in other areas of the country. Secondly, 25 percent of the plant's employees were graduate engineers. With emphasis on such a highly educated labor force it is not surprising that General Electric was very concerned with the quality of the local environment and apparently the Roanoke SMSA was found attractive in this respect. A third consideration was the supply of housing available for new employees and Roanoke was found to be particularly advantageous in this regard. Fourth, proximity to the largest engineering college in the state, Virginia Polytechnic Institute, which draws many students from the Roanoke area, may have been influential. It might be that General Electric counted on the appeal of the home area to attract a number of engineers who might be willing to work at

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46 Hunker and Wright, op. cit., p. 79.
a salary somewhat below the national mean.\textsuperscript{47} Certainly, G. E. did not come to Roanoke to avoid unions because it has national contracts with its workers' union. Finally, there is the probable attraction of the Roanoke Valley's focal situation, giving G. E. direct rail and road access to the U.S. Manufacturing Belt and to international markets via the Port of Hampton Roads.

It is instructive, however, that the primary emphasis apparently was placed on the cultural features of the local environment—education facilities, housing supply, and general amenities. Also significant is the fact that while G. E. selected a suburban site, it did so in the full expectation of taking maximum advantage of the cultural facilities of the SMSA, not just those in Salem. G. E. knew that its employees could work in Salem but, due to the scale of the SMSA, could chose to live in that portion of the SMSA they found most attractive.

A second important new plant was the special purpose electron tube facility of International Telephone and Telegraph. It was built in 1958 on a rather isolated site in the unincorporated county (Figure 6). Factors in the selection of a site were probably low cost of land, nearness to a major highway,\textsuperscript{48}

\textsuperscript{47} This is conjecture but it is based on fragmentary personal evidence. G. E. does employ some V.P.I. graduates.

\textsuperscript{48} It is not known whether or not I.T.T. anticipated that interstate highway 81 would be built in 1963-1965 within one-half mile of its site.
and proximity to Woodrum Field, the SMSA's commercial airport, which is little more than one mile from the plant. I.T.T. does not use railroad transportation to any extent but sends much of its small, light-weight product by airfreight. Materials coming in from New York, Ohio, West Virginia, Pennsylvania, and New Jersey probably move by truck.

Factors sited in the selection of the Roanoke SMSA were first, access to the engineering departments at V.P.I. and the Virginia Military Institute, both as sources of graduate engineers and as places where employees might continue their educational interests. Second was the availability of a good water supply. Third was the willingness and ability of the Appalachian Electric Power Company to satisfy some rather specialized power requirements. The plant employed 185 persons in 1962, 30-35 of whom were graduate engineers and most of the rest were machinists, tool and die makers, glass workers, and trained assemblers. Presumably, the ability of the SMSA to supply such skilled labor, as well as engineers, was a fourth locational inducement. Although the I.T.T. plant is classified with G.E. in the Electrical Machinery Industry, there is no indication of linkage existing among the two plants. In fact, I.T.T.'s output goes almost exclusively to the military.

The third important new plant came to Roanoke in 1954 after experiencing labor difficulties in New York State. First known in Roanoke as Diamond Plastics, the company has since been acquired by the Eli Lily Company, and has been re-named Creative Packaging, Inc. The plant makes rigid plastic
containers and recently also began the production of extruded plastic containers as well. Plastic pellets come from New England, Ohio and Missouri and the final product is shipped to numerous manufacturers who use plastic packagings.

When the company came to Roanoke it was apparently still in the early stage of developing a new product. It employed 100 persons and began production in a rented building near the CBD of the city. By 1960 the building was too small, as the company was evidently becoming successful and needed to expand its facilities.

The factors considered pertinent to Creative Packaging's new site selection again must be surmised. One feature of the plant's operation is that it is clean and quiet and thus not incompatible with other land uses. As a result of this, a zoning ordinance change was approved by Roanoke City Council which allowed the company to purchase a city site adjacent to a middle income residential neighborhood. The site is large, 36 acres, level, probably inexpensive, and not far to both highways and the railroad (Figure 6). The plant was enlarged in 1964-1965 and by 1964 employed 445 persons, with substantial increases expected. It is significant that Creative Packaging

49 Evidence of this was the reaction of a person who lived within sight of the plant who, when asked by the author for directions to the plant, knew of no plastics factory, only the "warehouse" at the bottom of the hill.

50 Directory. Employment in 1966 probably approaches 1,000.
did not consider higher Roanoke City taxes a compelling reason to move into the suburban ring.

Creative Packaging uses a high proportion of female labor, presumably low-wage, and this, along with a willingness to move when faced with labor difficulties, suggests that the plant came to Roanoke seeking low-wage labor. The plant is still non-unionized. Given the distribution of materials and markets, it is also probable that, once again, Roanoke's focal situation was influential. Beyond these factors, the coming of the plant to Roanoke was probably fortuitous.

The fourth new major plant in the 1954-1958 period did not come to the SMSA but was established there by local initiative and capital. The Roanoke Electric Steel Company was founded in 1955 in direct response to difficulties experienced in obtaining certain types of steel used in construction. A primary user of this steel is the John Hancock Company, a fabricator of steel joists, so linkage was obviously a factor in the location decision.

The dominant factor in selecting the site for Roanoke Electric Steel was the availability of a rail siding, since virtually all of both materials and product are transported by the railroad, even to local consumers. This fact, the need to be where the smoke of the operation would not be a nuisance, and proximity to high capacity electric transmission lines, led to
the selection of a site that is within the unincorporated county, adjacent to the western limits of the city (Figure 6). 51

Roanoke Electric Steel is an interesting example of how the relatively small economies of scale of the electric furnace permit the production of steel for a small market area. Another significant conclusion to be drawn from the Roanoke Electric Steel example is that it is over three miles from the other plant with which it is industrially linked. Obviously, the costs of moving the steel that far were not considered to be great enough to compel the two companies to occupy adjacent sites. 52

By 1958, then, the SMSA's ability to attract new industries, all of which were based on modern technological advances, appeared to be re-generating the momentum lost in the Depression. In that year, however, the timing of several otherwise unrelated events checked growth and caused a period of extreme anxiety for many people.

The dominant factor was the national economic recession of 1958 which, while generated by events largely external to the Roanoke economy, had an unusually severe impact on the SMSA.

51 Very soon after construction of the plant, however, residential sub-divisions began to be built near it and the company was subjected to much criticism. This may eventually cause the plant to be relocated.

52 The John Hancock Company plant is also very close to a residential area, on one side, and to a city park, on the other. It is under public pressure to relocate. It is not unreasonable to expect that if both plants are ever relocated they may well seek adjacent sites. This is particularly likely since both are under the same ownership. Linkage, in this case, is also vertical integration.
In addition to the usual unemployment resulting from decreased demand nationally, the period of economic adversity apparently triggered several decisions which had been coming for some time.

First, there was the announcement by the American Viscose Corporation that it was closing its Roanoke plant, releasing 1,758 persons from employment. The reasons announced for the closing were the steady, long-term decline in the demand for rayon fiber and the expense involved in renovating a rather specialized plant for the production of synthetic fibers. The company's Marcus Hook, Pennsylvania plant had already been closed and another, at Parkersburg, West Virginia, was operating below capacity. Probably the 40-year old plant was by this time obsolete.

The other event, also probably in part a reaction to the recession, was the Norfolk and Western Railway's decision to dieselize its system and make other technological adjustments which, together, resulted in 2,375 employees being laid-off in the Roanoke shops.

53 McCrea, op. cit.

54 Rumors among businessmen in the area state that the Company had threatened to leave the area if the site were ever annexed by the city and that, therefore, the closing of 1958 was the logical result of the annexation of 1949. Apparently, Roanoke City Council gave some credence to the rumor, as indicated when it almost immediately repealed a nominal manufacturer's tax which had not been levied in the suburban ring.

55 An independent event which made this pattern of timing rather complexly involved was the coming to the presidency of the Norfolk and Western Railway of Stuart Sanders, now president of the Pennsylvania Railway. He was elevated to this job on the
Local unemployment jumped to 8.8 per cent of the labor force, compared with the 5.5 per cent rate in the national economy. The severity of the shock was such that unemployment did not dip below the national level again until 1961 (Table 5). However, the fact that unemployment did decline and manufacturing employment began to rise again soon (Table 4) was eloquent testimony of the basic vitality of the economy.

The shock of 1958 resulted in a restructuring of the SMSA economy generally and its manufacturing component specifically. First, losses occurred in manufacturing and transportation employment but these were quickly compensated for by gains in retail and services employment. The manufacturing proportion of SMSA employment dropped from 23.5 per cent in 1956 to 20.7 per cent in 1959. The differences may seem trivial but had the 1956 proportion held in 1959 it would have meant an additional 1,600 manufacturing jobs.

...)
### TABLE 5

**TOTAL UNEMPLOYMENT, ROANOKE AND THE NATION, 1940-1963**

<table>
<thead>
<tr>
<th>Year</th>
<th>Metropolitan Area</th>
<th>Roanoke City</th>
<th>Suburban Ring</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>10.9%</td>
<td>10.8%</td>
<td>11.1%</td>
<td>14.6%</td>
</tr>
<tr>
<td>1950</td>
<td>3.3</td>
<td>3.6</td>
<td>2.6</td>
<td>5.3</td>
</tr>
<tr>
<td>1960</td>
<td>6.8</td>
<td>5.5</td>
<td>7.8</td>
<td>5.6</td>
</tr>
<tr>
<td>1961</td>
<td>5.2</td>
<td>5.1</td>
<td>5.6</td>
<td>6.7</td>
</tr>
<tr>
<td>1962</td>
<td>3.6</td>
<td>3.4</td>
<td>3.9</td>
<td>5.5</td>
</tr>
<tr>
<td>1963</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>5.5</td>
</tr>
</tbody>
</table>

**Note:** Unemployed as per cent of total work force.

Table 6 indicates the obviously more profound restructuring of the manufacturing complex. In 1950 only two industries, chemicals and food products, had ten per cent or more of local manufacturing employment but by 1960 six industrial groupings had at least that proportion. The manufacturing complex left the 1950's more diversified and more closely related to the new technology than when it entered the decade.

The combination of growth during 1954-1958 and loss in 1958 probably had its most lasting affect on the internal distribution of employment. Between 1954 and 1960 the net result of the change was for the city to lose 1,200 manufacturing jobs while the suburban ring showed a net gain of 2,000 jobs (Table 4). The net growth for the SMSA was only about 800 jobs but within the framework of that modest growth the suburban ring proportion of the SMSA total leaped from 23.8 to 37.2 per cent.

In addition, the people working in manufacturing were living in the suburbs. Between 1950 and 1960 the proportion of suburban ring residents employed in manufacturing climbed from 24.3 to 26.6 per cent, during a period in which employed residents of the suburban ring increased in number by nearly 53 per cent. The city increased the number of residents working in manufacturing that while "basic" manufacturing may generate income which in turn supports "non-basic" activities, the "non-basic" activities may themselves develop a basic component which can act to provide resiliency in the economy when losses occur in manufacturing. This is probably the primary implication of Thompson's "Stage of Regional Metropolis."
TABLE 6

COMPARATIVE COMPOSITION OF THE ROANOKE SMSA'S MANUFACTURING EMPLOYMENT BASE, 1950, 1960, AND 1964, FOR SELECTED INDUSTRIES

<table>
<thead>
<tr>
<th>Industry (SIC code)</th>
<th>1950</th>
<th>1960</th>
<th>1964</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Related (20)</td>
<td>18.4%</td>
<td>19.3%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Textiles (22)</td>
<td>b</td>
<td>11.8%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Apparel (23)</td>
<td>9.9%</td>
<td>10.2%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Lumber &amp; Furniture (24, 25)</td>
<td>9.7%</td>
<td>13.9%</td>
<td>13.9%</td>
</tr>
<tr>
<td>Paper &amp; Printing (26, 27)</td>
<td>6.3%</td>
<td>8.1%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Chemicals (28)</td>
<td>30.5%</td>
<td>1.1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Stone, Clay, Glass (32)</td>
<td>4.2%</td>
<td>2.6%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Primary &amp; Fabricated Metals (33, 34)</td>
<td>8.2%</td>
<td>14.0%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Electrical Machinery (36)</td>
<td>b</td>
<td>13.2%</td>
<td>15.7%</td>
</tr>
<tr>
<td>All Others</td>
<td>12.8%</td>
<td>5.8%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>


\(^{b}\)Included in "All Others."
by a paltry 22 persons while the number was soaring by 2,335 in the suburban ring, suggesting that suburban jobs were being filled mainly by suburban residents.\footnote{U.S. Census of Population: 1960.} There is no knowing which came first but there was an obvious inter-relationship between the suburbanization of population and manufacturing.

**The 1960's**

The early and middle 1960's were a period of steadily rising demand in the U.S. economy and the Roanoke manufacturing complex shared in this steady growth (Table 4). Food producers showed a slight absolute decrease during 1960-1964 but the other major industries maintained about the same relative proportions (Table 6). The suburban ring slowly increased its share, except in 1962, and by 1964 43.4 per cent of all SMSA manufacturing employment was found in the suburban ring (Table 4). Increases in manufacturing employment in the SMSA came from additions at existing plants, unlike the 1954-1958 period in which important new facilities were attracted. As a result, intra-area shifts in employment proportions were slight.

The modest level of the rate of suburbanization was also due to the fact that in 1961 a largely local partnership purchased the Viscose property and turned it into an industrial park. Renamed the Roanoke Industrial Center, the property contained 1,608,375 square feet of floor area, on a 208-acre site, which
was made available for re-sale or lease. By 1965 the center had 15 occupants and three were manufacturers whose total employment exceeded 1,000 persons. Most of the remaining usable space was taken in 1966 when the Eaton, Yale and Towne Company decided to lease space there to employ 500 people in the production of locks and other hardware equipment.

Other developments in the 1960's led to suburbanization. The anxiety caused by the Viscose closing resulted in the formation of the Roanoke Valley Development Corporation (R.V.D.C.), a local investor company empowered to purchase and hold sites for industrial development. Also, the Greater Roanoke Valley Development Foundation (G.R.V.D.F.) was formed on a non-profit basis for the purpose of improving sites, erecting buildings and financing lease, lease-purchase, or direct sale of the site and buildings for industrial clients. After a systematic

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60 Interview with Jack Goodykoontz, Secretary, Roanoke Valley Development Corp., June 18, 1964.

61 The Roanoke Times, February 7, 1965, p. a-8. The largest tenant was Kenrose, which had relocated from within the CBD.

62 Roanoke World-News, January 20, 1966. This at first appearances is a centralization move because the lock and hardware production facilities were formerly located in the Salem plant of the company. The reality is that Eaton, Yale and Towne is converting its Salem plant to the production of materials handling equipment. Apparently the two facilities will not be functionally linked or integrated. The net effect, then, is that Salem keeps a large plant while a new one has come to the SMSA and located in the Roanoke Industrial Center. The rear-guard action of the Center against suburbanization seems to be completed with this event.

63 Goodykoontz interview.
study, the R.V.D.G. selected an 82-acre site between Roanoke City and Salem as most desirable for development as the Blue Ridge Park for Industry. Investors in the park included the City of Roanoke (but not the Town of Salem) which agreed to spend up to $250,000 over a five year period on the installation of utilities and toward the promotion of the park.

In 1965 three manufacturers were operating there and two of them were relocatees from CBD sites, from which they had been forced to leave because of highway construction.

Another event which was, in effect, suburbanization was the closing of the inner city's American Bridge facility, involving the loss of 513 jobs. Reasons cited for the closure were insufficient volume of sales in the local market and high labor costs. From appearances the facility is also obsolete. Plans for the disposition of the site have not yet been announced.

As Figure 6 shows, the locational pattern was extended into the unincorporated county, primarily along rail lines. The Mason's Creek valley district continued to attract industry and

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64 Ibid.
65 Ibid.
66 Roanoke World-News, September 29, 1965. Ironically, this closing cancels the gain experienced by the Eaton, Yale and Towne Company move to the Roanoke Industrial Center and it occurs within the same industry, fabricated metals. The net effect is suburbanization because the loss is in the core of the central city and the gain is in the outer part of the central city.
67 Ibid.
now constitutes the most active industrial belt in the SMSA.
The Double Envelope Corporation moved from the CBD of the city
to a site adjacent to that of I.T.T., not on a railroad line.
More and more plants were finding it possible, if not necessary,
to occupy sites scattered throughout the urbanized parts of the
SMSA.

In Chapter IV the study turns to the over-all trends in
industrial location in the SMSA and in Chapter V to a considera­
tion of the relevant industrial location factors.
CHAPTER IV

THE PATTERN OF SUBURBANIZATION

In the previous chapter the historical phases of the development of the manufacturing complex were discussed, on the basis of major locational events and general statistics. It is the task of the present chapter to consider the locational trends of all plants which occupied new sites during the contemporary era. This discussion is essentially descriptive, laying the basis for the analysis of causative factors in the following chapter.

Methods of analysis

As indicated in the first chapter, the active elements of suburbanization, those representing actual location decisions, are plants which are relocated within the area and those which come to the area for the first time. The net effects of the two types of location decisions are the same but there is an important distinction to be drawn in the decision-making phase. For the relocated plant there is the preliminary realization of the inadequacy of the original facility and the need to correct its deficiencies. Therefore, it becomes relevant to the study to determine why plants reject the original site and move to another
one within the same area. Once the decision to move has been made, the relocated plant and the new plant are in the same position, having to choose from among the various alternatives offered by the SMSA. In this portion of the study, it is useful and necessary to distinguish initially between the two types of movements in order to indicate the relative intensity of each.¹

The spatial framework of central city versus suburban ring is no longer adequate. The central city has been divided, using Census Tracts as a guide, into the inner city, representing the older portion of the city, and the outer city, the more recently industrialized part of the City of Roanoke² (Figure 7). The suburban ring has been sub-divided into its two component towns, Salem and Vinton, and the residual comprises the unincorporated county. Thus, five zones are recognized, two in the central city and three in the suburban ring. This allows a finer distinction of the patterns of movement and the result on shifts in employment sources. Following the approach discussed in Chapter I, moves into the outer city from the inner city are

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¹The term "relocation" is reserved exclusively for the intra-area change of site. "New" plants are always those coming into the area, or are originally established by local interests during the period, for the first time. Some of the new plants may be relocations from other SMSA's but the reasons for the selection of Roanoke, considered in Chapter III, are no longer relevant to the study.

²Roanoke, Census Tract Committee, Census Tracts for the Roanoke Valley Region, April, 1963.
Note: Dashed line is the 1926-1943 corporate limit.

Fig. 7.--Intra-area zones
considered as elements of suburbanization, just as a reverse flow would be centralization.\(^3\)

**Relocated plants**

Available records indicate that relocation has always been a part of the locational pattern of Roanoke manufacturing concerns. In the 1910-28 period relocations occurred at the rate of 0.6 per year and the rate increased to 0.7 per year during the 1928-40 period.\(^4\) Between 1940 and 1950 the rate further accelerated, to 0.9 moves per year, but most of this activity was confined to the latter half of the decade. In the 1950-64 period, 3.2 plants were moved each year and four more took place during the first half of 1965. A total of 64 relocations have occurred since 1910, with about half since 1950 and two-thirds since 1940. One explanation for this accelerated rate of change is the increased number of establishments which make-up the SMSA's manufacturing complex. However, the rate of relocations has increased much faster than has the number of

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\(^3\)This distinction is necessary to reveal trends toward the suburbs but it also creates some confusion in the statistics. In order to reduce this confusion all tables will include subtotals for the two major areas, the suburban ring and the central city. This is also desirable because one of the primary interests of the study is the effect of relative growth by the suburban ring on the political central city.

