



Selective Urban Growth in the Middle Ohio Valley, 1800-1860

Edward K. Muller

Geographical Review, Volume 66, Issue 2 (Apr., 1976), 178-199.

Stable URL:

<http://links.jstor.org/sici?sici=0016-7428%28197604%2966%3A2%3C178%3ASUGITM%3E2.0.CO%3B2-B>

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

Geographical Review is published by American Geographical Society. Please contact the publisher for further permissions regarding the use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/ags.html>.

Geographical Review

©1976 American Geographical Society

JSTOR and the JSTOR logo are trademarks of JSTOR, and are Registered in the U.S. Patent and Trademark Office. For more information on JSTOR contact jstor-info@umich.edu.

©2002 JSTOR

SELECTIVE URBAN GROWTH IN THE MIDDLE OHIO VALLEY, 1800-1860*

EDWARD K. MULLER

ONE of the most popular themes in the history of North American urbanization has been the success or failure of cities to amass population faster than their rivals. Although much scholarly attention has been given to the experiences of the continent's largest metropolitan centers, the processes of selective growth among smaller, lower-order cities and towns within regions has remained relatively neglected. Theories of urban growth and of the spatial patterning of cities offer oversimplified explanations for the differential performances of these smaller urban centers because few of them take into account the interaction of specific functions of smaller cities with the conditions and timing of regional development. In the transformation of a frontier region to a fully integrated part of the national economy, there were well-defined changes in regional accessibility and economic activity to which the towns and cities within the region had to adjust. A changing locational and hierarchical pattern of nodality within the transportation network can be related to three phases of regional development, during each of which there were distinct patterns of selective urban growth. This argument is specifically evaluated in the middle Ohio Valley but offers general findings appropriate to most newly settling regions of North America.

TRADITIONAL EXPLANATIONS OF URBAN GROWTH

Until the mid-1960's the experiences of smaller towns and cities remained the province of local historians and regional geographers, who were concerned neither with the general processes of urbanization nor with comparative issues. Early writers, often geographers examining the settlement of specific frontiers, emphasized initial advantages of the site and situation of towns. Although the initially prominent urban centers usually retained their regional importance in later decades, variations in the performances of these towns over the years indicated that even for smaller towns the difficulties of adjusting to the changing conditions of regional development must have been severe.

One such adjustment involved the frequently changing transportation networks of nineteenth-century North America. Since most towns initially provided commercial and consumer services to rural populations, those with favorable nodal positions on the regional circulation network and with enterprising merchants quickly assumed hinterland hegemony and regional prominence.¹ In order to maintain or enlarge their

* This article is based in part on my dissertation research, and I gratefully acknowledge the important contributions of my adviser, David Ward, and the financial support of the University of Wisconsin, Madison. I also wish to express my appreciation to Paul A. Graves for criticism in the preparation of the manuscript and to the Cartographic Laboratory of the Department of Geography, University of Maryland, College Park.

¹ James E. Vance, Jr.: *The Merchant's World: The Geography of Wholesaling* (Prentice-Hall, Inc., Englewood Cliffs, N.J., 1970), pp. 82-85.

● DR. MULLER is an assistant professor of geography at the University of Maryland, College Park, Maryland 20742.

functional roles, towns sought the latest forms of transportation.² However, the mere acquisition of new modes of movement fails to account for subsequent urban growth.³ The actual effects of transportation changes involved the shifting of accessibility between towns and their hinterlands within the region and the altering of commercial ties—in short, the changing structure of nodality. Central place theory offers an explanation for the effects of these shifts in nodality, for it systematically links provision of goods and services, patterns of accessibility, and distribution of rural settlement.⁴ There is empirical support for the relationship between rural population growth and the growth of towns during the early decades of regional development,⁵ but because central place theory does not account for non-central place functions such as the import trade and manufacturing, a good deal of selective urban growth remains unexplained, especially in later phases of development.

It may be argued that certain kinds of manufacturing corresponded locationally with the central place hierarchy. During the initial years of settlement, when manufacturing depended on local markets, industrial production was relatively undifferentiated from place to place, whereas the amount of production varied closely with the hierarchical organization of the provisioning of goods and services.⁶ Hence manufacturing had little effect on the selectivity of early urban growth.⁷ As the region became integrated with the larger national economy, specific industries, at first agricultural processing and subsequently nonprocessing industries, exploited greatly enlarged markets that reached well beyond the former localized ones. In these post-frontier periods manufacturing activities exerted a predominant influence on the dimensions of urban growth, but the resulting locational patterns can be understood only after the evolution of different types of manufacturing is precisely specified within the context of the phases of regional development.⁸ Indeed, each of the traditional explanations of urban growth—initial advantages, transportation change, central place relationships, and industrial development—lacks such a specification in time and space.

PERIODIZATION OF SELECTIVE GROWTH

The evolution of export production and circulation (both intraregional and inter-regional) can be generalized into three periods of regional development that facilitate

² Allan R. Pred: *The Spatial Dynamics of U.S. Urban Industrial Growth, 1800-1914* (MIT Press, Cambridge, Mass., 1966), pp. 186-194.

³ Robert L. Higgs: *The Growth of Cities in a Midwestern Region, 1870-1900*, *Journ. Regional Sci.*, Vol. 9, 1969, pp. 369-375; reference on pp. 374-375.

⁴ Brian J. L. Berry: *Geography of Market Centers and Retail Distribution* (Prentice-Hall, Inc., Englewood Cliffs, N.J., 1967), pp. 5-9.

⁵ Higgs, *op. cit.* [see footnote 3 above], p. 373; and Jeffrey G. Williamson and Joseph A. Swanson: *The Growth of Cities in the American Northeast, 1820-1870*, *Explorations in Entrepreneurial History*, 2nd Ser., Suppl., Vol. 4, 1966, p. 47.

⁶ Pred, *op. cit.* [see footnote 2 above], pp. 14-15. F. E. Ian Hamilton provides a more elaborate discussion of this relationship in his review article entitled "Models of Industrial Location" (in *Models in Geography* [edited by Richard J. Chorley and Peter Haggett; Methuen & Co., Ltd., London, 1967], pp. 361-424, reference on pp. 389-401).

⁷ Williamson and Swanson, *op. cit.* [see footnote 5 above], p. 47.

⁸ *Ibid.*, p. 53; and Pred, *op. cit.* [see footnote 2 above], p. 61. The regional distribution of manufacturing depends in part on the national structure of manufacturing. In early phases of national industrialization, the distribution of consumer-oriented manufactures in a newly settling region may be more pronounced and enduring, while in more advanced phases such activities would be a more ephemeral component of the settling process.

the positing of changing relationships among nodality, hinterland service, manufacturing, and urban growth.⁹ The first period, the Pioneer Periphery, involved establishing permanent settlements, clearing the land for agricultural production, searching for viable crops, and experimenting with export commodities in a context of remoteness from external markets. Although regional trade and purchasing power remained relatively limited and rural settlement was confined to the vicinity of natural routes, the outlines of a commercial hierarchy emerged as a few towns undertook the provisioning of migrants and gained control of interregional contacts.¹⁰ Most new towns, however, primarily offered elemental goods and services for local areas. Urban growth was greatest at the few nodal points of contact between the intraregional and interregional circulation networks, frequently because of site and situational advantages, and also at the trade centers within the local areas of most rapid rural settlement.¹¹

Expansion and intensification of rural settlement accompanied the vastly improved interregional connections and specialized staple productions that characterized the second period of regional development—the Specialized Periphery. The dominant regional entrepôt concentrated much of the increased interregional commerce, but the pattern of growth among other towns still depended on nodality with respect to the servicing of local and subregional hinterlands. The frequent internal improvements of a developing region sometimes caused dramatic shifts in the location of such nodality. Moreover, if processing of the staple products was required before exportation, the emerging processing industries at the nodal centers along the new transportation facilities enhanced their population growth at the expense of trade centers without such access.

The eventual integration of the region with the national transportation and marketing systems often resulted in a third phase—the Transitional Periphery of diversification in agricultural production and emergence of substantial secondary manufacturing activities. The few subregional nodal centers within the region initially benefited from the decentralization of some interregional functions and from the concentration of some formerly local activities. Although such locational changes maintained the fundamental outlines of the regional urban hierarchy as based on the regional commercial system, the development of exported secondary manufactures altered the bases of growth. With superior access to regional and external markets as well as to raw materials, the centers of greatest nodality in this third regional transportation network developed the largest amount and greatest variety of manufactures (their growth reflecting considerable locational inertia or advantages from earlier periods). In addition, a few towns near the regional entrepôt developed some specialized manufactures that were linked to the emerging industrial market of the entrepôt.

Thus during the course of regional settlement and economic development the

⁹ The periodization is based on the staple theory approach to regional economic development in North America represented by (among others) Douglas C. North: *The Economic Growth of the United States, 1790-1860* (W. W. Norton, New York, 1961), pp. 1-14. Spatial characteristics of development reflect the propositions in Edward J. Taaffe, Richard L. Merrill, and Peter R. Gould: *Transport Expansion in Underdeveloped Countries: A Comparative Analysis*, *Geogr. Rev.*, Vol. 53, 1963, pp. 503-529.

