

BUSINESS REVIEW

ISSN 0007-7011

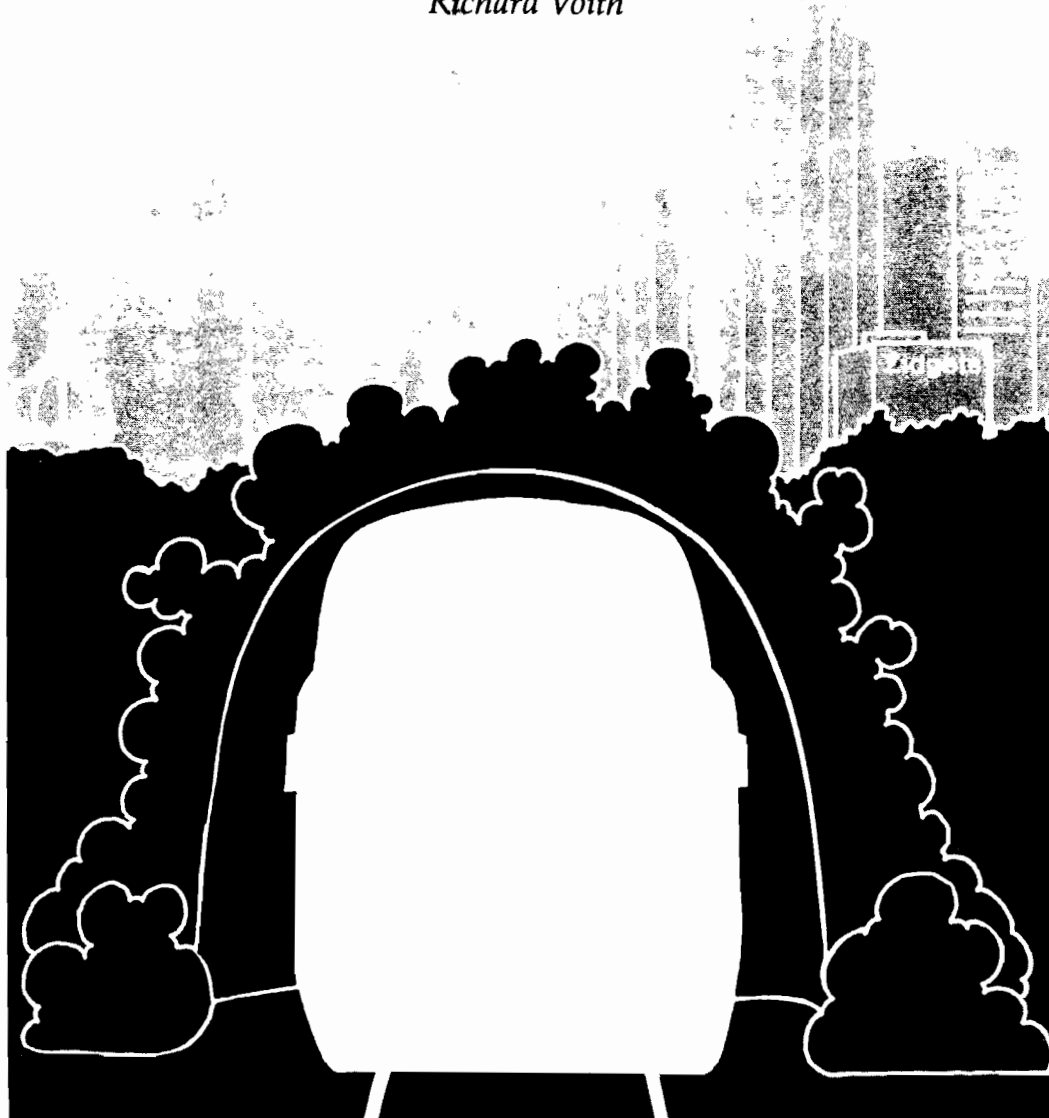
Federal Reserve Bank of Philadelphia
NOVEMBER • DECEMBER 1987

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Commuter Rail Ridership: The Long and the Short Haul

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The BUSINESS REVIEW is published by the Department of Research six times a year. It is edited by Judith Farnbach. Artwork is designed and produced by Dianne Hallowell under the direction of Ronald B. Williams. The views expressed herein are not necessarily those of this Reserve Bank or of the Federal Reserve System.

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PRODUCTIVITY IN CITIES: DOES CITY SIZE MATTER?