\(^4\)Site changes were inventoried through the use of various historical sources, mainly through the study of city directories. These directories are published annually and a complete collection, back through 1888, was made available by the Roanoke Chamber of Commerce. The rates of relocations include all known moves but the relocations actually studied include only those companies still in business locally in 1964.
establishments. Between 1939 and 1964 the number of establishments increased by 85 per cent, less than double, while the annual rate of relocations increased 3.5 times.

Figure 8 illustrates the movement pattern of the 34 plants which are known to have moved since 1940 and are still operating today. In one case a plant was moved twice, the second move taking it into an adjacent county and beyond the SMSA. This double move gives a total of 35 relocations by the 34 plants.

Table 7 gives the net shifts which have taken place within and between the various intra-area zones. The only zone to show a net loss in employment or number of establishments was the inner city which lost 2,310 jobs now offered by 14 plants. The loss is not so great for the corporate city as a whole because the outer city gained three plants and 1,264 jobs but it still amounts to a substantial loss by the central city of 1,046 jobs and eleven plants. Ten of the eleven plants went to the various parts of the suburban ring, mostly to the unincorporated county and Salem. As indicated previously, the

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5 Data for 1939 from the Census of Manufactures: 1947.

6 Relocations were to have been analyzed back to 1950 only but the limited number of relocations which occurred made it advisable to extend the period in order to enlarge the sample. The smallness of the sample reflects the relative smallness of the Roanoke manufacturing complex and the exclusion from the study of firms which were no longer in business locally in 1964. Twenty-one relocations took place after 1950 and they include all of the seven firms which employ 100 or more persons. These seven largest relocatees in 1964 employed 71 per cent of all persons working in relocated plants.
Fig. 8.—Relocated plants, 1940-1964

Plant Size

- over 500 employees
- 100 - 500 employees
- 20 - 99 employees
- 1 - 19 employees

0 1 2 miles
<table>
<thead>
<tr>
<th>Zone</th>
<th>Retained</th>
<th>Gained</th>
<th>Lost</th>
<th>Net of Gains and Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment</td>
<td>Plants</td>
<td>Employment</td>
<td>Plants</td>
</tr>
<tr>
<td>Inner City</td>
<td>227</td>
<td>14</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Outer City</td>
<td>37</td>
<td>1</td>
<td>1,445</td>
<td>7</td>
</tr>
<tr>
<td>Vinton</td>
<td>0</td>
<td>0</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Salem</td>
<td>175</td>
<td>1</td>
<td>434</td>
<td>5</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>0</td>
<td>0</td>
<td>485</td>
<td>4</td>
</tr>
<tr>
<td>City Total</td>
<td>1,729</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>175</td>
<td>1</td>
<td>981</td>
<td>10</td>
</tr>
</tbody>
</table>

- Employment figures from Directory.
- City and suburban ring totals include only moves between these two areas. Moves between inner and outer city are treated as retentions in the city totals.
- Gains and losses do not balance because one plant, with 65 employees, moved just beyond the metropolitan area. It appears in the loss column but not with the gains.
eleventh plant left the metropolitan area. The data in Table 7 make it quite clear that the net tendency in relocations is centrifugal, toward the suburbs, whether in the city or beyond it. Table 8 identifies those relocations which involved an intra-urban transfer with 18 plants moving from one SMSA zone to another. No fewer than 15 inner city facilities were moved out of that central area while only one plant was moved into the inner city. Table 9 reveals that those plants which stayed in the same zone were quite small, especially those within the central city. Those which changed zones were about five times as large as those which did not. It is evident, then, that the inner city was able to hold only small facilities while the larger relocatees tended to move either to the outer city or into the suburban ring. The growth through relocation by the outer city was entirely at the expense of the inner city. The suburban ring gained ten plants and 981 jobs from the city but there was no return whatever in the other direction. Table 10 separates the relocatees according to major S.I.C. industry groups. Ten of the 18 Roanoke area industries were represented but two, food and printing-publishing, contributed half of the total. The dramatic contrast in median size between the plants which stayed in the same zone and those which changed zones has already been noted. This contrast also appears within industry groupings as well. Only in the apparel industry are the factories which stayed in the same zone of comparable size to the inter-zonal relocatees. However, this average is as high as it is
TABLE 8
ORIGIN AND DESTINATION OF RELOCATED PLANTS, 1940-1964

<table>
<thead>
<tr>
<th>Zone Moved Into</th>
<th>Inner City</th>
<th>Outer City</th>
<th>Vinton</th>
<th>Salem</th>
<th>Unincorporated County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone Left</td>
<td>Employment Plants</td>
<td>Employment Plants</td>
<td>Employment Plants</td>
<td>Employment Plants</td>
<td>Employment Plants</td>
</tr>
<tr>
<td>Inner City</td>
<td>. . .</td>
<td>1,445</td>
<td>7</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Outer City</td>
<td>20 1</td>
<td>. . .</td>
<td>0</td>
<td>0</td>
<td>48</td>
</tr>
<tr>
<td>Vinton</td>
<td>0 0</td>
<td>0 0</td>
<td>. . .</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Salem</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>. . .</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
</tbody>
</table>

*Employment for 1964 from Directory.*
TABLE 9

SIZE OF RELOCATED PLANTS

<table>
<thead>
<tr>
<th>Type of Relocationa</th>
<th>Number of Plants</th>
<th>Number of Employees, 1964b</th>
<th>Employees per Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same Zone</td>
<td>16</td>
<td>439</td>
<td>27</td>
</tr>
<tr>
<td>Different Zone</td>
<td>18</td>
<td>2,446</td>
<td>136</td>
</tr>
<tr>
<td>Same Zone in City</td>
<td>15</td>
<td>264</td>
<td>18</td>
</tr>
<tr>
<td>Same Zone in Suburban Ring</td>
<td>1</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>City to Suburban Ring</td>
<td>10</td>
<td>981</td>
<td>98</td>
</tr>
<tr>
<td>Different City Zone</td>
<td>8c</td>
<td>1,445</td>
<td>176</td>
</tr>
</tbody>
</table>

aOne plant which moved just out of the metropolitan area is not included.

bFrom Directory.

cSeven of these went into the outer city. The one plant which moved into the inner city employed 20 persons.
### TABLE 10

**INDUSTRY OF MANUFACTURING ESTABLISHMENTS RELOCATED**
**WITHIN THE ROANOKE SMSA, 1940-1964**

<table>
<thead>
<tr>
<th>Industry (S.I.C.)</th>
<th>Stayed in Same Zone</th>
<th>Moved to Different Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Establishments</td>
<td>Average Employment</td>
</tr>
<tr>
<td>Food (20)</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>Apparel (23)</td>
<td>2</td>
<td>136</td>
</tr>
<tr>
<td>Furniture (25)</td>
<td>0</td>
<td>.</td>
</tr>
<tr>
<td>Paper (26)</td>
<td>0</td>
<td>.</td>
</tr>
<tr>
<td>Printing (27)</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Chemicals (28)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Plastics (30)</td>
<td>0</td>
<td>.</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment (37)</td>
<td>0</td>
<td>.</td>
</tr>
<tr>
<td>Ophthalmic Goods (38)</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>Miscellaneous (39)</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>27</td>
</tr>
</tbody>
</table>

\(^a\)1964 employment from Directory.

\(^b\)Includes one plant which was moved into an adjacent county.
only because it includes the 175 employees of the Maid Bess Hosiery Mill, which changed sites within the town of Salem. Otherwise, the plants which did not change zones are uniformly small, with none having 100 employees and only one with more than 20 employees. Printing shops led the intra-zonal group, followed by several food processors, ophthalmic goods producers, and fabricators of advertising displays. It is noteworthy that all of these industries probably involve close proximity to retail customers or distributors. Of the 14 relocatees which stayed within the inner city only one, an apparel mill, does not have apparent close functional ties with the commercial center of the urban area, the inner city.

The plants which changed zones were led in number by food processors with six, while the remaining 13 plants were scattered among six other industries. Employment is dominated by apparel, plastics, food, paper, and furniture, in that order. Only the printing houses and, possibly, the food processors can be presumed to have strong functional ties with the center of commercial and consumer activity. Even among the six food processors, however, only one, a bakery, has a retail function while the other five sell their bakery products, candy, soft drinks, and coffee on a wholesale basis.

In summary, there was a net tendency for those firms which relocated to move outwards from the center of the city. Moreover, most of the relocatees which stayed in the same zone did so in the inner city, they were small, and had apparent
functional ties with the center of commercial activity. Those relocatees which changed zones moved mostly into the suburban ring from the inner city, they were relatively large, and few had evident functional ties to the center of commercial activity.

All but six of the 35 relocatees originated within the inner city but this central zone retained only 15 of the relocated plants. The outer city retained eight of them but the net effect of the whole process was the gain of 981 jobs and ten establishments by the suburban ring, entirely at the expense of the corporate city.

New plants

The Roanoke SMSA has gained some 67 new plants since 1950, employing 4,809 persons in 1964 (Table 11). All zones shared in this growth (Figure 9). No fewer than 27 of the new establishments settled in the inner city, a number equal to the total increase of the suburban ring. The remaining 13 central city plants located in the outer city. The suburban ring also received

---

New plants are those which first began operations in Roanoke between 1950 and 1964. Only those plants still operating locally in 1964 were considered. A cut-off year of 1950 was selected because inventories back to that time were largely complete and the sample is large enough. Since Roanoke City's last annexation came in 1949 essentially unchanged political boundaries are available as spatial references. Census of Manufactures data for years subsequent to 1950 can thus be used as "benchmarks." The 1947 Census of Manufactures came between annexations in 1943 and 1949 and is, therefore, of little value in checking growth within the present area of the city. The different time periods used for relocations and new plants present a problem of non-comparability of data but the error is small. As was indicated earlier the plants which were relocated during 1940-50 now represent only a minor proportion of employment by all plants moved in the entire 1940-64 span.
TABLE 11

NEW MANUFACTURING ESTABLISHMENTS, 1950-1964\(^a\)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Number of Establishments</th>
<th>1964 Employment(^b)</th>
<th>Average Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner City</td>
<td>27</td>
<td>763</td>
<td>28</td>
</tr>
<tr>
<td>Outer City</td>
<td>13</td>
<td>840</td>
<td>65</td>
</tr>
<tr>
<td>Vinton</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Salem</td>
<td>13</td>
<td>2,561</td>
<td>197</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>11</td>
<td>640</td>
<td>58</td>
</tr>
<tr>
<td>City Total</td>
<td>40</td>
<td>1,603</td>
<td>40</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>27</td>
<td>3,206</td>
<td>119</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>67</td>
<td>4,809</td>
<td>72</td>
</tr>
</tbody>
</table>

\(^a\) Derived from newspaper accounts of plant openings and other various historical sources. The inventory may not be complete but the few missing probably are not large.

\(^b\) Directory.
Fig. 9.--New plants, 1950-1964

- UNINCORPORATED COUNTY
- OUTER CITY
- INNER CITY
- VINTON

Plant Size
- over 500 employees
- 100 - 500 employees
- 20 - 99 employees
- 1 - 19 employees
27 new plants but the growth greatly favored the suburban ring. The Town of Salem alone received better than half of all the new jobs and the suburban ring outdid the corporate city by a ratio of exactly 2:1. Obviously, the suburban ring plants were larger than their city counterparts. New inner-city establishments averaged only 28 employees while those in Salem each averaged 197 employees. The large Salem-based General Electric facility dominates the statistics.

As indicated in Table 12, sixteen of the eighteen Roanoke area industries shared in growth but six contributed better than 85 per cent of the 1964 employment totals of the new plants. Electrical machinery was responsible for one-half of the new plant jobs. Plastics, apparel, primary metals, food, and non-electrical machinery followed, in that order. No other industries gained as many as 200 jobs in new plants. Nearly half of the inner city’s share was in two apparel plants while plastics led in the outer city. Electrical machinery dominated Salem’s gains and was important in the unincorporated county. Primary metals led that latter area’s gains. The food and non-electrical machinery industries spread their modest growth among several zones. Even among those industries thought to be most closely linked to the inner city, food and printing-publishing, growth was greater in the suburban ring than in the city.

There was a clear suburbanization trend among those plants new to the area since 1950 as measured by recent employment. Many plants did locate in the inner city but these were
TABLE 12
INDUSTRY OF NEW ESTABLISHMENTS, 1950-1964--EMPLOYMENT FOR 1964a

<table>
<thead>
<tr>
<th>S.I.C. Industry</th>
<th>City Inner</th>
<th>City Outer</th>
<th>Vinton</th>
<th>Salem</th>
<th>Unincorporated County</th>
<th>Total City</th>
<th>Suburban Ring</th>
<th>SMSA Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>69(5)</td>
<td>72(3)</td>
<td>3(1)</td>
<td>92(1)</td>
<td>62(1)</td>
<td>141(8)</td>
<td>157(3)</td>
<td>298(11)</td>
</tr>
<tr>
<td>22</td>
<td>60(1)</td>
<td>100(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>160(2)</td>
<td>0</td>
<td>160(2)</td>
</tr>
<tr>
<td>23</td>
<td>362(2)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>362(2)</td>
<td>0</td>
<td>362(2)</td>
</tr>
<tr>
<td>24</td>
<td>29(3)</td>
<td>3(1)</td>
<td>0</td>
<td>8(2)</td>
<td>37(3)</td>
<td>32(4)</td>
<td>45(5)</td>
<td>77(9)</td>
</tr>
<tr>
<td>25</td>
<td>5(2)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5(2)</td>
<td>0</td>
<td>5(2)</td>
</tr>
<tr>
<td>26</td>
<td>127(1)</td>
<td>25(1)</td>
<td>0</td>
<td>1(1)</td>
<td>0</td>
<td>152(2)</td>
<td>1(1)</td>
<td>153(3)</td>
</tr>
<tr>
<td>27</td>
<td>5(2)</td>
<td>1(1)</td>
<td>2(2)</td>
<td>6(1)</td>
<td>1(1)</td>
<td>6(3)</td>
<td>9(4)</td>
<td>15(7)</td>
</tr>
<tr>
<td>28</td>
<td>26(2)</td>
<td>0</td>
<td>0</td>
<td>4(1)</td>
<td>0</td>
<td>26(2)</td>
<td>4(1)</td>
<td>30(3)</td>
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<tr>
<td>30</td>
<td>0</td>
<td>445(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>445(1)</td>
<td>0</td>
<td>445(1)</td>
</tr>
<tr>
<td>32</td>
<td>0</td>
<td>41(1)</td>
<td>0</td>
<td>0</td>
<td>88(2)</td>
<td>41(1)</td>
<td>88(2)</td>
<td>129(3)</td>
</tr>
<tr>
<td>33</td>
<td>2(1)</td>
<td>0</td>
<td>0</td>
<td>25(1)</td>
<td>288(2)</td>
<td>2(1)</td>
<td>313(3)</td>
<td>315(4)</td>
</tr>
<tr>
<td>34</td>
<td>36(4)</td>
<td>35(2)</td>
<td>0</td>
<td>27(2)</td>
<td>0</td>
<td>71(6)</td>
<td>27(2)</td>
<td>98(8)</td>
</tr>
<tr>
<td>35</td>
<td>22(3)</td>
<td>115(1)</td>
<td>0</td>
<td>138(3)</td>
<td>0</td>
<td>137(4)</td>
<td>138(3)</td>
<td>275(7)</td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>3(1)</td>
<td>0</td>
<td>2260(1)</td>
<td>155(1)</td>
<td>3(1)</td>
<td>2415(2)</td>
<td>2418(3)</td>
</tr>
<tr>
<td>37</td>
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</tr>
<tr>
<td>38</td>
<td>20(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>20(1)</td>
<td>0</td>
<td>20(1)</td>
</tr>
<tr>
<td>39</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9(1)</td>
<td>0</td>
<td>9(1)</td>
<td>0</td>
<td>9(1)</td>
</tr>
<tr>
<td>ALL</td>
<td>763(27)</td>
<td>840(13)</td>
<td>5(3)</td>
<td>2561(13)</td>
<td>640(11)</td>
<td>1603(40)</td>
<td>3206(27)</td>
<td>4809(67)</td>
</tr>
</tbody>
</table>

Note: Figures in parenthesis are number of establishments.

Directory.
mostly small, in contrast to the larger suburban ring facilities. The only major new addition to the inner city was in the low-wage apparel industry. One of the new inner city plants moved to the outer city when growth necessitated new facilities.

Net shifts due to both relocations and new plant locations

In Table 13 and Figure 10 the results of relocations and new plant locations are combined to reveal the net effects they had on intra-zonal change. Since several new plants subsequently relocated their sites there is duplication between the two sets of data and it was necessary to remove this duplication from the totals in the table.

The inner city suffered a heavy loss which was barely compensated for by gains in the outer city. Salem gained substantially as did the unincorporated county. While the data are for different time periods it is clear that the only source of major growth left open to the central city has been the expansion of existing facilities. This alternative has failed to off-set other losses, since the Census of Manufactures indicates that the city lost 1,253 jobs during the 1954-1963 interim, despite the net gain of 19 establishments.\(^8\) During the same period the suburban ring gained the same number of plants but also more than doubled its manufacturing employment by adding 3,273 employees.\(^9\) Of course, plant closures played a role in

---

\(^8\)Census of Manufactures: 1954; and Census of Manufactures: 1963.

\(^9\)Ibid.
<table>
<thead>
<tr>
<th>Zone</th>
<th>Establishments</th>
<th>Employment&lt;sup&gt;b&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New</td>
<td>Relocated</td>
<td>Net</td>
<td>New</td>
<td>Relocated</td>
<td>Net</td>
<td></td>
</tr>
<tr>
<td>Inner City</td>
<td>27</td>
<td>-14</td>
<td>12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>763</td>
<td>-2310</td>
<td>-1567&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Outer City</td>
<td>13</td>
<td>3</td>
<td>14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>840</td>
<td>1264</td>
<td>1622</td>
<td></td>
</tr>
<tr>
<td>Vinton</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>62</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Salem</td>
<td>13</td>
<td>5</td>
<td>18</td>
<td>2561</td>
<td>434</td>
<td>2995</td>
<td></td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>11</td>
<td>4</td>
<td>15</td>
<td>640</td>
<td>485</td>
<td>1125</td>
<td></td>
</tr>
<tr>
<td>City Total</td>
<td>40</td>
<td>-11</td>
<td>26&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1603</td>
<td>-1046</td>
<td>55&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>27</td>
<td>10</td>
<td>37</td>
<td>3206</td>
<td>981</td>
<td>4187</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup>Duplication excluded.

