

Is Access to Center City Still Valuable?

*Richard Voith**

The old real estate adage—that the three most important factors in house value are “location, location, and location”—may be an exaggeration. Nevertheless, prices for similar houses vary greatly *within* metropolitan areas and even more so *across* metropolitan areas. What makes one location more attractive than another?

Some studies have emphasized amenities and the efficiency of local government as important determinants of where people choose

to live and how much their houses are worth. Another major factor, however, is accessibility to employment, shopping, and **recreation**. And because people prefer to live in neighborhoods convenient to employment and everyday activities, houses in these areas command higher prices.

Although we often hear about “accessible” neighborhoods, accessibility is not an easy thing to measure. Before the rapid growth of the suburbs, a city’s central business district (CBD) was the focal point of a region’s economic activity. Accordingly, economists’ early models of residential location tended to define accessibility in terms of distance from the CBD.

*Richard Voith is a Senior Economist in the Urban and Regional Section of the Philadelphia Fed’s Research Department.

But suburbanization changed all that, requiring us to reconsider what makes one location more accessible than another.

Since people can work, shop, and find entertainment in any number of employment centers, a neighborhood's accessibility depends not just on how close it is to those various centers, but on the quality of transportation to and from them. Even if close to an employment center, a residential area may not be perceived as accessible if transportation to that center is poor. Another complicating factor is that different neighborhoods may be convenient to employment and recreation centers that are not equally attractive. A house within easy commute to a center with a large number of high-wage jobs is likely to be more valuable than a house nearby a center with relatively low wages. And since a locale's accessibility and nearby attractions may be greatly affected by economic development and transportation policies, it is important to know how much accessibility affects people's location choices.

EARLY MODELS OF RESIDENTIAL LOCATION

Urban economists first addressed how accessibility influences residential locations and land values by making some simplifying assumptions. The most important was that businesses concentrated in the CBD because being close to one another increased productivity.¹ These productivity increases associated with a CBD location were termed "agglomeration economies."² The only concentration of em-

ployment was in the CBD, giving rise to the term "monocentric region." Other common assumptions were that transportation costs per mile to the CBD were equal from anywhere within the metropolitan area, and that only transportation costs for work trips were important. These assumptions implied that the travel costs associated with any location were determined solely by its distance to the CBD.

Given these assumptions, economists analyzed how people trade off commuting costs with what they are willing to pay for housing. They drew three conclusions: 1) the value of land should fall as distance from the CBD increases; 2) population density should fall as distance from the CBD increases; and 3) people choose residential locations that minimize total commute time in the region.

Not surprisingly, the monocentric model predicts higher prices for land close to the CBD, which in turn leads to higher house prices for otherwise identical houses. Consumers can avoid some of the costs of commuting by living closer to the CBD, but in doing so, they bid up the prices of houses such that the higher house price just offsets the commuting savings. A direct consequence is higher land costs for locales closer to the CBD and lower land costs for more distant locations. Accordingly, people living closer to the CBD own smaller houses than residents of more distant, less expensive areas. This leads to the second major conclusion of the monocentric model—that population density declines with distance from the CBD. Finally, the predicted pattern of declining house prices and less density with distance from the CBD results in the optimal amount of

¹For a detailed discussion of the monocentric model, see Edwin S. Mills, "An Aggregative Model of Resource Allocation in a Metropolitan Area," *American Economic Review* 47 (1967) pp. 197-210, or Richard F. Muth, *Cities and Housing: The Spatial Pattern of Urban Residential Land Use* (University of Chicago Press, 1969).

²See Gerald Carlino, "Productivity in Cities: Does City Size Matter?" this *Business Review* (November/December

1987). This assumption did not preclude employment scattered in the suburban areas. Of course, the downside of agglomeration is congestion, and if a locale becomes too congested, productivity may decline. Firms locating outside the CBD forfeit the agglomeration economies, but could realize a benefit by lowering their workers' commuting costs, allowing the suburban firms to offer a lower wage.

commuting. That is, given house prices and commuting costs, no two households could exchange locations and both be better off.