¹⁰ Vance, *op. cit.* [see footnote 1 above], pp. 96-98 and 161; and Julius Rubin: *Urban Growth and Regional Development, in The Growth of the Seaport Cities, 1790-1825* (edited by David T. Gilchrist, Univ. of Virginia Press, Charlottesville, 1967), pp. 10-13.

¹¹ Taaffe, Merrill, and Gould, *op. cit.* [see footnote 9 above], pp. 503-505.

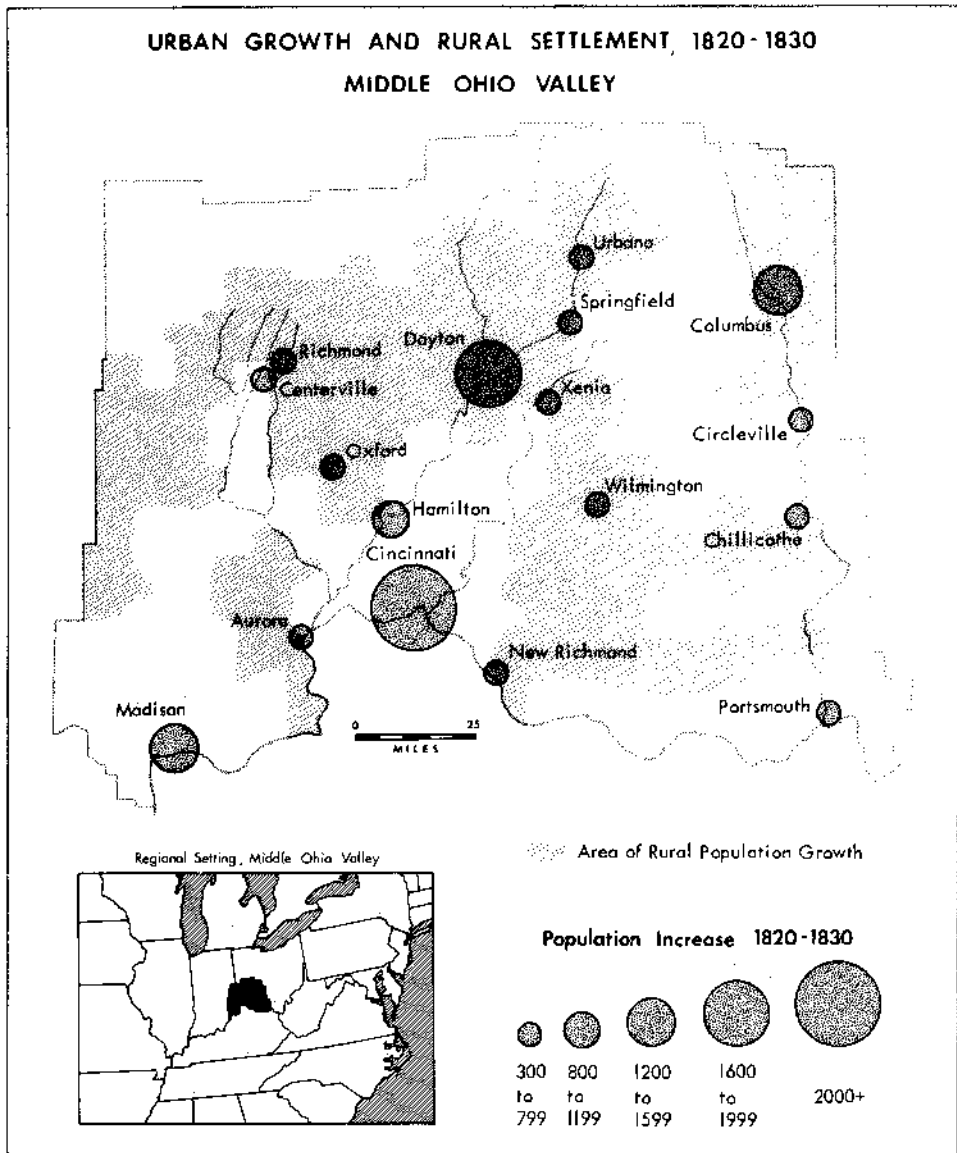


FIG. 1.—Urban growth and rural settlement in the middle Ohio Valley, 1820-1830. Rural population growth is based on townships and is derived from data in published volumes and manuscript schedules of the United States censuses of population, 1820 and 1830. See also Muller, *op. cit.* [see text footnote 14].

factors of selective urban growth shifted from accessibility to local hinterlands for providing commercial services and agricultural processing industries to accessibility to wider regional and external markets for the support of secondary manufactures. The locational impact of these shifting bases of urban growth depended on the distribution of nodality within the evolving transportation network. Although different economic specializations, transportation technologies, topographic characteristics, and settlers' origins probably resulted in quite varied characteristics of the number,

sizes, and spacing of urban centers, the interrelated changes in transportation and export production defined periods of similar settlement experiences for most North American regions. The bases for regional comparison are, therefore, the spatial properties of circulation and export production, not the specific mode of movement or staple production.

THE MIDDLE OHIO VALLEY, 1800-1860

A middle Ohio Valley region was selected for analysis because it exemplified the three hypothesized periods of regional development. A study area of forty-one counties in southwestern Ohio and southeastern Indiana was delineated on the basis of its dependence on Cincinnati and on the Ohio River for most external contacts during the initial periods of settlement (Fig. 1). Four major tributary rivers flow southward from the interior of this area to the Ohio River. Cincinnati merchants tapped the movement along two of these rivers and through various internal improvement schemes attempted to control the commerce of the other two. The common conditions of movement and settlement provided the necessary cohesion for this area to be considered a regional unit of study.

The successive adoption of major transportation innovations facilitated the transition of the region from a remote frontier to a vigorous, integrated section of the national economy. The early river and road network spatially limited settlement and supported the production of small amounts of whiskey, flour, salt pork, and livestock, which could withstand the arduous downriver journey to external markets. The construction of turnpikes and canals after 1830 stimulated rural settlement and commercial specialization in wheat, corn, and livestock. With the rapid adoption of railroads around 1850, the middle Ohio Valley began to diversify into secondary manufacturing while continuing to produce agricultural staples.

The antebellum period presents formidable data problems, however. The changing boundaries of local subdivisions, the inconsistencies of federal population enumerations, and the lack of federal agricultural and manufacturing censuses until 1840 prevent systematic statistical testing of urban growth relationships. Moreover, determination of the distribution of nodality must depend on incomplete and incomparable state and corporate records of the movement of commodities and people on the various transportation facilities. Despite these shortcomings in the record, the available documents and improved census materials after 1840 offer documentation of the pattern of selective urban growth in the middle Ohio Valley.¹²

ACCESS TO LOCAL HINTERLANDS IN THE PIONEER PERIPHERY, 1800-1830

In 1830, after three and a half decades of permanent American settlement, more than half a million people inhabited the middle Ohio Valley region. Settlement was concentrated along the Ohio River and in the four major tributary river valleys, where flatboats and crude country roads provided sporadic and seasonal access to the Ohio River. In addition to a variety of crops grown for local consumption, farmers produced small surpluses of grains for conversion to forms feasible for movement by

¹² The federal censuses and congressional surveys do not provide systematic data on agriculture, manufacturing, or even population before 1840. Judicious use of these documents was combined with various other primary sources, such as state governmental reports, account books, gazetteers, and county agricultural society reports.

wagon and boat.¹³ Although incoming settlers and passing migrants periodically provided markets for local produce, sustained economic development depended on the increased flow of goods down the Ohio and Mississippi rivers to external markets and on the driving of livestock eastward over the Appalachian Mountains.

A network of approximately 148 urban centers with populations of more than 100 gradually emerged to service this frontier economy.¹⁴ At least three orders of centers can be identified by the end of the initial period. The concentration of interregional contacts and commerce, migrant influx, and local administration at the junctions of regional and interregional routes resulted in the growth of entrepôt towns, particularly along the Ohio River. While several smaller towns, such as Portsmouth, Ripley, and Lawrenceburg, provided these entrepôt functions for limited settlement areas, a few with substantial access to the interior of the region developed sizable commercial complexes and commensurate populations. Chillicothe, at the intersection of the earliest major east-west highway (Zane's Trace) and the Scioto River, and Madison, at the western edge of the region, were the second and fourth largest cities in 1830, with populations of 2,846 and 2,400, respectively. Cincinnati, with access to three of the major tributary valleys, developed into the dominant entrepôt of the middle Ohio Valley region with a population of nearly 26,000, a figure which ranked it as the nation's seventh largest city.¹⁵

The spread of settlement northward up the various river valleys led to the establishment of merchant and milling activities at the interior junctions of smaller streams and local roads with the major tributary rivers, and small towns frequently emerged at these sites as service centers for the immediate environs.¹⁶ Most of these new communities remained local in orientation and quite small in population; some (hereafter called district trade centers) gained local prominence as market centers, county seats, or highway junctions. A few subregional towns with access to larger areas of the interior became intermediate trading points for the collection and distribution of goods and services between their extended hinterlands, including smaller centers, and the focuses of interregional commerce. For example, Dayton concentrated commercial activity at the junction of movement in the Mad River and upper Miami River valleys. Hamilton performed a similar role at the Miami River junction with the roads that led from Cincinnati to the new settlements of western Ohio townships and from the central Whitewater River valleys in Indiana. In the Little Miami River Valley, Lebanon emerged at the intersection of a major east-west road for western migrants and the north-south route through the valley. Columbus and Circleville organized the newly settling areas in the Scioto River Valley north of Chillicothe. Thus by 1830 there had emerged a few interregional entrepôt towns, a dozen or more district trade centers and interior subregional nodal points, and many small, local service centers. The urban network corresponded closely with the spread and intensification of rural settlement and commercial agriculture.