<sup>b</sup>1964 employment from: Directory.
Fig. 10.--New and relocated plants

Plant Size

- over 500 employees
- 100 - 499 employees
- 20 - 99 employees
- 1 - 19 employees

UNINCORPORATED COUNTY

SALEM

INNER CITY

SBD

OUTER CITY

VINTON

112
these shifting figures, particularly since the 1954 data include the now defunct Viscose plant and its nearly 2,000 employees. However, the 1963 data include employment by companies which now occupy the old Viscose buildings so the Viscose closure alone cannot explain the city's decline. The fact is that the city lost employment because the negative effects of plant closures and relocations were not off-set by expansions or new plants. In the suburban ring the growth added by new and relocated plants was so great as to obscure the effects of closures and expansions.

**Summary**

Table 14 summarizes the contributions of the new and relocated plants to total manufacturing employment in 1964. The inner city, while still the major industrial zone of the metropolitan area, is living off past gains, losing more through relocations than gaining through new plants or expansions. The outer city, while experiencing substantial gains in new plants, has benefited greatly from its position adjacent to the inner city. The total growth of the city was modest. The only zone of the suburban ring to benefit substantially from relocations was the unincorporated county, partially because of adjacency to the city. However, new plants contributed nearly all of the remaining employment in the unincorporated county zone. Vinton was affected but little by suburbanization. Relocations played a minor role in Salem's growth, the majority of manufacturing employment occurring in post-1950 new plants. On the whole,
### TABLE 14

**1964 Employment of New and Relocated Plants in Proportion to Total Manufacturing Employment**

<table>
<thead>
<tr>
<th>Zone</th>
<th>Relocations, Net</th>
<th>New Plants</th>
<th>All Manufacturing</th>
<th>Relocations</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner City</td>
<td>-2,310</td>
<td>763</td>
<td>5,936</td>
<td>.</td>
<td>12.8%</td>
</tr>
<tr>
<td>Outer City</td>
<td>1,264</td>
<td>840</td>
<td>2,707</td>
<td>45.9%</td>
<td>31.0</td>
</tr>
<tr>
<td>Vinton</td>
<td>62</td>
<td>5</td>
<td>660</td>
<td>9.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Salem</td>
<td>434</td>
<td>2,561</td>
<td>4,827</td>
<td>8.9</td>
<td>53.0</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>485</td>
<td>640</td>
<td>1,140</td>
<td>42.5</td>
<td>56.1</td>
</tr>
<tr>
<td><strong>City Total</strong></td>
<td><strong>-981</strong></td>
<td><strong>1,603</strong></td>
<td><strong>8,643</strong></td>
<td>.</td>
<td>18.5</td>
</tr>
<tr>
<td><strong>Suburban Ring Total</strong></td>
<td><strong>981</strong></td>
<td><strong>3,206</strong></td>
<td><strong>6,627</strong></td>
<td><strong>14.8</strong></td>
<td><strong>48.3</strong></td>
</tr>
<tr>
<td><strong>SMSA Totals</strong></td>
<td>.</td>
<td><strong>4,809</strong></td>
<td><strong>15,270</strong></td>
<td>.</td>
<td><strong>31.4</strong></td>
</tr>
</tbody>
</table>
suburban ring growth is attributable far more to an ability to attract new plants than to luring plants out of the city.
CHAPTER V

THE DYNAMICS OF SUBURBANIZATION

The search for the causative forces responsible for suburbanization involves the considerations which required the relocated establishment to relinquish its site and the factors which controlled the choice of a site by both the relocated and the new plant.

The Relocation Decision

The decision to abandon an already developed site is a traumatic experience for a firm and is undertaken only when the site is very unsatisfactory and other alternatives prove unworkable.¹ The first conclusion necessary is that in some way the present facility is inadequate. This can come about slowly as space use increases to accommodate expanded production and employment. Or it can come rather suddenly, with the development of new equipment or processes which require more or a different arrangement of space.

¹The analysis of the relocation decision is based on confidential interviews with officials of companies which have undergone relocation. Interviews with industrialists covered 13 companies representing 15 location decisions. Nine of the decisions were relocations, four involved recent new plants and two were for plants which have occupied the same sites since before 1930.
Eventually, at some unknown level of inadequacy, management realizes that a threat exists to the economic security of the company. In some cases the crisis can be met through renovation or rebuilding of the facility on the existing site. In others, though, it becomes apparent that the existing site is not large enough and the alternative of purchasing adjacent land is investigated. If not much land is needed and it can be obtained easily and inexpensively this alternative is probably used. In a number of cases this alternative must be rejected because of the great difficulties involved. This occurs especially when the needed land involves several owners and the land is developed with buildings.

First of all, developed land is obviously more expensive than vacant land, not only in sale price but because of the necessity to raze the buildings and, possibly, to redevelop the site. Secondly, the parcels may have clouded titles, requiring long delays in getting them cleared. Then there is always the possibility that the last land holder will learn of the company's plans and hold-out for an inflated price from the deeply committed company. There may also be the necessity of obtaining zoning changes or of getting permission to legally close streets and alleys from local authorities, all of which can take considerable time and legal fees.

The central city plant may have also increased in the value of the site, to the point that it is desirable to sell the land and relocate the plant. The company not only takes
advantage of the increased property value but also can reduce its property taxes by relocating to lower value land which carries a lower tax assessment.

The company which is considering a site expansion would also begin to wonder about the quality of the environment. Lack of parking space, traffic congestion, vandalism, or a blighted neighborhood may raise operating costs, create nuisances or detract from the product's image. The company's analysis should also consider relationships with customers and access to whatever external economies it relies upon. In short, management must begin to wonder just why it needs to stay in its present location.

Always poised against the analysis of the present location is the possibility that all of these problems can be avoided by moving to a vacant site where the necessary changes in process can be made with greater design freedom and a more suitable neighborhood can be obtained. Management, realizing that these problems can develop again, may also wish to buy a new site where, for little additional cost, a space cushion can be obtained from incompatible neighbors.

Given all of these conditions, the final response of a particular firm will depend on the awareness and skill of management, the financial strength of the firm, the outlook for future expansion, and the quality of the new site alternatives.
In studies already cited, Linge\(^2\) and Black\(^3\) both attribute relocations to site crowding and undesirable environmental conditions, in direct contrast to the alternatives available in the suburbs. Black\(^4\) and Logan\(^5\) also observed that the large plant is most likely to grow and its expansion requirements are likely to be greater, making on-site expansion more difficult.

In Roanoke, the most commonly cited factor was the need for a larger site which could not be obtained satisfactorily in the original location. Either no more space was available or the existing arrangement needed to be reorganized, from multi-story to single story. In several cases the two conditions were combined. The alternative of acquiring adjacent land was rejected as either too expensive or not desirable for other reasons. One company could have acquired the necessary land but the neighborhood was deteriorating and offered no hope of improvement. All nine plants secured new sites which made plentiful allowance for future expansions.

One company operated from several sites, representing a previous compromise with site crowding. Eventually the diseconomies of scattered operations drove the company to consolidate and all of the original sites were rejected for expansion. The ninth company moved only because it lay in the path of highway

\(^2\)Linge, \textit{op. cit.}, pp. 30-34.
\(^3\)Black, \textit{op. cit.}, p. 219.
\(^4\)Ibid., p. 221.
\(^5\)Logan, \textit{op. cit.}, p. 151.
construction. These last two companies, when they did relocate, acquired considerably more space than that used previously. Figure 11 gives two examples of the crowding of old sites and the expansion which takes place with relocation.

Among the plants which gave the need to expand as primary relocation factors a number of secondary considerations also occurred. Two of them also consolidated scattered activities. One plant was left by the zoning ordinance in a residential neighborhood and when it attempted to expand the site its request for zoning changes was refused. Another plant occupied near-CBD rental quarters which were not only too small but considered to be too expensive. When this plant changed ownership the new management group had the alternative of obtaining a building built to its specifications and made available on a lease-purchase basis and this alternative was chosen.

Significantly, not one company listed traffic congestion or lack of off-street parking space as disadvantages of even secondary value. Only one official mentioned local taxes and even he admitted that the intra-areal variations were not in themselves sufficient inducement to relocate.

The nine companies all left the inner city to take either outer city or suburban ring sites. Officials of the six largest companies were emphatic in their conclusion that increased distance from the CBD, or the inner city generally, was a matter of no inconvenience to them. The other three, the smallest in the group, complained of marginal frictions relating to loss of "drop-in" sales or distance from external economies.
Areas with primary potential as industrial sites
Areas with secondary potential as industrial sites, large portions of some probably unusable

Fig. 11.—Potential Industrial Sites
As previously observed, one of the considerations involved in evaluating the adequacy of an existing location was the access of that situation to customers and various services. It was apparent from the experiences of the nine relocatees that for these companies either the local market and external economies were not significant or that in an area as small as the Roanoke SMSA they were easily reached from locations distant from the center of the urban area. Furthermore, the nine plants not only were well located but their officials could think of no particular reason for being near the center of the city, given the locational freedom to be there.

In conclusion, it is evident from the logic of the situation and also from the comments of management that the relocation decision is a battle between locational inertia and the increasing inadequacy of a site and facilities. In Roanoke, at least, there is no countervailing positive force acting to strengthen the holding action of inertia.

Site Selection Factors

Industrial location within the intra-urban context is concerned with the selection of the specific parcel of land on which production is to take place. The regional phase of decision

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The nine relocatees represent only five per cent of the SMSA total of establishments but they do include virtually all of the plants relocated since 1960.
brings the plant into existence in the SMSA. It was shown in earlier discussions that labor, situation, quality of the environment, linkage, local initiative, and other factors were instrumental in bringing manufacturing to the SMSA. These are active factors which attract a location decision. Once these requirements are met a host of both similar and unrelated conditions must be satisfied if the plant is to be built. These are the permissive factors which must be present but do not in themselves attract industry. Often sites, power, and water are of this nature.

The basic question for industry and for suburbanization is to what extent are the location factors, both active and permissive, mobile throughout the urban area? The question of mobility relates directly to the earlier discussion of agglomeration versus deglomeration in which it was seen that, in theory and in practice, the mobility of concentration advantages acts to partly neutralize the diseconomies of concentration.

In what follows, the various traditional location factors are analyzed from the point of view of intra-urban mobility. Regional factors, such as climate and non-local governmental activities, can be excluded without discussion, as can the regional aspects of factors, such as labor and transportation, which may also have intra-urban significance. Several other less traditional factors, such as external economies and scale of operations, are felt to be of relevance in this more localized framework. The order in which the factors are presented is not intended to be significant.
Data sources

Most detailed employment and other data necessary for this analysis were obtained from local industrial directories and are summarized in Table 15. Information on certain economic characteristics of the manufacturing complex was obtained from questionnaires, the responses to which give a good sample of all industries. The data reported by several plants in an industry were assumed to be representative of the entire industry but only after weighting each respondent's data with its employment so as not to overstate the small plant or to understate the large.

Geographic markets

Markets traditionally carry great force in determining locational patterns. The interest here, though, focuses on the location of the market areas served by SMSA producers and the extent to which variations in inter-urban location might be related to the scope of the geographic market served.

Four geographic markets are recognized but the fourth, exports, is small and is therefore combined with the national


8The questionnaires were sent out in June, 1962, until the auspices of the Roanoke Chamber of Commerce and the Roanoke Valley Regional Planning Commission. Respondents included 91 of the SMSA's 187 manufacturing establishments, representing 70.6 per cent of all manufacturing employees. All 18 of the area's major S.I.C. industries were represented, with employment reported ranging between 25.6 and 100.0 per cent of the industry's total. The returns were never fully analyzed until the present author undertook the task. The questionnaires remain on file in the Roanoke City Department of City Planning.
TABLE 15
MANUFACTURING EMPLOYMENT WITHIN THE SMSA, 1964, BY INTRA-AREA ZONE

<table>
<thead>
<tr>
<th>S.I.C. Industry</th>
<th>Inner City</th>
<th>Outer City</th>
<th>City Total</th>
<th>Salem</th>
<th>Vinton</th>
<th>Unincorporated County</th>
<th>SMSA Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1,212</td>
<td>355</td>
<td>1,567</td>
<td>492</td>
<td>71</td>
<td>95</td>
<td>2,225</td>
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<tr>
<td>22</td>
<td>855</td>
<td>100</td>
<td>955</td>
<td>150</td>
<td>525</td>
<td>0</td>
<td>1,630</td>
</tr>
<tr>
<td>23</td>
<td>682</td>
<td>790</td>
<td>1,472</td>
<td>175</td>
<td>0</td>
<td>0</td>
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<td>25</td>
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<td>25</td>
<td>152</td>
<td>1</td>
<td>0</td>
<td>269</td>
<td>422</td>
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<tr>
<td>27</td>
<td>806</td>
<td>8</td>
<td>814</td>
<td>16</td>
<td>2</td>
<td>1</td>
<td>833</td>
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<td>28</td>
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<td>90</td>
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<td>32</td>
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<td>0</td>
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<td>445</td>
<td>445</td>
<td>0</td>
<td>0</td>
<td>50</td>
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<td>0</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>32</td>
<td>103</td>
<td>138</td>
<td>241</td>
<td>103</td>
<td>0</td>
<td>88</td>
<td>432</td>
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<tr>
<td>33</td>
<td>63</td>
<td>186</td>
<td>249</td>
<td>58</td>
<td>0</td>
<td>285</td>
<td>592</td>
</tr>
<tr>
<td>34</td>
<td>639</td>
<td>162</td>
<td>801</td>
<td>648</td>
<td>0</td>
<td>0</td>
<td>1,449</td>
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<td>35</td>
<td>68</td>
<td>126</td>
<td>194</td>
<td>138</td>
<td>0</td>
<td>0</td>
<td>332</td>
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<td>36</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>2,260</td>
<td>0</td>
<td>155</td>
<td>2,418</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>62</td>
<td>0</td>
<td>142</td>
</tr>
<tr>
<td>38</td>
<td>82</td>
<td>0</td>
<td>82</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>39</td>
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<td>0</td>
<td>109</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>118</td>
</tr>
</tbody>
</table>

Totals          | 5,936      | 2,707      | 8,643      | 4,827 | 660    | 1,140                 | 15,270     |

Per Cent of SMSA | 38.9       | 17.7       | 56.6       | 31.6  | 4.3    | 7.5                   | 100.00     |
market. This reduces the total to three: 1) national-export, 2) within Virginia but beyond the SMSA, and 3) intra-SMSA, local. Proportions of shipments going to each market were determined for each industry and this was simplified through the use of market ratios designed to indicate the local relative importance of the various markets. Table 16 summarizes the market orientation percentages and ratios for each of the major industry groups. By observation of the market ratios it is possible to characterize each industry as having one of three possible basic market orientations: national-export, intermediate, or local.

National-export market industries are those which had national-export ratios of at least 1.0, indicating that at least 74.0 per cent of all shipments went to those markets. As a matter of fact, however, the orientation of the group is even stronger than the minimum requirement, since the lowest qualifying industry had a proportion of 83.2 per cent (1.12). The eight constituent industries thus form a rather distinctive group which has very weak local or state-wide markets.

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9Respondents indicated percentages of shipments to the first destination of shipments. No indication was made of whether the percentages referred to value, weight, or bulk. The percentages were weighted by the respondent's employment, which amounted to assigning a number of its employees to each market area. The employment totals for each market were summed for all respondents in an industry and new percentages derived. These percentages are the ones reported in Table 16. The market ratios indicate an industry's deviation from the mean for all SMSA industries; values greater than 1.0 indicating a relatively strong orientation; values below 1.0 indicating a relatively weak orientation.
TABLE 16
GEOGRAPHIC MARKETS OF ROANOKE SMSA MANUFACTURING INDUSTRIES

<table>
<thead>
<tr>
<th>Industry Name</th>
<th>S.I.C. Code</th>
<th>Weighted Percentages of Shipments</th>
<th>Market Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Local</td>
<td>State</td>
</tr>
<tr>
<td>Food</td>
<td>20</td>
<td>37.3</td>
<td>37.4</td>
</tr>
<tr>
<td>Textiles</td>
<td>22</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Apparel</td>
<td>23</td>
<td>1.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Wood</td>
<td>24</td>
<td>55.3</td>
<td>11.3</td>
</tr>
<tr>
<td>Furniture</td>
<td>25</td>
<td>8.7</td>
<td>1.1</td>
</tr>
<tr>
<td>Paper</td>
<td>26</td>
<td>7.0</td>
<td>20.7</td>
</tr>
<tr>
<td>Printing-Publishing</td>
<td>27</td>
<td>54.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Chemicals</td>
<td>28</td>
<td>19.7</td>
<td>18.1</td>
</tr>
<tr>
<td>Plastics</td>
<td>30</td>
<td>0.8</td>
<td>4.1</td>
</tr>
<tr>
<td>Leather</td>
<td>31</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>Stone-Clay-Glass</td>
<td>32</td>
<td>47.2</td>
<td>39.4</td>
</tr>
<tr>
<td>Primary Metals</td>
<td>33</td>
<td>16.8</td>
<td>25.0</td>
</tr>
<tr>
<td>Fabricated Metals</td>
<td>34</td>
<td>13.9</td>
<td>52.3</td>
</tr>
<tr>
<td>Non-Electrical Machinery</td>
<td>35</td>
<td>7.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Electrical Machinery</td>
<td>36</td>
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<td>0.1</td>
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<tr>
<td>Transportation Equipment</td>
<td>37</td>
<td>1.2</td>
<td>3.8</td>
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<tr>
<td>Instruments</td>
<td>38</td>
<td>16.7</td>
<td>47.9</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>39</td>
<td>36.9</td>
<td>53.6</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>12.9</td>
<td>13.1</td>
</tr>
</tbody>
</table>
Strong local market industries are defined, rather generously, as those having local market ratios of 2.0, or 25.8 per cent of shipments going to local buyers. Actually, however, the break was fairly clear, with the lowest qualifying at a ratio of 2.86 (36.9 per cent) and the highest non-qualifying ratio standing at 1.53 (19.7 per cent). National and state markets can be of considerable importance to these industries but they are the ones most closely bound to the local market.

The residium form the intermediate market group which has more of a regional market orientation. Local market ratios do not reach 2.0 and national-export market ratios do not reach 1.0. State market ratios in every case exceed 1.0. Table 17 identifies the market orientation of each industry and gives the ratio means for each group.

Table 18 gives the market percentages for all industries in each zone of the SMSA. Local market orientation is strongest in the inner city but it is hardly overwhelming. Second only to the inner city is the unincorporated county. All zones have a major orientation to national-export markets. Due to this very modest tendency for local-market industries to concentrate in the central city it is concluded that market orientation is not a major controlling force in intra-urban location decisions.