How do these predictions correspond to the real world? Although there is evidence that residential density declines with distance from the CBD, there is little consistent evidence that house values fall as well.³ Also, residential distances from the CBD and the associated level of commuting predicted by the monocentric model are much lower than that actually observed. In other words, people tend to live farther away from the CBD than would be expected given the trade-off between house prices and commuting costs to the CBD. Some authors argue there is a great deal of “wasteful” commuting, suggesting that the underlying notion that people make residential-location decisions based on a trade-off between commuting and housing costs is fundamentally flawed.⁴ After all, people may want to be near amenities not available in the CBD and thus may be willing to pay more to locate farther from the CBD. Others suggest that the concept is correct, but that the assumptions about the metropolitan areas are wrong.⁵

³The density predictions are consistent with the monocentric model, since much of the housing stock in older cities was constructed when the model’s assumptions were more consistent with the actual metropolitan structure. House prices can adjust much faster than the stock of housing, so the failure of the monocentric model should be observed first in its predictions regarding prices. Examples of recent studies finding either a positive relationship or no relationship between distance from the CBD and house value include D.M. Blackley and J.R. Follain, “Tests of Locational Equilibrium in the Standard Urban Model,” *Land Economics* 63 (1987) pp. 46-61; M.L. Cropper and P.L. Gordon, “Wasteful Commuting: A Re-examination,” *Journal of Urban Economics* 29 (1991) pp. 2-13; and E.J. Heikkila et al., “What Happened to the CBD-Distance Gradient? Values in a Poly-centric City,” *Environment and Planning* 21 (1989) pp. 221-32.

⁴Bruce W. Hamilton, “Wasteful Commuting,” *Journal of Political Economy* 90 (1982) pp. 1035-53.

IMPROVING THE SIMPLIFIED MODEL

Though the monocentric model is a useful starting point for examining residential-location choices, its basic assumptions are less realistic today than when the model was first proposed. Most metropolitan areas have not just a CBD but many suburban employment centers, and these centers can differ from the CBD in several ways. High-quality automobile transportation to suburban centers is almost universally available, while public transportation to these centers is poor at best. Generally dependent on the automobile for access, these centers are less dense in their development, which lowers their potential for agglomeration economies. On the other hand, most CBDs are accessible by public transportation and by automobile, though usually at a higher cost than are the suburban sites. Public transportation allows higher-density development in the CBD than in most suburban centers, increasing the potential for agglomeration economies. Though most suburban neighborhoods have high-quality auto access to suburban employment centers, not all have high-quality public transportation to the CBD.

More complicated models that consider suburban employment centers and differences in public transportation services do not lead to simple conclusions about the relationship between distance from the CBD and house value and residential density. These models predict that people “sort” themselves into residential communities that are convenient to specific employment locations. Communities convenient to an employment center—the CBD, for example—should have a disproportionately high percentage of their residents working in that center. Over time, this sorting process should result in people choosing employment

⁵See, for example, Michelle J. White, “Urban Commuting Journeys Are Not ‘Wasteful,’” *Journal of Political Economy* 96 (1988a) pp. 1097-110.

and residential locations that minimize the region's total commuting burden. Recent studies provide strong evidence for this sorting behavior. In fact, if differences in the quality of the transportation system and the multicentered nature of regions are taken into account, there is little evidence of "wasteful" commuting.⁶

But what are the implications for house values? Certainly house prices are no longer strictly linked to their distance from the CBD. Since there are many smaller, similar suburban employment centers, all with relatively good highways and parking, a suburban residential location is likely to be convenient to at least one employment center. A house far from the CBD may not be highly valuable to a CBD worker, but it might be highly attractive to a suburban worker. Though one might expect some differences in house prices based on distances from suburban centers, these differences are likely to be small and difficult to observe, requiring detailed geographic and transportation data that are seldom available.

Still likely, though, is that higher house values would be observed for locations having commuting advantages to high-wage employment centers not duplicated elsewhere.⁷ One such advantage is the availability of high-quality public transportation to the CBD. If the CBD has higher-wage employment, differences in the availability and quality of public transportation across suburban neighborhoods could cause differences in suburban house values. In communities with good public transportation, higher house values should go hand in hand with a greater fraction of the labor force em-

ployed in the CBD and with lower auto ownership, as people substitute public transportation for cars.

The extent of residential sorting is important to consider when evaluating policy changes that affect accessibility. Policymakers should take into account not only how a policy change would affect the existing population, but also what changes in population the policy would induce. A policy that dramatically affects the accessibility of a residential area or the productivity of a commercial area could have much larger impacts than expected.

