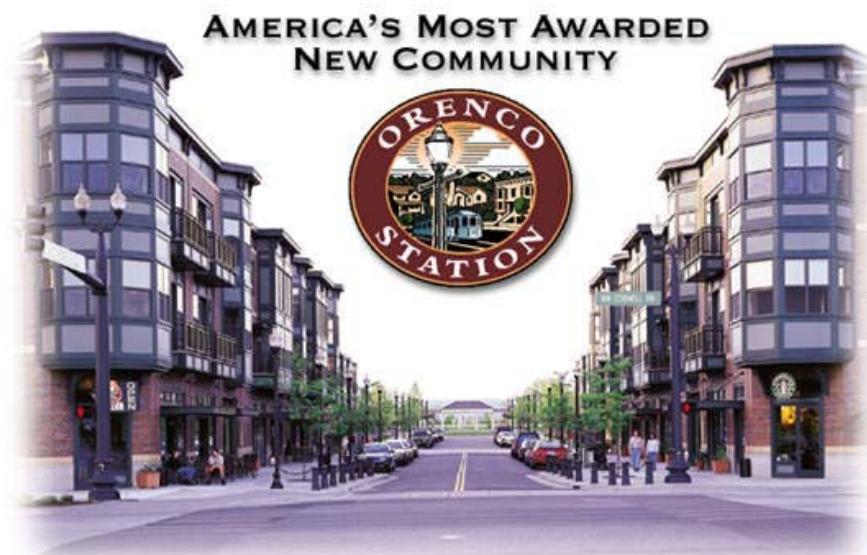


## Financing Transit Systems Through Value Capture *An Annotated Bibliography* 28 November 2010

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*Orenco Station in Portland, Oregon is a successful Transit Oriented Development. Property values tend to increase in such areas reflecting their improved accessibility and transportation cost savings.*

### Abstract

This paper summarizes the findings of more than 100 studies concerning the impacts transit service has on nearby property values, and the feasibility of capturing a portion of the incremental value to finance transit improvements. The results indicate that proximity to transit often increases property values enough to offset some or all of transit system capital costs.

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## Introduction

Experts generally offer three bits of advice to people shopping for a home or business: *location, location, location*. Why is location so important? Various factors come into play. People generally don't want to live near a noisy factory, hazardous waste site or other locally undesirable land use (LULU). Some neighborhoods are considered safer or more prestigious. One important factor is *accessibility*, that is, the ease with which people can reach services, activities and other important destinations. Home buyers want to know that the house they purchase is located within reasonable travel time to health care services, shops, and worksites. Similarly, business managers want a location that is easy for customers and employees to reach.

A particular location's accessibility is affected by both its proximity to people and activities, and by the quality of transportation serving it. In rural and suburban areas this depends primarily on automobile travel conditions, so locations along a major roadway, or even better, at the intersection of two major highways, is considered optimal. This is why businesses tend to line highways, and suburban home advertisements often claim "Just 20 minutes from town!"

In urban areas, transit access can also be important. By its nature, transit accessibility is more concentrated. Transit users generally walk a few blocks from their origin to a stop or station, ride a bus or train, and then walk a few more blocks to their destination. Transit riders generally don't want to walk more than a quarter mile. As a result, locations within a quarter mile radius of a transit line or station are considered to have better access than in other areas, providing benefits to residents and businesses due to reduced transportation costs and access to a larger pool of potential services, jobs, customers and employees.

For example, people may recognize that by locating near a busway or transit station they can commute by transit and avoid the cost of a second car. Quality transit service can leverage additional economic benefits. Transit-oriented communities tend to have better walking conditions and more clustered commercial activities than communities that are more automobile-dependent, and they often have lower parking requirements that provide additional consumer savings. Several studies indicate that residents of multi-modal neighborhoods spend significantly less in total on transportation than residents of automobile dependent communities (McCann, 2000; Litman, 2004). Quality transit service can also reduce the burden of chauffeuring non-drivers, and insuring that people will have adequate access if for any reason they cannot drive, for example due to a physical disability or poverty.

Similarly, many businesses want to locate near bus routes and transit stations to attract employees and customers, and to reduce their parking costs. All else being equal, convenient transit service increases an employers' potential employment pool, and many types of retail businesses want to take advantage of the concentrated pedestrian traffic around transit stations.

Of course, as with any infrastructure project – be it a transit system, a public park, a highway or a school – there may be negative impacts that reduce the location value for some people. Some people move away from highways to escape the noise and smog, and some people move away from playgrounds to escape the shrill voices of kids at play. But for the market overall, positive impacts tend to outweigh the negative impacts, increasing overall property values.

The value of accessibility has been well studied by the disciplines of urban economics, land economics and urban planning. In general, the more accessible a location, the higher its property values, all else being equal. For many years these experts assumed that transit accessibility was being displaced in importance by automobile accessibility, but in recent years there has been increasing recognition of the potential importance of public transit, and therefore the potential that proximity to quality transit service can increase nearby property values (Litman, 2002). Note that this increase in property value only reflects a portion of the total benefits of public transit: those that are directly perceived by the person who is buying or renting a building. There are usually additional benefits to other people and to overall economic productivity.

Proximity to transit can affect property values in three somewhat different ways, one negative and two positive. First, being located very close to a transit station or along a transit line tends to have negative, including noise and air pollution from trains, and increased automobile traffic from users. These nuisance effects may reduce residential property values very close to a transit station or rail line.

Second, it gives one location a relative advantage over other locations, attracting residential and commercial development that would otherwise occur elsewhere in the region. This is an economic transfer.

Third, transit can also increase overall productivity by reducing total transportation costs (including costs to consumers, businesses and governments for vehicles, parking and roads) and providing a catalyst for more clustered development patterns that provide economies of agglomeration, which can reduce the costs of providing public services and increase productivity due to improved accessibility and network effects (Coffey and Shearmur, 1997). Although these productivity benefits are difficult to quantify, they can be large: just a few percentage increase in property values, a few percentage reduction in automobile and parking costs, or few percentage increase in business productivity in a community can total hundreds of millions of dollars.

Proximity to transit tends to be particularly important for:

- Retail businesses that serve transit riders.
- Employment centers that attract many commuters, such as offices, medical centers and educational facilities.
- Recreational and entertainment activities that attract large crowds.
- Residents who cannot drive, or prefer to use alternatives.

These potential economic benefits from improved transit services raise intriguing prospects. Is it feasible that public transit systems could be partly funded by capturing a portion of the increased property values? This is consistent with the concept of *land value taxation* promoted by Henry George ([Lincoln Institute](#)). Many planners and economists, including Nobel laureate William Vickrey, suggests that cities could benefit by funding transit system development costs and a major portion of operating costs from land value capture, that is, by taxing a portion of the additional value of adjacent properties that result from transit accessibility.

A number of published studies have investigated the concept of value capture to fund transit. Most researchers examining these value affects limit their data to properties within transit corridors (i.e., within about 500 meters of a transit stop or station, that is, the distance that people are typically willing to walk). Tideman and Borhart both maintain that this perspective underestimates the full impact. A greater capital improvements revenue base would be available to transit agencies if rising land values within an entire region were appropriated through a general land-based property tax.

There are many examples of potential or successful land value capture to fund transit. R. T. Meakin notes that Hong Kong's rail transit system receives no subsidy, all costs, including interest on bond indebtedness, are paid from land rents derived from development in station areas. W. Rybeck estimated the added land values sequential to the development of Washington D.C.'s Metro, and found a surplus of incremental value. D. Riley, who studied the London tube extension, also found that surplus values were generated.

In recent years there has been growing support for *Transit Oriented Development* (TOD, a component of *New Urbanism* and *Smart Growth*), which results when a transit station provides a catalyst for mixed-use, walkable land use patterns, sometimes called an *urban village*. It tends to increase property values, reflecting the direct benefits to residents and businesses of having diverse transportation options, and resulting automobile and parking cost savings. Transit oriented location is similar to waterfront property, it is a valuable and scarce resource. Of course, not every transit improvement provides significant land value increases. Only if there is demand for proximity to transit are substantial increases in property values likely to occur.

A number of factors can support this type of development, including supportive land use development policies, overall transit service improvements, and other mobility management strategies, all of which can work together to make transit oriented development and transit use more attractive to consumers and businesses, and more cost effective ("Transit Oriented Development," VTPI, 2004).

A substantial portion of the capital costs associated with constructing public transit facilities is land acquisition. This cost could be effectively reduced if ground rents were collected. That is, when the public sector captures incremental land values through the general property tax and through special levies on land holdings in transit corridors, less value remains for private owners to capitalize into price. This dampening of land prices helps to reduce land acquisition costs.

Other possible revenue sources include joint-development, and the leasing of sites near stations. Localities can adopt other forms of "green" taxation such as congestion pricing and vehicle emission permit fees to help fund transit systems. For example, London recently introduced a congestion charge for driving downtown, and many cities use parking revenue to help fund local transportation services.

In the past, private developers often built transit systems to urban fringe neighborhoods and recouped the capital costs from the sales of developed sites (still common practice in Japan). Such profits from land residuals are commonplace in the private sector, but could reasonably be

extended to the public domain – where local government covers the financial risk and the cost of building transit systems. Cervero, et. al. (2004) state that a central element of joint-development amounts to a *quid pro quo*, whereby private developers' benefits from transit accessibility are capitalized into higher rents and occupancy rates, and transit agencies' capital funding is enhanced through cost sharing mechanisms.

To date, most studies of value capture financing for transit focus on U.S. cities, where low density development and auto-dependency predominate. Studies have begun to emerge from developing countries, where denser cities and a more even modal split can be found (Cervero & Susantono, Gutman, Nakagawa & Matsunaka, Prest, and Tsukada). Some of these authors have noted that while progressive legislation may be on the books, the practical means of capturing site values for transit projects is hampered by inadequate land registration records and lagging assessments.

Previous summaries and bibliographies of transit financing through value capture have been compiled by the U.S. Subcommittee on the City (1980), Pickett & Perrett (1984), Huang (1994), the Transportation Research Board (1998), Diaz (1999), Lewis & Williams (1999), NEORail II (2001), Jonathan Hack (2002) and TRB 2010. The following is an annotated list of studies that the authors recommend as worthy reading.

## Financing Public Transportation

- 1) Wayne Boyle (1993), “Eight Ways to Finance Transit: A Policymaker’s Guide,” Item # 9362, *National Conference of State Legislatures*.

The Los Angeles Metro Rail Special Benefit Assessment District survived a challenge in court, and contributed \$130 million per year to the cost of retiring LA Metro bonds.

- 2) M. Buchanan (1988), *Urban Transport and Market Forces In Britain*, Anglo-German Foundation for Study Industrial Society, London. Available from: AGFSIS, 17 Bloomsbury Square, London, England, pp 211-219.