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10 This proportion is generous in comparison to Hoover's and Vernon's minimum qualification for local market industries in New York. They required 50 per cent or more of shipments to go to the local market. In Roanoke this would qualify only the wood and printing-publishing industries (Hoover and Vernon, op. cit., p. 38).
**TABLE 17**

**INDUSTRY MARKET ORIENTATION RATIOS**

<table>
<thead>
<tr>
<th>Market Group</th>
<th>S.I.C. Industry</th>
<th>Market Ratios</th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Local</td>
<td>State</td>
<td>National-Export</td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>20</td>
<td>2.89</td>
<td>2.85</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>32</td>
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<td>3.01</td>
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</tr>
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<td></td>
<td>39</td>
<td>2.86</td>
<td>4.09</td>
<td>0.12</td>
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</tr>
<tr>
<td>Means</td>
<td></td>
<td>3.78</td>
<td>2.45</td>
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<tr>
<td>Intermediate</td>
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<td>1.53</td>
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<td></td>
<td>33</td>
<td>1.30</td>
<td>1.91</td>
<td>0.79</td>
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</tr>
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<td>38</td>
<td>1.29</td>
<td>3.66</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>Means</td>
<td></td>
<td>1.15</td>
<td>2.53</td>
<td>0.70</td>
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<tr>
<td>National-Export</td>
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<td>0.10</td>
<td>0.11</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>0.08</td>
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<td>0.31</td>
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<td>0.58</td>
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<td>36</td>
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<td>1.35</td>
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<td>37</td>
<td>0.10</td>
<td>0.29</td>
<td>1.29</td>
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</tr>
<tr>
<td>Means</td>
<td></td>
<td>0.21</td>
<td>0.21</td>
<td>1.27</td>
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</tr>
</tbody>
</table>
TABLE 18
GEOGRAPHIC MARKET ORIENTATIONS OF INDUSTRY, BY ZONE

<table>
<thead>
<tr>
<th>Zone</th>
<th>Market Orientation (per cent)</th>
</tr>
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<tr>
<td></td>
<td>Local</td>
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<tr>
<td>Inner city</td>
<td>21.8</td>
</tr>
<tr>
<td>Outer city</td>
<td>15.4</td>
</tr>
<tr>
<td>Salem</td>
<td>8.7</td>
</tr>
<tr>
<td>Vinton</td>
<td>5.5</td>
</tr>
<tr>
<td>Unincorp. county</td>
<td>15.9</td>
</tr>
<tr>
<td>City Total</td>
<td>19.8</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>9.6</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>12.9</td>
</tr>
</tbody>
</table>
In the theoretical context, this factor has great intra-concentration mobility.

It is here, however, that a significant contrast with the large metropolitan area appears. Hoover and Vernon noted that in 1956 the local market industries (their definition) accounted for 23 per cent of all manufacturing employees in the New York Metropolitan Region and 30 per cent of those in New York City. They observed that considerations of product distribution tended to lead many plants into locations immediately peripheral to the CBDs, where they could avoid extreme land values and congestion but still enjoy centralized distribution points. The scale of the Roanoke SMSA is so much reduced that distribution considerations need not necessarily dictate a centralized location. Therefore, the local market in the large metropolitan area, because it is larger and because time-space frictions are greater, has a centralizing influence while in the Roanoke SMSA such an influence is largely absent or very weak. The modest tendency for Roanoke SMSA national-export industries to operate from suburban sites probably represents factors other than simple

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11_Ibid_. It is recognized that New York may be unique and an atypical example of a large urban area but the Hoover and Vernon study is unparalleled in its depth and perception.

12_Ibid_.

13_One reason for the greater local market orientation for New York plants is that they can reach maximum economies of scale and still serve a strictly local market. The same plant in Roanoke would have to serve an interstate market in order to reach the same level of production.
market orientation. Size of the plant (related to the economies of scale to be attained by a national market industry) and timing may have been more influential.

Labor

The conditions surrounding labor are another major location consideration and evidence was presented earlier to indicate that this factor has been a significant attraction for some SMSA plants. The most pertinent aspects of labor are its cost, supply, and attitudes, the latter as suggested by union activity. Productivity is the really critical labor question but it is largely immeasurable because of the complicated inter-relationships with capital equipment. However, if it can be shown that workers are highly mobile within the SMSA then this should eliminate variations in labor productivity as an intra-urban location factor.

Supply.—Since 1960 the Roanoke SMSA labor force has been employed at a rate higher than that in the national economy (Table 5). Several manufacturing executives revealed that they had reached the point where they were having considerable difficulty in securing labor, even in low-skill, low-wage occupations. The Virginia Employment Commission estimated that in February, 1964, the potential labor supply (for all needs) within the City of Roanoke and a 20-mile radius around it numbered 4,340 persons, of whom nearly half were women not then in the labor force.¹⁴ The remainder were either males from agriculture or young people

¹⁴Cited in Economic Data, p. 4.
entering the labor force for the first time. Obviously, the lack of skills and experience of such people would greatly limit their potential for manufacturing employment. On the other hand, the 20-mile radius is conservative in the estimation of many. Some workers are known to drive a one-way distance of over 50 miles to factory jobs. One executive felt sanguine about the situation, expressing the belief that new jobs would draw workers "out of the hills."

The intra-urban mobility of labor was considerable and officials of relocated plants had no difficulty in keeping the same labor force when the plant was moved. In several cases the moves were from within the CBD to outlying sites in the suburban ring and included seasonal female workers. Apparently, low-wage female workers are just as apt to drive to work as are their higher-wage male counterparts. No longer must the apparel mill, for example, choose a site which has maximum access to public transportation. The commutation of 50 miles by some also suggests a high degree of labor mobility.

Labor mobility would not be as great in the large city because of the larger size of the area. The manufacturer who wishes to relocate within the Roanoke SMSA and keep his labor force can do so with great locational freedom. The large city manufacturer, by contrast, must be more careful and is less free

15Hoover and Vernon, pp. cit., p. 140; the median one-way trip to work in New York took 42 minutes in 1956, a travel time virtually unheard of in Roanoke.
to select from all available alternatives. This factor, then, represents a relatively greater restraint on suburbanization in the large urban area.

Wage rates.--Industrial wage rates are not high in the SMSA (Table 19). In 1963 the average annual wage of $4,103 paid to Roanoke production workers was only 88 per cent of the national average. However, this represented a halt in a trend toward relative decreases which began after 1929. The downward trend was the result of growth during the period of the low wage furniture and textile-apparel industries. The recent upswing reflected the removal of Viscose from the statistics and the new industries which came in to the SMSA during the 1954-1958 period. Variances from the SMSA pattern are observable in Table 19 and Viscose was the early leader in these variances. In 1947 Viscose was still in the suburban ring and dominated manufacturing in that area. The 95 per cent level achieved then suggests that Viscose was a relatively high wage employer and its annexation to the City of Roanoke caused the city's relative level to increase by 1954. After that, accelerated suburbanization and dwindling employment at Viscose caused the city's percentage to fall while the suburban ring's was rising. By 1963 the central city experienced a modest increase but in the suburban ring employment increases in the new industries pushed the level to within two percentage points of the national mean. The considerable spread between wage levels in the central city and the suburban ring are probably direct effects of suburbanization and
TABLE 19
AVERAGE ANNUAL WAGE OF MANUFACTURING WAGE EARNERS, 1899-1963

<table>
<thead>
<tr>
<th>Years</th>
<th>SMSA</th>
<th>Central City</th>
<th>Suburban Ring</th>
<th>Virginia</th>
<th>U.S.</th>
<th>Per Cent of U.S.</th>
<th>SMSA</th>
<th>Central City</th>
<th>Suburban Ring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1899</td>
<td>.</td>
<td>$ 455</td>
<td>.</td>
<td>$ 306</td>
<td>$ 420</td>
<td>108</td>
<td>108</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>.</td>
<td>485</td>
<td>.</td>
<td>361</td>
<td>512</td>
<td>95</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1919</td>
<td>$1,113</td>
<td>1,138</td>
<td>$ 829</td>
<td>1,005</td>
<td>1,142</td>
<td>97</td>
<td>99</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>1,260</td>
<td>.</td>
<td>.</td>
<td>982</td>
<td>1,130</td>
<td>97</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>1939</td>
<td>1,044</td>
<td>.</td>
<td>.</td>
<td>862</td>
<td>1,152</td>
<td>91</td>
<td>.</td>
<td>.</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>2,192</td>
<td>1,975</td>
<td>2,418</td>
<td>2,023</td>
<td>2,538</td>
<td>86</td>
<td>.78</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>1954</td>
<td>2,996</td>
<td>2,994</td>
<td>3,005</td>
<td>2,846</td>
<td>3,604</td>
<td>83</td>
<td>.83</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>1958</td>
<td>3,404</td>
<td>3,261</td>
<td>3,675</td>
<td>3,361</td>
<td>4,251</td>
<td>80</td>
<td>77</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>4,103</td>
<td>3,776</td>
<td>4,564</td>
<td>4,139</td>
<td>4,665</td>
<td>88</td>
<td>.81</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

*Derived from the Census of Manufactures for the years listed.*
are considered so significant that they are analyzed in more detail in a following section.

Obviously, the higher wage rates prevalent in the suburban ring were not a cause of suburbanization but are instead a result of it, indicating the different industrial composition of the two intra-urban zones. Even if the logic of this conclusion were not unassailable the fact of nearly perfect intra-urban labor mobility would so make it.¹⁶

**Labor unions.**—Relatively low wage rates, at least in the central city, and a tight labor market are fertile grounds for labor organizers.¹⁷ In 1964 only 18 of the 53 larger establishments for which data were available had unions but these 18 plants employed a total of 7,337 persons, nearly half of the SMSA total. Plants known to be organized averaged 408 employees each, as compared to only 170 in the average known non-union plant. Primary metals, wood, and fabricated metals industries had unions in more than half of their plants. The

¹⁶Hoover and Vernon, *op. cit.*, pp. 42-43; wage differentials have existed in New York and led a few plants to choose suburban sites. By 1955, however, labor mobility had increased to the point that the differentials were no longer relevant location forces.

¹⁷Unions were unpleasant subjects for most manufacturers and objective data were difficult to obtain. The only information available was that in a survey made by the Virginia State Chamber of Commerce in December, 1963 (cited in Economic Data). These data have been supplemented by personal observation and are complete for 53 of the 56 plants having 50 or more employees. The presence of a union in a plant often means that only a fraction of the employees are actually organized because the "closed shop" is forbidden by state law.
largest organized plant was General Electric, with a total employment of 2,260 in 1964. Other large plants with unions were Johnson-Carper Furniture (1,016 employees), Kenrose (apparel - 750 employees), and the Times-World Corporation (newspapers - 505 employees).

Unions were absent in the five large textile mills, which together had 1,585 employees. Also non-union were Rowe Furniture (490 employees) and Creative Packaging (plastics - 445 employees).

The tendency for unions to be more common in large plants was further evident in the 14 plants which had at least 250 employees. Unions were present in seven of them, including five of the seven with more than 500 employees. The two exceptions in the largest category were two textile-apparel mills. The seven largest organized plants were spread among six different industries, suggesting that susceptibility to unionization was more a matter of size than industry.

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18 Local rumor has it that Burlington Industries closed its Salem hosiery mill around 1960 because of an apparently successful attempt to organize the workers. To the extent that the rumor is believed and circulated (irrespective of the truth) it probably has served to dampen enthusiasm for unions by textile and apparel workers, especially those in Burlington's Vinton plant.

19 Their success in avoiding unions cannot be wholly explained. A factor may be the propagation of the "Salem-Burlington" rumor. Otherwise, one is left with the trite conclusion that the mills have developed a successful non-union policy.
Suburban ring plants tended to be larger than those in the central city but they were not as heavily unionized. Only four of the 21 plants (19 per cent) in the suburban ring which had at least 50 employees also had unions. By contrast 14 of the 32 larger plants (43 per cent) in the central city were unionized. This may reflect lower wage levels and the earlier date of central city plants but it is functionally related to the intra-urban location decision.

Executives of non-union plants were anxious to avoid organization and this caused them to choose sites which were not in proximity to unionized facilities. A feeling was expressed that adjacency to such a plant would facilitate infiltration by union organizers. This consideration can not only influence site selection directly but may also be an indirect influence, causing officials to seek sites which are larger than they might be otherwise in order to provide a wide spatial buffer between themselves and any neighbors. To some the Roanoke Industrial Center was at a disadvantage because its largest occupant, Kenrose, had a union. 20

20Another potentially powerful item of industrial gossip deserves mention in this context. According to personal accounts, the Universal Ball Co., which moved to the Roanoke Industrial Center from Pennsylvania in 1963, came to Roanoke to escape labor difficulties in its home area. However, due to the need to begin production quickly, the company hired labor hastily, without the "proper" screening earnestly recommended by local industrialists. Within six months the workers voted to join a union and plans to bring the rest of the company's operations to Roanoke were cancelled. This story was cited by an industrialist as an example of what can happen when one becomes neighbor to an organized plant. This conclusion is probably exaggerated but,
It does not necessarily follow that the lower incidence of union activity in the suburban ring proves that suburban sites offer greater protection against unions. However, the desire to avoid proximity to unions does have the effect of increasing suburbanization. This would be the expected result of the fact that fewer unionized potential neighbors exist in the suburban ring and that more large sites are available there.

The large urban area, with a relatively high degree of labor immobility, offers the possibility of relocating in order to seek out lower wage or non-union labor within the area. If the plant were unionized, however, it could be expected that the union would impede any effort to replace the existing labor force and still keep the plant within the same urban area. Thus, a high incidence of union activity in the large city should not, of itself, lead to suburbanization. In fact, a high incidence of unionization would make it less likely that companies would care whether or not potential neighbors had unions. The relocating plant itself is more likely to be unionized. The suburbanizing influence of union activity in Roanoke's central city would not be very relevant in a large, highly unionized urban concentration.

In summary, labor factors do not influence intra-urban location decisions in Roanoke except for the non-union plant.

Once again, it is not the truth of the story that matters so much as it is the willingness of some to believe it to be true. Significantly, Universal Ball was the last manufacturer to lease space in the Roanoke Industrial Center until the already unionized Eaton, Yale and Towne Company decided to locate there in 1966.
which seeks to avoid proximity to organized plants. Wage differ-
entials may have induced some suburbanization in large urban
areas but their force has probably diminished to the point of
irrelevance today. Otherwise, union activity and labor mobility
factors are more conducive to suburbanization in Roanoke than they
are in a larger urban area.

Transportation

Questionnaire data allow an analysis of transportation
media used by the various SMSA industries. Table 20 is a
summary of transportation-use proportions for each industry.

Trucks are the dominant transport form used for both
incoming and outgoing shipments. Every one of the 91 respondents
moved some of its final shipments by truck and 65 received some
proportion of incoming materials from trucks.

The railroad handled only a minority of industrial
freight but it was required to handle certain items moving in
large quantities, such as raw steel, coal, plastic pellets,
furniture, bulk paper, and many chemicals. Incoming materials
were more apt to be carried by the railroad than were outgoing
shipments but there were exceptions to this tendency. The
furniture industry received much of its wood from independent
suppliers who hauled it in on trucks from near-by areas. The

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21 Respondents reported percentage of use of each medium
(rail, truck, or air) for both incoming and outgoing freight.
The percentages were applied to the respondent's employment
and the number of employees thus assigned to each medium was
combined with those for other plants in the same industry.
Percentages were then calculated from these industrial sums.
### TABLE 20

**TRANSPORTATION MEDIA USED BY ROANOKE SMSA MANUFACTURING INDUSTRIES, PER CENT**

<table>
<thead>
<tr>
<th>S.I.C. Industry</th>
<th>Rail</th>
<th>Truck</th>
<th>Air</th>
<th>Outgoing Rail</th>
<th>Truck</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>30.5%</td>
<td>69.6%</td>
<td>0.0%</td>
<td>16.8%</td>
<td>83.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>22</td>
<td>0.8</td>
<td>98.9</td>
<td>0.3</td>
<td>1.2</td>
<td>98.5</td>
<td>0.3</td>
</tr>
<tr>
<td>23</td>
<td>5.2</td>
<td>94.0</td>
<td>0.8</td>
<td>18.2</td>
<td>80.9</td>
<td>0.9</td>
</tr>
<tr>
<td>24</td>
<td>18.5</td>
<td>81.5</td>
<td>0.0</td>
<td>34.6</td>
<td>65.4</td>
<td>0.0</td>
</tr>
<tr>
<td>25</td>
<td>17.4</td>
<td>82.6</td>
<td>0.0</td>
<td>52.4</td>
<td>47.6</td>
<td>0.0</td>
</tr>
<tr>
<td>26</td>
<td>15.9</td>
<td>84.1</td>
<td>0.0</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>27</td>
<td>63.8</td>
<td>31.9</td>
<td>4.2</td>
<td>17.8</td>
<td>74.2</td>
<td>3.6</td>
</tr>
<tr>
<td>28</td>
<td>29.1</td>
<td>70.9</td>
<td>0.0</td>
<td>2.4</td>
<td>97.6</td>
<td>0.0</td>
</tr>
<tr>
<td>30</td>
<td>81.3</td>
<td>18.7</td>
<td>0.0</td>
<td>8.9</td>
<td>71.6</td>
<td>19.5</td>
</tr>
<tr>
<td>31</td>
<td>90.0</td>
<td>10.0</td>
<td>0.0</td>
<td>76.0</td>
<td>24.0</td>
<td>0.0</td>
</tr>
<tr>
<td>32</td>
<td>38.2</td>
<td>61.8</td>
<td>0.0</td>
<td>13.7</td>
<td>86.3</td>
<td>0.0</td>
</tr>
<tr>
<td>33</td>
<td>83.6</td>
<td>16.4</td>
<td>0.0</td>
<td>74.6</td>
<td>25.4</td>
<td>0.0</td>
</tr>
<tr>
<td>34</td>
<td>66.9</td>
<td>33.1</td>
<td>0.0</td>
<td>15.3</td>
<td>84.7</td>
<td>0.0</td>
</tr>
<tr>
<td>35</td>
<td>8.1</td>
<td>85.7</td>
<td>6.2</td>
<td>0.0</td>
<td>96.9</td>
<td>3.1</td>
</tr>
<tr>
<td>36</td>
<td>16.0</td>
<td>82.1</td>
<td>1.9</td>
<td>15.6</td>
<td>79.9</td>
<td>4.5</td>
</tr>
<tr>
<td>37</td>
<td>20.0</td>
<td>80.0</td>
<td>0.0</td>
<td>20.0</td>
<td>80.0</td>
<td>0.0</td>
</tr>
<tr>
<td>38</td>
<td>75.0</td>
<td>18.8</td>
<td>6.2</td>
<td>91.7</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>39</td>
<td>14.3</td>
<td>84.5</td>
<td>1.2</td>
<td>0.0</td>
<td>100.0</td>
<td>0.0</td>
</tr>
<tr>
<td>All</td>
<td>25.5</td>
<td>73.8</td>
<td>0.7</td>
<td>19.7</td>
<td>78.1</td>
<td>2.2</td>
</tr>
</tbody>
</table>
finished furniture, however, went out mostly over the railroad. The greater use of the railroad for outbound shipments by the apparel industry was of dubious significance because most of the rail freight was waste fabric which might have been sent out by truck if necessary.

Air freight use was minor although plastic products, apparel, electron tubes, and precision machinery were sent out on this medium from time to time.