Gerald A. Carlino

While we sometimes hear gloomy reports of the decline of American cities, economists have found that big cities can enhance the productivity of the firms located there. In some cases, firms benefit from being near similar firms, in order to dip into the city's pool of specialized workers or specialized products. In other cases, firms benefit from the great variety of workers and services a big city offers. Firms will exploit these advantages through the "invisible hand" of the market place. But local policymakers have a role in "lending a hand" to minimize the costs of growth, such as congestion, high rents, and high wages.

COMMUTER RAIL RIDERSHIP: THE LONG AND THE SHORT HAUL

Richard Voith

Riders on commuter rail lines, from New York to California, know too well the cycle of service reductions, rising fares, and declining ridership observed in many sectors of the public transportation industry. The dilemma for transit authorities and state and local policymakers centers on the consumers, who are the ultimate judges of public transit policies. In particular, although disgruntled consumers may not be able to react quickly when fares rise or service declines, in the long run they can take to the highway, or even change their homes or workplaces, to avoid depending on public transportation.

From Firm to Cities Does City Size Matter?

Gerald A. Carlino

INTRODUCTION

Economists have long recognized that a firm's size can affect its productivity. As a firm increases its size, it can sometimes increase productivity by having its workers specialize in particular tasks, or by using its capital equipment more efficiently. In these situations a firm is said to enjoy *internal* economies of scale.

Another important source of a firm's productivity that is often overlooked is a type of

economies of scale that is *external* to the firm. These external economies of scale are also referred to as *agglomeration economies*. Increases in productivity due to agglomeration economies depend not upon the size of the firm itself, as in the case of internal economies of scale, but either upon the size of a firm's industry in a particular city or upon the size of the city itself.

To a large extent, market forces will encourage private firms to seek out and take advantage of agglomeration economies as they attempt to become more productive. But city planners also have a crucial role to play in accommodating such growth. If planners fail to address and

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resolve the problems of congestion that arise as a city grows, firms will find their costs of doing business in that city increasing. The productivity gains from city size may not be fully tapped if the city cannot accommodate the growth which agglomeration economies spur. This means investing in public infrastructure, such as roads, bridges, sewers, and public transportation systems.

In addition to enabling firms to take advantage of agglomeration economies by investing in public infrastructure, local governments accommodate economic activity by making an investment in the people who live there. It is through education and training, which is primarily the responsibility of local authorities, that worker productivity is increased and that advances in technology are introduced to the labor force.

Economists have not only developed theories about why firms may be more productive in cities, but they have also attempted to measure how much agglomeration economies matter, and how much public infrastructure as well as education and training may influence productivity. Without exception, the effects of each of these factors on productivity have been found to be significant.

BIGGER IS OFTEN BETTER: WHY AGGLOMERATION ECONOMIES MEAN GREATER PRODUCTIVITY

Economists describe the advantages and disadvantages of a firm's expanding in terms of "returns to scale." Suppose a firm doubles all of its inputs in production, using twice as much raw material, twice as many workers, and twice as much capital equipment. If it more than doubles its original level of output, the firm is said to be enjoying increasing returns to scale, or *internal* economies of scale. In this case, bigger is better. If the firm doubles all of its inputs and produces exactly twice as much output as originally, economists refer to this as constant returns to scale. When a firm doubles all of its inputs and finds that its output is less than twice the original level, it has reached the point of decreasing

