Journal of Economic Perspectives—Volume 12, Number 2—Spring 1998—Pages 127–138

Urban Diversity and Economic Growth

John M. Quigley

At the risk of some simplification, it is possible to identify four periods of intense study of cities by economists. Each of these has led to an increased understanding of the economics of urban areas and the unique role played by cities in the modern economy.

The first of these periods occurred in the decade after World War I—only about ten years after the truck revolutionized the transport of goods within urban areas. This period included the first systematic empirical analysis of the forces affecting the location of firms and households within cities. Robert Murray Haig (1926) and a number of other microeconomists at Columbia analyzed the spatial patterns of manufacturing activity in lower Manhattan and in the rest of New York City. Haig and his colleagues devoted considerable attention to ''where things 'belong' in an urban area'' (p. 402), providing the first systematic economic analysis of urban spatial structure. For example, they analyzed the garment industry, concluding that it was destined ''by nature'' to disperse north of 14th Street, and predicting that it would follow the established spatial pattern of the cooperage (barrel-making) industry. Standardization in size and quality of barrels had meant that identical barrels could be made throughout the New York metropolitan area, even in New Jersey, and the introduction of the truck meant that they could be transported cheaply throughout the region and exported.

The second of these periods—though not in chronological order—began in the mid-1960s. It formalized many of the insights about location incentives within urban areas which had been uncovered a half century before, mixed them with the logic of Heinrich von Thünen's (1826) ancient theories about agricultural crops and land values, and applied them to the household sector. The works of William Alonso (1964)

■ *John M. Quigley is Chancellor's Professor of Economics and Public Policy, University of California, Berkeley, California. His e-mail address is* ⟨*quigley@econ.berkeley.edu*⟩.

and John Kain (1962) exemplified this new approach, which was thoroughly worked out and picked over during the 1960s and 1970s. According to these theories, in a world of identical households, all would be indifferent among residential locations within the city, since spatial variations in housing prices would equalize utilities. Differentiation in the population would lead to predictable differences in location patterns, as land and housing prices adjusted to the spatial differentiation of demand. In this framework, the widely observed pattern of decline in housing prices and a steeper decline in land prices with distance to the urban center arises from a residential equilibrium in which higher income households live further from downtown and commute longer distances, but consume more housing in less dense accommodations. The poor outbid the rich for central locations with higher housing and land prices because they consume only small quantities of housing services.

The third concentrated period of advancement in our understanding of cities also arose from intensive analysis of the nation's primary city, New York. In the late 1950s, the Regional Plan Association and a group of economists at Harvard combined in a three-year study of the New York Metropolitan Region—an area which contained 10 percent of the U.S. population at the time and which stretched from Monmouth County, New Jersey, to Fairfield County, Connecticut. The Regional Plan Association sought to project economic and demographic conditions three decades into the future, and this practical objective provided academic researchers with a golden opportunity for intensive study of the fundamental factors affecting the development of industry and the location of economic activity. This effort ultimately resulted in publication of nine books and several technical reports, including an honest-to-God projection of economic conditions.[1] The hallmark of the New York study is the use of the concept of ''external economies of scale;'' that is, the notion that some firms can achieve cost savings when they operate in the context of a larger local economy. The summary volume of the New York study by Raymond Vernon (1962) includes a chapter devoted to the ''rise and spread of external economies'' and to the impact of these externalities on firm location and the well-being of central cities.[2]

We are in the midst of the fourth of these bursts of advancement in understanding the economics of cities. This era was ushered in by a reconsideration in the 1980s of the nature of economic growth. It has drawn new attention to aggregate cross-section and time-series data on cities, using variation between cities as the vehicle for analyzing and evaluating the nature and causes of economic growth.

The parallelism between the first two sets of developments and the latter two is striking. Much of the work on residential location theory of the 1960s can be traced to the original New York study of the 1920s. Similarly, much of the current emphasis on externalities and the growth of urban areas can be traced to the influential New York study of the late 1950s. The first two sets of developments emphasized the

[1] Dick Netzer (1992) has provided a provocative evaluation of these projections—comparing forecasts published in 1962 with outcomes in the 1970s, 1980s, and 1990s.