Table 21 summarizes transportation uses by industries according to their SMSA zone. It indicates that central city plants were much heavier rail users than were those in the suburban ring. The exclusive use of trucks doubtless gives a plant much greater locational freedom, as indicated by the relatively remote locations of the non-rail using Double Envelope and I.T.T. plants. However, many plants may be proportionately small rail users but need a rail siding anyway. If the proportion which moves by rail is small the company may choose to ignore a presumed higher cost of shipping an item by truck in order to secure an otherwise advantageous site. This is not likely to be necessary in Roanoke, however, because the area has a well developed system of rail lines through the SMSA (Figure 6). As will be seen later, there are still available a number of large vacant sites with close proximity to rail lines. As a result, some companies have chosen sites with rail sidings even though they feel that they are of no particular necessity. 22 One

---

22 This probably gives the company greater flexibility in
<table>
<thead>
<tr>
<th>Zone</th>
<th>Materials Moved In</th>
<th>Product Moved Out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rail %</td>
<td>Truck %</td>
</tr>
<tr>
<td>Inner City</td>
<td>27.3</td>
<td>72.3</td>
</tr>
<tr>
<td>Outer City</td>
<td>41.9</td>
<td>57.8</td>
</tr>
<tr>
<td>Salem</td>
<td>18.8</td>
<td>80.9</td>
</tr>
<tr>
<td>Vinton</td>
<td>9.6</td>
<td>90.4</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>11.1</td>
<td>82.8</td>
</tr>
<tr>
<td>County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City Total</td>
<td>32.7</td>
<td>66.9</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>16.4</td>
<td>82.4</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>25.5</td>
<td>73.8</td>
</tr>
</tbody>
</table>
official admitted that he could receive his materials by truck as well as by railroad but he chose to use the railroad out of a feeling of loyalty to that local shipper.

Truck transportation is almost completely mobile throughout the SMSA but, given the preference for rail sidings, industry still tends to develop along the railroad lines (Figure 6). However, since good rail service can be obtained in the suburban ring, the preference for rail sidings does not necessarily retard suburbanization. It can be expected that a few plants will be willing to forego a rail siding in order to obtain low-cost land, as have Double Envelope and I.T.T., but this is not likely to be an important trend until such time as the demand for sites with rail sidings increases the price between rail and non-rail sites rather substantially. The observed preference of I.T.T. for access to the airport rather than the railroad is unusual, representing only those plants which receive small quantities of expensive raw materials and ship out a small, high value product for which delivery times are critical.

Traffic congestion, a function of the size and intensity of the area, was not highly relevant in the Roanoke example. Interviewed officials considered it to be a nuisance, particularly anticipation of unforeseen changes in transport needs. If, for example, the company can increase production sufficiently it might some day be able to take advantage of lower carload lot rates on the railroad. Smaller shipments today might be large enough for carload rates on trucks but the railroad will not accept less than carload shipments. In any event, there is a general reluctance to take sites to which a siding cannot be extended.
if it led to the need to provide more employee parking space, but not something for which one would relocate in order to escape. As noted, relocated plants were put in less congested areas and provided with large parking lots but this appeared to have been a benefit, rather than a cause, of relocation. All interviewed officials felt that their trucks could reach the interstate highway then under construction easily enough without requiring the plant to relocate. They perceived that the new highway would be of considerable benefit to them but congestion in the SMSA was not great enough to cause major time losses in reaching it.\textsuperscript{23} Companies looking for a new site, however, can be expected to place some value on access to the interstate highway but only if land cost and other factors are suitable. Given the size and probable congestion of large urban areas, it is not unlikely that many companies have to depend more heavily on truck transportation because sites with rail sidings are too expensive. In Roanoke manufacturers are still able to have the best of both railroad and truck transportation without having to select an expensive or crowded site. In short, the availability of a form of transportation in Roanoke is probably both greater and, at the same time, less critical to the location decision than it is in a large area such as New York.

\textsuperscript{23}However, Associated Transport Co., a major interstate common carrier truck company, recently relocated its regional terminal in Roanoke to a site which has direct access to the interstate highway. This, in effect, brought Associated's industrial customers nearer to that highway.
Table 22 summarizes the relationships between market orientations and transportation forms. As expected, local market industries were the heaviest truck users. Greatest rail users were in the intermediate market industries, such as primary and fabricated metals, indicating the weight and volume of their products and materials. However, there is little suggestion that transportation requirements of a market grouping lead to any particular intra-urban patterns beyond the weak tendency for truck-using, national-market industries to select suburban sites.

In summary, the availability of transportation forms is not a primary intra-urban location factor, so long as undeveloped sites with railroad access remain available in quantity. Transportation is a factor which neither pushes industry out from the central city nor pulls it in.

Sites

The supply of potential industrial sites can be a factor of critical importance in a mountainous area. Relatively large vacant parcels are needed which are level or can be developed without undue expense. Drainage must be adequate and the sub-surface has to be capable of supporting heavy industrial buildings. Generally, this means that excessive slopes (usually in excess of seven per cent), swampy areas, and active floodplains are avoided. The elimination of areas which possess these shortcomings is the beginning of an inventory of potential industrial sites.
### Table 22

**TRANSPORTATION MEDIA AND GEOGRAPHIC MARKET ORIENTATION**

<table>
<thead>
<tr>
<th>Market Orientation</th>
<th>S.I.C. Industry</th>
<th>Incoming (%)</th>
<th>Outgoing (%)</th>
<th>Employment 1964</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rail</td>
<td>Truck</td>
<td>Rail</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>30.5</td>
<td>69.6</td>
<td>16.8</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td>18.5</td>
<td>81.5</td>
<td>34.6</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>63.8</td>
<td>31.9</td>
<td>17.8</td>
</tr>
<tr>
<td>32</td>
<td></td>
<td>38.2</td>
<td>61.8</td>
<td>13.7</td>
</tr>
<tr>
<td>39</td>
<td></td>
<td>14.3</td>
<td>84.5</td>
<td>0</td>
</tr>
<tr>
<td><strong>Group mean</strong></td>
<td></td>
<td>36.5</td>
<td>62.6</td>
<td>18.0</td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>15.9</td>
<td>84.1</td>
<td>0</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>29.1</td>
<td>70.9</td>
<td>2.4</td>
</tr>
<tr>
<td>33</td>
<td></td>
<td>83.6</td>
<td>16.4</td>
<td>74.6</td>
</tr>
<tr>
<td>34</td>
<td></td>
<td>66.9</td>
<td>33.1</td>
<td>15.3</td>
</tr>
<tr>
<td>38</td>
<td></td>
<td>75.0</td>
<td>18.8</td>
<td>91.7</td>
</tr>
<tr>
<td><strong>Group mean</strong></td>
<td></td>
<td>60.6</td>
<td>39.2</td>
<td>27.5</td>
</tr>
<tr>
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<tr>
<td>22</td>
<td></td>
<td>0.8</td>
<td>98.9</td>
<td>1.2</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>5.2</td>
<td>94.0</td>
<td>18.2</td>
</tr>
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<td>25</td>
<td></td>
<td>17.4</td>
<td>82.6</td>
<td>52.4</td>
</tr>
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<td>30</td>
<td></td>
<td>81.3</td>
<td>18.7</td>
<td>8.9</td>
</tr>
<tr>
<td>31</td>
<td></td>
<td>90.0</td>
<td>10.0</td>
<td>76.0</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>8.1</td>
<td>85.7</td>
<td>0.0</td>
</tr>
<tr>
<td>36</td>
<td></td>
<td>16.0</td>
<td>82.1</td>
<td>15.6</td>
</tr>
<tr>
<td>37</td>
<td></td>
<td>20.0</td>
<td>80.0</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>Group mean</strong></td>
<td></td>
<td>16.2</td>
<td>82.8</td>
<td>19.8</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td></td>
<td>25.5</td>
<td>73.8</td>
<td>19.7</td>
</tr>
</tbody>
</table>
Topographic analysis is capable of delineating usable vacant industrial land only in the physical sense. Equally as important in an urban area is the competition from other land uses, most of which can pay a higher price for land. Thus, from the physical inventory one must exclude land already in urban development, land likely to be developed, and land zoned for non-industrial uses.

In 1960 a study was made of the larger potential industrial sites in the Roanoke Valley. A number of tracts were selected which met the following criteria: "Generally vacant, not wanted for commercial or public use, capable of being served by road and railroad and possess topography generally amenable to industrial development." Several of the tracts which otherwise qualified were thought to possess the potential of threatening residential neighborhood property values if developed for industry. Several other tracts which met all of the criteria except that of rail access were also identified. The map, Figure 12, shows the distribution of all potential sites identified in the study, including those without rail access, but excluding those whose development might threaten neighborhood values. Several modifications were made to reflect events which have occurred since 1960. The map excludes a host of small sites but still makes apparent the distribution of the major reserves of vacant

---

Fig. 12.--Sites of two relocated plants

DOUBLE ENVELOPE CORP.

OLD SITE

CREATIVE PACKAGING

NEW SITE

Contour interval 5 feet.
industrial land. It represents the outer limits of the site supply situation in the Roanoke Valley. Large areas are classified as having secondary potential because only portions of them are useable due to internal topographic or other physical deficiencies.

The obvious conclusion to be drawn from the map is that most of the large sites are either in Salem or the unincorporated county. The corporate city is nearly without such sites and the inner city portion is devoid. Small wonder, then, that site-seeking plants, whether new or relocated, show a net tendency to favor suburban ring sites. It is equally obvious that, so long as vacant land is desired, new and relocated plants will continue to favor the suburban ring. Only there is land space in major supply.

The situation with respect to land values is summarized in Table 23. It confirms the existence of the expected pattern, with maximum costs in the inner city, decreasing steadily to minimum levels in the unincorporated county. It reinforces the earlier conclusion that land is also more available in the suburban ring. However, it is necessary to qualify certain parts of these data. Over half of the acreage available in the outer city was in the 92-acre floodplain tract adjacent to the Roanoke Industrial Center, priced at a low $2,000 per acre. The remaining seven sites in the outer city averaged only about ten acres and the median price was about $7,800 an acre, close to that for the inner city sites. The low cost of the Roanoke Industrial Center site requires qualification because any purchaser might
<table>
<thead>
<tr>
<th>Area</th>
<th>Number of Sites</th>
<th>Total Acreage</th>
<th>Mean Acreage</th>
<th>Size Range (acres)</th>
<th>Mean Price (per acre)</th>
<th>Price Range (per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner City</td>
<td>8</td>
<td>43</td>
<td>5.4</td>
<td>1-17</td>
<td>$7,700</td>
<td>$3,000-10,000</td>
</tr>
<tr>
<td>Outer City</td>
<td>8</td>
<td>166</td>
<td>20.7</td>
<td>3-92</td>
<td>4,600</td>
<td>1,400-10,000</td>
</tr>
<tr>
<td>Vinton</td>
<td>3</td>
<td>153</td>
<td>51.0</td>
<td>2-145</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Salem</td>
<td>17</td>
<td>409</td>
<td>24.1</td>
<td>1-100</td>
<td>4,400</td>
<td>2,000-10,000</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>7</td>
<td>406</td>
<td>58.0</td>
<td>4-225</td>
<td>4,100</td>
<td>2,500-7,000</td>
</tr>
<tr>
<td>City Total</td>
<td>16</td>
<td>209</td>
<td>13.0</td>
<td>1-92</td>
<td>6,000</td>
<td>1,400-10,000</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>27</td>
<td>968</td>
<td>35.8</td>
<td>1-225</td>
<td>4,200</td>
<td>2,000-10,000</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>43</td>
<td>1,177</td>
<td>27.3</td>
<td>1-225</td>
<td>$4,900</td>
<td>$1,400-10,000</td>
</tr>
</tbody>
</table>

*Derived from an inventory prepared by the Agricultural and Industrial Development Department of the Norfolk and Western Railway. July, 1964. Includes only sites with existing rail sidings or close proximity to the railroad. If this gives the inventory bias it would be to exaggerate the central city's inventory position.*
weigh the alternatives of risking potential flood damage or of building dikes, as recommended by the U.S. Corps of Engineers after the area was flooded in 1940. Because of this the sale price of the land did not truly reflect its cost.

The figures for the unincorporated county were somewhat inflated by the existence there of the Blue Ridge Park for Industry. The 67 acres remaining vacant in that facility sold for $7,000 an acre but offered level land, installed utilities, direct access to major highways and rail lines, and protection against potential incompatible land users. Few, if any, other areas within the Roanoke Valley were of comparable quality. Excluding this tract from the unincorporated county totals would not have greatly altered the average size of sites but it would have lowered the mean price to about $3,500 an acre.

Logan, Reinemann, Linge, Alonso, and others have attributed a primary role to land values in determining the intra-urban location pattern. As obvious as it may seem, the role of site supply and cost is frequently overlooked.


26Logan, op. cit., p. 150.

27Reinemann, op. cit., p. 144.

28Linge, op. cit., p. 31.

29Alonso, op. cit., pp. 36-42.

30In a recent study of manufacturing in Lexington, Kentucky, the analysis of location factors mentioned sites only incidentally
literature on location theory, concerned as it is with a higher level of generalization, attaches little significance to this factor. Isard, for example, states that "in the case of industrial firms, outlays on land services may frequently be less critical locationally than outlays on transport, labor, power, and other inputs."\(^{31}\) This may be true in the regional framework but not in the intra-urban context. Hunker and Wright did not attempt to conceal their astonishment in finding that a "surprisingly strong factor affecting the location of industry [in Ohio] is the availability of adequate sites and/or buildings."\(^{32}\)

Planning studies, to the contrary, tend to emphasize site supply conditions (if not price), as do the multitude of promotional brochures published by every industrial development agency in the country. It seems that as the perspective of a writer of a study or brochure becomes more localized, the concern with sites increases in direct proportion. Surprisingly little is said about cost factors or their intra-urban variations. A steady decrease in costs outward from the center is presumed but rarely documented, obvious as it may seem.

Hoover and Vernon were notable exceptions. They collected data which showed that the maximum price for a 10-acre vacant

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\(^{31}\)Isard, op. cit., p. 199.

\(^{32}\)Hunker and Wright, op. cit., p. 73.
industrial site in the New York Region in 1957 was $1,300,000 and
the minimum was $30,000 in Monmouth, New Jersey. Isard not
withstanding, this level of land price differential is not to be
dismissed lightly, especially by the company interested in limit­ing
the amount of capital it must tie-up in fixed overhead. By
contrast, the differential in Roanoke for a 10-acre vacant site
was between a maximum of $100,000 in the central city and a
minimum of $20,000 in the suburban ring. The differential is not
so great as in New York but great enough to expect the plant which
has great locational freedom to take advantage of it.

In the theoretical context, land is categorized as being
physically immobile and land value differentials, being competi­
tively derived, tend to become increasingly great as the size of
the area increases. This is the major diseconomy of concen­
tration that a manufacturer can minimize through suburbanization.
This push is greatest in the large area but, while smaller in the
small area, it is still strong enough to be of consequence there.

---

33 Hoover and Vernon, op. cit., p. 259.

34 The emphasis on site cost, often surprising to the
detached observer, also can be explained by the simple fact
that the industrialist is often not able to distinguish between
alternative sites except on the basis of price. This can be a
case of all other things being equal or of the industrialist's
failure to investigate fully the many hidden costs which may
derive from a given site. The full significance of the land
value differential, however, is not its actual bearing on the
operating costs so much as it is the average industrialist's
tendency to over-emphasize it.
Power

Electricity is supplied to the Roanoke area by the Appalachian Electric Power Company, a subsidiary of the American Electric Company. An already adequate power base was greatly strengthened in 1965 with the completion of the company's Smith Mountain hydroelectric project 45 miles south of Roanoke City, adding 480,000 kilowatts of generating capacity to the system. 35

A comprehensive network of transmission lines extended the availability of this power resource throughout the Roanoke Valley. I.T.T.'s satisfaction with the manner in which AEPCo was able to meet some special power requirements indicates that the quality of power service may be of some significance in bringing an industry to an area. However, since electric power is highly mobile within the area it does not seem to be an intra-urban location factor of major consequence.

The Roanoke Gas Company supplies the area with natural gas from pipelines which connect with those of the extensive Columbia Gas System. 36 Pipelines are less flexible in distribution than are electrical transmission lines but the network of distribution lines is extensive and does not appear to place major restrictions on intra-urban plant location.

Scale of operations

Plant size, a function of the plant's level of production, derives from the type of process, the scope of the market served,

36 Ibid.
economies of scale, and other factors. The area needed for the buildings and grounds is determined by these considerations. It follows, then, that large plants will tend to favor those intra-urban areas where large sites are most plentiful and least costly. Adding to this is the tendency observed by Logan, Linge, and Black for large plants to be more self-contained and able to choose sites with less reliance on external economies. That is, large size is an additional mobility factor.

Using employment as an index of size, Table 24 summarizes the zonal distribution of plants by size and industry in the Roanoke SMSA. The greater size of suburban ring plants is obvious. Table 25 separates the locational pattern of large plants (those with more than 250 employees) from that of smaller plants and indicates the relatively greater importance to the suburban ring of the large plant, as does Table 26. This is further support for the contention made in the historical analysis that large plants are leaders in suburbanization, with smaller plants dispersing at a later stage.

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37 Logan, op. cit., p. 151.
38 Linge, op. cit., p. 35.
39 Black, op. cit., p. 221.
40 It is recognized that employment is an imperfect index of size but it is the only measure available in sufficient detail.
41 Timing of the location decision is important in this and is examined in a following section.
### TABLE 24

**AVERAGE PLANT SIZE FOR INTRA-AREA ZONES AND BY INDUSTRIES, 1964**

<table>
<thead>
<tr>
<th>S.I.C. Industry</th>
<th>Inner City</th>
<th>Outer City</th>
<th>Vinton</th>
<th>Salem</th>
<th>Unincorporated County</th>
<th>City Total</th>
<th>Suburban</th>
<th>SMSA Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>61</td>
<td>44</td>
<td>24</td>
<td>164</td>
<td>48</td>
<td>56</td>
<td>82</td>
<td>62</td>
</tr>
<tr>
<td>22</td>
<td>285</td>
<td>100</td>
<td>525</td>
<td>150</td>
<td>0</td>
<td>239</td>
<td>338</td>
<td>272</td>
</tr>
<tr>
<td>23</td>
<td>171</td>
<td>395</td>
<td>0</td>
<td>175</td>
<td>0</td>
<td>245</td>
<td>175</td>
<td>235</td>
</tr>
<tr>
<td>24</td>
<td>23</td>
<td>41</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>31</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td>255</td>
<td>71</td>
<td>0</td>
<td>490</td>
<td>75</td>
<td>218</td>
<td>214</td>
<td>216</td>
</tr>
<tr>
<td>26</td>
<td>127</td>
<td>25</td>
<td>0</td>
<td>1</td>
<td>269</td>
<td>76</td>
<td>135</td>
<td>106</td>
</tr>
<tr>
<td>27</td>
<td>58</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>43</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>28</td>
<td>8</td>
<td>90</td>
<td>0</td>
<td>8</td>
<td>21</td>
<td>8</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>445</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>445</td>
<td>50</td>
<td>247</td>
</tr>
<tr>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>160</td>
<td>0</td>
<td>160</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>32</td>
<td>26</td>
<td>28</td>
<td>0</td>
<td>103</td>
<td>44</td>
<td>27</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>33</td>
<td>32</td>
<td>62</td>
<td>0</td>
<td>29</td>
<td>285</td>
<td>50</td>
<td>114</td>
<td>74</td>
</tr>
<tr>
<td>34</td>
<td>80</td>
<td>32</td>
<td>0</td>
<td>216</td>
<td>0</td>
<td>62</td>
<td>216</td>
<td>91</td>
</tr>
<tr>
<td>35</td>
<td>11</td>
<td>32</td>
<td>0</td>
<td>46</td>
<td>0</td>
<td>19</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>2260</td>
<td>155</td>
<td>3</td>
<td>1208</td>
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<td>16</td>
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<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>16</td>
<td>16</td>
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<tr>
<td>39</td>
<td>17</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>9</td>
</tr>
</tbody>
</table>

| All Ind.       | 67         | 60         | 94     | 161   | 67                     | 65         | 123      | 82         |

| 1958<sup>b</sup> | | | | | | | | |

| 1954<sup>c</sup> | | | | | | | | |

<sup>a</sup>Derived from: Directory.