For example, suppose a public transit authority alters its prices or service quality. This will immediately change the demand for its services and ultimately affect accessibility as well. Over time, people will decide to relocate, which magnifies the initial impact of the policy. These sorting impacts may be larger than the direct impacts, eventually affecting a community's size and house values.⁸

THE PHILADELPHIA EXAMPLE

The Philadelphia metropolitan area is an excellent case study for examining the issues raised by urban models. The Philadelphia region, having multiple employment centers, is fairly decentralized, yet it has a large CBD that has grown along with the suburban subcenters in the 1980s.⁹ The location and commuting

⁶See White (1988a).

⁷Note that higher wages can be sustained only if the employment center is more productive. Frequently, this higher productivity depends on the employment center's accessibility to a large, high-quality labor force and agglomeration economies associated with concentrations of businesses.

⁸For example, Richard Voith, in "The Long-Run Elasticity of Demand for Commuter Rail Transportation," *Journal of Urban Economics* (1991), has estimated that the long-term effects on transportation demand of changing price and quality can be more than twice as large as the short-term effects. A highly readable discussion of these issues is provided by Voith in "Commuter Rail Ridership: The Long and the Short Haul," this *Business Review* (November/December 1987).

⁹The Philadelphia CBD is defined as the area bounded by the Schuylkill and Delaware rivers and Vine and South streets.

patterns were examined for evidence of sorting and its effects on residential location, car ownership, and house values.¹⁰ Though general evidence is provided on the importance of sorting throughout the metropolitan area, the focus is on where CBD workers live, the role of the suburban commuter rail system in their choice of neighborhood, and the system's effects on car ownership and house values.¹¹

Geography and Transportation. According to the 1980 Census, about 55 percent of the 2.2 million people in the Philadelphia metropolitan area labor force lived in the suburban Pennsylvania counties of Bucks, Chester, Delaware, and Montgomery and in Camden County, New Jersey.¹² The extent of employment decentralization in the region is evident. Only 4.6 percent of the suburban labor force works in the CBD, and fully 17 percent of the suburban census tracts have no residents working in the CBD. Still, the CBD has maintained its importance in the regional economy. Some suburban census tracts have as many as 22 percent of their labor force working in the CBD. The CBD's share of the region's total employment has been almost constant at 10 percent in the years from 1976 to 1986. However, while suburban employment grew tremendously over the period, the rest of the city did not prosper.¹³

¹⁰See Richard Voith, "Transportation, Sorting, and House Values in the Philadelphia Metropolitan Area," *Journal of the American Real Estate and Urban Economics Association* (forthcoming), for a detailed description of the analysis.

¹¹The analysis is based on 1980 Census data. These data are still useful because the issues examined reflect long-run location choices. The factors affecting these choices, especially the transportation system and the CBD's relative importance to the region, have changed little in the last 10 years.

¹²The Philadelphia metropolitan area also includes Burlington and Gloucester counties in New Jersey. We did not examine these counties because they do not have commuter rail service.

The transportation system in the Philadelphia area has not changed dramatically in the last 20 years, though the highway system has improved progressively. But these improvements have barely kept pace with the increase in auto travel due to the region's decentralization.