The report features sections on buses, trains, and roads. The application of market forces and competition may decrease the public cost of transport and decrease traffic congestion in the U.K. Thus far, policies addressing market forces have been confined largely to bus service where deregulation has produced little change in service levels. Although public savings have been realized in large urban areas, the tendering process has led to major increases in county council costs and public transport staff. Market forces have not been effectuated in the railway system in the same way; large subsidies are still required. Tighter financial targets, the disposal of surplus land, and the subcontracting of work have all been undertaken, as have improvements in administration. Construction of new railways is being funded in part by the consequent increase in land values, an example being the London docklands railway. Four methods are discussed: allocating the subsidy to specific purposes; paying the subsidy via a third party; separating the operation of railways from the provision and maintenance of infrastructure; and privatization. Methods to commercialize road infrastructure include: urban parking management, the financing of new highway construction from tolls, and road pricing. (From Transport and Road Research Laboratory in TRIS Database under “Taxing Property Values for Transit”)

- 3) Matthew Doherty (2004), *Funding Public Transport Development Through Land Value Capture Programs*, EcoTransit ([www.ecotransit.org.au](http://www.ecotransit.org.au)).

This paper examines the potential to raise capital for funding public transport development through the use of land value capture programs. A literature review of studies that examine examples from Australia and abroad has been undertaken to do this. Among the mechanisms considered are development land taxes, systems of property rating, taxation models and specialised loans. These are considered alongside other funding measures such as statutory charges, CBD parking levies, business rate supplements and recent international methods of congestion charging.

- 4) Thomas A. Gihring (2001), “Applying Value Capture in the Seattle Region,” *Journal of Planning Practice & Research*, Vol. 16, Nos. 3-4 (Winter): 307-320.

The “geo-bond” financing mechanism features the capture of land rent as distinct from other capture devices that may include the building component of assessed value. Using the Broadway station area of Sound Transit’s proposed LINK light rail line, the author employs a model simulating the tax effects of (i) a general land value property tax and (ii) a land value gains tax

within the transit benefit district itself. The LVT produces the desired development incentive effects, as it shifts the burden off buildings in this “main street” setting. The gains tax targets the difference between the annual assessed land value increase and the revenue derived from the general property tax within the half-mile radius benefit district. Given the rapid rises in values in recent years, “a land value gains tax combined with a hypothecated general LVT can raise as much as \$118 million to support the necessary transit improvements. At a minimum, about \$24 million could be raised from an incremental gains tax alone.” Sound Transit estimates station and street improvements (excluding right-of-way acquisition) construction costs at \$80 million.

**5) Donald G. Hagman and Dean J. Mischynski, eds. (1978), *Windfalls for wipeouts: land value capture and compensation*. American Society of Planning Officials. (Funded by U.S. Dept. of HUD).**

Special Assessment Districts (SAD) by local governments, once used extensively, fell out of favor during the Great Depression. Yet by the 1970s, the tool was making a comeback. In 1913, Los Angeles, Oakland, Portland, and Kansas City raised 20% of their budgets from SADs. When the Depression wiped out land value, civic bonds became difficult to pay off and lost their ratings. Then, by 1972, the cities over 100,000 population that had SADs in effect (about 5% of all local jurisdictions), funded an aggregate 12% of their budgets through this method. With regard to the use of the Land Value Tax (LVT), the editors questioned the effectiveness of Pittsburgh’s experience in shifting the property tax rate from buildings to locations, citing a 1973 Price Waterhouse study (written before the rate differential was increased to 6:1, land to improvements). Nevertheless, the solid results from using the LVT for developing Waikiki Beach, Hawaii were also noted.

**6) Yoshitsugu Hayashi (1989), “Issues in Financing Urban Rail Transit Projects and Value Captures,” *Transportation Research. Part A: General*, Vol. 23A, Issue 1 (January).**

In Japan, urban rail transit projects are suffering from cost burden due to the current financing system’s dependence on borrowed money from loans and bonds that are repaid mainly by fares. The transit fund cannot bear increased expenditures from accelerated construction demand and the rising cost of land acquisition. This paper reexamines the financing system and analyses the possible means of raising revenues. From the viewpoint of the benefits principle, the author examines the imbalance between those who bear the costs and those who receive the benefits, using Japanese examples.

**7) Martin Higginson (1999), “Alternative sources of funding,” *Public Transport International*, Vol. 48, No. 5 (September).**

The author cites several transit systems. Copenhagen, Denmark, is funding a line to a new suburb by selling off public land for the development, privatizing development, and collecting more property tax revenue from the higher ensuing land values.

**8) Jane A. Howard (1984-85), *Strategies to Implement Benefit-Sharing for Fixed-Transit Facilities*. Series Report from Transportation Research Board, National Research Council, National Cooperative Transit Research & Development Program No. 12.**

A Local Improvement District is a special property assessment to pay for capital improvements benefiting a defined area. In Portland, Oregon, it is designed to collect some site rent (attributed increases in land values) to fund transit-related improvements such as street paving, streetscape amenities, and trolleys. In a required-by-law election, affected downtown owners unanimously approved the LID, and are assessed by square footage of land (excluding buildings), with greater weight given to frontage within 100 feet of transitways. The LID is paying off \$1.5 million in bonds over 20 years, comprising over a quarter of the \$5.5 million total project cost.

**9) M. Ito (1989), *Establishing New Measures to Construct New Railroad Lines*, JTERC Reports, Vol. 11, Japan Transport Economics Research Centre, Tokyo, Japan.**

This study examines the New Joban railway line in the northeastern area of Tokyo. It estimates land values of properties along the corridor, with and without the rail line, and calculates the resulting increment. Methods of ensuring that a region receives an adequate return on its investment are discussed. Included are (i) local taxes for a Railroad Construction Fund; and (ii) reduction of station construction costs, either by setting up a trust company to construct a combination of station retail outlets, or by making the developer or local companies responsible for some of the costs. For rural areas, the author recommends a system of integrated development, ensuring that development of residential, educational and cultural facilities along the line keep pace with rail construction. Also included are suggested methods by which problems of acquiring railway land can be overcome. (See IRRD 857359 in Transport Research Laboratory on TRIS Database, “Taxing Property Values for Transit”)

**10) T. M. Ridley and J. Fawkner (1987), *Benefit Sharing: the Funding of Urban Transport through Contributions from External Beneficiaries*, Report from the 47<sup>th</sup> Congress, International Union of Public Transport, Lausanne.**

“Specific improvement assessments” funded the first 35 km of Milan, Italy’s Metro. The special levy is assessed on properties within 500 m of stations. This form of LID had raised 36 billion lire, but following its initial success the levy was replaced by a real estate transfer tax that feeds into the local general fund.

**11) Rick Rybeck (2004), “Using Value Capture To Finance Infrastructure And Encourage Compact Development,” *Public Works Management & Policy* (<http://pwm.sagepub.com>), April, pp. 249-260.**

This article discusses the theory and practice of value capture. It describes how transportation investments often increase nearby land values, including a review of empirical studies of this effect. This increased value can choke off urban development, pushing new growth to cheaper sites remote from these investments. This “leapfrog” development creates a demand for infrastructure extension that starts the process over again. Transportation infrastructure, intended to facilitate development, thus chases it away. The resulting sprawl strains transportation, fiscal, and environmental systems. Several jurisdictions around the country utilize a value-capture

technique embedded in their property tax to help finance infrastructure and motivate affordable compact development. They reduce the tax rate on assessed building values and increase the tax rate on assessed land values. The resulting compact development should facilitate better transportation and accommodate economic growth with reduced fiscal and environmental costs. This technique's ability to foster affordable compact development might help bridge the gap between those who advocate growth boundaries and those who fear the impact of growth boundaries on affordable housing. The author is an attorney with a master's degree in real estate and urban development, has served as the Deputy Administrator for Transportation Policy and Planning within the District of Columbia Department of Transportation since 1997.

**12) Philip J. Shinbein and Jeffrey L. Adler (1995), "Land Use and Rail Transit,"  
*Transportation Quarterly, Vol. 49, No. 3, pp. 83-92.***

Using a case study of Orange County, New York, the authors state the case for shifting transit subsidies from the present system of general taxes to land value taxes, arguing that it is realistic to think of self-financing transit improvements from LVT. Joint development programs coupled with permissive zoning to encourage high density "pocket communities" near transit stations would increase land values that can be recaptured to pay for the capital costs of rail infrastructure.

**13) James G. Strathman and Kenneth J. Dueker (1987), *Regional economic impacts of local transit financing alternatives: input-output results for Portland*, Portland State University, Center for Urban Studies.**

This study ranks several taxing methods for funding transit. The one found to distort economic activity the least is the gasoline tax, followed by the property tax. The least desirable method of raising revenues is a higher onboard fare, followed by a payroll tax. Taxes on income, parking, and sales produce moderate distortion effects.

**14) E. Walther, L.A. Hoel, L. J. Pignataro and A.K. Bladikas (1990), *Value Capture Techniques in Transportation: Final Report, Phase One*, Report No. DOT-T-90-11, Office of the Secretary of Transportation.**

The authors provide an overview of the potential use of value capture techniques. Included is a general set of criteria for state and local officials to evaluate the applicability of value capture to specific funding situations. A series of techniques in communities of various sizes is provided, along with a decision support methodology based on a set of 63 indicators to evaluate specific value capture proposals. Techniques include: special assessment districts, donations, negotiated investments, public / private partnerships.

## Prospects for Cost Recovery

- 15) Allen, W. Bruce (1987), "Value Capture in Transit," *Journal of the Transportation Research Forum*, Vol. 28, no. 1.

This case study in south metropolitan Philadelphia offers an interdependent set of models of modal choice, station choice, and travel savings using the economic law of market areas. These models (i) spatially separate auto users from transit users, (ii) spatially separate the users of station A from the users of station B, and (iii) spatially connect the locii of all points where the user saves an equal amount of money from using transit over auto. All of these models yield hyperbolas that bend around the stations on the line. The station choice model is tested using auto access data for all suburban stations of the line for a morning rush hour (13,000 observations), and assumes the station chosen most often from any given location is the preferred station. The savings model is tested by postulating that residential sales price is a function of the characteristics of the property, the neighborhood, distance from the CBD, and savings (using over 1,300 real estate transactions from 1980). Each dollar of daily savings is found to add \$443 to the value of the property. If rents fell elsewhere, such loss was not deducted. The benefit to non-transit census tracts (less congestion and shorter travel times) was not added in; if it were added, savings would be 30% higher. Without it, \$4,581 could be captured per single family home. Within the transit census tracts, this adds up to \$279.5 million, or 117.9% of the construction cost of the Lindenwold Line, the right-of-way of which did not need to be purchased. Buying the land and constructing bridges would have raised the cost to \$820 million, of which captured land rent could have paid one-third (unless all rent were captured, which would drop land's price to zero). In order that the costs are borne by the beneficiaries, land value should be captured at the time it is created, that is, between the announcement of a new improvement and its actual opening.