[2] The study also paid careful attention to Scitovsky's (1954) distinction between ''technological externalities'' and ''pecuniary externalities.''

intrametropolitan location patterns of households and firms. The latter two have emphasized the overall patterns of growth of cities and metropolitan regions.

For example, *Made in New York*, a compendium of descriptive case studies of manufacturing in New York, includes the following passage (Hall, 1959, pp. 12–13):

> Rubbing elbows with others of their kind and with ancillary firms that exist to serve them, [firms] satisfy their variable wants by drawing upon common pools of space, labor, materials, and services. In more concise language, they can take advantage of external economies.
>
> The economies are external in the sense that the firm obtains them from outsiders, and they are economies in the sense that the firm can satisfy its variable or part-time needs in this manner more cheaply than it could satisfy them from within. The outsider, in turn, can afford to cater to the firm's fractional needs because he also caters to many other firms. The external economy may derive from an electrician or a sewing machine repairman or a free-lance photographer, responding to the call of a firm which does not need him full-time. . . . It may even grow out of a revolving supply of specialized labor, such as garment workers accustomed to seasonal cycles, printers, staff writers, editors, or electronic engineers. Such a supply enables a firm to pick up employees quickly and let them go with equal suddenness, and makes it unnecessary to maintain a stable force of workers for an unstable demand.
>
> Thus, it is obvious that external economies reduce the cost of doing business just as labor and transport [savings] do. Indeed, there is no real line of demarcation.

This description seems surprisingly close to more recent formal models in which the production of individual firms is competitive with constant returns to scale, but there are socially increasing returns as aggregate production rises. In the world of these recent models, capital investment has external benefits not reaped by private investors. The private investors solve well-specified optimization problems, and the economy of the urban area is more productive due to the external effects of this investment. With the benefit of hindsight, of course, the theoretical model is obvious. It has been said that the essence of really good theorizing is results which convince us that, in retrospect, it is all clear and it has been clear all along.

The original applications of the modern endogeneous growth models emphasized the stock of accumulated knowledge. Paul Romer (1994) refers to this as the stock of ''results'' in a paper in this journal. Lucas (1988) was more precise in specifying the embodiment of results in human capital. Ideas can clearly benefit others as much or even more than they benefit the inventor of the idea. Knowledge or human capital, take your pick, may be the most important example of the application of the theory of endogeneous growth. Nevertheless, cities have other important attributes which affect the growth of the economy in analogous ways—most especially their internal heterogeneity and diversity.

Recall that in the 1920s, the standardization of barrel manufacturing was associated with its decentralization to outlying parts of the New York area. A central

conclusion of the Hall (1959, p. 8) volume, published almost 40 years later, detailing trends in the apparel, publishing, and electronics industries, was the following:

> The chief common denominator in these manufacturing operations that were attracted more strongly to other places than to the [New York] region appears to be standardization. The rest of the country gained relative to New York in products whose specifications could be planned in advance with reasonable assurance. Large numbers of identical copies—house dresses, magazines, radio sets—could be poured out of the plants without making any changes in the design. . . . But the fact remains that the manufacture of standardized products . . . has shown pervasive tendencies . . . to prefer locations far from New York.

Of course, those conclusions referred only to the New York City metropolitan region and only to a small number of industries studied intensely. But within these limits, the evidence showed that firms producing nonstandardized differentiated output were more strongly attracted to the urban core than those firms producing homogeneous products. Even more directly, Benjamin Chinitz (1961) speculated that an urban environment with many firms producing heterogeneous output is more conducive to economic growth than an environment dominated by a few large firms or a single industry. This argument was based upon the superior competitive conditions fostered in an environment with smaller firms, more entrepreneurial activity, and a more adaptable investment and banking infrastructure. Again, this speculation was based on a specific comparison of two cities, New York and Pittsburgh, during the postwar period. The general models came much later.

Implications of Agglomeration

How do diversity and large size affect the level of output and the level of well-being achievable in a city? Table 1 suggests that there are at least four ways, not even including the knowledge spillovers which have figured so prominently in the debate about the new growth theory. Many of the arguments here were first put forward in a recognizably modern form by Alfred Marshall in his *Principles of Economics* and *Industry and Trade* (David and Rosenbloom, 1990). However, the concepts have been sharpened and differentiated over time.