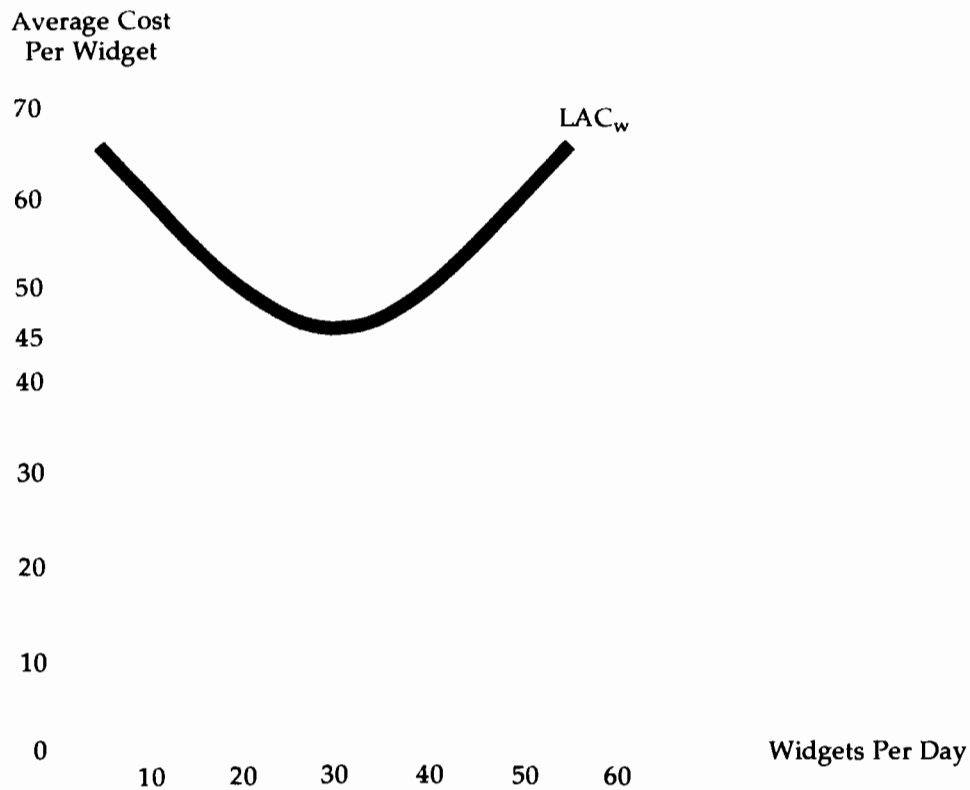
returns to scale (diseconomies of scale). This typically occurs as the scale of a firm expands beyond a certain point, because management becomes less efficient in very large-scale operations. In this case, bigger is not necessarily better (see **ECONOMIES OF SCALE FOR THE INDIVIDUAL FIRM**).

Just as internal economies of scale lead to increased productivity as a firm grows up to a point, *external* economies of scale may also increase a firm's productivity up to some point as well. Economists have identified two such types of external economies of scale, or agglomeration economies. The first type, *localization economies*, depends not upon the size of any one firm in an industry, but upon the size of the firm's industry in a given city. That is, as more and more firms in a given industry locate in a city, each firm's productivity increases. The second type, *urbanization economies*, does not depend upon the size of any one firm in the city, or upon the size of its industry in that city, but upon the overall size of the city itself. That is, as more and more firms of any sort locate in a city, the productivity of each firm increases.¹

Just as in the case of the growth of an individual firm, growth of an industry in a given city or growth of the city itself increases firms' productivity *only up to some point*. Growth brings not only greater efficiency, but also problems, such as congestion, that may eventually balance or outweigh the efficiency gains from size. When size becomes a hindrance rather than a help, firms in a city experience what is called "diseconomies of scale."

The Size of a Firm's Industry in a City Matters . . . The origin of an industry in a particular city could be the result of natural resources or

¹The expressions "city," "urban," "urban areas," "metropolitan area," and their adjectives are being used to designate a metropolitan statistical area (MSA). In general, MSAs are statistical constructs used to represent integrated labor market areas. They typically are geographic areas combining a large population nucleus with adjacent communities that have a high degree of economic integration with the nucleus.



The notion of economies of scale for a firm is easily illustrated by looking at the long-run average cost curve (LAC_w) for a hypothetical firm, Original Widgets. The long-run average cost curve shows how a firm's cost of production changes as it varies all inputs, including its plant size, or scale of operation. Economies of scale enable the firm to produce large outputs at lower average cost than small outputs. For example, a large financial outlay is usually required to commence production at all. The larger the output, the less is this fixed outlay per unit of product. In theory, a firm's long-run average cost curve is "U-shaped;" as output increases, average cost decreases up to some point and then increases.

To produce 10 widgets a day, Original Widgets' cost per widget is \$60. By producing twice as many widgets per day, Original Widgets cuts its average cost to \$50 per widget. If Original Widgets again increases production, to 30 widgets per day, its average cost again declines, though not by as much, to \$45 per widget.