- 16) Mezyad Alterkawi (1991), "Land Economic Impact of Fixed Guideway Rapid Transit Systems on Urban Development in Selected Metropolitan Areas: The Issue of the Price-Distance Gradients." Ph. D. thesis, Texas A&M University, Stock No: 91-33904 University Microfilms International.

This study concentrated on Washington, DC and Atlanta, GA. It also noted that Toronto, Canada's Yonge Street Subway increased property tax revenue by \$5 million annually, while the annual cost of servicing the subway's bonds was \$4 million.

- 17) Alex Anas (1983), *The Effects of Transportation on the Tax Base and Development of Cities*, Report for the U.S. Dept. of Transportation.

Transportation improvements and investments change zone-to-zone travel times and costs. This researcher's model forecasts changes in land values. The forecasts are determined annually and by small geographic zones in a metropolitan area. The Chicago application shows that under 1970 conditions, capitalized land value changes are nearly 36-40% of the capital cost of rail rapid transit proposals then proposed for Chicago's southwest side. Similar calculations for bus systems appear more promising. Anas suggests a one-time lump sum property assessment rather

than an increase in the land tax rate, since that latter would lower “site values”. This would lower selling price, while the value remains the same (what buyers are willing to pay: price plus tax).

**18) H. William Batt (2001), “Value Capture as a Policy Tool in Transportation Economics: An Exploration in Public Finance in the Tradition of Henry George”, *The American Journal of Economics and Sociology*, Vol. 60, No. 1, pp. 195-228.**

This study shows how value capture could have been used to finance a 9-mile portion of the New York State interstate highway system. The added increment of land value attributed to the Northway sector amounted to 11 times that of the cost of right-of-way acquisition, road and bridge construction. Batt concludes that the windfall gains in land value that fell to private landowners could easily have paid off the bonds issued to build the project. Furthermore, the added taxes from value capture assessments in the highway corridor removes the invitation to land holders to speculate on their sites. Directing some of the gains to mass transit also indirectly compensates for the cost of smog and other pollutants emitted from cars.

**19) Jonathan Hack (2002), *Regeneration and Spatial Development: a Review of Research and Current Practice*, IBI Group, Toronto.**

This paper provides specific examples of how, and to what degree, urban transit investment (principally light rail) has stimulated urban regeneration and created private opportunities for private sector investment in transit corridors, notably around transit stations. The case studies provided are derived from a review of research to date that showcases recent examples of LRT investment in Europe and North America.

**European cities:**

1. Tyne & Wear Metro, Newcastle, U.K.: 55 km./44 stations:

- House prices increased 2% within 200 meters of metro stations.
- Retail activity or office developments near stations does not appear to be directly linked to LRT.

2. Manchester Metrolink (LRT completed 1992):

- Development of 20 500 sq.m of offices and services in City centre.
- Yet, no evidence of urban development outside City centre.

3. London Docklands Light Railway: open 1987, 13 km./16 stations; Beckton & Lewisham extensions totalled 50 km and cost 424 million pounds:

- A priori assessment proved correct: 50% of capital cost was recaptured through transport costs reduction, reduction in congestion and in accident, while 50% was recaptured through overall office development and job creation.

4. Croydon Tramlink, South-London (opened May 2000, 28 km. Croydon to Wimbledon/38 stations):

- Economic impact yet to be felt.

5. LRT in Strasbourg, France (built 1991-94):

- Between 1994 and 1995, park-and-ride schemes near the city centre resulted in an increase of 100% of transit system users and draw shoppers from outside the metropolitan area.
- Pedestrianization around adjacent Place Kleber helped create larger and more accessible activities.

6. Helsinki Metro, Finland (1982):

- Property within walking distance of railway or metro station worth 7.5% more than other locations.
- Impact was most significant at a distance of 500-750 m., as opposed to adjacent locations, where values dropped.
- In the best locations, dwelling prices raised by 11%.

7. Vienna S-Bahn, Austria (opened 1962, 14 km.):

- Districts located along S-Bahn corridor have witnessed increases in number of new housing units of 18,7% over 10 yr. period, as opposed to 4% and 10% in more remote locations.

8. Nantes, France:

- Between 1985 and 1995, 25% of new offices, 13% of new commercial premises and 25% of new residential dwellings were built adjacent to LRT.

**North American Experience:**

9. Baltimore Central Light rail, USA (first segment 1992, 29 miles):

- While useful from a transit standpoint, Baltimore LRT system failed to spur retail activity in downtown area.

10. Portland Metropolitan Express (started in 1986, 15 miles/32 stations, plus plans for 18 miles expansion):

- Since 1986, \$1,9 billion in property development in the immediate vicinity of line.

11. St-Louis, Missouri (opened 1993, 18 miles/18 stations):

- To date, development spurred by transit system totals \$530 millions and includes major projects.
- A \$1,5 billion expansion to LRT is expected to have a \$2,3 billion impact on business sales.

12. San Diego Trolley, California, a LRT which connects downtown area to Tijuana, Mexico (40 miles/34 stations):

- Since construction, some 4 million sq. feet of Class A office space has been added to downtown area, with population growing from 0 to 20 000 persons.

13. Metro Toronto Subway (built during 1950s & 1960s):

- Between 1959-1964: 90% of all new office spaces and 40% of apartment buildings in Toronto took place along the metro lines.
- Tax assessment values near City centre stations rose by 45% and by 107% around suburban stations, as opposed to 25% elsewhere.
- Office space rents adjacent to the stations average 30% more than average for the City as a whole, while office rents within 500 m. of stations rose by 10% more than average.

14. Chicago LRT:

- Chicago Transit Authority estimates that maintaining a “good repair” scenario in its transit system would yield \$4,6 billion in additional business sales, 41 209 jobs over 20 years and annual tax revenues of \$154 million.
- Chicago authority projected that return on capital investment in LRT was \$6 for every \$1 spent.

15. Dallas Area Rapid Transit (DART):

- Property values near the DART lines are 25% higher than similar real estate elsewhere in the area.

16. Other cities:

- In Atlanta and Washington DC., real estate developments around transit stations command a premium of between \$3 and \$4 per sq. foot.

**20) Todd Litman (2004), *Rail Transit In America: Comprehensive Evaluation of Benefits*, Victoria Transport Policy Institute ([www.vtpi.org](http://www.vtpi.org)). Also see, *Evaluating Public Transit Benefits and Costs*, by the same author and publisher, which provides additional information on methods for evaluating benefits.**

This study evaluates rail transit benefits based on a comprehensive analysis of transportation system performance in major U.S. cities. It finds that cities with large, well-established rail systems have significantly higher per capita transit ridership, lower average per capita vehicle ownership and annual mileage, less traffic congestion, lower traffic death rates, lower consumer expenditures on transportation, and higher transit service cost recovery than otherwise comparable cities with less or no rail transit service. It finds that monetized benefits exceed rail transit costs several times over. This indicates that rail transit systems provide economic, social and environmental benefits, and these benefits tend to increase as a system expands and matures. This report discusses best practices for evaluating transit benefits. It examines criticisms of rail transit investments, finding that many are based on inaccurate analysis.

**21) Lewis, David, and Fred L. Williams (1999), *Policy and Planning as Public Choice: Mass Transit in the United States*, Ashgate.**

This book examines various economic benefits from public transit, including improved mobility, reduced congestion and increases in nearby property values. They conclude that, “The public realizes \$5 in cash savings for each tax dollar invested in transit services.” On page 141, they display a chart that clearly correlates transportation mobility with national wealth (and elsewhere with household wealth).

**22) D. Nakagawa and R. Matsunaka (1997), *Funding Transport Systems: A Comparison Among Developed Countries*, Pergamon.**

The authors repeat the findings of Tsukada and Kuranami (below) that in Japan private railroads manage real estate within rail corridors, and thereby enhance profits.

**23) Phyllis J. Nathanson and Gary Booher (1983), *Survey of Joint Development and Value Capture Activity in Selected Metropolitan Areas*, City of Los Angeles Planning Dept.**  
Among several systems noted in this survey, Miami's Metrorail raised enough site rent to cover 25% of its total capital cost (\$116 million).

**24) Don Riley (2001), *Taken for a Ride: Trains, Taxpayers, and the Treasury*, Centre for Land Policy Studies, U.K.**

London’s Jubilee extension cost £3.5 billion, and raised the nearby land’s rental value by £1.3 billion. Public collection of 25% of that increase would pay off the Jubilee in 20 years. In the vicinity of Edinburgh, Scotland, developers are co-funding a new line on an old right-of-way.

**25) Walter Rybeck (1981), *Transit-Induced Land Values: Development and Revenue Implications*, Report published in Commentary, Council on Urban Economic Development, 24 October 1981, pp 23-27.**

In his report to Congress, this former staff to Sen. Paul Douglas noted that Washington, DC's Metro in 1981, after some \$3 billion in expenditures, was 40% complete and had generated over \$2 billion in land value. In January 2001, after \$9.5 billion in expenditures, the completed system had generated between \$10 and \$15 billion in new land value.

**26) Nicolaus Tideman (1993), "Integrating Rent and Demand Revelation in the Evaluation and Financing of Services," In *Does Economic Space Matter?*, eds. Hiroshi Ohta and Thisse Jacques-Francois (London: Macmillan) 133-150.**

Taking into account more than just the property selling price, this researcher considers how a transportation project changes the returns to land, labor and capital, compared to the project's costs: 1) the increase in privately collected rent – i.e., the increase in the selling price (and lease value) of land; 2) the increase in taxes on land; 3) the decrease (more usual than an increase) in its value, because capital can't be moved (as land rose in value but building fell in value); 4) the change in taxes on existing buildings; 5) the taxes on new buildings erected in response to the transportation improvements; 6) the cost of extra public services for the added buildings (unless there are user fees); 7) the extra tax revenue if there's a sales tax or a wage tax which reduces land values; 8) the savings in travel time if low fares reduce congestion; 9) reduced smog; and 10) the loss of human happiness from uncompensated personal adjustment to the change in the built environment. The sum of these 10 items is compared to the transportation system costs.

**27) Transportation Research Board, Price Waterhouse & Co. (1998), *Funding Strategies for Public Transportation*. TRB Report 31, Transit Cooperative Research Program, 1998.**  
Precise location in the transit facility-property value relationship is found to be crucial. In one New York station, moving a concession stand a mere 20 feet doubled the rent the transit system collected from the vendor.