The general impression of steady, almost inevitable growth in rural and urban

¹³ Robert L. Jones: *Ohio Agriculture in History*, *Ohio Hist. Quart.*, Vol. 65, 1956, pp. 229-238, reference on p. 234; and Fred Kuhne: *History and Review of the Condition of Agriculture in Ohio*, *Board of Agriculture, Ohio, 14th Annual Rept.*, 1859, p. 468.

¹⁴ Edward K. Muller: *Town Populations in the Early Censuses: An Aid to Research*, *Hist. Methods Newsletter*, Vol. 3, 1970, pp. 2-8.

¹⁵ Because my focus is on smaller towns, I have excluded Cincinnati from my analysis of selective growth.

¹⁶ R. C. Downes: *Frontier Ohio* (Ohio State Archaeol. and Hist. Soc., Columbus, 1935), pp. 117-120.

settlement during this first period obscures evidence of selective growth among the larger towns. A regression analysis of the absolute increase in the towns' populations between 1820 and 1830 and the towns' populations at the beginning of the decade (1820) identified several towns that grew more or less than expected on the basis of their size in 1820 and of the general growth performance of all other towns in the

TABLE I—POPULATION INCREASE IN CITIES OF THE MIDDLE OHIO VALLEY, 1820-1830*

CITY	ABSOLUTE INCREASE, 1820-1830	POPULATION SIZE RANK, 1830
Dayton	1,882	1
Madison ^a	1,420	4
Columbus	1,335	3
Hamilton	835	5
Circleville	601	7
Portsmouth	536	10
Oxford	525	15
Centerville ^a	500	20
Richmond ^a	500	12
Springfield	463	9
Urbana	458	8
Chillicothe	420	2

Sources: Published volumes and manuscript schedules of the various United States censuses of population, 1800-1870. See also Muller, *op. cit.* [see text footnote 14].

* Towns not listed here increased by fewer than 400 inhabitants.

^a Partially estimated.

region.¹⁷ As anticipated, the differential growth performances of these larger towns was primarily related to the nodality of their locations on the developing transportation network with respect to the pace of rural settlement and expansion of agriculture in the local hinterlands. Because trade moved along the river and road network in much the same direction throughout this period, the few earliest nodal centers for large areas of the region benefited the most from proliferating regional commerce. Along with Cincinnati and Madison as regional entrepôts, the subregional nodal towns of Hamilton, Dayton, and Columbus attracted by far the largest numbers of new residents during the 1820's (Table I). The other most rapidly growing towns in relation to their sizes were the district trade centers in areas of recent rapid rural expansion. Access to newly settling areas was important to and differentiated the growth of both the subregional nodal towns and the district trade centers (Fig. 1). Thus the northernmost subregional nodes of Dayton and Columbus more than doubled the decennial population increments of the two older subregional centers of Hamilton and Chillicothe in longer settled and less rapidly growing areas closer to the Ohio River. Similarly, district trade centers such as Centerville and Richmond in the Whitewater River valleys and the Ohio towns of Urbana and Springfield added between 400 and 600 new residents, while several older centers that had experienced their initial burst of growth before 1820 attracted fewer than 300 new inhabitants. Except for Cincinnati, the growth of the numerous small Ohio River ports also varied in relation to the timing of the development of their local hinterlands.

¹⁷ The residuals of the regression analysis for each decade indicate exceptional growth performances. Estimated and interpolated population figures were excluded from the regressions; and, consequently, analyses for any given decade omit important towns. The analysis of the 1820-1830 period was particularly incomplete; and no analyses could be run for earlier decades.

Manufacturing activities contributed little to the pattern of selective growth among these towns. Most trade centers contained sawmills and flour mills, distilleries, small meat-packing operations, and artisan productions of leather, wood, and hardware articles for the local market. According to the 1820 Census of Manufactures, processing of agricultural and forest products accounted for between 60 and 80 percent of the total value of production of every county.¹⁸ In 1833, with the exception of Cincinnati, there was still little manufacturing other than agricultural processing, sawmilling, and the crafts. Only a few textile mills and iron foundries were scattered throughout the region.¹⁹ With far greater access to the regional market and raw materials, Cincinnati dominated secondary manufacturing in the Ohio Valley; but even in that city, most surplus capital went into the more attractive investment opportunities of commerce and real estate.²⁰ Scattered accounts of business activities in these towns reveal the general homogeneity of artisan, milling, and professional services. The few largest towns such as Dayton, however, contained a greater number and variety of these activities, reflecting their access to larger hinterlands within the region. In short, selective growth of towns during the pioneer period of settlement depended on access to and the growth of local hinterlands and, consequently, on the timing of settlement expansion within the region.

THE EMERGENCE OF URBAN MANUFACTURING IN THE SPECIALIZED PERIPHERY, 1830-1850

The dramatic rise of the Old Northwest to national prominence in the production of corn and wheat by mid-century depended in part on the significant contribution of the middle Ohio Valley region. Vital to this development was the adoption of the latest transportation advancements, which extended improved accessibility to several areas within the region and provided greater internal interconnectivity (Fig. 2). The Ohio, Miami, and Whitewater canals eliminated many of the navigational problems on the tributary rivers that had limited settlement and commercial agriculture before 1830. Moreover, three railroads and several turnpikes were built in areas that did not obtain the advantages of canals. Although agricultural commodities moved both northward and southward along the Ohio Canal in the Scioto River Valley, overall the new canal and overland facilities continued to channel most movement to the Ohio River. Only the northern connections of the Miami Canal and Little Miami Railroad in the late 1840's began to challenge the traditional flow of goods, loosening the long-standing dependence on Ohio River ports and complicating movement patterns.²¹

The lower transport costs and greater bulk capacity of the canals and railroads

¹⁸ "Digest of Accounts of Manufacturing Establishments in the United States and their Manufactures" (Gales and Seaton, Washington, D.C., 1823). Despite serious problems with this census, relative proportions of broad manufacturing categories were calculated from derived average values per unit of production of the different kinds of goods. Grain milling, meat packing and provisions, distilling, brewing, and sawmilling were classified as processing industries. Leather, wood and cloth fabrications, paper, hardware, foundry, and machinery work grouped into a nonprocessing category. These latter activities included both artisan and factory production.

¹⁹ "McLane Report on Manufactures, Documents Relative to Manufactures in the United States" (22nd Congr., 1st Sess., *House Doc. 308*, Vol. 2, 1833), pp. 860-862.

²⁰ *Ibid.*, p. 860; and Richard T. Farrell: Cincinnati, 1800-1830: Economic Development Through Trade and Industry, *Ohio History*, Vol. 77, 1968, pp. 111-129.

²¹ "Report of the Board of Canal Commissioners, Ohio General Assembly," *Journ. of the Senate*, (1833), p. 425; and Harry N. Scheiber: Ohio Canal Era: A Case Study of Government and the Economy, 1820-1861 (Ohio Univ. Press, Athens, 1969), p. 194.