Up to this point, Original Widgets has enjoyed increasing returns to scale. At 30 widgets per day, the minimum point of its average cost curve, Original Widgets is producing at the point of constant returns to scale. Expansion of widget production beyond 30 units per day results in an increase in Original Widgets' average cost. The average cost of producing 40 widgets per day goes back up to \$50, the same as the cost of producing only 20 widgets per day. In other words, Original Widgets is operating with decreasing returns to scale. Decreasing returns may happen when Original Widgets grows so large that it becomes hard to manage effectively. Original Widgets actually does best when it achieves constant returns to scale, or 30 widgets per day at an average cost of \$45 per widget.

simply a historical accident. But once an industry develops in a geographic location, individual firms in that industry often reap special benefits by also locating there. Consider for example, California's Silicon Valley, Route 128 near Boston, North Carolina's Research Triangle, and Route 202 in the Philadelphia suburbs, four areas where the computer industry has concentrated. Computer manufacturing firms occasionally require highly specialized workers who maintain and repair computer manufacturing instruments. A computer firm located far from one of the industrial clusters would need to employ full-time computer repair specialists, or else spend considerable time and money bringing them from a distance when they are needed. But when firms cluster together, their combined needs for the repair of their instruments can support at least one firm that specializes in instrument repair. Thus, those services become available at lower cost from a local firm. All the computer firms in the cluster can enjoy a lower average cost of production by contracting for these specialized services only when they are needed.

Of course, computer manufacturing firms that cluster together conceivably share a number of other inputs. For example, these industrial concentrations tend to contain common pools of specialized workers that any one firm in the industry can draw upon when it wants to expand its work force. They also typically contain suppliers of component parts, such as computer chips, and other intermediate inputs that are used by many firms in the industry.

Localization economies undoubtedly played a significant role in the concentration of the motion picture industry in Los Angeles, the auto industry in the Detroit area, and the steel industry in the Pittsburgh region. While a localized input such as ore deposits, or a large body of water, may have been important in getting these industries started, localization economies have been a factor in maintaining these concentrations. In 1985 over half the steel production in the U.S. was concentrated in three states, Pennsylvania, Ohio, and Indiana, and in 1986 Michigan

accounted for about 44 percent of total employment in the auto industry.

... **And So Does the Size of the City Itself.** Just as some kinds of business, such as the repair of computer instruments, are found only where specific industries concentrate, other activities, such as financial and business services, are generally found only in urban areas. In some cases, only a large urban setting can provide a sufficient client base for these specialized firms to flourish. Access to these types of specialized services in a city gives rise to the economies of scale that are external to any one firm and to its industry—urbanization economies. Urbanization economies involve the more general cost savings that a firm in any industry may receive by locating in a metropolitan area. For example, urban areas provide wholesaling facilities that reduce the level of inventories any one firm needs on hand. Urban areas also provide access to large and varied labor pools, and to accounting, data processing, legal, and other specialized business services. A *Wall Street Journal* story (July 7, 1987, p. 1) reports an interesting example. A bicycle manufacturer in suburban Boston was "too small to have a full-time chief financial officer, but big enough to have some of the same problems that confront far larger companies." However, it was able to find a local firm that provides financial managers who spend part of each week "doing what CFOs are supposed to do: prepare budgets, project sales, negotiate with banks, and figure out how to cope with the sagging dollar."

The degree of urbanization economies depends upon the number of firms in a city, regardless of what industry they represent. Some of the advantages that a firm gets by locating in one of the nation's largest cities, such as New York City, Los Angeles, or Chicago, could not be realized by locating instead in much smaller cities such as Akron, Ohio, or York, Pennsylvania. New York City not only has many banks, investment houses, advertising agencies, and law firms, but it is large enough to maintain highly specialized varieties of these types of firms. In addition, New York City's labor market is so large that it

offers not only a large number of placement firms, but also a large number of agencies that specialize in particular kinds of personnel.

HOW MUCH DIFFERENCE DOES SIZE MAKE?

Economists have measured agglomeration economies by applying the notion of a production function to metropolitan areas. A production function shows the relationship between the inputs of production (labor, land, capital, and so on) and output. The production function for an individual firm will show whether proportionate changes in all its inputs lead to a proportionate increase in output (constant returns), a more than proportionate increase (increasing returns), or a less than proportionate increase (decreasing returns). If increasing returns to scale or agglomeration economies exist in a city, we would expect to find that a proportionate change in all inputs in a city would result in a more than proportionate increase in output (see AGGLOMERATION ECONOMIES LOWER THE AVERAGE COST OF PRODUCTION, p. 8).