<sup>b</sup>U.S. Census of Manufactures: 1958.

<sup>c</sup>U.S. Census of Manufactures: 1954.
<table>
<thead>
<tr>
<th>Area</th>
<th>All Plants</th>
<th>Large (250 or more employees)</th>
<th>Small (fewer than 250 employees)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plants</td>
<td>Employment</td>
<td>Employment Per Plant</td>
</tr>
<tr>
<td>Inner City</td>
<td>88</td>
<td>5,936</td>
<td>67</td>
</tr>
<tr>
<td>Outer City</td>
<td>45</td>
<td>2,707</td>
<td>60</td>
</tr>
<tr>
<td>Vinton</td>
<td>7</td>
<td>660</td>
<td>94</td>
</tr>
<tr>
<td>Salem</td>
<td>30</td>
<td>4,827</td>
<td>161</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>17</td>
<td>1,140</td>
<td>67</td>
</tr>
<tr>
<td>City Total</td>
<td>133</td>
<td>8,643</td>
<td>65</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>54</td>
<td>6,627</td>
<td>123</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>187</td>
<td>15,270</td>
<td>82</td>
</tr>
</tbody>
</table>
### TABLE 26

EMPLOYMENT BY LARGE MANUFACTURING ESTABLISHMENTS, 1964

<table>
<thead>
<tr>
<th>Intra-Area Zone</th>
<th>Large Plant Employment</th>
<th>Per Cent of All Area Large Plant Employment</th>
<th>Per Cent of All Area Large and Small Plant Manufacturing Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner City</td>
<td>2,925</td>
<td>33.3</td>
<td>38.9</td>
</tr>
<tr>
<td>Outer City</td>
<td>1,195</td>
<td>13.6</td>
<td>17.7</td>
</tr>
<tr>
<td>Vinton</td>
<td>525</td>
<td>6.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Salem</td>
<td>3,573</td>
<td>40.7</td>
<td>31.6</td>
</tr>
<tr>
<td>Unincorporated County</td>
<td>554</td>
<td>6.3</td>
<td>7.5</td>
</tr>
<tr>
<td>City Total</td>
<td>4,120</td>
<td>46.9</td>
<td>56.6</td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td>4,652</td>
<td>53.1</td>
<td>43.4</td>
</tr>
<tr>
<td>SMSA</td>
<td>8,772</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Note: 57.4% of all SMSA Manufacturing employment is in large plants (250 or more employees).
Size is also related to the location of the company's home office, with non-local companies representing branch plant operations or, if the plant is the company's sole production facility, orientation to an extensive market. Five of the six largest plants listed in Table 27 are non-local concerns, suggesting a tendency for non-local plants to be suburbanization leaders among large plants.

Table 24 also documents the changes in average plant size which occurred in the 1954-1964 decade. It demonstrates the tendency for active industrial suburbanization to reduce plant size in the central city. The larger size of suburban ring plants is not accidental but represents the juxtaposition of the larger site requirements and greater self-sufficiency of the large plant on a more adequate supply of sites in the suburban ring.

Small plants were relatively unimportant in Roanoke. Only 16.3 per cent of the SMSA's manufacturing employment was in establishments with fewer than 60 employees in 1964. Most of these plants were in the central city but even there the total employment in larger plants was almost four times as great. 42

The minor role of small plants suggests several conclusions. First, small plants are frequently the scenes of

42 This is in marked contrast with New York, where 55.4 per cent of New York City's share of the New York Metropolitan Region's total manufacturing employment was in plants with fewer than 60 employees. (Hoover and Vernon, op. cit., pp. 49-50.)
TABLE 27
THE LARGEST MANUFACTURING ESTABLISHMENTS IN THE ROANOKE SMSA, 1964^d

<table>
<thead>
<tr>
<th>Establishment</th>
<th>S.I.C. Industry</th>
<th>Employment</th>
<th>Intra-Area Zone</th>
<th>Date of Present Location</th>
<th>Site Coverage (%)</th>
<th>Site Size (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Electric</td>
<td>36</td>
<td>2,260</td>
<td>Salem</td>
<td>1955</td>
<td>14</td>
<td>80</td>
</tr>
<tr>
<td>Johnson-Carper</td>
<td>25</td>
<td>1,016</td>
<td>Inner City</td>
<td>1928</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Roanoke Mills</td>
<td>22</td>
<td>750^b</td>
<td>Inner City</td>
<td>1918</td>
<td>100^b</td>
<td>.</td>
</tr>
<tr>
<td>Kenrose</td>
<td>23</td>
<td>750</td>
<td>Outer City</td>
<td>1963</td>
<td>56</td>
<td>11</td>
</tr>
<tr>
<td>Eaton, Yale &amp; Towne</td>
<td>34</td>
<td>573</td>
<td>Salem</td>
<td>1948</td>
<td>17</td>
<td>16^c</td>
</tr>
<tr>
<td>Burlington Mills</td>
<td>22</td>
<td>525</td>
<td>Vinton</td>
<td>1939</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Times-World</td>
<td>27</td>
<td>505</td>
<td>Inner City</td>
<td>1890</td>
<td>100</td>
<td>.</td>
</tr>
<tr>
<td>Rowe Furniture</td>
<td>25</td>
<td>409</td>
<td>Salem</td>
<td>1946</td>
<td>36</td>
<td>10^c</td>
</tr>
<tr>
<td>Creative Packaging</td>
<td>30</td>
<td>445</td>
<td>Outer City</td>
<td>1960</td>
<td>19</td>
<td>36</td>
</tr>
<tr>
<td>American Bridge^d</td>
<td>34</td>
<td>386^c</td>
<td>Inner City</td>
<td>1889</td>
<td>100</td>
<td>.</td>
</tr>
<tr>
<td>Roanoke Electric Steel</td>
<td>33</td>
<td>285</td>
<td>Unincorporated County</td>
<td>1955</td>
<td>.</td>
<td>20</td>
</tr>
<tr>
<td>Double Envelope</td>
<td>26</td>
<td>269</td>
<td>Unincorporated County</td>
<td>1960</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Halmode</td>
<td>23</td>
<td>268</td>
<td>Inner City</td>
<td>1963</td>
<td>80</td>
<td>.</td>
</tr>
<tr>
<td>Valleydale Packers</td>
<td>20</td>
<td>250</td>
<td>Salem</td>
<td>1936</td>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

^dDerived from the following sources:

Directory;
Questionnaires and interviews;
Large scale topographic maps of the Roanoke Valley Regional Planning Commission.

^bMain plant only.

^cEstimated.

^dClosed in 1966.
innovations of new products and processes. The relative unimportance of small plants suggests that innovation is not highly active in Roanoke. Secondly, the relatively high proportion of larger plants remaining in the Roanoke central city indicates lower pressures to relocate to the suburbs. This latter conclusion is to be expected because of the low magnitude of land value differentials in the SMSA. The push toward the suburbs is not strong. However, since small plants are more dependent on the services offered in a central area than are large plants, it follows that when small plants are not numerous the attractive forces of the inner city cannot be great, at least in terms of its effect on the intra-urban location pattern. The small number of small plants also suggests that "communications-oriented" industries are relatively unimportant in the SMSA.

Timing

The year in which a plant, particularly a large one, was established on its present site is a major consideration in revealing the size-location relationship. The longer the large plant has been in the same place the less likely it is to occupy a suburban site now. This indicates the greater availability of large sites in earlier years, a tendency to stay closer to the urban center, reduced competition from other land uses when the area was smaller, and the locational inertia that the plant soon acquired. Four of the five largest plants

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43 Locational inertia is likely to be greatest with the large plant because of a heavy investment in capital equipment
(250 or more employees) in the inner city occupied their sites prior to 1930 (Table 27). The fifth, Halmode Apparel, is a new plant which occupied Kenrose's building when the latter company relocated and provides the inevitable exception to the rule. Table 27 also indicates that these large inner city plants tend to occupy their sites with buildings almost to capacity. The major exception is Johnson-Carper Furniture which apparently had a far-sighted land acquisition policy from the beginning. Otherwise, the prevalent site crowding would suggest that further expansion of the facilities might prompt a relocation decision. 44

The two large plants in the outer city occupied their present sites after 1960, following relocations from the inner city. Kenrose went to the Roanoke Industrial Center and Creative Packaging took one of the last large industrial sites remaining in the central city.

Five of the seven large suburban ring plants occupied their sites after the Second World War. The two exceptions were the Vinton weaving mill and the Valleydale Packing Company, a slaughterhouse and meat packer. The Vinton location decision has already been described in terms of its access to the central and facilities. The relocation of equipment would be an expensive and complicated matter. One large plant spent about $300,000 in relocateing.

44 Halmode has already experienced growing pains and expanded to another vacant CBD building, several blocks from the original plant. Such spatial fragmentation of production was a temporary adjustment for several companies which ultimately relocated in order to consolidate operations under one roof.
city labor supply. The Valleydale plant has a high nuisance value and was probably forced to take a suburban site for that reason. The data on site coverage, supplemented by personal observation, give a clear picture of low site utilization by the large suburban ring plants. They were able to buy large sites because land was relatively inexpensive at the time of the purchase; they were more likely to seek large sites because they purchased them at a time when industry desired to have expansive sites; they purchased sites at a time when the local market failed to exert a centralizing influence on location.

**External economies**

Hoover and Vernon have made a lucid analysis of the locational influence of external economies. The availability of various services which may be purchased as needed, to reduce the costs of entering the field or the insecurity of being a small producer, has attracted small plants to their source areas, typically in the cores of urban areas. These external economies have been unusually important in New York, probably to an extent not duplicated anywhere else.

The role of external economies in Roanoke is much less clear but several inferences may be drawn from previous analysis. Certainly, machine shops, wholesale jobbers, and repair services do exist in Roanoke. There is, however, no particular reason for them to congregate in the inner city. The smallness of the

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SMSA frees them to locate rather freely and still be able to provide quick service. Second, external economies must be less relevant simply because small plants are relatively less numerous. Therefore, it is concluded that external economies are virtually irrelevant as location factors in the Roanoke SMSA and do not possess the centralizing influence that they have in the New York Region.

**Linkage**

The use by one firm of a large proportion or all of the output of another is industrial linkage and might reasonably be expected to bring the two facilities into close proximity. It is a variety of external economy which affects large as well as small plants. Linkage has been a factor in bringing a few plants to the Roanoke SMSA. It is especially strong in the furniture plants.

The previously cited example of Roanoke Electric Steel and the John Hancock Company is an indication that linked plants in the Roanoke SMSA do not necessarily locate within close proximity to each other. West Furniture Manufacturing, a supplier to Johnson-Carper Furniture, recently relocated from near the CBD to a plant in the outer city, on the same side of the city as Johnson-Carper but still several miles from it.

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46 As observed earlier also, the two plants are under joint ownership. Less uncertainty as to the stability of interchange between the two is presumed and the decision to congregate should have been relatively easy to obtain. That they did not makes this a particularly good example of the weakness of linkage as an intra-urban location factor.
The primary attraction for this supplier seems to have been a vacant industrial building rather than improved access to Johnson-Carper.\footnote{Ironically, the building was erected by a plant which did locate in close proximity to its linked counterpart. Stauffer Chemical Company built the plant close to Viscose and supplied it with certain chemicals. When Viscose left so did Stauffer.} The several paper box companies, one in Norwich, are not in close proximity to furniture plants although one is known to be a major supplier to them.

The examples confirm what one would expect: the smallness of the SMSA permits a relatively free flow of goods within the area, allowing linked plants to locate with respect to other considerations, such as land costs or the availability of an existing building.

Linge mentioned linkage as one of several miscellaneous intra-urban factors in Auckland.\footnote{Linge, \textit{op. cit.}, p. 34.} As he visualizes it, the persistence in one place of one component to a linked arrangement makes it more costly for the other to relocate. Or if one relocated anyway this would give the other greater incentive to follow along. Thus, linkage can act to either retard or accelerate suburbanization, at least in the large urban center.

In Roanoke it is not relevant except in the case of actual physical linkage in which case pipelines or conveyor belts might tie the facilities together and this literal type of linkage is not known to exist in the study area.
Building supply

It has been shown that a number of location decisions, such as Rowe Furniture, Wells Manufacturing, and Halmode Apparel, were conditioned by the availability of vacant industrial buildings. Presumably, pre-existing industrial buildings, because of size, arrangement, and transport access, would be the most appealing to prospective manufacturers who did not wish to erect their own facilities. Since industrialization began in the central cities one would expect them to possess a superior supply of buildings.

In light of the discussion of external economies it would seem that the significance of available structures would tend to increase as the proportion of small plants increases and they would tend to be drawn to whatever intra-urban district which possesses such space. The coming together of small plants and external economies tends to give the existence of vacant rental space a centralizing influence.

Relocations by manufacturers have created a supply of buildings in Roanoke and most of them are in the central city (Figure 13). However, it is quite apparent that they have not been a decisive factor in the intra-urban locational process. Only two of the 35 vacated facilities were occupied by other manufacturers in 1964 (Table 28). One was the already mentioned Halmode Apparel plant. The other was the building vacated by Double Envelope, which was taken by the neighboring Roanoke Mills. This expansion opportunity for Roanoke Mills
Fig. 13.--Sites vacated by relocations
<table>
<thead>
<tr>
<th>Use</th>
<th>Number of Sites</th>
<th>Per Cent in Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>2</td>
<td>5.7</td>
</tr>
<tr>
<td>Retail-Services</td>
<td>16</td>
<td>45.8</td>
</tr>
<tr>
<td>Wholesale-Warehouse</td>
<td>4</td>
<td>11.4</td>
</tr>
<tr>
<td>Vacant</td>
<td>9</td>
<td>25.7</td>
</tr>
<tr>
<td>Other (demolished, etc.)</td>
<td>4</td>
<td>11.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
alleviated a critical crowding problem and at least postponed the necessity to relocate.

As for the rest of the buildings, they have been singularly unattractive for new industrial clients. One reason was that their centrality appealed more to retail, wholesale, and service establishments. The remainder were vacant (over 25 percent) or were to be demolished. The competition from non-industrial clients probably drove the rents up beyond the levels desired by manufacturers, causing centrality to be an actual disadvantage. In any case, it is evident that the advantages of centralization, such as they were, were not sufficient to attract manufacturers to these buildings in any great numbers. This derives from the relatively small role of the small plant in Roanoke and the ease with which they can locate almost at random. Furthermore, the low rate of utilization of vacant industrial buildings is evidence that Roanoke is not providing the incubator or cradle function to any great extent. 49

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49 A certain amount of innovation probably occurs in any manufacturing area. The Graham-White Company was begun in 1914 by a former Norfolk and Western shop employee who invented a railroad sanding device. The plant was originally near the CBD but, after several moves, is now in Salem. The inner city also acted as a cradle for Creative Packaging while it was getting its product established. These events, however, are isolated and certainly the intensity of innovation is not likely to be as great as in areas such as New York. Areas the size of Roanoke are more likely to receive the "spin-off" from innovations established in large industrial centers and then sent out to lower cost centers for mass production. The I.T.T. electron tube facility represents this pattern exactly.
Capital

Capital, in terms of funds available for investment, is usually given only passing notice, if any, in considerations of intra-urban location factors. The conditions attached to borrowed funds are likely to be based on the prognosis for success by the company and there is no reason to believe that they would dictate a choice of site.

However, if the availability of capital funds becomes attached to particular parcels of land then it does acquire locational influence. The Roanoke Valley Development Corporation and the Greater Roanoke Valley Development Foundation, without apparent intentional bias, make capital available in a manner that almost inevitably favors the suburban ring. They develop sites and buildings for industrial clients and make them available on lease or lease-purchase agreements. This can be a powerful intra-urban locational inducement to the capital-short company. The development agencies concentrate on vacant land and this dictates that most of their activities will occur in the suburban ring. Their major effort has been with the Blue Ridge Park for Industry, in the unincorporated county, but they also assisted a plant which settled in Vinton. The latter company had no pre-disposition for Vinton but went there solely

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50 Capital equipment and facilities are another matter since they are relatively immobile and are thus the prime factor in locational inertia.
because land and a new building were made available on a lease-purchase basis by the development agencies.

The Roanoke Industrial Center is a similar activity except that it is committed to the development of a specific site. Several clients occupy space there on leases. The capital assistance represented by the center is now about ended since it is nearly filled. The R.V.D.C. and the G.R.V.D.F. continue to seek out clients and match them with sites. With sites more abundant in the suburban ring, they will continue to act as instruments of suburbanization.

Roanoke City Council seems to be in the process of establishing an Industrial Authority which will be authorized to issue revenue bonds to help finance industrial activity. It is unclear how the proposed authority will use its funds and, given a probable jurisdictional limit of the corporate city and the meager supply of sites in the city, it remains to be seen whether the authority will be able to exert significant intra-urban locational influence.

Governmental activity

Local government officials generally favor continued industrial growth, as indicated by the interest in establishing an Industrial Authority and the city's contribution to the Blue Ridge Park for Industry. To some industrialists this represented a change from as recently as the 1940's when city government was felt to have displayed an uncooperative attitude. Some still complain of the quality of local government services but agreed
that local bodies were cooperating with industry. However, the recent election of a mayor whom some suspect of pro-labor sentiments was a matter of concern to several industrial officials. They feared that this might adversely affect the area's "business climate."

Beyond cooperation, governmental activity is felt mostly in terms of local tax variations. However, the wise industrialist weighs the quality of community facilities against taxes paid rather than simply seeking to minimize taxes.

Local taxes are confined to those on real estate and on tools and machinery. Table 29 summarizes local tax rates but they must be viewed with caution since assessment rates vary. A definite differential appears to exist if one assumes equal value and assessment for a property but, since land values are lower in the suburban ring, the differential is even greater, in fact, than the rates would suggest. The value of structures

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51 A more impressive example of recent governmental cooperation was contained in a story related to the author by a responsible official. A very large manufacturer expressed interest in locating in the SMSA on a suburban site but the site was without road access or utilities. Within an afternoon several local governmental units pledged to spend over $1,000,000 on the necessary improvements. Unfortunately the company decided to locate elsewhere because of an inadequate supply of certain labor skills in Roanoke.