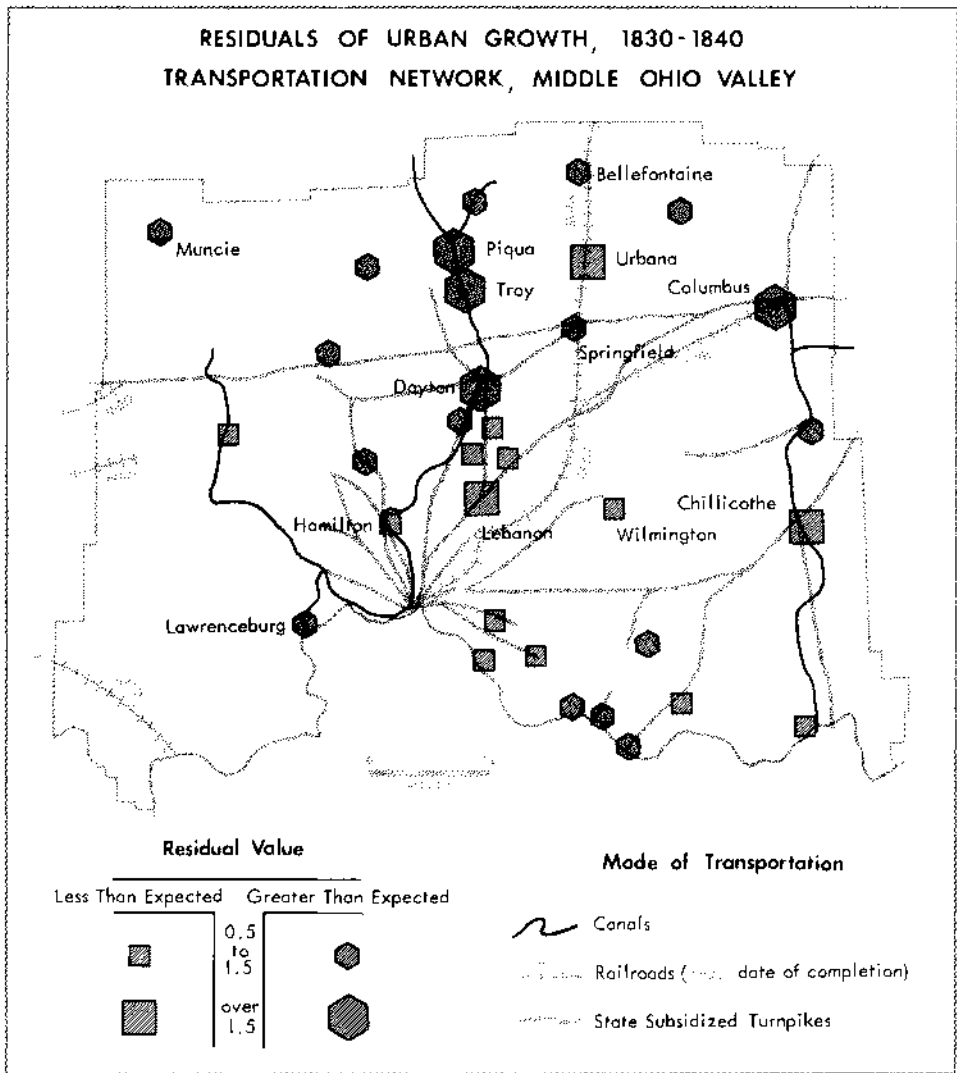


FIG. 2.—Transportation network of the Specialized Periphery and residuals of urban growth in the middle Ohio Valley, 1830-1840. Sources of the data are discussed in Muller, *op. cit.* [see text footnote 14].

stimulated specialization in wheat and corn-hog production in most of the region. Although measurement of regional production is impossible until 1840, the almost doubled output of wheat and corn crops during the 1840's and the dramatic rises in the clearances of these products and their derivatives at canal ports demonstrate the dimensions of commercial agricultural expansion.²² Not surprisingly, the rural population increased by approximately 200,000 during the twenty-year period.

²² "Compendium of the Sixth Census of the United States, 1840" (U.S. Dept. of State, Washington, D.C., 1841), pp. 275-277 and 287-289; "Seventh Census of the United States: 1850" (U.S. Bureau of the Census, Washington, D.C., 1853), pp. 790-797 and 868; "Ohio State Auditor, Annual Report," *Ohio Exec. Docs.*, 1853, Part 1, pp. 376-383; and "Board of Canal Commissioners and Board of Public Works, Annual Reports," *Ohio Exec. Docs.*, 1833-1850.

Urban settlement in the middle Ohio Valley increased at an even faster rate. By 1850, one-fifth of the region's inhabitants resided in the twelve cities with populations in excess of 2,500. Similar to the earlier pioneer period, the expansion of settlement and agriculture that accompanied the spread of transportation facilities into unsettled areas supported the growth of new district trade centers, and these newer towns were again among the region's most rapidly growing ones, as indicated by the high positive residuals of the regressions of town size and absolute population increase for both decades. For example, Cambridge City and Connorsville arose along the banks of the Whitewater Canal, Piqua and Troy along the Miami Canal north of Dayton, Bellefontaine as a depot on the Mad River Railroad, and Delaware and Muncie on turnpikes leading to the new canals.

Most of the established towns were also well aware of the importance of these new transportation facilities and worked frantically to obtain their services. Access to growing local hinterlands remained a primary determinant of the towns' performances. The reduced transport costs enhanced their nodality by extending accessibility to larger areas within the region. Construction of waterpower sites along the canals augmented this position, as large-scale agricultural processing industries developed at most major canal ports.²³ Because the southern direction of movement prevailed until the late 1840's and because most large towns eventually acquired some form of improved access, the general distribution of nodality did not markedly change by the end of the period; and only two new towns—Piqua and Delaware, both of which were trade centers in the rapidly growing northern counties—broke into the region's list of fifteen largest. However, the considerable variation in growth rates between 1830 and 1850 (Table II) indicates the efforts of towns to adjust during the evolution of the transportation network.

The canals' advantages for movement and waterpower had an immediate impact on the urban system. The opening of the Miami Canal in the late 1820's immediately shifted the focus of commercial activity to Middletown and Dayton on the canal. This concentration of commerce occurred at the expense of the trade centers of Lebanon and Xenia in the nearby valley of the Little Miami River. The residuals of the regression of urban growth for both the 1820's and 1830's clearly reflect this pattern (Fig. 2). With the extension of the Miami Canal north of Dayton in 1837, the new canal ports of Piqua and Troy experienced rapid growth, while Urbana in the Mad River Valley to the east actually lost population. Of the established trade centers in these two important river valleys east of the Miami Canal, only Springfield managed to maintain its rate of growth, primarily because of nearby natural waterpower sites that supported expanding processing activities. On the eastern branch of the upper Whitewater River, Richmond became the focus for the movement of goods by turnpike from rapidly settling east central Indiana to Dayton or Cincinnati and was one of the region's fastest growing towns, becoming the eighth largest in population. Like Dayton and Richmond, Columbus became the major nodal point for a large portion of rapidly settling central Ohio. Columbus obtained access to the Ohio Canal through an eleven-mile extension canal and was the hub of several turnpikes, including the National Road. Of course, its selection as the state capital further enhanced local business opportunities and, consequently, population growth.

As it became clear that no additional canals were to be constructed, many areas without such access turned to the railroads. The completion of several railroads and

²³"Special Report of the Auditor of the State," *Ohio Exec. Docs.*, 1850-1851, Part 1, pp. 827-829.

the remaining canal projects in the 1840's altered the pattern of nodality that had been evolving in the preceding decade. The opening of the Mad River and Little Miami railroads in the 1840's reversed the previously dismal growth performances of district trade centers in these valleys. Urbana halted its population loss and increased by 950 residents in 1840. Both Springfield and Xenia tripled their population increments over those of the preceding decade. The new Whitewater Canal on the western branch of the Whitewater River immediately shifted trade to the canal ports (particularly Cambridge City) away from Richmond. Richmond's growth declined by more than 50 percent, and the city dropped back to its lower position of 1830 in the ranking of regional cities.

Down the Ohio River from Cincinnati, the port of Madison constructed a railroad into south central Indiana, eventually connecting with Indianapolis. Within a few years the flow of agricultural commodities to Madison and the northward return of merchandise made it the second most active Ohio River port in the region.²⁴ Only Columbus and Dayton grew more than Madison during the 1840's. Madison's success contrasted with the disappointing performance of Lawrenceburg, also on the Ohio River but closer to Cincinnati. Lawrenceburg anticipated a bright future as the river terminal of the Whitewater Canal. However, when the canal functioned only sporadically (because of poor construction and climatic catastrophies) and when Cincinnati merchants drew off trade with their own connecting canal to the Whitewater, the city managed only a modest increase in commercial activity and population, particularly compared with Madison's prosperity.²⁵ Other river ports near but not at the terminals of the new intraregional transportation facilities faded into strictly local centers for their immediate environs. Similarly, many interior trade centers, such as Lebanon, Oxford, Wilmington, and Washington Courthouse, in already settled areas lost nodality to canal and rail towns when they did not get the service of a new mode of transportation.

The provision of commercial services for changing hinterlands only partially explains the pattern of urban growth in this second period. In 1830 Dayton, Chillicothe, Columbus, Madison, and Hamilton were similar in size and function. By 1850, population size and growth trends clearly differentiated these towns (Table III). This sorting corresponded closely with variations in nodality on the circulation system and with the attendant amount and kinds of manufacturing activities. Manufacturing had become an important component of the assortment of functions in the larger towns, and urban population was positively related to the total value of manufacturing production. With the regional specialization in grains and livestock, agricultural processing industries predominated, providing 62 percent of the total value of production.²⁶ Large processing activities developed at canal waterpower sites and at the major junctions of other new transportation facilities. Correspondingly, urban populations also exhibited a positive relationship to the total value of output of processing industries. However, although the concentration of processing at specific nodal points stimulated urban growth, significant variations in this relationship obtained at those few places in which populations were larger than indicated by the

²⁴ *Madison and Indianapolis Railroad, Annual Reports, 1843-1844 and 1848-1853*, Indiana State Library and Cincinnati Historical Society.