**28) United States Congress: House Committee on Banking, Finance, and Urban Affairs, Subcommittee on the City (1998), *New urban rail transit: how can its development and growth-shaping potential be realized?*, U.S. Government Printing Office.**

From page 81: Burkhardt and Howard summarize historical evidence. "Major land value increases occurred in many station areas of New York City's expanding transit system in the early 1900s." From page 124: Donald Richmond states, "The (Toronto Transit) Commission ... experience...suggests that the long-term land-leasing program can completely recover land acquisition costs over a reasonable time period."

## Effects of Transit Facilities on Property Values

- 29) Shishir Mathur and Christopher E. Ferrell (2009), *Effect Of Suburban Transit Oriented Developments On Residential Property Values*, Mineta Transportation Institute ([www.transweb.sjsu.edu](http://www.transweb.sjsu.edu)); at [www.transweb.sjsu.edu/MTIportal/research/publications/documents/Effects%20of%20Sub-Urban%20Transit%20%28with%20Cover%29.pdf](http://www.transweb.sjsu.edu/MTIportal/research/publications/documents/Effects%20of%20Sub-Urban%20Transit%20%28with%20Cover%29.pdf).

This study estimated the impact of *Transit Oriented Developments* (TODs) on surrounding single-family residential housing values in four suburban San Francisco Bay area neighborhoods: Ohlone Chnyoweth TOD in San Jose, Pleasant Hill TOD in Contra Costa County, Downtown Hayward TOD in the City of Hayward in Alameda County, and Bay Meadows TOD in the City of San Mateo in San Mateo County. Finds that every 100 feet decrease in distance for single-family homes to the Ohlone Chynoweth TOD the home sale price increased an average of \$10,150 or 1.5%. However, the remaining three TODs do not have any effect – positive or negative – on the prices of surrounding single-family homes.

- 30) Musaad A. Al-Mosaind, Kenneth J. Duecker, and James G. Strathman (1992), “Light Rail Transit Stations And Property Values: A Hedonic Price Approach,” *Discussion paper 92-04, Presented at Transportation Research Board 72nd Annual Meeting*, Center for Urban Studies, School of Urban and Public Affairs, Portland State University.

Proximity to LRT stations may improve the accessibility of residents to the CBD and the rest of the urban area, and may also result in transportation cost savings. These effects show up in higher property values. However, in the absence of attention to design qualities, LRT stations may impose negative externalities, depreciating nearby home values. Which of these two effects predominates? In metropolitan Portland, Oregon, two distance models to LRT stations were compared. The first showed a positive capitalization in sale prices for homes within 500 m (1600 ft or 1/4 mi) walking distance. This effect was equally felt for all homes within that distance zone. The second model found a statistically weak negative price gradient for homes within the 500-m zone. This implies a positive influence of proximity, where homes are priced about 10% higher. Zoning for higher density around stations also raised site values.

- 31) A. Anas and Regina Armstrong (1993), *Land Values and Transit Access: Modeling the Relationship in the New York Metropolitan Area: An Implementation Handbook*. Report No. FTA-NY-06-0152-93, U.S. Federal Transit Administration, Office of Technical Assistance and Safety, Springfield VA. (National Technical Information Service).

This article presents findings of a multi-year study of the relationship between land values and transit access in the New York area. Initiated as an element of the Third Regional Plan for the New York/New Jersey/Connecticut Region, the results serve as a research prototype for transit systems throughout the US. Two economic models are presented – NYREG and NYSTA – which predict shifts in land values within the region and at a parcel scale in relation to transit stations. “The total benefits of reducing wait times on transit equal \$3.7 billion (\$1.57/trip). Taxing the producer surplus increases would raise \$100 million/yr, enough to finance a doubling of the number of trains (an unknown cost).”

**32) Robert J. Armstrong (1994), “Impacts of Commuter Rail Service as Reflected in Single-Family Residential Property Values”, *Transportation Research Record* 1466, pp. 88-97.**

Single-family residential properties in metropolitan Boston, Mass, are examined. Results indicate that there is an increase in single-family residential property values of approximately 6.7% by virtue of being located within a community having a commuter rail station. At the regional level there appears to be a significant impact on single-family residential property values resulting from the accessibility provided by commuter rail service.

**33) William G. Barker (1998), “Bus Service and Real Estate Values”, *68th Annual Meeting of the Institute of Transportation Engineers, Toronto, Ontario, (available from ITE, 1099 14th Street, NW, Washington DC 20005-3438 U.S.A.)*.**

Real estate developers and lending institutions are not willing to base investments on the location of easily changed bus routes. However, the availability of local bus service does increase the value of at least some urban real estate.

**34) Keith Bartholomew and Reid Ewing (2010), “Hedonic Price Effects of Pedestrian-and Transit-Designed Development,” under review by the *Journal of Planning Literature*; at [http://faculty.arch.utah.edu/bartholomew/Individual%20Files/12\\_Hedonic\\_Price\\_Effects.pdf](http://faculty.arch.utah.edu/bartholomew/Individual%20Files/12_Hedonic_Price_Effects.pdf).**

This article reviews literature concerning the use of hedonic pricing to evaluate whether consumer demand for pedestrian- and transit-designed development is growing. This analysis indicates that transit accessibility, walkability, and local environmental quality do tend to be capitalized into real estate prices. It demonstrates that amenities of transit-designed development, such as improved walkability and mixed land use tend to increase urban land values independent of transit accessibility.

**35) Nathaniel Baum-Snow and Matthew E. Kahn (2001), “The Effects of Public Transit Projects to Expand Urban Rail Transit,” *Journal of Public Economics*, Vol. 77, pp. 241-63.**

Study of land values in Boston, Atlanta, Chicago, Portland and Washington DC found that a decrease from three to one kilometer distance from transit stations increases rents by \$19 per month, and housing values by \$4,972.

**36) John D. Benjamin and G. Stacy Sirmin (1996), “Mass Transportation, Apartment Rent and Property Values,” *The Journal of Real Estate Research*, Vol. 12, No. 1.**

This study examines the effects of transit access, measured in ground distance to the nearest station, on residential rent levels. From over 250 observations of 81 apartment complexes, the authors find that rents decrease by 2.4% to 2.6% for each one-tenth mile in distance from a Metro station in Washington, DC.

- 37) **M. Bernick, R. Cervero and V. Menotti (1994), *Comparison of Rents at Transit-Based Housing Projects in Northern California*, Working Paper 624, University of California at Berkeley, Institute of Urban and Regional Development.**

“Rents at the BART housing projects are higher than those of nearby projects.”

- 38) **C. Bollinger, K. Ihlanfeldt, and D. Bowes (1998), “Spatial Variation in Office Rents Within the Atlanta Region”, 1996 TRED Conference, Lincoln Land Institute, Cambridge, Mass., Georgia State University, Policy Research Center.**

This is a hedonic rent study of office buildings in the Atlanta area from 1990 to 1996. Part of the rent differences among office buildings is due to differences in wage rates, transportation rates, and proximity to concentrations of office workers. The convenience of face-to-face meetings facilitated by office agglomerations is also reflected in office rents, providing evidence that agglomeration tendencies continue to be important in explaining office concentrations, despite the ability of information technology designed to reduce the need for some such contacts.

- 39) **Robert J. Borhart (1994), *Corridor Reservation: Implications for Recouping a Portion of the ‘Unearned Increment’ Arising from Construction of Transportation Facilities*, Final Report, Virginia Transportation Research Council, Charlottesville, Va., Series title: VTRC; 94-R15.**

Increases in land rents show up in higher property taxes, not only in property selling prices. The author quotes President Franklin D. Roosevelt supporting value capture.

- 40) **David R. Bowes and Keith R. Ihlanfeldt (2001), “Identifying the Impacts of Rail Transit Stations on Property Values,” *Journal of Urban Economics*, Vol. 50, pp. 1-25.**

Found that properties between one and three miles of a rail transit station in Atlanta, Georgia have a higher value than otherwise comparable properties located more than three miles away, but properties within a quarter mile of a station are worth 19% less than homes beyond three miles.

- 41) **Cambridge Systematics (1998), *Economic Impact Analysis of Transit Investments: Guidebook for Practitioners*, TRB Report 35, Transit Cooperative Research Program, Transportation Research Board ([www.trb.org](http://www.trb.org)).**

This comprehensive guidebook describes various technical methods for measuring the economic impacts of transit investments, including changes in adjacent property values. It also includes a summary of research findings on the increases in property values found around BART stations in the San Francisco Bay area. Results are summarized in the table below. Tables 9.6 – 9.10 list 15 studies dating from 1970 to 1996 that calculate the premium effect of transit investments, measured in unit area of property.

**Table 1 Property Value Increases Near BART Stations (1997 U.S. Dollars)**

Land Use Type	Distance From BART Station (ft)	CBD/Urban	Suburban
<i>Single Family</i>		<i>Per Unit</i>	<i>Per Unit</i>
	0-500	\$48,960	\$9,140
	500-1,000	\$14,400	\$7,930
	1,000-1,500	\$8,640	\$3,040
	2,000-2,500	\$5,760	\$5,500
<i>Multi-Family</i>		<i>Per Unit/Month</i>	<i>Per Unit/Month</i>
	0-1,300	\$50.00	\$42.30
	1,300-2,500	\$0.00	\$0.00
<i>Offices</i>		<i>Per Sq. Ft/Month</i>	<i>Per Sq. Ft/Month</i>
	0-1,300	\$0.13	\$0.00
	1,300-2,000	\$0.07	\$0.28
	2,000-2,500	\$0.00	\$0.00
<i>Retail</i>		<i>Per Sq. Ft/Month</i>	<i>Per Sq. Ft/Month</i>
	0-500	\$0.07	\$0.24
	500-1,000	\$0.00	\$0.24
	1,000-2,500	\$0.00	\$0.00

This table summarizes how property values change with proximity to BART stations for different types of land uses.

**42) Robert Cervero (1994), “Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta,” *Journal of the American Planning Association*, Vol. 60, No. 1, pp. 83-94.**

In addition to public-private cost sharing and the lease revenues derived from commercial space in rail stations, joint development projects generate more fare revenues as they stimulate more transit trips. This study examines how transit investments affect office market indicators.

Evidence shows that J-D projects create measurable land value increases and other associated benefits. Among five dependent variables studied, office rent levels are most closely correlated with transit factors – especially ridership. Other benefits associated with transit centers are low vacancy rates, higher absorption rates, and larger office building size. In conclusion, urban rail transit will significantly benefit land use and site rents only if a region’s economy is growing and supportive programs such as permissive zoning are in place.