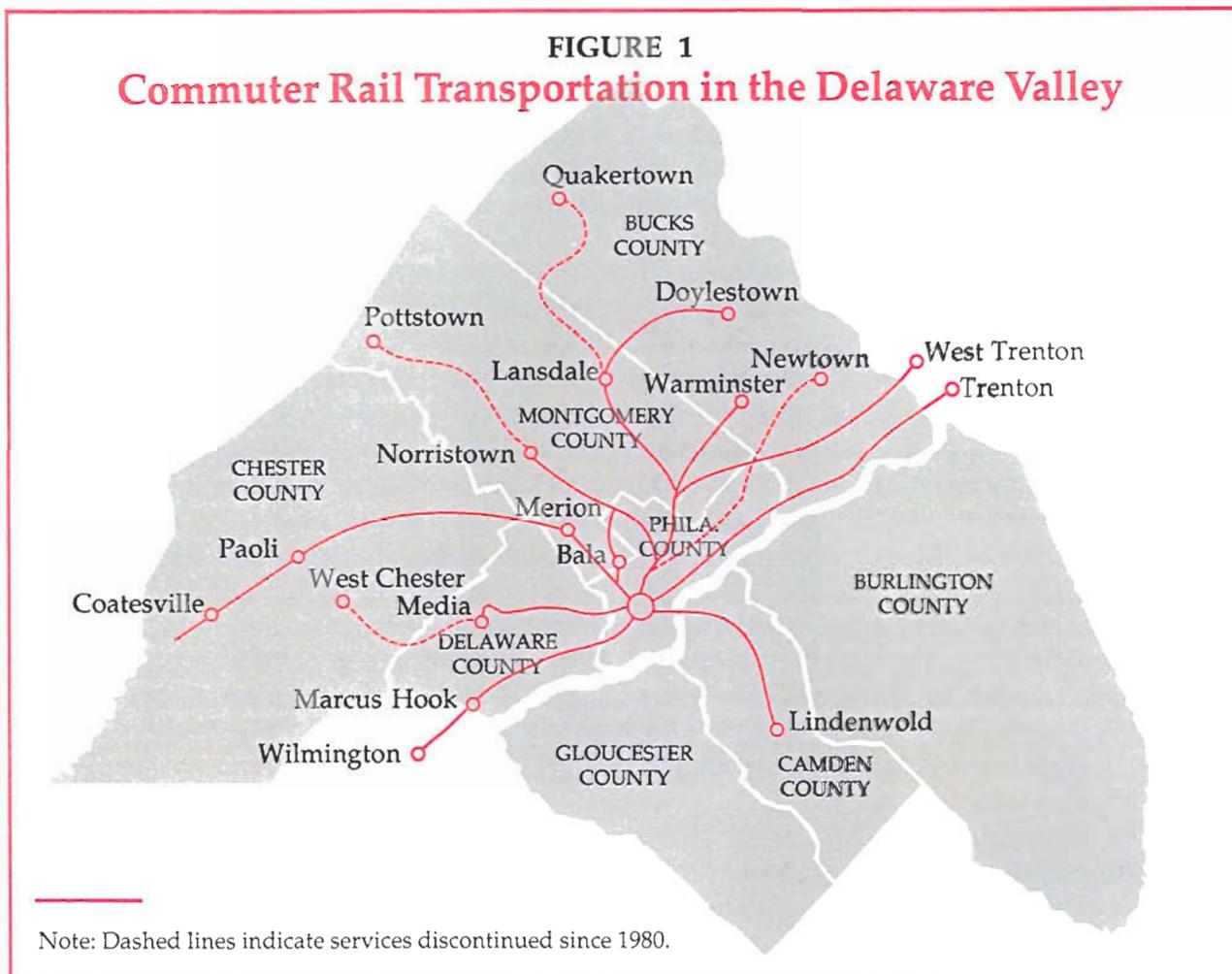
The commuter rail system, now operated by the Southeastern Pennsylvania Transportation Authority (SEPTA), has been a fixture on the Pennsylvania side of the Philadelphia region for most of the century. The Port Authority of Pennsylvania and New Jersey (PATCO) has provided commuter rail service in Camden County, New Jersey, since 1968. The primary function of both systems is to bring suburban commuters to downtown Philadelphia. Despite recent interest in "reverse commuting," these systems are generally not competitive with the automobile for commuting to suburban employment. With 137 stations combined, they provide service to a large number of suburban communities. Over 42 percent of the suburban census tracts have access to commuter rail transportation (Figure 1), but the quality of commuter rail service differs considerably across communities.

How Long Do Philadelphians Commute to Work? A powerful piece of evidence for sorting in the Philadelphia region is that average reported commuting times differ very little across residential locations.¹⁴ People have the opportunity to work at an employment center

¹³See Anita Summers and Peter D. Linneman, "Patterns and Processes of Urban Employment Decentralization in the U.S., 1976-1986," Wharton Real Estate Center Working Paper 75, University of Pennsylvania (1990). CBD employment grew about 10.5 percent, but overall employment in the city of Philadelphia fell over 6 percent. Suburban employment rose 33 percent.

¹⁴The commuting data are based on the 1980 U.S. Census.