The first—scale economies or indivisibilities within the firm—are the historical rationale for the existence of cities in the first place. Indeed, it has been long understood that, without the existence of scale economies in production, economic activities would be dispersed to save on transportation costs. Without scale economies, there is no role for the city at all.[3] Just as many urban industrial activities

[3] The economic inefficiency of cities, absent scale economies, is sometimes called the "Starrett theorem," after the work of Starrett (1978). One exception to this conclusion is the original von Thünen (1826) market village—a central node through which goods pass to be exported to world markets.

Table 1
Agglomerative Implications of Size and Diversity in Cities

Factor	*Example*	*Theoretical Argument*
1. Scale Economies		
in production, within firms	larger plant size	Mills (1967), Dixit (1973)
in consumption	public goods: parks, sports stadiums	Arnott and Stiglitz (1979)
2. Shared Inputs		
in production	repair, accounting, legal, advertising	Krugman (1993)
in consumption	theater, restaurants, high/low culture	Rivera-Batiz (1988)
3. Transaction Costs		
in production	labor market matching	Helsley and Strange (1990), Acemoglu (1996)
in consumption	shopping districts	Artle (1959)
4. Statistical Economies	unemployment insurance	David and Rosenbloom (1990)
in production	resale market for assets	Helsley and Strange (1991)
in consumption	substitute goods	Mills and Hamilton (1984)

display economies of scale over some range, exhibiting U-shaped average cost curves (Mills, 1967; Mirrlees, 1972), so too do many public facilities like sports stadiums, swimming pools, and so on. For many of the collective consumption goods provided to urban residents (for example, walking in the park), the average cost of enjoyment declines with additional residents over a broad range. At some point, however, the average cost turns up again with more residents, at the point where congestion in the park becomes important.[4] To the extent that heterogeneity or variety encourages larger-sized urban areas that can take better advantage of scale economies or indivisibilities, these basic factors will increase the output of larger cities and the utility of their residents.

The second factor—shared inputs in production and consumption—encompasses the ''economies of localized industry'' described by Alfred Marshall, as well as its consumption analogue. The production aspects of these shared inputs are aptly described in the passage quoted above from Hall (1959), as well as in the more modern treatment by Krugman (1993) explaining how the ready availability of workers (in a metropolitan area), and of particularly specialized workers in accounting, law, advertising and other technical fields, can reduce costs for businesses. Shared inputs in consumption include networks for disseminating information about cultural activities, as well as the facilities for such activities. The use of shared inputs to produce more differentiated consumption goods in large cities is apparent in all manner of fashion, culture, and style—where seemingly identical inputs of cloth (or acting talent) are rearranged to produce quite different products, and

[4] The development of club theory in local public finance is premised on significant scale economies in publicly provided consumption and on the congestion that arises ultimately when these facilities are rationed by average cost pricing through local taxation (Scotchmer, 1994).

where equivalent inputs of crayfish and rice can be transformed into Cajun meals, Creole meals, or authentic Dublin Bay scampi.

A third possible reason why a metropolitan area may provide greater economic efficiency arises from reductions in transactions costs. On the production side, this factor includes the possibility of better matching between worker skills and job requirements. This reduces the search costs of workers with differentiated skills and employers with differentiated demands for labor, as pointed out in the theoretical works by Helsley and Strange (1990) and more recently by Acemoglu (1996). Of these two papers, the Helsley and Strange model is more directly relevant to cities, and the authors take pains to compare the effects of labor market search costs upon equilibrium city sizes. The Acemoglu analysis focuses on investment in physical and human capital and the external pecuniary effects of these decisions. It builds upon the observation that there are complementaries in production between physical and human capital. Thus, when a group of workers increases its stock of human capital, firms that expect to employ them will choose to invest more in physical capital. With heterogeneity, costly search, and imperfect matching, however, some workers not in the group will end up working with more physical capital, earning higher returns on their human capital. Thus, the return on the human capital to a worker in a city rises as the stock of human capital in the city rises, and the return on physical capital investment to an investor also increases with the stock of capital in the city. Acemoglu demonstrates that this result can obtain even when all output in the city is produced with constant returns to scale and with no technological externalities.