**43) Robert Cervero (1996), “Transit-Based Housing in the San Francisco Bay Area: Market Profiles and Rent Premiums,” *Transportation Quarterly* Vol. 50, No.3, pp. 33-49.**

Cervero’s study evaluated apartment rents (most studies evaluate housing prices). Around the three BART stations studied, most residents lived in multi-unit complexes of 20-60 units, were young adults, professionals earning incomes comfortably higher than around some other stations, living alone or as couples, but without children (DINKs), most of whom owned just one car, not one car apiece. The housing near two of the stations those residents lived in did lease at building rents that were 10%-15% higher; around the third (Richmond) no rent premium was found.

Cervero did not explain if any characteristic of that neighborhood was different: more industrial or surrounded by lower-income residents or what. He concluded that, “In theory, the existence of a rent premium for multi-unit projects suggests value capture mechanisms (e.g., forming benefit assessment districts) could be used to help finance rail systems.”

- 44) Robert Cervero (2002), “Benefits of Proximity to Rail on Housing Markets: Experiences in Santa Clara County,” *Journal of Public Transportation*, Vol. 5, No. 1.** Hedonic price models show that nearness to light rail and commuter rail stops substantially add value to residential parcels. Large apartments within ¼ mile of LRT stations command land value premiums as high as 45 percent. Such market profits provide a potential source of local revenue from value capture programs.
- 45) Robert Cervero and Michael Duncan (2002), “Transit’s Value Added: Effects of Light Commercial Rail Services on Commercial Land Values,” *Presented at TRB Annual Meeting* (available at [www.apta.com/info/briefings/cervero\\_duncan.pdf](http://www.apta.com/info/briefings/cervero_duncan.pdf))** This study models the value effects of proximity to light rail and commuter rail stations, as well as freeway intersections, in Santa Clara County, California. Substantial capitalization benefits to commercial-retail and office properties were found, on the order of 23% for a typical commercial parcel near an LRT stop, and more than 120% for commercial land in a business district within a quarter mile of a commuter rail station.
- 46) Robert Cervero, Christopher Ferrell and Steven Murphy (2002), “Transit-Oriented Development and Joint Development in the United States: A Literature Review,” *Research Results Digest*, No. 52, *Transit Cooperative Research Program*.** This is a comprehensive review of literature on transit oriented development. Topics include: Definition of TOD, agency roles, impacts and benefits on land markets, supportive policies and regulations, the use of value capture financing, and station area design supportive of TOD. The authors suggest that transit boards might share in the land-value benefits derived from proximity to transit by participating in joint development as well as value capture.
- 47) Hong Chen, Anthony Rufolo, and Kenneth Dueker (1998), “Measuring the Impact of Light Rail Systems on Single Family Home Values: An Hedonic Approach With GIS Application”, *Transportation Research Record 1617*, TRB, National Research Council, Washington, DC.** Proximity to transit stations account for a 10.5% home price differential. This confirms the findings of Al-Mosaind et. al. (see Ref. 25). They conclude that the positive effects outweigh the negatives.
- 48) David Damm, Steven Lerman, Eva Lerner-Lam, and Jeffrey Young (1980), “Response of Urban Real Estate Values in Anticipation of the Washington Metro,” *Journal of Transport Economics and Policy*, pp. 315-335.** The authors draw conclusions from reviews of earlier studies of value capture financing, showing that in response to new transit lines, land values are enhanced in centers of concentrated activity and in predominantly undeveloped areas. Their Metro case study demonstrates that the values of retail properties are highly sensitive to proximity to transit stations. This suggests that retail areas are better suited for value capture policies.

- 49) Ghebreegziabiher Debrezion, Eric Pels and Piet Rietveld (2006), *The Impact of Rail Transport on Real Estate Prices: Empirical Study of the Dutch Housing Market*, Tinbergen Institute (<http://www.tinbergen.nl/discussionpapers/06031.pdf>).**

This study used a hedonic pricing model to analyse railways impacts on house prices. The railway relevant features considered are: 1. distance to railway station, 2. frequency of railway services at the station, and 3. distance to the railway line, reflecting potential noise and other disturbance effects. Correcting for various other house price determinants we find that dwellings very close to a station are on average about 25% more expensive than dwellings 15 kms or more distant. This percentage ranges between 19% for low frequency stations and 33% for high frequency stations. A doubling of frequency leads to an increase of house values of about 2.5%, ranging from 3.5 for houses close to the station to 1.3% for houses far away. We find a negative effect of distance to railways, probably due to noise effects: within the zone up to 250 meters around a railway line prices are about 5% lower compared with locations further away than 500 meters. As a result of the two distance effects, the price gradient starts to increase as one moves away from a station, followed by a gradual decrease after a distance of about 250 meters. Two railway station references were used the nearest and most frequently chosen station in the post code area. Our estimations reveal that this distinction is important. In many cases the traveller does not choose the closest station. This indicates that railway station accessibility is a more complex concept than one might think. It involves competition between railway stations.

- 50) Roderick B. Diaz (1999), “Impacts of rail transit on property values,” *Commuter Rail/Rapid Transit Conference, Toronto, Ont.*, American Public Transit Association.**

The author summarizes recent North American studies examining the impact of 12 rail projects, including both heavy rail and light rail. Several variables contributing to positive and negative changes in property values are identified. In Miami, home values near stations increased by up to 5 percent (Gatzlaff, 1993). In Toronto, nearby home value increases averaged \$2,237 (Bajic, 1983). In general, proximity to rail increases accessibility, which is the primary factor in rising property values. (From “Rail transit and property values” in *Information Center Briefing*, No 1 - March 2001, at [www.apta.com/info/briefings/briefings\\_index.htm](http://www.apta.com/info/briefings/briefings_index.htm)).

- 51) Michael Duncan (2010), “The Impact of Transit-oriented Development on Housing Prices in San Diego, CA,” *Urban Studies* (<http://usj.sagepub.com/content/early/2010/05/18/0042098009359958.abstract>).**

This research measures the influence of transit-oriented development (TOD) on the San Diego, CA, condominium market. A hedonic price model is estimated to isolate statistically the effect of TOD. This includes interaction terms between station distance and various measures of pedestrian orientation. The resulting model shows that station proximity has a significantly stronger impact when coupled with a pedestrian-oriented environment. Conversely, station area condominiums in more auto-oriented environments may sell at a discount. This indicates that TOD has a synergistic value greater than the sum of its parts. It also implies a healthy demand for more TOD housing in San Diego.

**52) Robert T. Dunphy (1998), *The Cost of Being Close*, ULI Working Paper 660, Urban Land Institute.**

In Southern California, real estate consultant Larry Netherton compared examples of comparable housing for sale at different distances from a central business area. Buyers would have to travel another 15 to 30 minutes to trim \$10 to \$15 per square foot off the price of a house. In Orange County, two similar upper-end housing projects were compared, one near major employment, retail, and cultural centers, and the other 20 miles away from employment centers. The closer-in units sold for an average of \$599,400, the distant units sold for \$320,000 – a difference of about \$280,000, or \$14,000 per mile, or \$11,200 per minute of extra commute time. In more distant Riverside County, the closer-in project was priced at \$214,900, while a same-sized, similar house 20 miles farther out sold for \$141,900. The differential here was \$73,000 total, or \$3,600 per mile, or \$2,400 per minute of extra commute time.

**53) Fejarang, R. A., "Impact on Property Values: A Study of the Los Angeles Metro Rail," *Transportation Research Board 73<sup>rd</sup> Annual Meeting, January 1994*.**

Did the announcement of Metro Rail impact property values? The announcement involved a consortium of federal, state, and local funding propositions that began in 1983 and legislated in 1988. The period studied was from 1980 to 1990 during which plans became actualized. That is, investments were secured and rail transit was under design and construction, but not yet available for riders or for rider-dependent shopping. Isolating exogenous variables was accomplished at both macro and micro levels. Using a pre-test - post-test control group, property values following the period of actualization were found to be significantly different from prior values. Property values near rail lines were found to be significantly different from property values located a distance. (From Transport Research Laboratory)

**54) Garrett, Thomas A., *Light Rail Transit in America: Policy Issues and Prospects for Economic Development*, Federal Reserve Bank of St. Louis ([www.stlouisfed.org](http://www.stlouisfed.org)), 2004.**

Hedonic pricing model applied to residential property values in St. Louis found that average home values increase \$140 for every 10 feet closer they are to a MetroLink rail transit station, beginning at 1,460 feet. A home located 100 feet from the station has a price premium of \$19,029 compared with the same house located 1,460 feet away. This represents a 32% increase in property values. Their analysis also indicated that beyond 1,460 feet, property values increased with distance from MetroLink stations, but this probably location-related reflects other factors not included in their model, such as traffic volumes on nearby streets, rather than proximity to station. Their analysis did not investigate property value impacts on commercial properties, which probably also increase with proximity to stations.

**55) Gatzlaff, Dean H., and Mark Smith (1993), "The Impact of the Miami Metrorail on the Value of Residences Near Station Locations", *Land Economics*, Vol. 69 No. 1 (February, 1993).**

Miami Metrorail began in the mid-1980s, in a city that is largely new and sprawling. The 20 miles of rail line run thru downtown, half to the poorer north, half to the richer south. Neither are considered prime areas for redevelopment. Ridership is relatively low (some stations are in blighted areas). The researchers looked at only houses that had sold before and after Metrorail was completed. The researchers found that the line perceptibly increased nearby site values in the richer neighborhoods, not in the poor areas where new capital still had not ventured.

**56) Debrezion, Ghebregehiher, Eric Pels and Piet Reitveld (2007), “The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-Analysis,” *Journal of Real Estate Finance and Economics*, Vol. 35, pp. 161-180.**

This meta-analysis of previous studies finds attempts to explain the variation in the findings by meta-analytical procedures. Generally the variations are attributed to the nature of data, particular spatial characteristics, temporal effects and methodology. Railway station proximity is addressed from two spatial considerations: a local station effect measuring the effect for properties within 1/4 mile range and a global station effect measuring the effect of coming 250 meters closer to the station. The study finds that the effect of railway stations on commercial property value mainly takes place at short distances. Commercial properties within 1/4 mile range are 12.2% more expensive than residential properties. Where the price gap between the railway station zone and the rest is about 4.2% for the average residence, it is about 16.4% for the average commercial property. At longer distances the effect on residential property values dominate. Finds that for every 250 meters a residence is located closer to a station its price is 2.3% higher than commercial properties. Commuter railway stations have a consistently higher positive impact on the property value compared to light and heavy railway/Metro stations. The inclusion of other accessibility variables (such as highways) in the models reduces the level of reported railway station impact.

**57) Goodwin, Ronald E., and Carol A. Lewis (1997), *Land Value Assessment Near Bus Transit Facilities: A Case Study of Selected Transit Centers in Houston, Texas, Southwest Region University Transportation Center, Houston, Texas*.**

Site values in the Houston region were falling due to shrinking incomes and diminished incomes. However, values fell less near bus stops than they did in more distant locations.