FIGURE 1
Commuter Rail Transportation in the Delaware Valley



that is relatively close, regardless of how far their house is from the CBD, and they choose to do so. People in tracts far from the CBD tend to commute the same amount of time as those close to the CBD. Average commute time in the region is about 23 minutes; this figure is remarkably consistent across counties, ranging from a low of 22 minutes in Chester and Montgomery counties to a high of 25 minutes in Delaware County (Figure 2). This contrasts with the dramatic differences in highway commute times to the CBD across counties, which vary from a low of 36 minutes in Camden County to a high of 77 minutes in Chester County. Even though the average highway commute time from Chester County to the CBD

is more than twice that of Camden County, residents of Chester and Camden counties spend nearly the same average time commuting. It appears that people choose to live in locations relatively close to their work places, and that virtually all suburban residential locations are convenient to at least some form of employment.

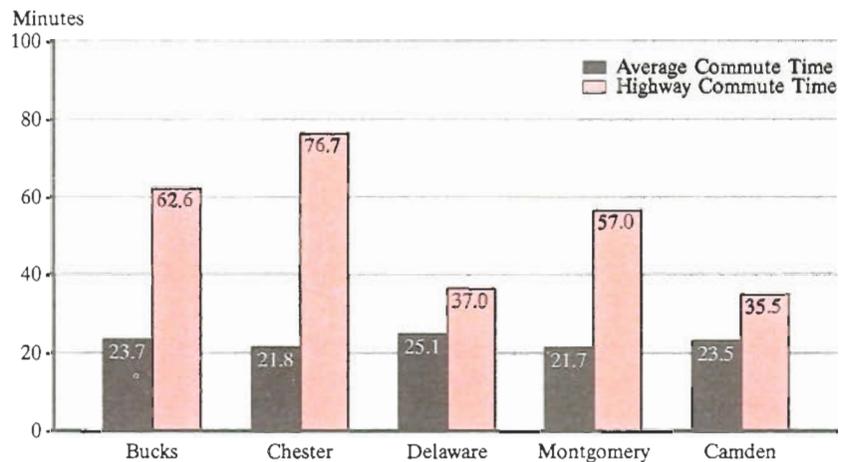
Where CBD Workers Live. Since people choose to live close to their jobs or to seek jobs close to their homes, those having jobs in the CBD should be concentrated in areas from which CBD commuting is relatively less costly. For any location, the greater its accessibility to the CBD, the higher the fraction of its residents that should work in the CBD. And more resi-

dents will work in the CBD if the community's accessibility to other work sites is poor.

Highway commute time to the CBD is one important factor affecting a neighborhood's convenience to the CBD and hence its attraction for CBD workers. A look at where suburbanites work shows how strongly highway commuting time influences their neighborhood choice (Figure 3). The fraction of people working in the CBD declines dramatically with highway commute time. For example, the percentage of Merion residents working in the CBD declines dramatically with highway commute time. For example, the percentage of Merion residents working in the CBD declines dramatically with highway commute time. For example, the percentage of Merion residents working in the CBD declines dramatically with highway commute time.

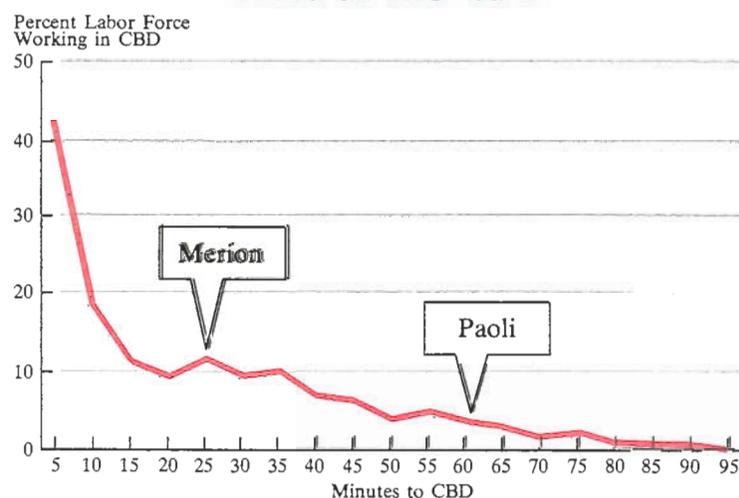
Some differences in the percentage of workers employed in the CBD may result from differences in accessibility to other work sites rather than in travel time to the CBD. Consider two communities, both with equal commute times to the CBD; if one has higher average commute times for all commutes, including those

FIGURE 2
Average Commute Times by County and Highway Commute Time to the CBD



Source: Average commute time is published by the U.S. Commerce Department's Bureau of the Census. Highway commute time is compiled by the Delaware Valley Planning Commission.