Empirical analysis of agglomeration economies has had to deal with two data problems. First, data on the stock of capital at the metropolitan area level are simply not available.² Fortunately, a production function technique has been developed that permits the estimation

²Some researchers have put together estimates of capital stocks. However, their results are not strictly comparable to those reported here, though the general direction of the results is the same. See David Segal, "Are There Returns to Scale in City Size?" *Review of Economics and Statistics* 58 (1976) pp. 339-350. Segal analyses the change in urban productivity with city size but does not focus on agglomeration economies, which is one component of city productivity. He finds that on average cities with over 2 million people are 8 percent more productive than cities with under 2 million people. See also Patricia Beeson, "Total Factor Productivity Growth and Agglomeration Economies in Manufacturing, 1959-73," *The Journal of Regional Science* 27 (1987) pp. 183-190. Since Beeson uses state level data her findings are hard to compare with those reported here. Beeson uses a capital stock series developed in Lynne Brown, Peter Mieszkowski, and Richard Syron, "Regional Investment Patterns," *New England Economic Review*, (July/August 1980) pp. 5-23.

of economies of scale without the need for data on the capital stock.³ Second, data on industries other than manufacturing are sparse. Therefore, research has had to focus almost exclusively on manufacturing industries in the past 15 years to determine whether agglomeration economies are a fact of economic life for U.S. cities.

Two studies from the 1970s focusing at the industry level take somewhat different approaches to estimate the degree to which agglomeration economies exist for manufacturing in U.S. cities. Daniel Shefer looks at 20 industries in a cross section of cities (ranging from 26 cities in the leather industry to 62 cities in the printing and publishing industry) in the years 1958 and 1963.⁴ He finds evidence of economies of scale for urban manufacturing industries in both years. For example, for the primary metal industry in 1963, he estimates that, on average, a 1.0 percent increase in all inputs used by this industry in a city would result in a 1.12 percent increase in output. One limitation of the Shefer study is that we do not know to what extent his estimates reflect internal or external economies of scale.

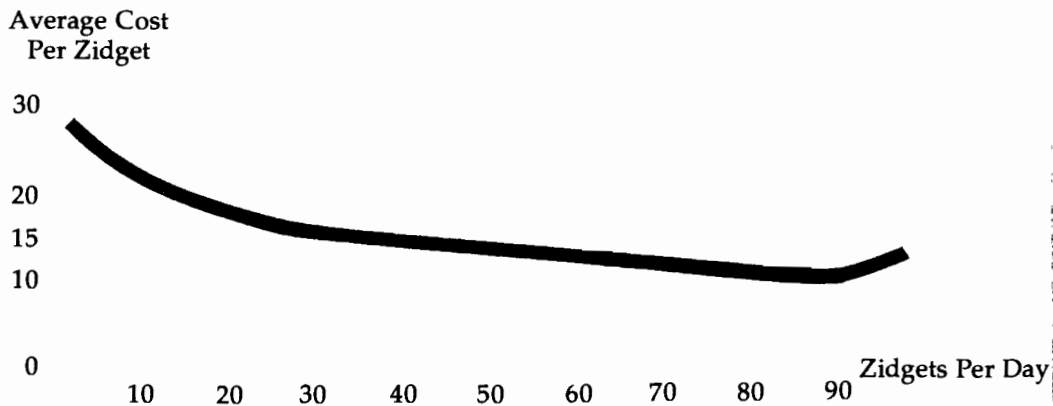
In a more recent study, Gerald Carlino extends the analysis of agglomeration economies. He estimates economies of scale for 19 industries in each of 68 metropolitan areas over the period 1957-1972.⁵ He derives a single measure of overall returns to scale in each industry in each city over that period. He then analyzes these industry-specific measures across cities to determine the extent to which overall economies of scale are related to internal economies of scale, localization economies, and urbanization econo-

³The technique involves estimating a wage equation. It is assumed that, since workers are paid according to their productivity (that is, there is perfect competition in local labor markets), wages and the demand for labor reflect the advantages of agglomeration economies.

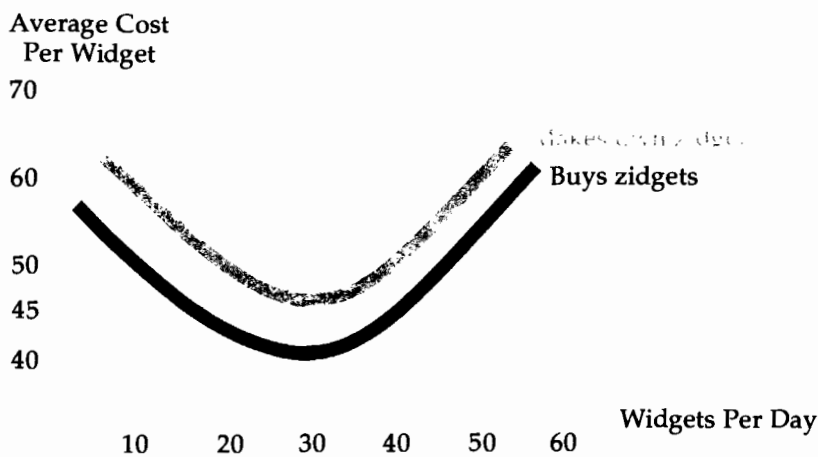
⁴Daniel Shefer, "Localization Economies in SMSAs: A Production Function Approach," *Journal of Regional Science* 13 (1973) pp. 55-64.