52 The subject of taxes can have more emotional impact than it merits or, as succinctly stated by Hoover and Vernon, it "is a subject steeped in pure emotion and impure data . . . ." (Hoover and Vernon, op. cit., p. 51).
TABLE 29
LOCAL TAX RATES ON REAL ESTATE, TOOLS AND MACHINERY²

<table>
<thead>
<tr>
<th>Area</th>
<th>Rate Per $100 Assessed Value</th>
<th>Average Effective Tax Rate Per $100 True Value (Real Estate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unincorporated county</td>
<td>$2.25</td>
<td>$0.74</td>
</tr>
<tr>
<td>Salem</td>
<td>3.00</td>
<td>0.99</td>
</tr>
<tr>
<td>Vinton</td>
<td>3.25</td>
<td>1.07</td>
</tr>
<tr>
<td>City</td>
<td>3.45</td>
<td>1.19</td>
</tr>
</tbody>
</table>

²Economic Data, Roanoke County, p. 10.
probably varies less with intra-urban location. Despite this qualification, it is instructive to examine variations in tax levies on a plant with an assumed true market valuation of $100,000. Applying assessment rates and tax rates to this value yields real estate tax payments ranging from a low of $740 annually in the unincorporated county to a high of $1,194 a year in the City of Roanoke.

Machinery and tools are taxed at the same rates as real estate but again assessment rates vary. The City of Roanoke assesses them at cost for the first year, at 60 per cent during the second year and drops the rate 10 per cent every year thereafter until after five years a rate of 20 per cent of purchase price is reached and maintained throughout the life of the equipment. In the suburban ring 60 per cent of the value of machinery and tools as carried on company books is used as the assessment value. This probably tends to allow suburban ring plants to report lower assessments. If it may be assumed that a new plant (the one with real estate valued at $100,000) goes into business with $50,000 worth of tools and machinery and carries this amount on its books for the first year, it is possible to crudely approximate the magnitude of local tax differentials. This is done in Table 30.

Clearly a differential exists, with the plant in the unincorporated county paying only 55 per cent of the amount required in the city. However, the magnitude of this contrast should not be over-stated. In this example the maximum absolute differential is just over $1,000 a year and will drop sharply
### TABLE 30

**LOCAL TAXES PAID BY A HYPOTHETICAL PLANT**

<table>
<thead>
<tr>
<th>Area</th>
<th>Real Estate&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Tools &amp; Machinery&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unincorporated county</td>
<td>$740</td>
<td>$675</td>
<td>$1,415</td>
</tr>
<tr>
<td>Salem</td>
<td>990</td>
<td>900</td>
<td>1,890</td>
</tr>
<tr>
<td>Vinton</td>
<td>1,070</td>
<td>975</td>
<td>2,045</td>
</tr>
<tr>
<td>City</td>
<td>1,194</td>
<td>1,350</td>
<td>2,544</td>
</tr>
</tbody>
</table>

<sup>a</sup>Assumed true market value of $100,000.

<sup>b</sup>Assumed cost and book value of $50,000.
in subsequent years as the assessments on tools and machinery are lowered. The feeling of all of the interviewed executives was that local tax differentials were too small to be of primary locational significance.

The logic of this conclusion is augmented by considerations of poorer governmental services which are available in those areas which collect the least taxes. For example, fire insurance on an equivalent industrial structure would be 30-35 per cent higher in the unincorporated county than in the city and 20 per cent higher in Salem.53 The City of Roanoke has a full-time professional fire department, Salem's is also professional but of lower quality, and the unincorporated county is served by volunteer fire stations.

Important differences also exist in the costs of water and sewerage. The City of Roanoke and Salem water departments supply water to customers beyond their corporate limits but a substantial surcharge is levied, 50 per cent by the city. An industrial customer with a four-inch connection would pay $35.59 for 10,000 cubic feet of water in the city but it would cost $53.38 if the customer were not in the city.54 If this was the plant's monthly consumption it would pay $162.00 less annually in the city than without, despite a 12 per cent city utility tax. Sewerage is charged at 40 per cent of the water usage. Table 31

53 Interview with John M. Chaney, Casualty and Fire Insurance agent, August, 1964.

TABLE 31
ANNUAL CHARGE FOR WATER AND SEWERAGE, 1964<sup>a</sup>

<table>
<thead>
<tr>
<th>Servicing Area</th>
<th>Customer Within Corporate Limits</th>
<th>Customer Beyond Corporate Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water</td>
<td>Sewerage</td>
</tr>
<tr>
<td>City</td>
<td>$402.12</td>
<td>$160.85</td>
</tr>
<tr>
<td>Salem</td>
<td>203.28</td>
<td>219.96</td>
</tr>
<tr>
<td>Vinton</td>
<td>401.40</td>
<td>93.55</td>
</tr>
</tbody>
</table>

<sup>a</sup>Assumed industrial customer on a 4" line using 10,000 cubic feet per month (about 900,000 gallons annually).
summarizes water and sewerage cost differentials for the various intra-urban zones on the above consumption levels. The alternative is to dig wells and install one's own sewage treatment facility and, if feasible, this could be expensive. Economies of scale would tend to make this alternative more practical for large plants, exemplifying the large unit's relative freedom from external economies.

The apparent cost advantages offered by a Salem location are available only for moderate water users. A city-based plant consuming one million gallons monthly would pay $200 a year less for water and sewerage than would a Salem equivalent despite the city utility tax. In fact, it might not be possible for the smaller Salem system to supply such a quantity.

Differentials in other community services are virtually impossible to measure, especially since a large proportion of educational expenses are met from taxes collected at the state level. Public recreational facilities are available to all regardless of place of residence and, in fact, some city parks are more accessible to suburban ring residents than they are to many in the city.\(^55\)

It seems, then, that tax differentials are roughly cancelled by an inverse relationship with the quality-cost of community services and that local taxes, therefore, are not a significant intra-urban location factor.

\(^55\)Roanoke, Department of City Planning, Parks Playgrounds Open Spaces, 1963.
The large urban area probably has a more complicated local tax structure and the influence of this factor in unclear. Commonly, it is felt that the influence of local tax differentials is felt only when a site must be chosen from several otherwise equally satisfactory alternatives. However, Black found that in Detroit those plants which wished to leave the city cited taxes as the reason more often than any other single factor, including space. He did not make clear the extent of local tax variations or whether these were state taxes and the company was thinking of leaving Michigan, not just Detroit. It may be just another example of the emotional impact of taxes.

Summary

Suburbanization is a growth process which results when plants are unable to adjust to a site which has become inadequate and cannot enlarge it economically. The central city of the Roanoke SMSA does not offer any functional attractions for most manufacturers so they select a new site in the suburban ring, largely on the basis of land values. New plants select sites in much the same way and also demonstrate a net tendency to favor the suburbs. A major consideration in the suburbanization process is the high level of mobility which has been attained

56 Whatever the influence of taxes, the differentials in state and local taxes found in the New York Metropolitan Region are diminishing (Hoover and Vernon, op. cit., pp. 51-56).

57 Hunker and Wright, op. cit., p. 92.

58 Black, op. cit., pp. 221-222.
by the various factors of production. The small size of the Roanoke SMSA accentuates the mobility of the advantages which the urban concentration offers.

The greater size of the large city somewhat reduces the mobility of the advantages of concentration. The relative prevalence of small plants and their need for external economies ties a significant proportion of manufacturing to core or inner city locations in large metropolitan areas. The functional attractions of the large cities also relate to their relatively large local markets and to their roles as cradles and incubators for new plants. Although the locational mobility of the advantages of concentration, such as external economies and local markets, is increasing, large urban centers will probably continue to attract a substantial number of manufacturing establishments to their core areas. These plants will locate on centralized sites despite the relatively high land values found in core areas. The communications-oriented industries, functionally tied to the centers of business activity, are another element of large city centralized location.

The functional ties of industries with the center of business are as weak in Roanoke as they are strong in large urban centers and, even if they were strong, the small area of the Roanoke SMSA would allow center-oriented plants to locate in the suburbs without necessarily impairing close CBD bonds.
Greater land value differentials and more intense congestion generally exert greater pressure on the large city plant to seek a suburban site. These forces caused suburbanization to occur in the large metropolitan area as soon as factor mobility became great enough to permit it. Left behind were a host of small plants which depended on close proximity to the center or needed a higher degree of factor mobility before they could leave it. In Roanoke, lower land value differentials exerted less pressure to suburbanize and so the undesirability of a central city location developed more slowly. Plants were not compelled to relocate even though factor mobility was great enough to permit a suburban location. However, once a new site was needed there was nothing positive about the inner city to counteract the attractions of lower land values in the suburban ring. New plants, unencumbered by locational inertia, more quickly responded to land value differentials, the lack of functional ties with the CBD, and the greater locational freedom offered by factor mobility to concentrate on suburban ring sites. As time goes on manufacturing plants will continue to locate in the suburbs for the same reasons. Locational inertia will keep some plants in the inner city for a time but, once it is overcome, these plants will also show a net tendency to disperse to the suburbs.

In summary, the push toward the suburbs is stronger in the large urban center but so are the pulls toward the center. The pushes are weaker in Roanoke but the pulls of the center are almost absent. It is the balance between these two sets of
forces which will determine the eventual extent of suburbanization, not the absolute level of one. As a result, the future may see manufacturing become even more heavily suburbanized in the small concentration than in the large one. The implications for the small city may be profound and demand further study. More research is needed in order to broaden the findings of the present study because Roanoke is only one SMSA and generalizations based on one case study are weak to that extent. However, the findings do suggest that the nature and intensity of suburbanization are related to the size of the area but not in the manner usually expected.

The Effects of Suburbanization

The tendency for manufacturing activity to concentrate increasingly in the suburban ring is re-ordering the structure of land uses in the SMSA and reducing the relative importance of manufacturing in the central city. These effects are obvious but what is not clear is the manner in which suburbanization is changing the income quality of industries remaining in the central city. It was observed earlier that industrial wage levels are higher in the suburban ring than in the central city and that the differential has become greater in recent years. The role of suburbanization in producing this differential now merits closer examination.

Method of analysis

In order to make such an analysis it is necessary to assume that an industry's wage level is determined by the nature
and value of its product, the processes used in fabrication, and the quality of labor used. If this be the case then it can be further assumed that the relative level of wages paid by an industry will hold throughout the economy. Regional variations in wage rates will and do occur but, in a general sense, the variations will apply to all industries in an area. Industries which pay relatively high wages throughout the nation will probably pay relatively high wages in a specific area, even if the absolute level of the wages is lower due to regional variations. Thus, while factors such as regional labor immobility may determine absolute variations in wages, the industrial "mix" of a particular concentration would determine the relative wage level of the manufacturing component of the local economy. If most of the employment is in high wage industries then an area will have a high wage industrial complex. The assumption of a nearly constant relative wage level, however, can be valid only to the extent that the plants which make up an industry are closely similar in product, process, and labor requirements. Therefore, an industrial classification that is more detailed than the S.I.C.'s twenty major industries is required. For this study the three-digit S.I.C. industries are used, largely because data for the even more detailed four-digit industries are incompletely reported. There are 137 three-digit industries recognized in the United States and 61 of these occur in the Roanoke SMSA.

Mean annual wages-salaries paid by the 137 three-digit industries were calculated by dividing total employment into
On this basis the mean annual wage-salary paid by all manufacturers in 1962 was $4,875. By examination of the distribution of wage levels it appeared that groupings based on $400 variations from the mean would yield seven groupings, enough for analysis without creating an unwieldy array of groups.

Industries with mean annual wage levels not more than $200 above or below the national mean were categorized as being average. Three sub-average groupings and three higher than average groups were also recognized. Table 32 gives the wage-level ranges used for each group. Each three-digit industry in Roanoke was classified according to this system and changes in the employment distribution between the intra-urban zones were identified for the 1960-1964 period. A ratio was developed to simplify the analysis. It was derived by giving each wage-level industry a numerical value, 7.0 for the very high

59Data were obtained from the 1962 Annual Survey of Manufactures because at the time of analysis the data reported by the 1963 Census of Manufactures were incomplete (U.S., Bureau of the Census, Annual Survey of Manufactures: 1962).

60The term wage is used for convenience although the data do include both wages and salaries. Part-time workers constitute a source of error in this calculation but they are not necessarily more common in one industry than another.

61The idea of this approach was inspired by the standards developed by Alderfer and Michl, op. cit., pp. 9-11.

62The analysis was limited to this period because detailed employment data were available for those two years only. It was taken from the industrial directories of the Roanoke Chamber of Commerce (Directory, 1964, and Directory, 1960).
TABLE 32
RANGES OF ANNUAL WAGE-SALARIES USED
IN DETERMINING THE WAGE-LEVEL
CLASSIFICATION OF
INDUSTRIES

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>Range of Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Above $5,876</td>
</tr>
<tr>
<td>High</td>
<td>$5,476 - 5,875</td>
</tr>
<tr>
<td>Above average</td>
<td>5,076 - 5,475</td>
</tr>
<tr>
<td>Average</td>
<td>4,675 - 5,075</td>
</tr>
<tr>
<td>Below average</td>
<td>4,275 - 4,674</td>
</tr>
<tr>
<td>Low</td>
<td>3,875 - 4,274</td>
</tr>
<tr>
<td>Very low</td>
<td>Below $3,874</td>
</tr>
</tbody>
</table>
group and 1.0 for the very low. An area's wage-level industrial mix can be characterized by multiplying each industry's employment by its wage-level numerical value, summing the results, and dividing by the area's total manufacturing employment. The extent of the departure of the area's ratio from the mean value of 4.0 indicates the degree to which the area has a high or low wage mix of industries.

**Inter-zonal changes, 1960 and 1964**

Table 33 summarizes the intra-urban distribution of employment in the various wage-level industries in both 1960 and 1964. Table 34 provides a percentage distribution of the same data. Examination of these data indicates that important shifts were taking place even in the short time interval observed. The inner city, which underwent an absolute decline in employment, experienced the greatest losses in the lower end of the scale and a modest gain in the upper levels. The outer city gained most heavily in the low and very low categories. As a result the central city experienced a net employment increase for the period but only in the lowest level and the two lowest groups increased their proportions from 49.0 to 55.4 per cent.

The suburban ring showed its greatest increases in the higher levels and the only loss occurred in the very low category. As a result the greater than average groups increased their shares from 38.8 to 45.0 per cent during the period.

The wage-level ratios in Table 35 indicate the same shifting pattern in favor of the suburbs. In the context of
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner City</td>
<td></td>
<td>Very High</td>
<td>High</td>
<td>Above</td>
<td>Average</td>
<td>Average</td>
<td>Below</td>
<td>Average</td>
<td>Low</td>
<td>Very</td>
<td>Low</td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>78</td>
<td>737</td>
<td>878</td>
<td>1,066</td>
<td>436</td>
<td>374</td>
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<td></td>
<td>6,393</td>
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</tr>
<tr>
<td>1964</td>
<td></td>
<td>25</td>
<td>809</td>
<td>905</td>
<td>813</td>
<td>383</td>
<td>316</td>
<td>2,685</td>
<td></td>
<td>5,936</td>
<td></td>
</tr>
<tr>
<td>Outer City</td>
<td></td>
<td>28</td>
<td>23</td>
<td>446</td>
<td>79</td>
<td>204</td>
<td>488</td>
<td>144</td>
<td></td>
<td>1,412</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>4</td>
<td>110</td>
<td>496</td>
<td>87</td>
<td>223</td>
<td>799</td>
<td>979</td>
<td></td>
<td>2,707</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>0</td>
<td>5</td>
<td>11</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>623</td>
<td></td>
<td>759</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>62</td>
<td>2</td>
<td>9</td>
<td>59</td>
<td>3</td>
<td>0</td>
<td>535</td>
<td></td>
<td>660</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td></td>
<td>0</td>
<td>5</td>
<td>11</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>623</td>
<td></td>
<td>759</td>
<td></td>
</tr>
<tr>
<td>Salem</td>
<td></td>
<td>99</td>
<td>70</td>
<td>1,805</td>
<td>888</td>
<td>145</td>
<td>156</td>
<td>846</td>
<td></td>
<td>4,009</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>163</td>
<td>95</td>
<td>2,336</td>
<td>859</td>
<td>160</td>
<td>216</td>
<td>968</td>
<td></td>
<td>4,827</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td></td>
<td>130</td>
<td>0</td>
<td>0</td>
<td>239</td>
<td>0</td>
<td>73</td>
<td>242</td>
<td></td>
<td>684</td>
<td></td>
</tr>
<tr>
<td>Unincorporated</td>
<td></td>
<td>285</td>
<td>1</td>
<td>0</td>
<td>419</td>
<td>0</td>
<td>243</td>
<td>190</td>
<td></td>
<td>1,140</td>
<td></td>
</tr>
<tr>
<td>County</td>
<td></td>
<td>130</td>
<td>0</td>
<td>0</td>
<td>239</td>
<td>0</td>
<td>73</td>
<td>242</td>
<td></td>
<td>684</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>285</td>
<td>1</td>
<td>0</td>
<td>419</td>
<td>0</td>
<td>243</td>
<td>190</td>
<td></td>
<td>1,140</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td></td>
<td>285</td>
<td>1</td>
<td>0</td>
<td>419</td>
<td>0</td>
<td>243</td>
<td>190</td>
<td></td>
<td>1,140</td>
<td></td>
</tr>
<tr>
<td>City Total</td>
<td></td>
<td>106</td>
<td>760</td>
<td>1,324</td>
<td>1,145</td>
<td>640</td>
<td>862</td>
<td>2,968</td>
<td></td>
<td>7,805</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>29</td>
<td>928</td>
<td>1,401</td>
<td>900</td>
<td>606</td>
<td>1,115</td>
<td>3,664</td>
<td></td>
<td>8,643</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td></td>
<td>229</td>
<td>75</td>
<td>1,816</td>
<td>1,247</td>
<td>145</td>
<td>229</td>
<td>1,711</td>
<td></td>
<td>5,452</td>
<td></td>
</tr>
<tr>
<td>Suburban Ring Total</td>
<td></td>
<td>229</td>
<td>75</td>
<td>1,816</td>
<td>1,247</td>
<td>145</td>
<td>229</td>
<td>1,711</td>
<td></td>
<td>5,452</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td>510</td>
<td>98</td>
<td>2,375</td>
<td>1,337</td>
<td>163</td>
<td>461</td>
<td>1,683</td>
<td></td>
<td>6,627</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td></td>
<td>335</td>
<td>835</td>
<td>3,140</td>
<td>2,392</td>
<td>785</td>
<td>1,091</td>
<td>4,679</td>
<td></td>
<td>13,257</td>
<td></td>
</tr>
<tr>
<td>SMSA Total</td>
<td></td>
<td>539</td>
<td>1,026</td>
<td>3,776</td>
<td>2,237</td>
<td>769</td>
<td>1,576</td>
<td>5,347</td>
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<td>15,270</td>
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</tr>
</tbody>
</table>
### TABLE 34