The reduced transactions costs in larger cities also include lower search costs for consumers. Larger cities are better able to support agglomerations of similar shopping outlets in particular districts. Examples range from the familiar side-by-side placement of used car lots in smaller cities to the specialized consumer services of the diamond exchange on New York's 47th Street; Artle (1959) offers extensive empirical evidence on the co-location of various types of retail establishments.

Finally, there are a set of potential economies and cost savings that arise, in the description of Mills and Hamilton (1984), from the application of the law of large numbers to the fact of fluctuations in the economy. For example, to the extent that fluctuations in purchases of inputs are imperfectly correlated across firms, employment can be stabilized, since some firms are hiring while other firms are not. To the extent that fluctuations in sales of output are uncorrelated across buyers, firms need carry less inventory, since some consumers are buying while others are not. These represent real savings to business firms and to the larger economy.

Theoretical Models of Heterogeneity

The factors noted in Table 1 reflect implications of both the size and the heterogeneity of cities. As emphasized above, scale economies, by themselves, provide the historic rationale for cities. But economies from the shared inputs in production and consumption, from reduced transactions costs from matching, and from reductions in variability all increase with the diversity of economic activities. Interesting

and powerful models of these implications of diversity have been around for less than a decade and are still under development. Many of these general equilibrium treatments are based upon the perspective of monopolistic competition and optimum product diversity introduced by Dixit and Stiglitz (1977). This influential work considered explicitly the trade-off between the output of goods and their variety.

When considering consumption, the general form of these models assumes that household utility depends on consumption of traded goods, space or housing, and a variety of local goods. The markets for traded goods and housing are competitive, while the differentiated local goods are sold in a monopolistically competitive market. If there is less differentiation among local goods, then variety loses its impact on utility; greater differentiation means that variety has a greater effect on utility. Under reasonable assumptions, the utility of a household in the city will be positively related to the aggregate quantity of local goods it consumes and the *number* of types of these goods which are available in the economy.[5]

On the production side of the economy, the importance of a variety of locally produced inputs can be represented in a parallel fashion. For example, suppose that the aggregate production function includes labor, space, and a set of specialized inputs. Again, the markets for labor and space can be taken as competitive, while the differentiated local inputs are purchased in a monopolistically competitive market. If there is less differentiation among inputs, then variety loses its impact on output; greater differentiation means that variety has a greater effect on output. For example, a general counsel may operate alone. However, she may be more productive if assisted by a general practice law firm, and even better served by firms specializing in contracts, regulation, and mergers. Again, under reasonable conditions, output in the city will be related to quantities of labor, space, and specialized inputs utilized and also to the number of different producer inputs available in that city.[6]

Theoretical models built along these lines can yield a remarkable conclusion: *Diversity and variety in consumer goods or in producer inputs can yield external scale economies, even though all individual competitors and firms earn normal profits.* The intuition behind this result works in this way. In these models, the size of the city and its labor force will determine the number of specialized local consumer goods and the number of specialized producer inputs, given the degree of substitutability among the specialized local goods in consumption and among specialized inputs in production. A larger city will have a greater variety of consumer products and producer inputs. Since the greater variety adds to utility and to output, in these models, larger

[5] For example, if the utility function of consumers is Cobb-Douglas in traded goods, housing, and local goods, and if there is a constant elasticity of substitution in utility among locally produced consumer goods, then the utility of consumers increases with the quantity of local goods and with the number of types of local goods available. For an introduction to these sorts of models, see Abdel-Rahman (1988), Fujita (1988), and Rivera-Batiz (1988). See Krugman (1991) for a later treatment.

[6] The conditions closely parallel those mentioned in the previous footnote. For example, if the production function for goods is Cobb-Douglas in the three inputs and the specialized inputs have a constant elasticity of substitution in production so that they have a symmetric effect on production, then output increases with the quantity of specialized inputs and also with the number of types of input. See the references in the previous note for detailed expositions of models of this kind.

cities are more productive, and the well-being of those living in cities increases with their size. This will hold true even though the competitive and monopolistically competitive firms in these models each earn a normal rate of profit.