⁵Gerald A. Carlino, "Increasing Returns to Scale in Metropolitan Manufacturing," *Journal of Regional Science* 19 (1979) pp. 343-351.

Letting the Specialists Produce the Zidgets . . .



. . . Lowers the Overall Cost of Producing Widgets



To see how agglomeration economies can lower a firm's long-run average cost, we can return to Original Widgets and assume that a crucial part of making a widget involves a fitting called a zidget (in reality, this crucial factor may be repair services, accounting, financial and legal services, computer programmers, and so forth). The top panel shows the long-run average cost of making zidgets, which involves substantial economies of scale. At 30 zidgets per day the cost is \$15 per zidget, but when 90 zidgets are produced, the cost per zidget drops to \$10.

Original Widgets cannot take full advantage of the economies of scale of zidget-making *internally*, because it only needs 30 per day for its widget production. But, suppose the local widget industry expands, say to three widget firms producing a total of 90 widgets per day. Now a separate firm, Acme Zidgets, can take advantage of the economies of scale of zidget production and supply them to all three widget manufacturers in the area. The result is shown in the second panel, where Original Widgets (as well as the other two widget firms) enjoys the cost-savings due to agglomeration economies because its average cost of producing 30 widgets per day could drop by as much as \$5 (from \$45 to \$40).

mies by industry. The results strongly suggest the importance of external economies of scale for urban manufacturing firms. He finds that urbanization economies are the more general source of external economies, since they are indicated for 12 of the 19 industries studied.⁶ For five of the remaining industries, localization economies are an important source of external economies of scale. Of the two remaining industries, internal scale economies are indicated in one case, and no significant source of economies of scale were found in one industry (see SOURCES OF ECONOMIES OF SCALE IN SELECTED INDUSTRIES, p. 10).

Using the same techniques with which they measured agglomeration economies at the industry level, Shefer and Carlino also estimate the degree to which agglomeration economies exist for manufacturing in general in U.S. cities. This provides another measure of urbanization economies. In the same study covering 67 cities in 1963, Shefer finds that a 1.0 percent increase in inputs used in urban manufacturing results in about a 1.2 percent increase in urban manufacturing output, on average. Carlino obtains an estimate of urbanization economies in manufacturing city by city. His study includes 82 metropolitan places during the period 1957 to 1977.⁷ He finds that agglomeration economies

⁶Two other studies using a somewhat different technique from the one discussed here have found that localization economies are dominant in urban manufacturing. See, J. Vernon Henderson, "Efficiency of Resource Usage and City Size," *Journal of Urban Economics* 19 (1986) pp. 47-70, and Ronald Moomaw, "Agglomeration Economies: Urbanization or Localization?" unpublished manuscript (1987). These findings may follow from the fact that they use only industry level data.

⁷Gerald Carlino, "Manufacturing Agglomeration Economies as Returns to Scale," *Papers of the Regional Science Association* 50 (1982) pp. 95-108. A number of studies since the mid-1970s have shown that productivity in general increases with the size of a city at least over the observed range of city sizes. These studies have found that a 3 to 6 percent increase in city productivity is associated with every doubling of city size. For a survey of this literature, see Ronald Moomaw, "Spatial Productivity Variations in Manufacturing: A Critical Survey of Cross-Sectional Analyses," *International Regional Science Review* 8 (1983) pp. 1-22.

also tend to increase with city size, up to some point. For example, a 1.0 percent increase in all inputs resulted in a 1.9 percent increase in output in Peoria, a 1.4 percent increase in output in Cincinnati, a 1.3 percent increase in output in both Kansas City and St. Louis, and a 1.2 percent increase in Boston's output. But estimates for Philadelphia, the fourth largest metropolitan area in the U.S. in 1980, indicate only about a 1.0 percent increase in output (that is, constant returns).

Why would a large metropolitan area such as Philadelphia, which contained approximately 4.7 million people in 1980, offer constant returns to its manufacturing firms on average while, say, Peoria, which contained less than 400,000 people in 1980, offers substantial returns to scale on average? The answer lies in the costs to both firms and households that result from increased urban size.