²⁵ Testimony of the Whitewater Canal Company Receivership Case, U.S. District Court, Chicago, May Term, 1857, p. 388.

²⁶ "United States Census of Manufactures, 1850," manuscript schedules for Ohio and Indiana (Ohio State Library, Columbus; and Indiana State Library, Indianapolis).

TABLE II—POPULATION INCREASE IN CITIES OF THE MIDDLE OHIO VALLEY, 1830-1840 AND 1840-1850

1830-1840		1840-1850	
City	Absolute increase	City	Absolute increase
Columbus	3,613	Columbus	11,834
Dayton	3,102	Dayton	4,910
Madison	1,398 ^a	Madison	4,214
Richmond	1,170 ^a	Chillicothe	3,123
Chillicothe	1,131	Springfield	3,046
Circleville	1,082	Portsmouth	2,373
Piqua	993	Hamilton	2,105
Springfield	982	Piqua	1,796
Troy	847	Xenia	1,617
Hamilton	844	Lawrenceburg	1,207
Cambridge City	827 ^a	Circleville	1,193
Ripley	673	Delaware	1,176
Aurora	606	Urbana	950
Portsmouth	575	New Richmond	896
Miamisburg	565	Aurora	858

Sources: Published volumes and manuscript schedules of the various United States censuses of population, 1800-1870.

^a Partially estimated.

TABLE III—POPULATION TRENDS IN THE LEADING CITIES OF THE MIDDLE OHIO VALLEY, 1830-1850, RANKED BY AMOUNT OF INCREASE

CITY	POPULATION IN 1830	POPULATION IN 1850	ABSOLUTE POPULATION INCREASE
Columbus	2,435	17,882	15,447
Dayton	2,965	10,977	8,012
Madison ^a	2,400	8,012	5,612
Chillicothe	2,846	7,100	4,254
Springfield	1,080	5,108	4,028
Hamilton	1,708	4,657	2,949
Portsmouth	1,063	4,011	2,948
Piqua	.. ^b	3,277	2,789
Circleville	1,136	3,411	2,275
Xenia	.. ^b	3,024	2,107
Lebanon	1,165	.. ^b	923
Urbana	1,102	.. ^b	918

Sources: Published volumes and manuscript schedules of the various United States censuses of population, 1800-1870.

^a Partially estimated.

^b Not ranked.

value of processing manufactures (Fig. 3). In these instances, the greater nodality with respect to regional markets seems to have supported the development of relatively large and diverse nonprocessing manufactures. In short, not only the amount but also the kind of manufacturing can be related to the pattern of selective growth.

By 1850 Dayton and Columbus had clearly become the two points of greatest nodality within the region. Both cities enjoyed access to extensive regional subareas through elaborate turnpike networks that focused on them as canal ports. Moreover, with the connection of both the Miami and Ohio canals to Lake Erie, these two cities increasingly handled northward interregional movements of wheat and flour from the central parts of the region. Except for the two Ohio River entrepôts of Cincinnati and

Madison, Dayton and Columbus had by far the largest total values of manufacturing production in 1850; and with the exception of Cincinnati, they also had the most diverse array of manufactures. Although there were large grain mills in the immediate environs, agricultural processing industries contributed only a small portion of the total value of industrial production and of the work force in these cities (Table IV).

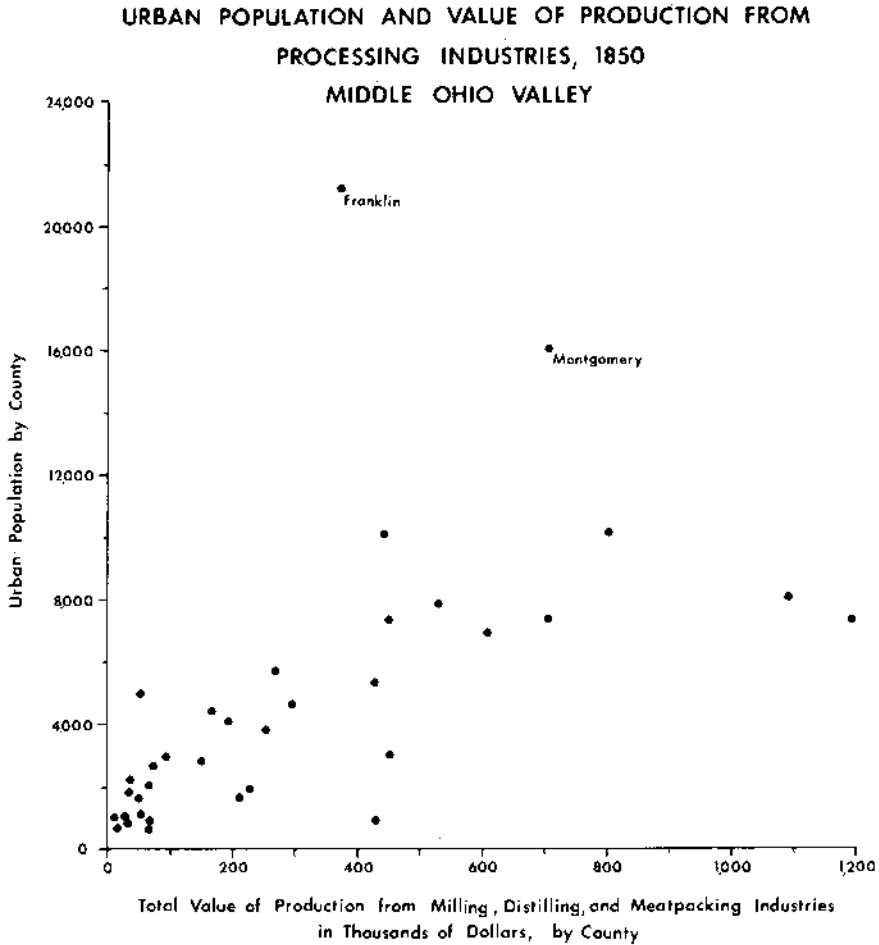


FIG. 3.—Urban population and the total value of production from processing industries, by county, in the middle Ohio Valley, 1850. Sources: "United States Census of Manufactures, 1850," manuscript schedules for Ohio and Indiana (Ohio State Library, Columbus; and Indiana State Library, Indianapolis); and Muller, *op. cit.* [see text footnote 14].

Instead, they each produced large total values of fabricated goods such as hardwares, building supplies, wagons, railroad cars, finished leather and wood products, clothing, farm implements, machinery, and other foundry items.²⁷ With net changes of 8,012 and 15,447, respectively, Dayton and Columbus recorded the greatest

²⁷ "United States Census of Manufactures, 1850," manuscript schedules for Franklin and Montgomery counties, Ohio (Ohio State Library, Columbus).

population increments during the twenty-year period, nearly double that of any other interior town.

Madison and Chillicothe experienced the next largest increases in population, but their bases of growth were quite different from those of Dayton and Columbus. As with a few other smaller Ohio River and interior canal ports, these two cities were primarily commercial outlets and processing points for vigorous agricultural areas. Processing industries dominated their total values of production, providing from 64 to 92 percent of the total values. Not one of these cities commanded a nodal position that offered substantial access to regional markets outside its agricultural hinterland. Compared with Dayton and Columbus, fewer and smaller nonprocessing manufactures developed. Chillicothe produced leather, paper, and iron products. Although substantial in total value, Madison's nonprocessing output was almost entirely from foundries and machine works associated with steamboat construction and repair. These nonprocessing activities distinguished Madison and Chillicothe from several other outlets of smaller local areas, but as a group they all were notably specialized in agricultural processing industries.

The two remaining most rapidly growing towns, Springfield and Hamilton, were most similar to Dayton and Columbus in the nonprocessing composition of their manufacturing, although they had considerably smaller total values of production. The growth of Springfield and Hamilton exemplifies the relationship between nodality within the region and the diversity of industrial activity. By the 1840's, Springfield had become the three-way junction of the National Road and two railroads, one running north to Lake Erie and the other south to Cincinnati. Excellent mill sites along the Mad River continued to sustain large processing industries in the surrounding township; but since 1840, when its regional access expanded, Springfield had developed an array of consumer-goods manufactures similar to Dayton's. Although the total value of Springfield's output was only a quarter of Dayton's total, diverse fabricating activities comprised almost 60 percent of the city's production. The net addition of a little more than 3,000 inhabitants during the 1840's represented a growth of almost 150 percent for Springfield.