Now, these advantages of size do not literally go on forever, even in the models that incorporate one or the other of these types of heterogeneity—at least not in the most recent models (Henderson, 1974, 1996). Explicit recognition of the land market and the necessity of commuting suggests that, at some point, the increased costs of larger cities—higher rents arising from competition for space and higher commuting costs to more distant residences—will offset the production and consumption advantages of diversity. Other costs like air and noise pollution no doubt increase with size as well. Nevertheless, even when these costs are considered in a more general model, the optimal city size—if it exists—will be larger when the effects of diversity in production and consumption are properly reckoned. Urban output will be larger and productivity will be greater. The utility of residents will be higher. Larger cities contribute more than proportionately to national output.

Empirical Support

The theoretical models of the economic advantages of heterogenous products and inputs that have been developed over the past decade provide a compelling framework for synthesizing a broad range of empirical results.

During the 1970s, for example, a number of studies estimated production functions for specific industries, using metropolitan statistical area (MSA) aggregates as the units of observation. The general finding is a parallel shift outward in the production function for larger metropolitan areas. For example, Shefer (1973) analyzed a group of 20 industries across MSAs, concluding that doubling city size would increase productivity by 14 to 27 percent. Sveikauskas (1975) used more sophisticated methods but a smaller number of industries and found that a doubling of city size would increase output by 6 to 7 percent. Segal (1976) aggregated across industries but constructed careful measures of urban capital stocks and concluded that in ''large'' cities of about two million or more in population, productivity was about 8 percent higher than in smaller cities. In the 1980s, Nakamura (1985) conducted a similar analysis using data on Japanese prefectures. His work confirmed the importance of agglomeration and localization economies, and concluded that a doubling of the size of a prefecture was associated with roughly a 3 percent increase in productivity. Somewhat weaker results were found for Canadian municipalities (Soroka, 1984). Similar empirical studies were undertaken using U.S. data by Beeson (1987) and others, with broadly consistent results.

The 1990s have seen an outpouring of sophisticated empirical analyses relating city size, the concentration of certain economic activities or else the diversity of a city's industrial mix to the level of economic output, or its growth in output. Several of these investigate explicitly the link between the urban human capital stock and productivity. Rauch (1993) provided the first empirical test of the labor market matching and human capital externality theories discussed earlier. If these externalities are significant, then otherwise identical workers will be more productive and will earn higher wages

in those cities in which the spillovers are larger—or to put it differently—skilled workers in human-capital-rich cities will earn more than those in human-capital-poor cities. Rauch provides convincing tests of these propositions, using 1990 data on individual workers living in over 200 U.S. metropolitan areas. He finds robust confirmation of these hypotheses—specifically a metropolitan area with an average educational level one-year higher than another would have about a 3 percent productivity advantage. Rauch's results are consistent with an external effect of education on productivity in cities that is almost 70 percent as large as the direct private effect. From the theoretical arguments summarized earlier, Rauch's results should underestimate the productivity advantages of large, human-capital-rich cities.

On the consumption side, workers should also be willing to work for lower wages to live in these more diverse environments. However, I am aware of only one study presenting any evidence on this point. Getz and Huang (1978) offer weak evidence that the availability of a broad range of publicly and privately provided consumer goods is reflected in local wage rates.

Analysts cannot directly observe ''knowledge'' as it spills out among buildings and the streets in cities, but some of this spillout does leave a paper trail. The geography of one paper trail has been mapped recently by Jaffe, Trajtenberg, and Henderson (1993). The authors compared the geographic location of patent grantees with the locations of the intellectual and/or commercial forebears of those innovations. These latter locations are determined by the geographic location of the owner of an existing patent cited in a subsequently successful application. Thanks to a careful experimental design and designation of controls, some of their results can be presented as straightforward cross-tabulations of patents and the patents they cite. The authors analyze cohorts of patents originating in 1975 and 1980, finding a clear localization in their pedigrees. The strength of the geographical associations is stronger in more recent data and the citations are more localized to the same state and the same metropolitan area than could be explained on the basis of pre-existing concentrations of activity. The patents cited as antecedents are five to ten times more likely to come from the same metropolitan statistical areas as are the patent citations of control groups. The evidence also suggests that the intrastate and intrametropolitan linkages are stronger for the patents held by private corporations than for those originating in universities.