PERCENTAGE DISTRIBUTION OF MANUFACTURING EMPLOYMENT BY
WAGE-LEVEL OF INDUSTRY, 1960 AND 1964

<table>
<thead>
<tr>
<th>Area</th>
<th>Very High</th>
<th>High</th>
<th>Above Average</th>
<th>Average</th>
<th>Below Average</th>
<th>Low</th>
<th>Very Low</th>
<th>Total Employment</th>
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<tbody>
<tr>
<td>Inner City</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>1.2%</td>
<td>11.5%</td>
<td>13.7%</td>
<td>16.7%</td>
<td>6.8%</td>
<td>5.9%</td>
<td>44.2%</td>
<td>6,393</td>
</tr>
<tr>
<td>1964</td>
<td>0.4</td>
<td>13.6%</td>
<td>15.2%</td>
<td>13.7%</td>
<td>6.5</td>
<td>5.3</td>
<td>45.3</td>
<td>5,936</td>
</tr>
<tr>
<td>Outer City</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>2.0</td>
<td>1.6%</td>
<td>31.6%</td>
<td>5.6%</td>
<td>14.4</td>
<td>34.6</td>
<td>10.2</td>
<td>1,412</td>
</tr>
<tr>
<td>1964</td>
<td>0.1</td>
<td>4.4%</td>
<td>18.3%</td>
<td>3.2%</td>
<td>8.2</td>
<td>29.5</td>
<td>36.2</td>
<td>2,707</td>
</tr>
<tr>
<td>Vinton</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>0</td>
<td>0.7%</td>
<td>1.4%</td>
<td>15.8%</td>
<td>0</td>
<td>0</td>
<td>82.1</td>
<td>759</td>
</tr>
<tr>
<td>1964</td>
<td>9.4</td>
<td>0.3%</td>
<td>1.4%</td>
<td>8.9%</td>
<td>0.5</td>
<td>0</td>
<td>79.5</td>
<td>660</td>
</tr>
<tr>
<td>Salem</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>2.5</td>
<td>1.7%</td>
<td>45.0%</td>
<td>22.2%</td>
<td>3.6</td>
<td>3.9</td>
<td>21.1</td>
<td>4,009</td>
</tr>
<tr>
<td>1964</td>
<td>3.4</td>
<td>2.0%</td>
<td>48.9%</td>
<td>17.8%</td>
<td>3.3</td>
<td>4.5</td>
<td>20.1</td>
<td>4,827</td>
</tr>
<tr>
<td>Unincorporated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>19.0</td>
<td>0</td>
<td>0</td>
<td>34.9%</td>
<td>0</td>
<td>10.7</td>
<td>35.4</td>
<td>684</td>
</tr>
<tr>
<td>1964</td>
<td>25.0</td>
<td>0.1%</td>
<td>0</td>
<td>36.7%</td>
<td>0</td>
<td>21.5</td>
<td>16.7</td>
<td>1,140</td>
</tr>
<tr>
<td>City Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>1.4</td>
<td>9.7%</td>
<td>17.0%</td>
<td>14.7%</td>
<td>8.2</td>
<td>11.0</td>
<td>38.0</td>
<td>7,805</td>
</tr>
<tr>
<td>1964</td>
<td>0.3</td>
<td>10.7%</td>
<td>16.2%</td>
<td>10.4%</td>
<td>7.0</td>
<td>12.9</td>
<td>42.5</td>
<td>8,643</td>
</tr>
<tr>
<td>Suburban</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>4.2</td>
<td>1.4%</td>
<td>33.2%</td>
<td>22.9%</td>
<td>2.7</td>
<td>4.2</td>
<td>31.4</td>
<td>5,452</td>
</tr>
<tr>
<td>1964</td>
<td>7.7</td>
<td>1.5%</td>
<td>35.8%</td>
<td>20.2%</td>
<td>2.4</td>
<td>7.0</td>
<td>25.4</td>
<td>6,627</td>
</tr>
<tr>
<td>SMSA Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>2.5</td>
<td>6.3%</td>
<td>23.7%</td>
<td>18.0%</td>
<td>5.9</td>
<td>8.2</td>
<td>35.4</td>
<td>13,257</td>
</tr>
<tr>
<td>1964</td>
<td>3.5</td>
<td>6.7%</td>
<td>24.8%</td>
<td>14.6%</td>
<td>5.0</td>
<td>10.3</td>
<td>35.1</td>
<td>15,270</td>
</tr>
</tbody>
</table>
### Table 35

**Industry Wage-Level Ratios of SMSA Zones, 1960-1964**

<table>
<thead>
<tr>
<th>Area</th>
<th>1960</th>
<th>1964</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner City</td>
<td>2.89</td>
<td>2.91</td>
<td>-0.02</td>
</tr>
<tr>
<td>Outer City</td>
<td>3.27</td>
<td>2.51</td>
<td>-0.76</td>
</tr>
<tr>
<td>Vinton</td>
<td>1.57</td>
<td>1.91</td>
<td>-0.34</td>
</tr>
<tr>
<td>Salem</td>
<td>3.81</td>
<td>3.91</td>
<td>-0.10</td>
</tr>
<tr>
<td>Unincorporated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>3.29</td>
<td>3.82</td>
<td>-0.51</td>
</tr>
<tr>
<td>City Total</td>
<td>2.96</td>
<td>2.78</td>
<td>-0.18</td>
</tr>
<tr>
<td>Suburban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring Total</td>
<td>3.43</td>
<td>3.68</td>
<td>-0.25</td>
</tr>
<tr>
<td>SMSA Total</td>
<td>3.16</td>
<td>3.18</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

**Note:** The scale ranges between 1.0 and 7.0, with 4.0 as the national mean.
a slight increase for the SMSA, the suburban ring made a substantial gain in all of its parts while the central city was declining further from an already low level.63

The role of suburbanization

Changes in employment at a plant or its closure will cause the industrial mix of an area to change, as weighted by employment, and thus change the wage-level composition of industries in the area. Therefore, temporal shifts in the wage-level ratio do not necessarily establish that relocated and new plants, the active suburbanization elements, caused the shift. Therefore, it is necessary to isolate their contribution before the role of suburbanization in changing the wage-level composition of industry in the area can be identified.

Plants relocated from the central city to the suburban ring had a wage-level ratio of 2.85 (Table 36). This slightly exceeds the ratio prevalent in the central city but falls well below that of the suburban ring. Relocations, then, have lowered the city's wage-level composition by leaving but have also held down the suburban ring's ratio since they increased employment at the lower end of the scale.

63 This analysis was prepared before the announcement of the closing of the American Bridge facility. It belonged to an above average (5.0) wage-level industry so the loss of this plant will greatly lower the wage-level composition of inner city industries. The Eaton, Yale and Towne location in the outer city will compensate for the number of jobs lost by the central city but not completely for the decline in wage-level composition because it belongs to an average (4.0) wage-level industry.
TABLE 36

WAGE-LEVEL OF PLANTS RELOCATED FROM THE CENTRAL CITY
TO THE SUBURBAN RING, 1940-1964

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>1964 Employment</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>142</td>
<td>14.4</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>0.6</td>
</tr>
<tr>
<td>Above average</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Average</td>
<td>269</td>
<td>27.5</td>
</tr>
<tr>
<td>Below average</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Low</td>
<td>129</td>
<td>13.1</td>
</tr>
<tr>
<td>Very low</td>
<td>435</td>
<td>44.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>981</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Note: Wage-level ratio: 2.85.
A markedly different picture emerges with plants new to the area in 1950-1964. Those which came into the central city were apparently seeking low-wage labor, having a ratio of 2.56, well below that for the central city as a whole (Table 37). Over 32 per cent of the new plant employment was in apparel and textile mills.

Table 38 contains dramatic proof of the role of suburbanization, particularly that of the new plant element, in bringing about the growing differential between central city and suburban ring. With a ratio of 4.80, the suburban ring new plants have greatly increased the suburban ring's industrial income picture during the same time that the central city was having its wage-level composition depressed by new plant employment. It is further significant that the suburban ring new plants employed twice as many people as did those in the central city.64

Implications for Public Policy

The suburbanization of manufacturing activities is causing the central city to lose jobs and tax revenues. Industries which remain in it are predominately of a low-wage variety. Unused vacant industrial buildings may lead to the formation of industrial slums. Therefore, it is pertinent to consider briefly a possible policy response to suburbanization. Should redevelopment efforts be directed toward recovering industrial sites and

64 The large G.E. plant contributed heavily to the new plant employment in the suburban ring but it did not cause the increase in the wage-level ratio. The other new plants had a healthy 4.74 ratio, so the increase was general.
**TABLE 37**

WAGE-LEVEL OF CITY-BASED NEW PLANTS, 1950-1964

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>Employment, 1964</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>High</td>
<td>125</td>
<td>7.7</td>
</tr>
<tr>
<td>Above average</td>
<td>97</td>
<td>6.0</td>
</tr>
<tr>
<td>Average</td>
<td>231</td>
<td>14.3</td>
</tr>
<tr>
<td>Below average</td>
<td>89</td>
<td>5.5</td>
</tr>
<tr>
<td>Low</td>
<td>629</td>
<td>39.7</td>
</tr>
<tr>
<td>Very low</td>
<td>432</td>
<td>26.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,603</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Wage-level Ratio: 2.56
### TABLE 38

**WAGE-LEVEL OF SUBURBAN RING - BASED NEW PLANTS, 1950-1964**

<table>
<thead>
<tr>
<th>Wage Level</th>
<th>Employment, 1964</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>336</td>
<td>10.5</td>
</tr>
<tr>
<td>High</td>
<td>88</td>
<td>2.7</td>
</tr>
<tr>
<td>Above average</td>
<td>2,313</td>
<td>72.3</td>
</tr>
<tr>
<td>Average</td>
<td>165</td>
<td>5.1</td>
</tr>
<tr>
<td>Below average</td>
<td>3</td>
<td>0.1</td>
</tr>
<tr>
<td>Low</td>
<td>269</td>
<td>8.3</td>
</tr>
<tr>
<td>Very low</td>
<td>32</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,206</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Wage-level Ratio: 4.80
other blighted land in the central city for the purpose of attracting industry to return? It is obvious to the casual observer that there are areas in the central city which are in need of renewal of some variety. A substantial amount of slum-quality land lies adjacent to the main railroad yards but renewal efforts would be so expensive that private developers are unlikely to attempt them. Public investment would be required and it is by no means certain that the investment would be wise. The most expensive vacant industrial sites in the Roanoke SMSA were shown to carry asking prices of only $10,000 an acre and it is very unlikely that land encumbered with buildings could be redeveloped into industrial sites and resold at anything like that price. To hold the sale price to such a low level would require heavy subsidization, more so if land costs are to be made competitive with suburban ring sites. Redeveloped land would probably be attractive for certain wholesaling, warehousing, and service functions which need centralized locations and can pay higher costs than a manufacturer.

The inner city has little or no functional attraction for manufacturers, certainly not enough for them to justify the higher land values associated with the central city. That is, once the cleared land is subsidized to the point that it is directly cost-competitive with suburban land the city starts out even in the competition. The potential industrial client is presented with another alternative but one without inherent superiority. There would be no guarantee that any plants would utilize the sites which were cleared at such great expense to
the public. Some public action aimed at preventing the spread of industrial slums may be necessary but redevelopment projects designed primarily to attract manufacturers are probably unwise and unrealistic.

Failure to be aware of, much less understand, the suburbanization of manufacturing can lead to debatable conclusions. This is illustrated in Roanoke City's recent general land use plan. The author of the plan, a professional planner, apparently unaware of the decline of manufacturing employment in the city and its implications, accepted projections which called for central city manufacturing employment to increase by 1,800 persons between 1964 and 1980. Based on an assumed ratio of 25 workers per acre, this led to a projected need for 72 new acres in manufacturing uses. This compares with the 807 acres

65 Roanoke, Department of City Planning, A Development Plan for Roanoke, 1964.

66 The projection of land use needs based on net employment gains is open to question. Obviously, it is assumed that all of the net increase of 1,800 jobs will take place in new plants, ignoring increases in existing plants. Expansion of production in existing facilities can take place without major site expansions. Also, net increases involve the balance between gains and losses. It has been demonstrated that new plants are reluctant to occupy vacated industrial buildings. It is possible for no net increase in employment to occur and still there could exist need for new industrial sites. If one company went out of business and a new one began operations at the same employment level, the new plant might utilize a vacant site while the vacated structure stays empty. Therefore, it cannot be assumed that only net increases in manufacturing employment can cause increases in land space requirements. In fact, the analysis of the relocation process suggests that additional sites will be needed if the city is to hold what it has, much less accommodate increases. However, the implication of the analysis is that the central city will continue to show absolute losses so the projected increase of 1,800 jobs is probably fallacious.
already in use by manufacturers, wholesalers, shippers, and utilities.\textsuperscript{67} Another 593 acres is proposed to accommodate these non-manufacturing activities and to provide a reserve for manufacturing. Provision of this land is to be accomplished "through the redevelopment of obsolete, deteriorating areas, and, to a limited degree, through the creation of new sites from vacant ground."\textsuperscript{68} The lack of comprehension of the suburbanization process is demonstrated in statements such as "large tracts of prime land can be carved out of the blighted fabric of the city with the aid of urban renewal and placed on the market at prices which would be highly competitive with land in the county."\textsuperscript{69} It is the opinion of the author of the present study that such views are unsound and a poor guide to action programs, insofar as they refer to manufacturing.\textsuperscript{70}

\textsuperscript{67} Ibid., pp. 71-72.
\textsuperscript{68} Ibid., p. 87.
\textsuperscript{69} Ibid., p. 68.
\textsuperscript{70} Even in New York, where a strong functional tie with the core exists, recapture of encumbered industrial sites is considered to be unrealistic (Hoover and Vernon, \textit{op. cit.}, p. 32).
CHAPTER VI

SUMMARY

Suburbanization is a process which, operating through time, causes manufacturing activities to grow more rapidly in the periphery of an urban area than in the center. It represents the industrialist's answer to the diseconomies of concentration. Increased mobility of the various productive factors allows the industrialist to avoid the high land values of the central city without suffering serious diseconomies.

The working of the suburbanization process has become well understood as a result of studies of a few large metropolitan areas. The present study questions the applicability of the findings of such studies to the small metropolitan area. The differences are viewed in terms of a different ordering of economic inter-relationships in the small area and the obvious fact of smaller size. Other studies, extrapolating the large area experience, conclude that pressures to suburbanize are direct functions of size and that, therefore, suburbanization decreases in intensity with decreasing size. What is overlooked is the fact that the diseconomies of concentration may develop along with an increasing level of economic advantage. The large area may possess strong pushes to the suburbs but the pull
toward the center is even stronger for some companies. The push-
ing (suburbanizing) pressures of the small area are probably
less but it does not necessarily follow that the pulls toward
the center (centralizing forces) are strong or, indeed, even
existant. It is the balance between these forces, tempered by
inertia, which determines the locational trends of industry
within the intra-urban framework.

Previous general studies of suburbanization demonstrated
the need for more specific area knowledge: the present study was
conducted in the context of a case study approach. The Roanoke,
Virginia SMSA, with a population of 157,764 in 1960 and over
15,000 manufacturing employees, was selected for study.

The study area has developed a manufacturing economy
based largely on a situation advantage and derived cultural
resources rather than any particular earth raw material. The
initial impetus to urbanization and industrialization came in
1881 with the location in the Roanoke Valley of a major rail-
road junction and a related railroad shop facility. The area
grew rapidly as a primary iron industry developed to broaden
the industrial base. Manufacturing plants, even the large new
ones, clung to central city sites.

The industrial economy went through an important tran-
sition around 1920 when the primary iron industry succumbed to
events in the national steel industry. At about the same time
the American Viscose Corporation decided to establish a very
large rayon fiber facility in Roanoke. As a result the iron
industry loss went unnoticed and the broadened industrial base
picked up momentum. Furniture and textile-apparel plants also appeared on the scene, attracted by access to raw materials and by local labor conditions. Suburbanization began to develop but only large plants dared to risk the relative isolation of a suburban site.

The Depression checked industrial growth in Roanoke, hitting the central city most heavily. A continuing surplus of female labor did attract several textile and apparel facilities in the late 1930's and early 1940's.

Industrial momentum was regained in the post-war period. Important new plants and industries were established in the area, mostly on suburban ring sites. In 1958 another transition occurred with the closure of the large Viscose facility for reasons of declining demand and plant obsolescence. The gains of the earlier 1950's and broadening regional service function of the economy were able to absorb this and other shocks, indicating that the timing of events had been fortuitous.

The primary element in suburbanization has been the new plant which has demonstrated a strong suburban preference. Existing plants, encumbered by inertia, have been slow to relocate but when they have it has been almost entirely in a centrifugal manner.

Plants which have relocated have done so when the original site became untenable, more or better space was needed, and the alternative of enlarging the original site was rejected as too expensive. The rejection of the existing site was facilitated
by a lack of functional ties with the inner city and the availability of inexpensive, unencumbered sites in the suburban ring.

The primary consideration in selecting new sites has been land values, which are substantially lower in the suburban ring than in the central city. Furthermore, simple land space is more available in the periphery. The land value differentials are not as strong as they are in New York so the suburban push is not as great. On the other hand large local markets, external economies, and communications-orientations have attracted relatively numerous small plants to the inner portions of the New York Metropolitan Region. These plants have strong functional ties with central areas. These ties with centralized functions are weak in the Roanoke SMSA and, even if strong, the small size of the area would greatly weaken their locational influence.

Within rather broad limits, transportation, labor, and markets do not strongly influence intra-urban location, nor do external economies or industrial linkage. The scale of the operation, related to land needs, is a factor because the large plant needs a large site and is better able to take advantage of lower-cost suburban land. Local taxes vary within the SMSA but there is a rough cancelling of differentials because of lower quality or higher cost of services in the areas with the lowest taxes.

The conclusion drawn from the comparison of these findings with those of other large urban centers, especially the New York Metropolitan Region, is that the gap between the pushes and pulls is greatest in the small area even though the intensity
of suburbanization is less. Locational inertia is acting to retard a more immediate reaction to this situation and the expected greater suburbanization of the small urban area remains for the future to see.

A method developed in this study approximates the redistribution of industrial jobs within the SMSA on the basis of their wage-levels. This analysis revealed that a wide gap is opening up between the wage-level composition of industry in the central city and the suburban ring. Suburbanization, specifically the new plant element, is responsible for this trend. Industrial wage levels are approaching the national mean in the suburban ring, while the central city is becoming a ghetto of low-wage industries. The implications of this trend may be ominous and suggest the need for further research.

In final summary, the focal points presented in Chapter I are generally confirmed by the case study:

1) Higher land values in the central city, the need for larger sites, and the increased mobility of the various advantages offered to industry by an urban area have caused suburbanization to occur in both the large and small metropolitan area.

2) Suburbanization is detrimental to the central city because of a reduction in job sources, the lowering of industrial wage levels relative to the suburban ring, and the possible inducement of industrial slums by the non-use of vacated industrial buildings.
3) The forces which hold manufacturers in the central city of a small metropolitan area are weak or non-existent, in contrast with the large urban area. Once locational inertia is overcome this may lead to suburbanization in the small area to an extent greater than that in the large urban area.

The study is not forwarded as being definitive on the question of suburbanization variations as functions of urban area size. It is hoped, rather, that it suggests that major variations may exist and that further attention needs to be given to this relationship. More case studies are needed and then, perhaps, research can return to a more general level. Only then will urban policy makers (administrators, politicians, planners, and industrialists, among others) have the knowledge basis for solving one of the serious problems of expansive urbanization.
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