The early commercial nodality of Hamilton, which was much closer to Cincinnati than was either Dayton or Springfield, was eroded with the improvement of transportation facilities leading to the "Queen City." Although Hamilton remained the Miami Canal terminal for turnpikes of the central Whitewater River Valley, as a depot on the canal and a recently completed railroad it had access throughout the densely settled Miami River Valley and to the emerging urban-industrial market at Cincinnati. The town developed clothing, wood, and iron manufactures that comprised 46 percent of its total value of production. Another 21 percent of its output came from paper mills, which probably depended on the large Cincinnati printing and publishing industry for their market.

The remaining trade centers within the region, represented in Table IV by Urbana, Eaton, Oxford, Middletown, and New Carlisle, had considerably smaller productions of manufactures. These towns catered almost exclusively to their local rural markets. As in the pioneer period, between 1830 and 1850 they balanced a few agricultural and forest processing activities with more numerous but smaller artisan shops. Only a few factories existed, and they rarely compared in value of output or in number of employees with those of the larger towns.

In summary, selective growth among the region's towns reflected reinforcement

and shifts of nodality in the evolving transportation network. Maintenance of nodality was imperative for continued service to rural hinterlands during this second period of sustained settlement expansion and agricultural specialization. Moreover, the superior facilities of the canals (and later railroads) not only enhanced the commercial position of a few towns but also added to their growth with the attraction of large

TABLE IV—COMPOSITION OF MANUFACTURING IN CITIES AND TOWNS OF THE MIDDLE OHIO VALLEY, 1850

CITY OR TOWN	PERCENTAGE OF TOTAL VALUE OF PRODUCTION			TOTAL VALUE OF PRODUCTION
	Primary processing industries	Nonprocessing industries	Miscellaneous industries	
Dayton	21	77	2	\$1,239,632
Columbus	10	76	14	1,022,151
Portsmouth	11	86	3	434,135
Springfield	37	59	4	320,975
Hamilton	31	67	2	293,866
Madison	64	34	2	1,675,052
Chillicothe	68	28	4	493,089
Lawrenceburg	85	15	0	648,685
Aurora	92	8	0	669,359
Rising Sun	70	30	0	161,550
Urbana	7	89	4	104,703
Eaton	34	66	0	96,820
Oxford	47	53	0	40,394
Middletown	53	37	10	72,827
New Carlisle	49	51	0	64,462

Source: "Seventh Census of the United States, Manufacturing," manuscript schedules for Ohio and Indiana (Ohio State Library, Columbus; and Indiana State Library, Indianapolis).

processing industries. Finally, through greater employment opportunities the expanding secondary manufactures of the few subregional nodal centers encouraged rapid city growth, particularly at Columbus and Dayton.

THE PRIMACY OF NONPROCESSING INDUSTRIES IN THE TRANSITIONAL PERIPHERY, 1850-1860

The rapid adoption of railroads at mid-century had an immediate impact on the pattern of urban growth in the middle Ohio Valley. Both hierarchical shifts in functions and locational changes in nodality contributed directly to the differential performances of the cities in the region. Moreover, the distribution of nodality among the larger towns was clearly related to the location of new nonprocessing manufactures at the time when these activities were becoming the foundation of continued urban growth.

More than a thousand miles of railroad track were laid in the middle Ohio Valley during the 1850's, nine-tenths of which were in operation by the early years of the decade (Fig. 4). By 1860 railroads penetrated the middle Ohio Valley region at more than a dozen points, making connections with both water and rail interregional routes in all directions. Consolidations and working agreements among the various railroad companies created five lines operating east and west through the region and three north-south lines between Cincinnati and Lake Erie ports.

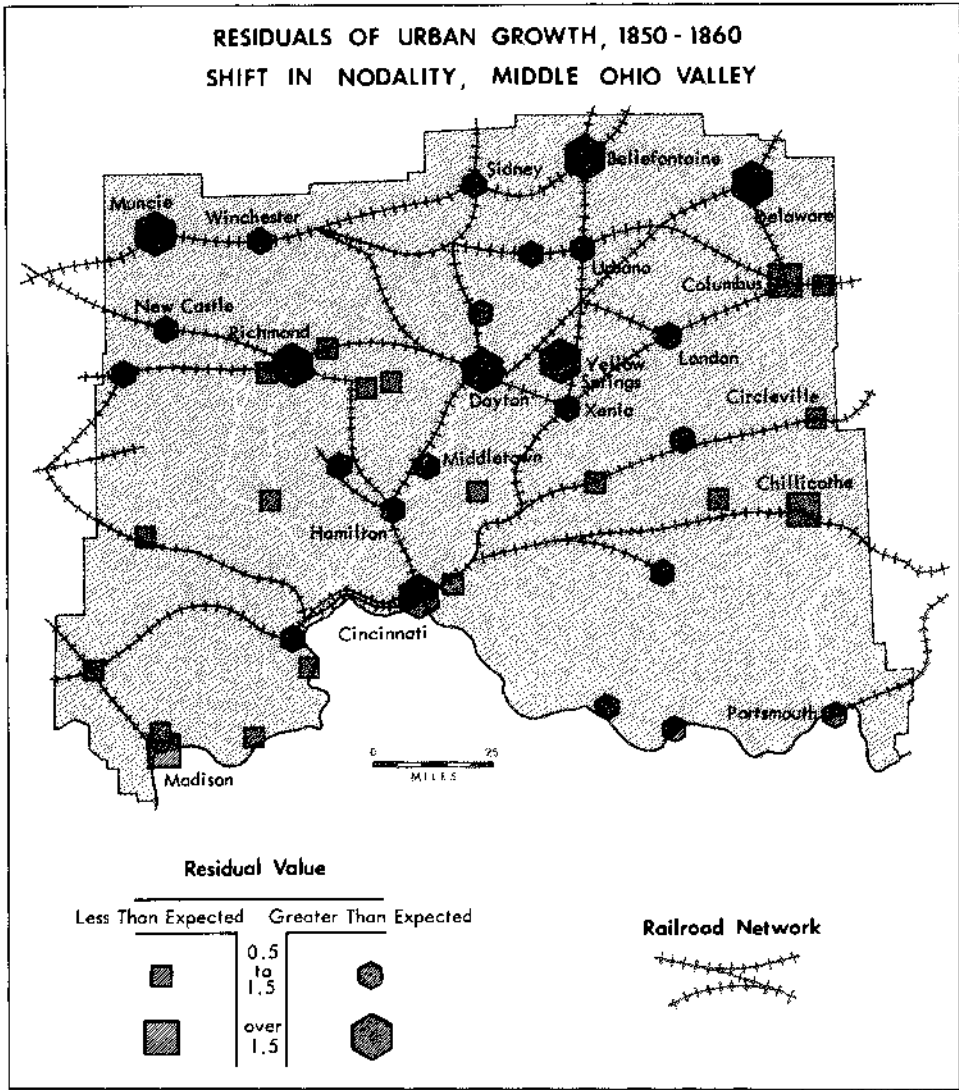


FIG. 4—Residuals of urban growth and shift of nodality in the middle Ohio Valley, 1850-1860. The railroad network was reconstructed from data in the annual reports of the railroad companies. These reports are scattered among several libraries, but the best collection for this region is held by the Cincinnati Historical Society. See also Muller, *op. cit.* [see text footnote 14].

Railroads quickly replaced the canals as the primary means of commerce. The tonnage and earnings of the canal system declined so sharply that both Indiana and Ohio state officials publicly admitted the vulnerability of the canals.²⁸ Although the southern river outlet remained surprisingly vigorous in the 1850's, the integration of the regional railroads with the eastern trunk systems increasingly attracted trade that had formerly moved to eastern markets by way of New Orleans. This shift in the

²⁸ "Auditor of the State, Annual Report," *Ohio Exec. Docs.*, 1850, Part 2, p. 28; and "Trustees of the Wabash and Erie Canal, Annual Report," *Indiana Doc. Journ.*, 1856, Part 2, p. 129.

mode and direction of movement enhanced the commercial position of railroad junctions in the interior of the region, while most Ohio River and canal ports in the southern portion drew on severely diminished, localized agricultural hinterlands.

The dramatic alteration of movement in the middle Ohio Valley did not immediately produce major changes in economic activity, but signs of diversification in agriculture and manufacturing were evident by 1860. The traditional cash grain crops expanded as the few remaining underdeveloped areas moved into commercial production. At the same time high-value, locally oriented farm specialties such as dairying began to displace grain crops in some counties.²⁹ With expanded grain production, agricultural processing industries similarly increased throughout the region and still dominated the total value of manufacturing production in 1860. The value of nonprocessing industries declined as a proportion of total regional production from 38 to 33 percent, for the greatly expanded diversified industries of a few cities did not fully compensate for markedly lower values of artisan and home manufactures in the more rural counties. In terms of employment, however, the nonprocessing industries generated the greatest growth, a relevant consideration for urban growth.³⁰

At first glance, the typical railroad explanation of selective urban growth seems to have validity. As a group, the towns that failed to obtain rail service performed poorly; and, furthermore, railroad junction towns outgrew mere way stations along the rail lines. However, variations in population growth within the groups of railroad towns indicate that the differential acquisition of rail service alone does not account for the pattern of growth.