Based upon more sophisticated statistical analyses, the authors estimated the decay in the localization of citations as the interval increases between the year of the approved patent and the approval of the patent it cites. The localization of patents erodes with this interval, but the erosion is far less for intrametropolitan geographical linkages than for other geographical linkages. These general findings were similar for patents in a variety of technical fields.

The geographical localization of patent citations within urban areas and the persistence of this localization over time are both quite striking. The local as well as the national role of universities in disseminating knowledge is also clearly documented in the results.

Much recent empirical work linking productivity and the urban economy has been focused on dynamic, or at least intertemporal, issues. This interest can be traced to the influential empirical analysis by Glaeser et al. (1992). By gathering a

comparable body of data on city-industries at two points in time, the authors are able to investigate the effects of initial conditions (in 1956) on subsequent performance (in 1987). For a large sample of cities, the authors analyze the industries which were largest in 1956 and their subsequent performance. The analysis is rich and complex, but from my vantage point, the most striking finding is the importance of industrial diversity on subsequent economic performance. This is consistent with the informal arguments of Jane Jacobs (1969) about the stimulation of ''ideas'' in heterogeneous surroundings and also with the view that diversity fosters specialization in inputs and outputs, yielding higher returns.

Subsequent work has confirmed this basic insight and elaborated on it. Henderson et al. (1995) consider a broadly representative body of cities and industries from 1970 to 1987. Their careful empirical analysis suggests that the extent of diversity in manufacturing industries at the start of the period was not very important in affecting employment outcomes and the subsequent performance of mature industries, but it did matter in attracting ''new'' or high tech industries (such as scientific instruments and electronic components) and in permitting those new industries to flourish.[7] In the same spirit, a recent historical analysis found that industrial diversity in 1880 had a substantial effect on output in 1890, using Census of Manufacturers data for 79 American cities (Bostic et al., 1997). Other recent research, related to states rather than to cities, reports analogous findings. For example, Garcia-Mila and McGuire (1993) find that the industrial mix of the state economy affects its level of economic growth over the period 1969–1985, even after controlling for the growth and variability of industries at the national level, the relative composition of fast and slow growth industries at the state level, and the relative mix of variable and stable industries by state. Ciccone and Hall (1996) also analyze productivity at the state level, relating gross state product to the concentration of economic activity as measured by the density of employment.

It is tempting to interpret these various empirical findings solely in terms of knowledge or education, so as to put them into the framework of modern growth theory. However, no matter how the results are described, it remains clear that the increased size of cities and their diversity are strongly associated with increased output, productivity, and growth. Large cities foster specialization in production and sustain a broader range of final products, increasing the returns of their firms and the well-being of their residents.

Conclusion

It is hardly surprising that economies of scale in production give rise to the higher density living and commuting arrangements that we call cities. It is only

[7] A potential criticism of all the work based on U.S. Census data is the aggregation of industries into ''two-digit'' Standard Industrial Classification (SIC) categories. Is this the best level for measuring diversity of output? Do larger or more diverse cities simply specialize in more productive subcommodities? Some empirical evidence is now available (Moomaw, forthcoming) suggesting that little is lost by the aggregation of industries for all these empirical analyses using SIC categories.

rather recently, however, that models of the variety available in cities have been developed to emphasize the independent role of diversity in enhancing economic efficiency. The logic underlying these models suggests that national growth is enhanced by the heterogeneous features of modern cities, and the empirical evidence suggests that these efficiency gains are not trivial.

However, traditional models of the optimal city size (Mills, 1967; Henderson, 1974) establish clearly that we would not be better off collectively living in Greatest New York. Land and housing prices increase with city size and commuting costs do as well. These factors place efficiency limits on city sizes. More recent models emphasize the importance of unpriced congestion, pollution, and other externalities in further limiting the size of the efficient city. Some of the evidence presented in the accompanying paper by Edward Glaeser in this symposium also suggests that crime and victimization increases with urban scale, and some of my own work (O'Regan and Quigley, 1996a,b) suggests that the poverty concentrations arising from urban life have external effects upon employment outcomes.