**58) Gruen, Aaron (1997), *The Effect Of CTA and METRA Stations on Residential Property Values: Transit Stations Influence Residential Property Values, Report to the Regional Transportation Authority*.**

By improving accessibility, lessening congestion, and reducing household transportation costs, transit service adds value to residential locations. Observing 96 Chicago-area Chicago Transit Authority (CTA) and METRA stations, Gruen used hedonic modeling supplemented by a literature review and interviews with realtors and other experts on local market conditions. More important than the presence of a transit station is the perception of neighborhood desirability. Still, the proximity of transit does positively affect property values. The price of a single-family house located 1,000 feet from a station is 20% higher than a comparable house located a mile away. Realtors in both the affluent suburban West Hinsdale station area and the gentrifying

Logan Square area on Chicago's northwest side point out that prices have been increasing and that these locations increasingly appeal to younger, higher-income professionals, many of whom commute via CTA or METRA to downtown Chicago. Apartment properties located closer to train stations tend to realize higher rents and occupancy levels than comparable apartments less conveniently located. ([www.ggassoc.com](http://www.ggassoc.com) from "Rail Transit And Property Values," *Information Center Briefing*, No. 1, March 2001, at [www.apta.com/info/briefings/briefingsindex.htm](http://www.apta.com/info/briefings/briefingsindex.htm)).

**59) Hass-Klau, Carmen, Graham Crampton and Rabia Benjari (2004), *Economic Impact of Light Rail: The Results Of 15 Urban Areas In France, Germany, UK and North America, Environmental & Transport Planning* (<http://etphassklau.co.uk>).**

This report investigates the effect of trams and light rail on travel patterns and economic activity in numerous cities in Europe and North America. It evaluates impacts on residential property prices, office rents and retailing; numbers of shoppers in city centres, car ownership; retail structure and competition between city centres and sub-centres; parking requirements and changes in building and development patterns. Many of these impacts are quantified and compared in tables. This study concludes that urban rail can provide substantial economic benefits with appropriate policies and support.

**Table 2 Property Value Impacts of Rail Proximity** (Hass-Klau, Crampton and Benjari, 2004)

City	Factor	Difference
Newcastle upon Tyne	House prices	+20%
Greater Manchester	Not stated	+10%
Portland	House prices	+10%
Portland Gresham	Residential rent	>5%
Strasbourg	Residential rent	+7%
Strasbourg	Office rent	+10-15%
Rouen	Rent and houses	+10%
Hannover	Residential rent	+5%
Freiburg	Residential rent	+3%
Freiburg	Office rent	+15-20%
Montpellier	Property values	Positive, no figure given
Orléans	Apartment rents	None-initially negative due to noise
Nantes	Not stated	Small increase
Nantes	Commercial property	Higher values
Saarbrücken	Not stated	None-initially negative due to noise
Bremen	Office rents	+50% in most cases

*This table summarizes how property values are affected by proximity to rail stations in various cities.*

**60) Hess, Daniel Baldwin and Tangerine Maria Almeida (2007), "Impact of Proximity to Light Rail Rapid Transit on Station-Area Property Values in Buffalo," *Urban Studies*, Volume 44, Issue 5 & 6, May 2007, pages 1041 – 1068.**

This study assesses the impact of proximity to light rail transit on residential property values near stations in Buffalo, New York, where light rail has been in service for 20 years, but population is declining and ridership is decreasing. The researchers construct hedonic models of assessed value for residential properties within ½ mile of 14 Metro Rail stations, including independent

variables that describe property characteristics, neighborhood characteristics, and locational amenities. The model suggests that every foot closer to a light rail station increases property values by \$2.31 (using geographical straight line distance) and \$0.99 (using network distance). Consequently, a home located within one-quarter mile radius of a light rail station can earn a premium between \$1,300 to \$3,000, or 4% to 11% of the median assessed home value. Model results suggest that three independent variables—the number of bathrooms, size of the parcel, and location on the East side or West side of Buffalo—are more influential than rail proximity in predicting property values. Individual regression models for each of the light rail system's 14 stations suggest that effects are not felt evenly throughout the system. Proximity effects are positive in high-income station areas and negative in low-income station areas. An analysis of the actual walking distance to stations (along the street network) versus the perceived proximity (measured by straight-line distance) to stations reveals that the results are statistically more significant in the network distance than the straight line distance model, but the effects are greater in the straight line distance model, which suggests that apparent proximity to rail stations is an added locational advantage compared to physical walking distance to the station.

**61) Huang, W. (1994), *The Effects of Transportation Infrastructure on Nearby Property Values: A Review of the Literature*, Working Paper 620, Institute of Urban and Regional Development, Berkeley, California.**

The effect of the presence of transportation infrastructure on distant lot values is small, but there are many distant lots, therefore the hedonic method may underestimate incremental site rents. Furthermore, it may be a mistake to regard as exogenous the values attributed to other amenities that developers add in response to accessibility-induced value.

**62) Kay, J. H., and G. Haikalis (2000), “All Aboard”, *Planning*, Vol. 66, No. 10, (Oct. 2000): 14-19.**

In Dallas, DART has shown what a modern city driven by the private sector can accomplish with rail transit. Property values around transit stations have jumped by approximately 25% since DART began operation in 1996. However, Dallas's extensive land area complicates transit's contribution to the regional transportation system. In a sidebar, Haikalis describes New Jersey's new Hudson-Bergen line. Available from: APA, 122 South Michigan Avenue, Suite 1600, Chicago, IL 60603-6107, TRIS Database: “Taxing Property Values for Transit”.

**63) Knaap, Gerrit, Lewis Hopkins, and Arun Pant (1996, *Does Transportation Planning Matter? Explorations into the Effects of Planned Transportation Infrastructure on Real Estate Sales, Land Values, Building Permits, and Development Sequence*, Lincoln Institute of Land Policy, Research Paper.**

This study observed property values in the Westside LRT corridor in Washington County, suburban Portland, Oregon. The study compared values prior to construction with values at the beginning of LRT operations. Values of parcels located within ½-mile of the line were found to decrease with distance from the stations, but rise with distance from the rail line between stations. Thus, the opposite affects of accessibility and nuisance were deduced.

- 64) Landis, John, Robert Cervero, Subhrajit Guhathukurta, David Loutzenheiser, and Ming Zhang (1005), Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Transit Systems, Monograph 48, Institute of Urban and Regional Studies, University of California at Berkeley.**

This study measured ground distance to BART stations in Alameda and Contra Costa Counties, California. The authors found that 1990 single family home prices declined by \$1 to \$2 per meter distance from a BART station. They did not find a significant impact on home values based on proximity to CalTrain commuter rail stations, although houses within 300 meters of the CalTrain right-of-way sold at a \$51,000 discount. No increase in value around commercial / industrial stops was found, but the authors note that commercial property observations encounter significant data measurement problems.

- 65) Lewis-Workman, Steven, and Daniel Brod (1997), “Measuring the Neighborhood Benefits of Rail Transit Accessibility,” *Transportation Research Record* 1576: 147-153. (Transportation Research Board [www.trb.org](http://www.trb.org))**

The authors found that within a one-mile radius from the Pleasant Hill rail station in the Bay Area, average home prices decline by about \$1,578 for every 100 feet distance from the station. In the area within a one-mile radius from the Forest Hills, 67<sup>th</sup> Avenue, and Rego Park rail stations, average home prices decline about \$2,300 for every 100 feet distance from the station.

- 66) Nelson, Arthur C. (1992), “Effects Of Elevated Heavy-Rail Transit Stations On House Prices With Respect To Neighborhood Income,” *Transportation Research Record* 1359: 127-132.**

In Atlanta’s low value neighborhoods, a transit stop raises value. The reverse is also found, whereby in high value communities, installing a transit stop lowers site value – by nearly the same amount.

- 67) Nelson, Arthur C. (1999), “Transit Stations And Commercial Property Values: A Case Study With Policy And Land-Use Implications,” *Journal of Public Transportation*, Vol. 2, No. 3.** Nelson develops a theory of commercial property value with respect to both transit station proximity and the role of policies that encourage commercial development around transit stations without discouraging such development elsewhere. He applies this theory to sale of commercial property in Atlanta’s “Midtown”, located 1 km (.6 mi) north of the downtown edge. Midtown is served by three heavy rail transit stations operated by the Metropolitan Atlanta Transit Authority (MARTA). To encourage transit-oriented development near MARTA stations, the city waives parking requirements and floor area ratio restrictions. Commercial property values are affected positively by both access to rail stations and policies that encourage more intensive development around those stations. Citywide analysis, measuring access as ground distance to a MARTA station, finds that price per square meter falls by \$75 for each meter away from transit stations. Prices rise by \$443 for location within special public interest districts (SPIDs). At the time of his study, Atlanta was the most sprawled metro region in the nation, and that the size of the SPIDs

was identical to comfortable walking distance from stations, about a 1/4 mile radius. Theoretical and policy implications are explored.

**Parsons Brinkerhoff (2001), *The Effects of Rail Transit on Property Values: A Summary of Studies*, Research carried out for Project 21439S, Task 7, NEORail II, Cleveland, Ohio, 27 February 2001; at [www.reconnectingamerica.org/public/download/bestpractice162](http://www.reconnectingamerica.org/public/download/bestpractice162).**

This paper summarizes the results of several previous studies in tabular form. The authors note that varying methodologies make it difficult to compare results. Nevertheless, it is clear that in most cases access to transit systems is valued by property owners. Rail's influence on residential values is demonstrated more clearly than on commercial uses; however, influence on commercial values appears to vary by: (i) how much accessibility is improved, (ii) the relative attractiveness of locations near stations, and (iii) the strength of the regional real estate market.

**68) Pickett, M.W., and K.E. Perrett (1084), *The effect of the Tyne and Wear Metro on Residential Property Values*, Supplementary Report 825, Transport and Road Research Laboratory, Crowthorne, Berkshire, U.K..**

Three different methods of analysis are performed on the data collected. Results show an average increase of £360 (1.7%) in the value of properties near Metro stations during the four-month period surrounding the date on which each section of line opened. In reference to related studies, Dvett et. al. found a small but significant positive effect on the value of single-family dwellings at three of the six BART station areas studied. Lerman et. al. found that distance from Washington Metro stations influences property values, the value rising as the opening date nears, and falling if the opening is delayed. The Regional Commission in Atlanta found an associated increase in industrial property values.

**69) Price Waterhouse Coopers (2001), *Review of Property Value Impacts at Rapid Transit Stations and Lines*, Technical Memorandum 6, Richmond/Airport – Vancouver Rapid Transit Project, April 3, 2001.**

The authors review transit impact studies from selected cities across North America. The reviewers find a positive relationship between property values and station location, but also a possible negative impact on single-family homes along the line due to nuisance impacts. Four research reports are summarized: (1) Transit Case Studies for the City of Hillsboro, Oregon, (2) Transit Benefits 2000 Working Papers, (3) Light Rail Transit Impacts in Portland, Oregon, and (4) Impact of the Vancouver, BC Skytrain on Surrounding Real Estate Value.