FACING THE COSTS OF GROWTH

The positive effects of agglomeration economies make up one side of the urban size ledger. The negative effects of congestion on households and firms brought on by city growth (agglomeration diseconomies) make up the other. The growth of cities is influenced by both forces, with agglomeration economies encouraging growth, and agglomeration diseconomies discouraging it.

Higher Transportation Costs . . . After some point, further increases in the number of people and firms residing in a metropolitan area tend to clog its roads and transportation network and increase the average time and cost of transporting goods and commuting either to work or to leisure activities. In addition, as a metropolitan area grows, its boundaries may spread out, which increases both the time and distance of the average commute. As a result, households will have to spend more annually for gasoline and auto maintenance, and they may even need to purchase a second car.

. . . Higher Rents . . . Most commuting to work involves trips to and from a metropolitan area's

Table 1. *Journal of Statistical Economics*

These 19 industrial groupings represent the two-digit Standard Industrial Classifications as defined by the U.S. Office of Management and Budget. Each consists of a fairly broad aggregate of establishments, each of which may derive different benefits from localization economies and urbanization economies. For example, the classification Electrical Machinery includes establishments engaged in manufacturing equipment for the generation, storage, transmission, and transformation of electrical power, establishments manufacturing computers and related products, and firms manufacturing household appliances. Thus, the finding that a particular two-digit industry does or does not depend upon a particular kind of agglomeration economy may not apply to all of its component establishments. The data used in this study are averaged over the period 1957-1972.

Industry	Internal	External	
		Localization	Urbanization
Food Products	Yes	No	Yes
Textiles	No	No	Yes
Apparel	No	No	Yes
Wood	No	No	Yes
Furniture	No	No	Yes
Paper	No	Yes	Yes
Printing and Publishing	No	No	Yes
Chemical	No	No	No
Petroleum and Coal	No	No	Yes
Rubber and Plastics	Yes	No	Yes
Leather	No	No	Yes
Stone, Clay and Glass	No	Yes	No
Primary Metal	Yes	No	Yes
Fabricated Metal	No	No	Yes
Nonelectrical Machinery	No	Yes	No
Electrical Machinery	No	Yes	No
Transportation Equipment	No	No	No
Instruments	No	Yes	No
Others	No	No	Yes

SOURCE: Compiled from G.A. Carlino, "Increasing Returns to Scale in Metropolitan Manufacturing", *Journal of Regional Science* 19 (1979) Table 2.

downtown, or its central business district. Many firms seek these central locations, in part, because they offer agglomeration economies. This competition will increase business rents. As households attempt to locate near these large centers of economic activity to avoid long commutes, they bid up residential rents as well. As a result, rents in a metropolitan area tend to reflect the proximity of a parcel of land to its central business district. Moreover, rents in an entire metropolitan area tend to be driven up by the growth of households and firms in that area.

... **And Higher Wages.** Workers in large cities

will demand higher wages in order to offset these increases in transportation costs and rents.⁸ As a result, wages tend to increase with metropolitan size. Firms are able to pay these higher wages to workers to the extent that agglomeration economies have made workers

⁸For a fuller discussion that includes analysis of the effects of local amenities and disamenities on wages, see Sherwin Rosen, "Wage-Based Indexes of Urban Quality of Life," in *Current Issues in Urban Economics*, Peter Mieszkowski and Mahlon Straszheim, eds., (Baltimore: The Johns Hopkins University Press, 1979).

more productive. But there is a limit to a firm's ability to compensate its workers for these higher living costs.

Finding the Balance: Is There An Optimal City Size? The agglomeration diseconomies reflected in higher transportation costs, higher rents, and higher wages serve to increase the unit cost of production for firms. As long as these additional costs are offset by increased productivity, firms will be willing to pay them, and a city will continue to grow. When the unit cost-saving from the agglomeration of people and firms is just offset by the increased cost due to agglomeration diseconomies, a city has reached what economists call its optimal size. At the optimal size, the average cost of production is minimized.

While the notion of an optimal city size has been addressed in a number of studies, it has proven hard to identify precisely for any city. Part of the reason is that a city's optimal size will depend on its mix of industries, its proximity to other cities, its rate of technical change and the level of its infrastructure. Since the cost of labor and land and the advantages of agglomeration economies vary with city size, firms' decision about locating in cities of particular sizes will depend on how much they use labor and land, and how much they would gain by taking advantage of agglomeration economies. The estimation of the optimal size for individual cities has not been attempted because the size of the population in most cities has not varied substantially during the period for which data are available.⁹

HOW CAN POLICYMAKERS ENHANCE PRODUCTIVITY?