The economic costs, even the external costs, of urban scale are undoubtedly large. However, the modern perspective on urban diversity surveyed here does remind us that large cities have been and will continue to be an important source of economic growth and improved living standards.

■ *This paper benefited from the comments of J. Bradford De Long, Masahisa Fujita, J. Vernon Henderson, Eugene Smolensky, and Timothy Taylor. Research assistance was provided by Scott Susin, and financial support has been provided by the Fisher Center for Real Estate and Urban Economics of the University of California, Berkeley.*

References

Abdel-Rahman, Hesham M., "Product Differentiation, Monopolistic Competition, and City Size," *Regional Science and Urban Economics,* 1988, *18*:1, 69–87.

Abdel-Rahman, Hesham M. and Masahisa Fujita, "Product Variety, Marshallian Externalities, and City Sizes," *Journal of Regional Science*, 1990, *30*:2, 165–83.

Acemoglu, Daron, "A Microfoundation for Social Increasing Returns in Human Capital Accumulation," *Quarterly Journal of Economics*, August 1996, *111*:3, 779–804.

Alonso, William, *Location and Land Use.* Cambridge, MA: Harvard University Press, 1964.

Arnott, Richard and Joseph E. Stiglitz, "Aggregate Land Rents, Expenditure on Public Goods, and Optimal City Size," *Quarterly Journal of Economics*, November 1979, *93*:4, 471–500.

Beeson, Patricia, "Total Factor Productivity Growth and Agglomeration Economies in Manufacturing," *Journal of Regional Science*, 1987, *27*:2, 183–99.

Bostic, Raphael W., et al., "Urban Productivity and Factor Growth in the Late 19th Century," *Journal of Urban Economics*, 1997, *4*:1, 38–55.

Chinitz, Benjamin J., "Contrasts in Agglomeration: New York and Pittsburgh," *American Economic Review*, May 1961, *51*, 279–89.

Ciccone, Antonio and Robert E. Hall, "Productivity and the Density of Economic Activity," *American Economic Review*, 1996, *86*:1, 54–70.

Dixit, Avinash K., "The Optimum Factory Town," *The Bell Journal of Economics and Management Science*, 1973, *4*:2, 647–54.

Dixit, Avinash K. and Joseph Stiglitz, "Monopolistic Competition and Optimum Product Diversity," *American Economic Review*, 1977, *67*:3, 297–308.

Fujita, Masahisa, ''On the Self-Organization and Evolution of Economic Geography,'' *Japanese Economic Review*, March 1996, *47*:1, 34–61.

Fujita, Masahisa, ''A Monopolistic Competition Model of Spatial Agglomeration: Differentiated Product Approach,'' *Regional Science and Urban Economics*, 1988, *18*:1, 87–124.

Garcia-Mila, Theresa and Therese J. McGuire, ''Industrial Mix as a Factor in the Growth and Variability of States' Economies,'' *Regional Science and Urban Economics*, 1993, *23*:6, 731–48.

Getz, Malcolm and Yuh-Ching Huang, ''Consumer Revealed Preference for Environmental Goods,'' *Review of Economics and Statistics*, 1978, *60*:3, 449–58.

Glaeser, Edward L., et al., ''Growth in Cities,'' *Journal of Political Economy*, 1992, *100*:6, 1126–52.

Glaeser, Edward L., et al., ''Economic Growth in a Cross Section of Cities,'' *Journal of Monetary Economics*, December 1995, *36:*1, 117–43.

Haig, Robert Murray, ''Toward an Understanding of the Metropolis,'' *Quarterly Journal of Economics*, 1926, *40*:1, 402–34.

Hall, Max, ed., *Made in New York.* Cambridge, MA: Harvard University Press, 1959.

Helsley, Robert W. and William C. Strange, ''Agglomeration Economies and Urban Capital Markets,'' *Journal of Urban Economics*, January 1991, *29*:1, 96–112.