FIGURE 3
Percent of the Suburban Labor Force Working in the CBD and Highway Commute Time to the CBD



Source: Based on data from the U.S. Census (1980) and the Delaware Valley Planning Commission.

outside the CBD, then that locale must have relatively worse accessibility to the non-CBD employment centers. The data suggest that for two communities with equal access to the CBD, increasing travel time to non-CBD employment centers by five minutes increases the percentage working in the CBD by 46 percent.

For Philadelphia-area commuters, the rail system is an important alternative to the automobile. A major difference between the rail system and the highway system, however, is that only some communities have access to the rail system, and it essentially serves only one employment destination—the CBD. Not surprisingly, for suburban communities with train service,¹⁵ the fraction of the labor force working in the CBD (5.3 percent) is 29 percent higher than for census tracts without service (4.1 percent). Part of this difference results from the fact that tracts with service tend to be closer to the city. But even with other factors held constant, the fraction of CBD workers living in census tracts with service is 15 percent higher.

The availability of the commuter train also results in fewer purchases of automobiles, even for households of equal income. Households in census tracts with train service own 4.5 percent fewer cars, on average. While this figure appears small, it actually is quite significant considering that only 5.3 percent of the labor force in these tracts commutes to the CBD. Assuming that train service is irrelevant for 90 percent of the people in a given census tract (and hence should not affect car ownership), the 4.5 percent reduction overall implies a household car-ownership rate for the remaining 10 percent of only 0.97 cars per household, about 60 percent of the average car-ownership rate.

Housing Prices and the Commuter Rail System. Does sorting into residential locations

convenient to work result in higher house prices in neighborhoods with greater accessibility? In particular, are people willing to pay a premium to live in residential neighborhoods that have commuter rail service to the CBD?

Median house values in each of the 678 census tracts in the Philadelphia metropolitan area were compared using statistical techniques to adjust for differences in housing quality.¹⁶ There was some evidence that houses tend to be more expensive the farther they are from the CBD, contrary to the prediction of the monocentric urban model.¹⁷ But consistent with the idea that most suburban communities are convenient to at least one suburban employment center was the finding that average commute times are unrelated to house value. This is not surprising, since sorting has resulted in similar commuting times throughout the region.

Even though house prices tend to increase with distance from the CBD and most residential locations are equally convenient to some suburban employment, the accessibility to the CBD provided by the commuter rail systems generates significant house value premiums for residents in neighborhoods with service. In fact, if we hold constant other factors, such as highway accessibility and house quality, houses in areas with train service enjoy premiums of 6.4 percent over those without service. This

¹⁶A linear regression model was used in which median house value was the dependent variable. House value was a function of its accessibility to the CBD by auto and by train, as well as to other employment centers. Since the theory is developed in terms of a standard unit of housing, characteristics of the housing and neighborhood are included in the regression to control for differences in attractiveness that are unrelated to accessibility across tracts.

¹⁷House prices may be higher for more distant houses partly because of larger lots. Unfortunately, data on lot sizes are not available.