Individual firms that have incentives to exploit agglomeration economies are guided by the

⁹Economists have, however, estimated an optimal size for an average city based on economies of scale in manufacturing using cross-sectional data. See, for example, Gerald A. Carlino, "Manufacturing Agglomeration Economies as Returns to Scale," *Papers of the Regional Science Association* 50 (1982) pp. 95-108 who finds the optimal size to be around 3.5 million people.

"invisible hand" of the marketplace to locate near other firms in the same industry or in areas where there is a general concentration of economic activity. Local policymakers have a major role in "lending a hand" to accommodate agglomeration economies by providing public infrastructure. In this sense public infrastructure and private capital are complementary inputs to local production. Local policymakers have an additional role to play in enhancing the productivity of firms by investing in the education of the city's workers.¹⁰ This sort of investment in education can result in what economists call increased "human capital."

Investment In Public Infrastructure. When a city is growing rapidly because it offers net agglomeration economies to firms in a number of industries, local planners need to make sure that the city's public infrastructure keeps in step with private growth. If local infrastructure is not growing fast enough, the area could become congested more rapidly, leading to a more rapid increase in wages, rents, and transportation costs. Such a situation could halt the growth of an area. After some point, additional public infrastructure is necessary for future growth to occur.

In a recent study, Randall Eberts measured the level of public infrastructure for 38 metropolitan places for the time period 1958-1981.¹¹

¹⁰Factors other than those discussed here could affect city productivity. They include the characteristics of a city's work force other than educational and skill attainment, local policies and regulations, research and development spending, unionization rates, and environmental considerations. While these factors may determine differences in city productivity, little, if any, research has been conducted on these issues.

¹¹Randall Eberts, "Estimating the Contribution of Urban Public Infrastructure to Regional Growth," Working Paper 8610, Federal Reserve Bank of Cleveland (1986). Eberts estimates the level of public infrastructure by summing up the past investments made to the stock of infrastructure in each of these metropolitan places, after adjusting these stocks for depreciation and discard. He uses a pooled cross-section of time-series approach to derive an average estimate of the effect of infrastructure on productivity across these 38 metropolitan places.

As with the studies that examine the effect of agglomeration economies on productivity, Eberts considers public infrastructure an input, together with labor and private capital, in a citywide manufacturing production function. While his method of estimation gives no particulars about specific cities, Eberts finds that a doubling of public infrastructure would lead to a 4 percent increase in manufacturing output on average in his sample of 38 metropolitan places.

Investment In Education. Besides determining the quality of local infrastructure, local policymakers in the U.S. have a great deal of influence on the skill level of the work force because they control the public education system. These investments in human capital lead to increased city productivity not only because education makes a city's work force more employable but also because education introduces a city's workers to new techniques and skills. For example, many high schools throughout the country have developed programs in computer literacy.

John Mullen and Martin Williams consider these issues in manufacturing for a sample of 29 metropolitan places during the 1958-1978 time period.¹² They compute the portion of a city's

growth of manufacturing output that can be accounted for by that city's increases in the number of workers and capital that took place during the period. The growth of a city's output beyond that explained by the increases in capital and labor they attribute to technical progress. They then decompose this measure of technical progress into that which is due to better workers (embodied in labor) and that which is due to better capital (embodied in capital). They find that across metropolitan places, technical progress embodied in the labor force was a more important source of productivity growth than technical progress embodied in private capital. This study suggests that local policies that increase the educational attainment and skill levels of its work force are highly worth pursuing.

Where Best to Put the Effort? Much has been written about the decline of large American cities — the urban blight, the crime, the many negative but very tangible and visible features of American urban life. But large cities have existed and will continue to exist at least in part because they tend to make workers and other factors of production more productive, as various studies have shown. Local planners need to recognize the fact that city size matters, for if they allow infrastructure and schools either to remain as they are or to decay, they will fail to exploit to the fullest the growth that agglomeration economies provide.

¹²John Mullen and Martin Williams, "Technical Progress in Urban Manufacturing," *Journal of Urban Economics* (forthcoming). One problem with this approach to measuring technical progress is that it fails to account for the growth in output that is due to agglomeration economies. As a result, some of the increase in productivity that is attributed to technical progress may be due to agglomeration economies.