**70) Richert, Thomas M. (1999), *Economic Impacts of Automated People Mover Development in Commercial Centers*, Advanced Transit Association.**

After one year of Automated People Mover (APM) operation, downtown retail sales grew 8% in Denver, 4% in St. Louis, and 1% in Miami (where patronage of downtown commercial space had historically lagged). Higher retail sales translate into higher site values.

**71) Rice Center for Urban Mobility Research (1987), *Assessment of Changes in Property Values in Transit Areas*, Urban Mass Transit Administration, Houston, Texas.**

This is a summary of earlier findings from Toronto, Baltimore, Denver, San Diego, and San Francisco. Some transit centers showed a 100% to 300% increase in commercial site values. In Atlanta, 61% of the businesses within 500 feet of a transit stop reported increased sales.

- 72) **Martin E. Robins and Jan S. Wells (2008), *Land Development at Selected Hudson-Bergen Light Rail Stations*, Alan M. Voorhees Transportation Center at Rutgers University; at <http://policy.rutgers.edu/vtc/reports/REPORTS/HBLR%20Final%20Report.pdf>.**

The Hudson Bergen Light Rail (HBLR) line is a 20.6-mile, 23-station commuter rail route. Since it opened in 2000, ridership has grown and land development has increased around stations at a scale beyond that which road network alone could have borne. Acres of old, abandoned industrial sites along the route have been transformed into compact residential, office and retail developments in pedestrian, transit-friendly environments reflecting “smart growth” principles. This study identified more than 10,000 new units conservatively estimated to be worth \$5.3 billion were completed by 2005.

- 73) **Rodríguez, Daniel A., Felipe Targa (2004), “The Value Of Accessibility To Bogotá’s Bus Rapid Transit System,” *Transport Reviews*, Vol. 24, No. 5**

([www.tandf.co.uk/journals/tf/01441647.html](http://www.tandf.co.uk/journals/tf/01441647.html)), pp. 587 – 610. Daniel A. Rodríguez and Carlos H. Mojica (2008), “Land Value Impacts of Bus Rapid Transit: The Case of Bogotá’s TransMilenio,” *LandLines*, April, Lincoln Institute for Land Policy ([www.lincolninst.edu](http://www.lincolninst.edu)).

By estimating spatial hedonic price functions, this paper determines the extent to which access to BRT stations in Bogotá, Colombia currently are capitalized into land values. Results suggest that every additional 5 minutes of walking time to a BRT station reduced rental price 6.8% to 9.3%, after controlling for structural characteristics, neighborhood attributes, and proximity to the BRT corridor. Evaluated at the average walking time to a BRT station, this effect translates into an elasticity of -0.16 to -0.22. Although these estimates cannot be attributable directly to the presence of the BRT system due to the study’s cross-sectional design, they suggest that the land market in Bogotá values access to BRT station locations.

- 74) **Ryan, S. (1999), “Property Values and Transportation Facilities: Finding the Transportation-Land Use Connection,” *Journal of Planning Literature*, Vol. 13, Issue 4 (May): 412-427.**

Ryan reviews empirical studies of the relationship between the presence of transport facilities – highways, heavy rail, and light rail transit systems – and property values. Inconsistencies in findings from this literature over the past several decades are explained. For example, results vary based on whether researchers measure accessibility in terms of travel time or travel distance. Measuring distance yields mixed results in property value effects. Measuring time yields the expected inverse relationship between access to transportation facilities and property values. The delineation of study areas also influences the direction of effects. This study offers a new interpretation of the transportation facility-property value literature, improving the ability to measure relationships and anticipate land-market responses to transport facilities.

**75) Sedway Group, *Regional Impact Study*, Report commissioned by Bay Area Rapid Transit District (BART), July 1999.**

This is a review of studies of the benefits associated with BART service, measured in positive residential and office property impacts. Reported single family home values fell by \$3,200 to \$3,700 for each mile distance from a BART station in Alameda and Contra Costa counties. Apartments near BART stations were found to rent for 15% to 26% more than apartments distant from BART stations. The average unit land price for office properties also decreased as distance from a BART station increased, from \$74 per square foot within  $\frac{1}{4}$  mile of a station to \$30 per square foot at locations exceeding  $\frac{1}{2}$  mile. Sedway Group, San Francisco, CA at [www.sedway.com](http://www.sedway.com) (From “Rail transit and property values,” Information Center Briefing, No. 1 - March 2001, at [www.apta.com/info/briefings/briefings\\_index.htm](http://www.apta.com/info/briefings/briefings_index.htm)).

**76) Voith, Richard, “Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia, 1970-1988,” Federal Reserve Bank of Philadelphia, Working Paper No. 31-19 (1991 November); *Journal of Urban Economics*, Vol. 33 (1993): 361-376.**

Voith estimates house value premiums associated with CBD-oriented train service provided by the Southeastern Pennsylvania Transportation Authority (SEPTA). Unlike most previous studies, he documents changes over an extended period, for each year in his 19-year sample. His data include over 59,000 home sales. In 1980 the average sales price was nearly \$120,000. Prices declined from 1974 through 1982, bottomed out during 1983 and 1984, and rose steeply from 1985 through 1988. Using hedonic house value regressions, he finds strong evidence that accessibility to the CBD is capitalized into suburban house values. The premium began in 1970 at well over \$12,000, declined until 1976, bottoming out at a bit over \$5,000, then from 1978 to 1984 averaged nearly \$9,000, and at the end of his sample, 1988, reached \$20,000 plus. The value of such accessibility fluctuates with the economic health of the city (which is impacted by the City's tax on wages). Between 1981-1988 while employment in the suburbs grew rapidly, so did the premium associated with train service (to the CBD) increase dramatically, indicating that the central city economy still contributes significantly to the overall wealth of communities. Hence, suburban communities may not be able to isolate themselves from central decline.

**77) Weinberger, Rachel R., *Commercial Rents and Transportation Improvements: Case of Santa Clara County's Light Rail*, WP00RW2, Lincoln Institute of Land Policy, 2001.**

In Santa Clara County, California, property owners sued the County claiming losses in value from the nearby light rail. To determine the actual effect of the light rail facility on property values, Weinberger examined commercial property rents comparing accessibility to transit and to highway as determinants of rent, and analyzed the effects over time. Controlling for other factors, properties within a half-mile of light rail stations were found to command almost 15% more rent. Highway access, being ubiquitous, offers no particular locational advantage. As the transit system matured, nearby properties accrued greater benefits. But, in times of high demand, so did all other locations command higher rents.

**78) Weinstein, Bernard L., and Terry L. Clower, *The Initial Economic Impacts of the DART LRT System*, Center for Economic Development and Research, University of North Texas, July 1999.**

Values of properties adjoining Dallas's DART ([www.dart.org](http://www.dart.org)) light rail stations grew 25% more than similar properties not served by rail. Proximity to stations appears to be an economic advantage for most classes of real estate, especially Class A and C office buildings, and commercial strip retail outlets. Average occupancy rates for Class A buildings near rail stations increased from 80% in 1994 to 88.5% in 1998, while rents increased from an average \$15.60/sf to \$23/sf. Commercial strip retailers near the stations experienced a 49.5% gain in occupancy and a 64.8% improvement in rental rates. (from "Rail transit and property values" in *Information Center Briefing*, No. 1, March 2001, at [www.apta.com/info/briefings/briefings\\_index.htm](http://www.apta.com/info/briefings/briefings_index.htm).)

**79) Terry L. Clower, Bernard Weinstein and Michael Seman, *Assessment of the Potential Fiscal Impacts of Existing and Proposed Transit-Oriented Development in the Dallas Area Rapid Transit Service Area*, by the Center for Economic Development and Research, University of North Texas, for the Dallas Area Rapid Transit, 2007; at <http://reconnectingamerica.org/public/download/dartreport102507>.**

This study updates the fiscal impacts of transit oriented development associated with development of the Dallas Area Rapid Transit light rail system. The analysis considers development near existing and planned light rail stations. The findings support the conclusion that the transit-oriented developments associated with DART Rail stations offer substantial fiscal impacts for local taxing entities. These findings include:

- The announced existing and projected values of development projects located near DART Rail stations have increased by almost 50% since 2005.
- While there are many factors contributing to development investment decisions, proximity to an LRT station is often an important site location factor. The total value of projects that are attributable to the presence of a DART Rail station since 1999 is \$4.26 billion.
- Adjusting for tax exemptions and the value of public buildings, the taxable value of real and business personal property associated with the projects reviewed in this analysis along existing DART Rail corridors and the planned Green, Orange, and Blue Line extensions exceed \$2.84 billion.
- In total, once all announced projects are completed, state and local tax revenues associated with development near DART Rail stations will exceed \$127 million per year.

## Lessons From Developing Countries

- 80) Calvo, Christina M., *Options for Managing and Financing Rural Transport Infrastructure*, Technical Paper No. 411, World Bank, Washington, DC, 1998.  
Berkshire, England successfully privatized the maintenance of roads. Calvo suggests applying this model to developing countries, where central governments are often hierarchical and indifferent to rural areas. “If increases in land value are captured mainly by the local elite or by outsiders, however, there will be little motivation for mass participation in the project.”
- 81) Cervero, Robert, and Bambrang Susantono, *Rent Capitalization and Transportation Infrastructure Development in Jakarta*, Review of Urban and Regional Development Studies Vol. 11, No. 1, Department of City and Regional Planning, University of California, Berkeley, Calif., 1999.  
Freeway off-ramps raised the rents of nearby offices in Jakarta, Indonesia. Thus, value capture would be fair, but the method is not feasible because land ownership and values are not registered; furthermore, owners can buy off tax collectors.
- 82) M.Q. Dalvi (1996), “Value Capturing as a Method of Financing Rail Projects: Theory and Practice,” *From the 7<sup>th</sup> CADATU Conference: Urban Transport in Developing Countries*, New Delhi, India.  
Hong Kong’s Mass Transit Railway Corp chooses to not sell land but co-develop it. Property rental income financed about 22% of MTRC’s operating cost in 1993.
- 83) Ian G. Heggie (1989), “Financing Public Transport Infrastructure: An Agenda for Reform”, *Proceedings of Seminar M, PTRC summer annual meeting*, Vol. P327, Planning and Transport Research and Computation (International) Co.  
In the developing world, value generated by a transport system can be significant. However, often cadastre records are missing or lack information on registered owners and the value of parcels. Furthermore, better-off owners “are often influential local politicians”.
- 84) Institution of Civil Engineers (1990), *Rail Mass Transit for Developing Countries*, London: Telford.  
R. T. Meakin, in “Hong Kong’s mass transit railway: vital and viable” notes that in Hong Kong the system receives no subsidy. All of its costs, including interest, are derived from rents from land development. “Discussion” by J. Faulkner notes that the World Bank requires mass transit (but not roads) to be self-financing, and that lenders should minimize environmental impacts.
- 85) L. R. Leinbach (1995), “Transport and Third World Development: Review, Issues, and Prescription,” *Transportation Research. Part A, Policy and Practice*, Vol. 5, pp. 337-344.  
This study finds that even distance sites benefit from the presence of roads. It concludes that the first step is to develop self-governing transit institutions (to evade corruption). [Author’s

suggestion: transportation vouchers, or even a general citizens dividend, might be more equitable and effective than subsidizing a public transit agency with collected site rent.]