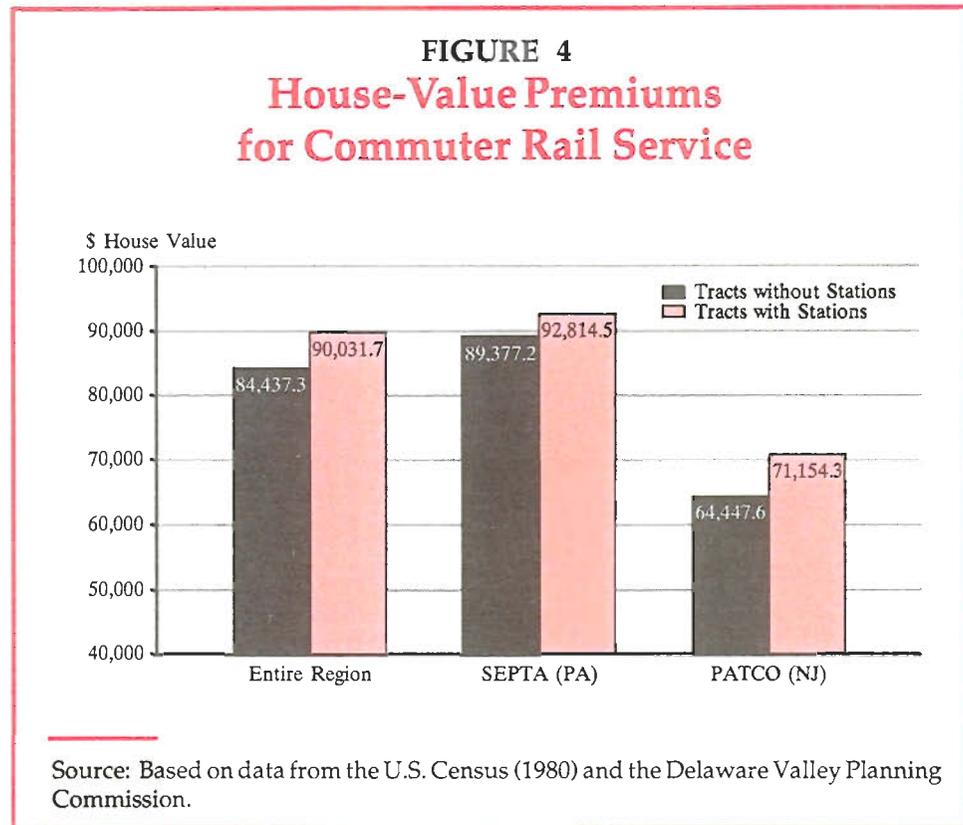
¹⁵The designations “with service” and “without service” refer not to the communities themselves, but to residences having rail stations in or nearby their census tracts.

implies a premium of \$5,594 for train service.¹⁸

The house-value premium associated with train service can be used to calculate a net increase in real estate values associated with the commuter rail system. A total of 258,437 owner-occupied houses are in census tracts with train service. This implies that the increase in suburban value associated with the train service is about \$1.45 billion.¹⁹

Service Quality and House Values.

If people are willing to pay a premium to live in an area with train service, they would likely be willing to pay even more for higher-quality train service. Once again, Philadelphia provides a natural test for this hypothesis. The two commuter rail systems serving the CBD—SEPTA and PATCO—are very different. PATCO service is, on average, five times as frequent as SEPTA’s. Furthermore, PATCO enjoys a greater time advantage, relative to the automobile, than SEPTA. Thus, PATCO generally provides higher-quality service.



The higher-quality PATCO service has a much larger positive effect on house values than the SEPTA service (Figure 4). The premium of \$6,706 in New Jersey is 10.1 percent of the average house price in Camden County. The \$3,437 premium for the Pennsylvania counties, where the average price of a home is higher than in New Jersey, is 3.8 percent of the average house price. Because these two systems serve the same destination, the difference in premiums very likely reflects consumers’ willingness to pay for higher-quality transportation.²⁰

CONCLUSION

Even in a region with multiple employment

¹⁸The figures, in 1990 dollars, are based on prices in 1980, inflated by the U.S. Consumer Price Index.

¹⁹This assumes that increases in value near stations are not offset by decreases in areas far from stations. Also, about one-third of all riders on the system reside within the city limits; any premiums associated with housing within the city are not included in the figures.

²⁰The difference in premiums could also reflect price differences between the two services. Additionally, the PATCO impacts may be magnified by the lack of alternative employment centers in Camden County.

centers, access to the CBD remains valuable to suburban residents. A high-quality, CBD-oriented public transportation system can affect suburban residents' choice of neighborhood, the number of cars they buy, and the value of their houses. The house-value premiums associated with the transportation service can be sustained, however, only if service quality is maintained or enhanced, and if the CBD retains a productive advantage over other employment centers.

The productivity of the CBD is not independent of the transportation system, as an attraction of the CBD is its accessibility to a wide labor pool. However, if other factors—such as local taxes, poor services, or crime—reduce the CBD's attractiveness, the real estate premiums associated with the commuter rail system are

likely to diminish. Additionally, increases in train-service quality are likely to increase house-value premiums, while eroding service quality will likely have the opposite effect over time.

In the Philadelphia area, these effects can be large, as indicated by the estimated \$1.45 billion premium on suburban real estate values associated with commuter train service. At a discount rate of 10 percent, suburban residents with train service would enjoy positive financial benefits even if they paid up to \$145 million a year to support the two rail systems that serve Philadelphia's CBD. This estimate suggests that, despite the region's increasing decentralization, over 40 percent of the metropolitan area's suburban residents have a direct interest in the quality of public transportation and the economic health of the CBD.