Helsley, Robert W. and William C. Strange, ''Matching and Agglomeration Economies in a System of Cities,'' *Regional Science and Urban Economics*,1990, *20*:2, 189–212.

Henderson, Vernon J., ''The Sizes and Types of Cities,'' *American Economic Review*, September 1974, *64*:4, 640–56.

Henderson, Vernon J., et al., ''Industrial Development in Cities,'' *Journal of Political Economy*, 1995, *103*:5, 1067–90.

Hobson, Paul A.R., ''Optimum Product Variety in Urban Areas,'' *Journal of Urban Economics*, 1987, *22*:2, 190–97.

Jacobs, Jane, *The Economies of Cities.* New York: Random House, 1969.

Jaffe, Adam B., et al., ''Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations,'' *Quarterly Journal of Economics*, August 1993, *108*:3, 577–98.

Krugman, Paul, ''First Nature, Second Nature, and Metropolitan Location,'' *Journal of Regional Science*, 1993, *33*:2, 129–44.

Lucas, Robert, ''On the Mechanics of Economic Development,'' *Journal of Monetary Economics*, July 1988, *22:*1, 3–42.

Mills, Edwin S. and Bruce W. Hamilton, *Urban Economics.* Third edition, Glenview, IL: Scott, Foresman, and Co., 1984.

Mills, Edwin S., ''An Aggregative Model of Resource Allocation in Metropolitan Areas,'' *American Economic Review*, May 1967, *57*, 197–210.

Mirrlees, James A., ''The Optimum Town,'' *Swedish Journal of Economics*, 1972, *74*:1, 114–35.

Moomaw, Ronald L., ''Agglomeration Economies: Are They Exaggerated by Industrial Aggregation?'' *Regional Science and Urban Economics*, forthcoming.

Nakamura, Ryohei, ''Agglomeration Economies in Urban Manufacturing Industries: A Case of Japanese Cities,'' *Journal of Urban Economics*, 1985, *17*:1, 108–24.

O'Regan, Katherine M. and John M. Quigley, ''Teenage Employment and the Spatial Isolation of Minority and Poverty Households,'' *Journal of Human Resources*, 1996, *31*:3, 692–702.

O'Regan, Katherine M. and John M. Quigley, ''Spatial Effects on Employment Outcomes: The Case of New Jersey Teenagers,'' *New England Economic Review*, March/June 1996, 41–58.

Rauch, James E., ''Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities,'' *Journal of Urban Economics*, 1993, *34*:3, 380–400.

Rivera-Batiz, Francisco L., ''Increasing Returns, Monopolistic Competition, and Agglomeration Economies in Consumption and Production,'' *Regional Science and Urban Economics*, 1988, *18*:1, 125–54.

Romer, Paul M., ''The Origins of Endogeneous Growth,'' *Journal of Economic Perspectives*, 1994, *8*:1, 3–22.

Scitovsky, Tibor, ''Two Concepts of External Economies,'' *Journal of Political Economy*, April 1954, *62*, 143–51.

Scotchmer, Suzanne, ''Public Goods and the Invisible Hand.'' In John Quigley and Eugene Smolensky, eds., *Modern Public Finance.* Harvard University Press, 1994, 93–125.

Segal, David, ''Are There Returns to Scale in City Size?,'' *Review of Economics and Statistics*, August 1976, *58*:3, 339–50.

Shefer, D., ''Localization Economies in SMSAs: A Production Function Analysis,'' *Journal of Regional Science*, 1973, *13*, 55–64.

Soroka, Lewis, ''Manufacturing Productivity and City Size in Canada, 1975 and 1985: Does Population Matter?'' *Urban Studies*, 1984, *31*:6, 895–911.

Sveikauskas, Leo, ''The Productivity of Cities,'' *Quarterly Journal of Economics*, August 1975, *89*:3, 393–413.

Vernon, Raymond, *Metropolis 1985.* Cambridge, MA: Harvard University Press, 1962.

von Thünen, Johannes Heinrich, *Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalekonomie.* Stuttgart: Gustave Fischer, 1966[1826].