The conversion of rail movement tended to shift the performance of some functions within the urban hierarchy, generally to the disadvantage of district trade centers. Before the railroad, district trade centers had functioned as intermediate collection, distribution, and processing points between local areas and canal ports or interregional shipping points. The creation of closely spaced rail depots (at lower-order places) decentralized the collection of farm products by bringing improved access directly to the small towns within the traditional hinterlands of the trade centers.³¹ Concurrently, the reduction of overland transfer costs continued the earlier trend of concentrating many commercial and manufacturing activities at major nodal towns. For example, grains or livestock, loaded at local depots, frequently bypassed processors in the district trade centers and went instead to those at the new interregional junctions.³² The moderately disproportionate growth of agricultural processing in the counties of major nodal cities indicated such a shift. Moreover, competition in consumer goods from eastern and regional manufacturers strongly challenged the traditional artisan basis of the trade centers.

The upward shift of these manufacturing functions in the urban hierarchy, combined with the diminution of the commercial role, left many trade centers in precarious positions. Negative residuals of the regression of town size and absolute

²⁹ "Eighth Census of the United States, 1860: Agriculture" (U.S. Bureau of the Census, Washington, D.C., 1864), pp. 38-45 and 112-119.

³⁰ "Eighth Census of the United States, 1860: Manufactures" (U.S. Bureau of the Census, Washington, D.C., 1865), pp. 117-141 and 441-480. The manuscript, schedules of the 1860 Census of Manufactures for Ohio counties beginning with letters A through M have been lost. Thus it is impossible to compare systematically the manufacturing activities of many regional cities for 1850 and 1860.

³¹ "Ohio State Board of Agriculture, Annual Reports," *Ohio Exec. Docs.*, 1849-1860.

³² See, for example, "Ohio State Board of Agriculture, Fourth Annual Report," *Ohio Exec. Docs.*, 1849-1850, Part 2, p. 67.

population increase for the 1850's document their rather poor performances (Fig. 4). As exceptions, Muncie, Winchester, New Castle, London, and the other newer trade centers of the few remaining unsettled areas, which received their initial improvement of access from the railroads and subsequently experienced a surge of rural settlement, grew quite well. Presumably, their rapid growth was temporary and leveled off when their hinterlands stabilized in subsequent decades.

Reflecting the locational shift of functions, the new railroad junctions in the northern counties and the few interior subregional nodal towns were the beneficiaries of the concentration of activity. The reorientation of trade to eastern railroad routes challenged the traditional importance of the Ohio River ports for interregional movement, even though several of them also obtained rail service. The most severe reversal occurred at Madison, where four east-west railroads sliced through its hinterland and diverted trade eastward. Receipts and tonnage on the Madison and Indianapolis Railroad plummeted, and Madison's river commerce no longer rivaled Cincinnati's. Similarly, some formerly important canal ports such as Chillicothe and Circleville, which became only way stations on railroads, were reduced to more localized commercial roles.³³ The regional railroad junctions with the east-west trunk lines in the northern counties became the new focuses of interregional movement. Although many agricultural commodities merely passed through, these junction towns (including Union City, Yellow Springs, Xenia, and Urbana) experienced a relatively rapid growth from the new transport, trade, and processing activities. The contrast of their positive residuals in the regression analysis of population growth with the negative residuals of the river and canal ports in the southern portions of the region illustrates the locational shift of commercial nodality (Fig. 4).

The greatest population increases occurred in those cities that maintained or enhanced their superior accessibility within the region or within the emerging Miami Valley urban-industrial market, for by far the largest and most diverse array of non-processing manufactures developed at these centers.³⁴ The importance of these industries for urban growth had been evident by 1850, but they became decisive when the region was linked with the national rail network. Although eastern manufacturers also obtained better access to the region, improved connections with regional and western markets and greater ease of assembling raw materials at specific centers of the regional circulation network gave those manufacturers augmented thresholds for potential sales and advantages in the transportation of bulky products. The relationship of nodality, nonprocessing industries, and urban growth is particularly clear in the differential experiences during the 1850's of those cities which had been the region's fastest growing ones in the preceding period (Fig. 5 and Table V).

Richmond's sudden growth in the 1850's exemplifies the importance of nodality and manufacturing. The opening of the Whitewater Canal in the early 1840's had shifted the commercial focus of east central Indiana to Cambridge City at the expense of Richmond. In the 1850's Richmond became the junction of four railroads, providing links to external markets as well as access to much of the middle Ohio Val-

³³ "Board of Public Works, Annual Reports," *Ohio Exec. Docs.*, 1850-1860; and "History of Franklin and Pickaway Counties, Ohio" (Williams Brothers, Cleveland, 1881), p. 201.

³⁴ Columbus's small increase in population was the major exception to the importance of subregional nodality. The disorganization of the manuscript schedules of the 1860 Census of Population for Franklin County and for Columbus prevented the corroboration of the published record. There is evidence of substantial suburban growth in both population and manufacturing, which would be more consistent with Columbus's nodal position.

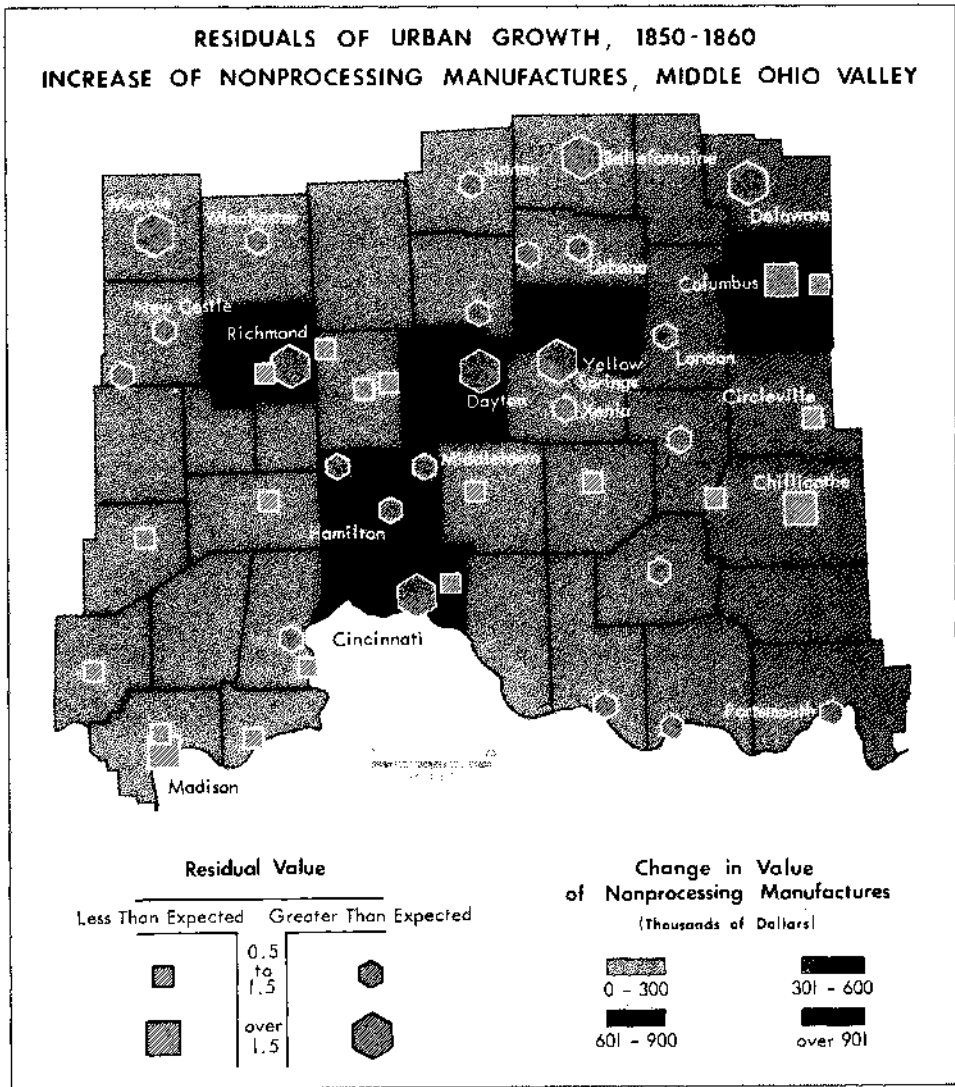


FIG. 5.—Residuals of urban growth and increase of nonprocessing manufactures, by county, in the middle Ohio Valley, 1850-1860. Sources: Eighth Census of the United States, 1860: Manufactures [see text footnote 30]; and Muller, *op. cit.* [see text footnote 14].

ley region. As trade shifted away from the Ohio River and the Whitewater Canal, Richmond regained its former nodal importance, while Cambridge City declined to a railroad way station. During the 1850's, the total value of manufacturing of the city of Richmond probably increased by more than \$700,000; 82 percent of this increase came from nonprocessing industries.³⁵ Acquisition of railroads, shift in nodality, and expansion of manufacturing resulted in a net population growth of 4,035. Only Dayton of all

³⁵ "United States Census of Manufactures, 1860," manuscript schedules for Wayne County, Indiana (Indiana State Library, Indianapolis).

TABLE V—URBAN GROWTH IN THE MIDDLE OHIO VALLEY, 1850-1860

CITY OR TOWN	RANK OF POPULATION INCREASE, 1850-1860	RANK OF INCREASE IN TOTAL VALUE OF MANUFACTURING IN THE COUNTY	RANK OF INCREASE IN VALUE OF NON-PROCESSING MANUFACTURES IN THE COUNTY	VALUE OF INCREASE IN NON-PROCESSING MANUFACTURES IN THE COUNTY (in thousands of dollars)	PERCENTAGE OF TOTAL VALUE OF COUNTY MANUFACTURES FROM PROCESSING MANUFACTURES	GROWTH RELATIONSHIP
Dayton	9,104	1	1	1,039	47	Subregional nodality, urban-industrial market
Richmond	4,035	2	3	778	58	Subregional nodality
Hamilton ^a	2,566	6	5	563	51	Urban-industrial market
Portsmouth	2,257	5	10	191	47	Specialized manufacture, raw material
Springfield	1,894	4	4	609	50	Subregional nodality, urban-industrial market
Delaware	1,815	..	12	147	40	Railroad junction
Xenia ^b	1,634	12	..	19	79	Railroad junction
Urbana	1,499	..	..	5	79	Railroad junction
Bellefontaine	1,377	..	8	202	55	Railroad junction
Piqua	1,339	7	6	258	68	Urban-industrial market, railroad junction
Yellow Springs ^b	1,181	12	..	19	79	Railroad junction
Muncie	1,116	..	..	80	78	Railroad junction
Union City ^c	1,038	..	..	..	..	Railroad junction
Aurora	1,036	13	..	53	87	Agricultural processing specialization
Middletown ^d	983	6	5	563	51	Urban-industrial market
Circleville	972	15	..	60	68	Agricultural processing specialization
Columbus ^d	958	3	2	847	29	Subregional nodality
Lawrenceburg	948	10	7	218	79	Agricultural processing specialization
Chillicothe	526	14	11	168	72	Agricultural processing specialization
Madison	118	9	9	201	65	Agricultural processing specialization

Sources: "United States Census of Manufacturing, 1850"; and Eighth Census of the United States: Manufactures [see text footnote 30].

^a Hamilton and Middletown are both in Butler County.

^b Xenia and Yellow Springs are both in Greene County.

^c Union City lies in both Darke and Randolph counties.

^d For comments on the population growth of Columbus, see text footnote 34.

the other regional cities could match Richmond's expansion in manufacturing and population.

Indeed, Dayton doubled the Indiana city's growth with a net addition of more than 9,000 inhabitants. Although the rail network undoubtedly decentralized some former commercial functions to other railroad junctions, Dayton obtained accessibility to nearly all parts of the region as well as to other western markets. The city's county led the region in the growth of both processing and nonprocessing industries.³⁶ Assuming that the nonprocessing activities were overwhelmingly concentrated in the city, as they had been in 1850, Dayton's population growth increasingly

³⁶ Eighth Census of the United States, 1860, Manufactures [see footnote 30 above], pp. 450-451, 467-468, and 140-141.

reflected the expansion of employment in its transport-oriented and consumer-goods industries.

The relatively rapid population growth of Hamilton, Portsmouth, and Springfield, third, fourth, and fifth in net population change after Dayton and Richmond, further reflected the importance of nonprocessing industries, as they prospered in marked contrast to the agricultural processing centers that had been their equals in size at the beginning of the decade. Nonprocessing industries contributed 47 percent or more of the total value of manufacturing in the counties of each of these cities in 1860 (Table V). Like Dayton, Springfield undoubtedly lost some commercial functions with the full operation of the railroads and with the decline of the National Road; however, its position as a junction on the rail network provided it with good access to the central part of the region, to the Miami River valleys, and to other western markets. With its county recording the fourth largest increase in the value of nonprocessing manufactures, Springfield became one of Ohio's leading producers of agricultural implements and hardware goods.³⁷

On the basis of county information, Hamilton appears to have further developed its industries for the nearby urban-industrial markets of Cincinnati and the Miami Valley. The value of output from paper mills increased fourfold, to \$402,000 with 215 employees, while large machine, iron casting, and agricultural implement industries also developed. Middletown, in the same county and on the old Miami Canal, shared in this expansion of nonprocessing manufactures, adding a net increase of almost 1,000 residents (fifteenth in the region). The completion of a water hydraulic in 1852 at Middletown and the conversion of former processing mills to factories, especially papermaking, illustrates the emergence of the Miami Valley urban-industrial market.³⁸

Portsmouth, unlike Springfield and Hamilton, did not grow during the 1850's because of its nodality within the middle Ohio Valley. Located in the extreme southeastern corner of the region, Portsmouth remained inaccessible to most regional markets, for railroads failed to improve its position. The city's industrial growth depended on the expansion of its iron industries, which utilized nearby ore resources. There was also an increase of commercial activities from the shipment of agricultural commodities, pig iron and iron castings on the Ohio River, in part the result of isolation from the rail network.

During the previous period of regional development, Madison, Chillicothe, Circleville, and Lawrenceburg had been among the leading cities in population growth, with specialized agricultural processing industries. As river and canal ports with reduced accessibility to localized areas, these cities not only suffered diminished commercial roles but also experienced relatively slower rates of industrial growth than those of the main interior nodal centers. Significantly, they continued their specialization in agricultural processing.³⁹ With the loss of nodality and failure to diversify manufacturing, these four cities experienced relatively little population growth during the 1850's.

³⁷ "Commissioner of Statistics, Fourth Annual Report," *Ohio Exec. Docs.*, 1860, Part 2, p. 455.

³⁸ Sherry O. Hessler: *Transport and Urban Growth in the Miami Valley, Ohio, 1820-1880* (unpublished M.A. thesis, Dept. of Geography, Johns Hopkins Univ., Baltimore, 1968), pp. 154-155, 186-187, and 219-221.

³⁹ "United States Census of Manufactures, 1860," manuscript schedules for Ohio and Indiana (Ohio State Library, Columbus; and Indiana State Library, Indianapolis).

NODALITY AND SELECTIVE URBAN GROWTH

Selective urban growth in the middle Ohio Valley before 1860 corresponded rather well with the anticipated pattern. During the first two periods of initial settlement and agricultural specialization, nodality on the evolving transportation network and the associated access to local hinterlands primarily influenced urban growth. As a result, newer centers in recently settled areas and towns with the greatest subregional nodality tended to grow most rapidly. The construction of new modes of movement in the region concentrated some commercial and agricultural processing functions to the advantage of towns along these facilities. In a few instances, the new lines of circulation caused dramatic shifts in nodality and growth, although generally they reinforced the extant pattern of movement. As late as 1840, the populations of larger towns still related closely to the value of agricultural processing production, reflecting the primacy of the hinterland service functions. However, with the continued improvement of regional transportation during the 1840's, the few towns with the greatest access to regional markets began to develop diverse nonprocessing industries and experienced some of the largest population increments.

With the integration of the middle Ohio Valley into the emerging national transportation network after 1850, manufacturing assumed the decisive role in urban growth. Hierarchical and locational shifts in commercial and manufacturing functions that resulted from the construction of railroads undermined the position of district trade centers in general and benefited northern junctions on the regional rail network. Formerly important subregional and district centers that lost their nodal positions on the new rail net experienced atrophied commercial relations, failed to diversify their manufactures, and suffered through a disappointing decade, never regaining their momentum during the remainder of the nineteenth century. In contrast, the few cities that maintained or acquired subregional nodality on the railroad network, as well as those of the industrializing Miami River Valley, grew rapidly with the concentration of commerce and nonprocessing industries. Moreover, these cities maintained their rankings among all regional centers throughout the century. Indicating the diminishing role of local hinterlands, the type more than just the amount of manufacturing clearly exercised the determining influence on urban growth.

Thus during the course of regional settlement the bases for urban growth shifted from the commercial servicing of local hinterlands to the development of secondary manufactures. The location of this growth depended on the distribution of nodality in the evolving transportation network. Considering the extensive and rapid changes in transportation facilities, the nodality of towns exhibited surprising inertia.⁴⁰ New transport modes tended to reinforce the existing circulation network and nodal points. The inertia of nodality, built up in the previous transportation network and institutionalized through the tradition of personal business relationships, frequently overrode the mere acquisition of newer transport modes. Nevertheless, the spread of transportation facilities and the integration of regional movement with the evolving national network resulted in significant changes in the nodality of towns and thus affected their growth.

⁴⁰ The inertia of the system suggests the danger of examining only towns with more than 2,500 inhabitants, since the explanation of selective growth may be partially found in the formative periods of urbanization, when very small towns played important regional roles.