**86) Munoz-Raskin, Ramon (2007), *Walking Accessibility to Bus Rapid Transit in Latin America: Does it Affect Property Values? The case of Bogota, Colombia*, TRB ([www.trb.org](http://www.trb.org)).**

This study investigated how proximity to Bogotá, Colombia's Transmilenio Bus Rapid Transit (BRT) affects residential property values. This research indicates that results vary by socio-economic strata. Low-income housing showed average 4.3% value discounts for new properties in the immediate walking proximity to trunk stations and 7.3% for the feeder lines, compared to the properties in the five-to-ten minute walking distance, reflecting the negative impacts of BRT air and noise pollution, and the tendency of low-income people to use cheaper paratransit instead of BRT. Middle income housing value premiums of 2.3% and 14.4% for new properties located in the immediate walking distance to trunk stations and to feeder lines, compared to five-to-ten minute walking distance. High-income housing revealed discounts averaging 19.9% for new properties in the immediate walking proximity of the trunk lines, compared with the average value of high-income housing in the five-to-ten minute walk to the BRT system, reflecting high-income household's preference for private vehicle transport.

**87) Alexandra Ortiz (1996), "Economic Analysis of a Land Value Capture System Used to Finance Road Infrastructure: The Case of Bogota, Colombia." Ph.D. thesis, University of Illinois at Champaign-Urbana.**

Starting in 1926, the City of Bogota charged property owners the anticipated rise in site value ("valorization") before road construction began. Revenue from these charges declined in the late 1980s as assessments fell behind and as poor landholders could not afford even the lagging assessments. A 1992 valorization had collected 80% of its target by mid 1995. Presumably the city made up the difference with other taxes, since new roads were built. What worked for roads could work for transit as well. Ortiz concludes that pre-emptive betterment charges for infrastructure would not be needed if a general land tax were working well. Columbia has a municipal land tax rate of 1% and a national rate of 2%, plus a land gains tax of up to 50%, yet land is registered at only 20% of its value.

**88) A. P. Prest (1996), *Transport Economics in Developing Countries*. Praeger.**

Prest relates how Uruguay has historically funded roads from land rent. In 1928 the country set up its Permanent Fund for Development and Farm-to-Market Roads, financed by taxes on gasoline, tires, and land value – prorated by distance from the road. Even at a very low rate, 0.125% to 0.65%, the land value tax funded 1/3 of the road construction budget. However, assessments did not keep pace with rising land values, and confusion arose when proximity to more than one road entered into the reckoning. Hence, the LVT fell into disuse.

**89) Shunso Tsukada and Chiaki Kuranami (1990), "Value Capture with Integrated Urban Rail and Land Development: The Japanese Experience and Its Applicability to**

**Developing Countries," Proceedings of Seminar M, PTRC Transport and Planning Annual Meeting, University of Sussex, England, PTRC Education and Research Services.**

To win matching funds from the Japanese central government for planned urban rail systems, local governments must raise 35% of construction costs. Some jurisdictions increase the property tax rate to raise this revenue. Taxable value is determined by distance from the rail station and the city center. Another strategy is to develop fallow land along rail corridors. One private rail line earns 18% of its total revenue from real estate (plus 54% from the railway and 28% from other businesses). The authors recommend that transit agencies serve extant demand from riders, coincide construction with an economic upswing, cooperate with the private sector, commit themselves then deliver on their promises, and become competitive with other transport modes.

**90) D. Walmsley, and G. Gardner (1993), *The Economic Effects of Public Transport*, Transport Research Laboratory in TRIS Database: "Taxing Property Values for Transit."** Studies from Western Europe, North America, and various developing countries show how changes in the organization and financing of public transport affect patronage and urban development. Its general findings could apply, perhaps on a smaller scale, to other improvements in public transport such as busways. It considers funding from: (1) revenues, (2) taxation, (3) land value capture, (4) advantages and disadvantages of assured funding, and (5) the involvement of private capital. Besides improving public conveyance, rapid transit systems can also improve the environment and the 'image' of a city, as well as encourage new urban development and enhance safety. Bus transit deregulation in the UK illustrates how market disciplines can be applied to bus operation, and how privatization might affect public transport. The report offers recommendations for transport planners in Eastern European countries.

## Walkability Impacts on Property Values

91) Joe Cortright (2009), *Walking the Walk: How Walkability Raises Home Values in U.S. Cities*, CEOs for Cities ([www.ceosforcities.org](http://www.ceosforcities.org)); at [www.ceosforcities.org/files/WalkingTheWalk\\_CEOsforCities1.pdf](http://www.ceosforcities.org/files/WalkingTheWalk_CEOsforCities1.pdf).

Cortright (2009) evaluated the effects of walkability on housing prices using the used Walkscore ([www.walkscore.com](http://www.walkscore.com)) and 95,000 real estate transactions, controlling for house (size, number of bedrooms and baths, age) and neighborhood characteristics (proximity to the CBD, income, and accessibility to jobs). He found that walkability had a statistically significant, positive impact on housing values in 13 of the 15 markets examined. In a typical metropolitan area, each walkscore point increase was associated with a \$700 to \$3000 increase in home values, after controlling for other observable factors, so for example, that all else held constant, shifting from a 50th to a 75th percentile walkscore increases a house's value between \$4,000 and about \$34,000, depending on the market. The biggest gains were in the large cities with the highest densities and best transit systems, such as San Francisco and Chicago. The researchers conclude that these results reflect the value consumers attach to walkable neighborhoods, which tend to be denser, mixed use neighborhoods with good accessibility, including transit service.

92) Gary Pivo And Jeffrey D. Fisher (2010), "The Walkability Premium In Commercial Real Estate Investments," forthcoming *Real Estate Economics*

([www.wiley.com/bw/journal.asp?ref=1080-8620](http://www.wiley.com/bw/journal.asp?ref=1080-8620)); [www.u.arizona.edu/~gpivo/Walkability%20Paper%20February%202010.pdf](http://www.u.arizona.edu/~gpivo/Walkability%20Paper%20February%202010.pdf).

This paper examines the effects of walkability on property values and investment returns. Walkability is the degree to which an area within walking distance of a property encourages walking for recreational or functional purposes. We used data from the National Council of Real Estate Investment Fiduciaries (NCREIF) and Walk Score to examine the effects of walkability on the market value and investment returns of more than 4,200 office, apartment, retail and industrial properties from 2001-2008 in the USA. We found that, all else being equal, the benefits of greater walkability were capitalized into higher office, retail and apartment values. We found no effect on industrial properties. On a 100 point scale, a 10 point increase in walkability increased values by 1 to 9 percent, depending on property type. We also found that walkability was associated with lower cap rates and higher incomes, suggesting it has been favored in both the capital asset and building space markets. Walkability had no significant effect on historical total investment returns. All walkable property types have the potential to generate returns as good as or better than less walkable properties, as long as they are priced correctly. Developers should be willing to develop more walkable properties as long as any additional cost for more walkable locations and related development expenses do not exhaust the walkability premium.

## Additional Titles Not Annotated

- 93) Gabriel Ahlfeld and Arne Feddersen(2010), *From Periphery To Core: Economic Adjustments To High-Speed Rail*, Working Paper, London School of Economics, presented at the German Economic Association; at [www2.lse.ac.uk/newsAndMedia/news/archives/2010/09/highspeedrail.aspx](http://www2.lse.ac.uk/newsAndMedia/news/archives/2010/09/highspeedrail.aspx).
- 94) R. Armstrong and D. Rodríguez (2006), “An Evaluation of the Accessibility Benefits of Commuter Rail in Eastern Massachusetts using Spatial Hedonic Price Functions,” *Transportation*, Vol. 33, No. 1, pp. 21-43.
- 95) Philip Day (1992), *Land Value Capture*, Report to the Local Government Association of Queensland.
- 96) Eleanor F. Dolan (1970), *The Effect of Rapid Transit on Land Value and Building Construction in Boston, Cambridge and Arlington, 1900-1930*, Cambridge, Mass.
- 97) Freeman, Mark J., and F.G. Price (1989), “Value Capture: A Neglected Factor in the Funding of Transport Facilities,” *Reprint of paper prepared for the Annual Transportation Convention, Paper 5D-10, Roads and Transport Technology*, No. 687. Pretoria, South African Council for Scientific and Industrial Research, Division for Roads and Transport Technology.
- 98) Hsu, Kuo-Wei (1996), *The Impact of Mass Rapid Transit Systems on Land Values: Case Study, Taipei*, Chaoyang University, Taiwan. (Available from: [secret@mail.cyut.edu.tw](mailto:secret@mail.cyut.edu.tw))
- 99) IEDC (2006), *Economic Development and Smart Growth: Case Studies on the Connections Between Smart Growth Development and Jobs, Wealth, and Quality of Life in Communities*, International Economic Development Council ([www.iedconline.org](http://www.iedconline.org)); available at [www.iedconline.org/Downloads/Smart\\_Growth.pdf](http://www.iedconline.org/Downloads/Smart_Growth.pdf). Evaluates the economic benefits of eight smart growth project case studies, including transit oriented development.
- 100) G. John and S. Sirmans (1996), “Mass Transportation, Apartment Rent and Property Values,” *Journal of Real Estate Research*, Vol. 12, No. 1, pp. 1-8.
- 101) J. Landis, S. Guhathakurta and M. Zhang (1994), Capitalization of Transportation Investments into Single-Family Home Prices: A Comparative Analysis of Five California Rail Transit Systems, University of California Transportation Center, Berkeley, CA.
- 102) Lawrence, Wai-chung Lai, “The Effect of MRT [Mass Rapid Transit] on Land Values Rekindled,” *Journal of Property Valuation & Investment*, Vol. 9, No. 2 (1991). MCB University Press Limited.
- 103) J. McDonald and C. Osuji (1995), “The Effect of Anticipated Transportation Improvement on Residential Land Values,” *Regional Science and Urban Economics*, Vol. 25, No. 3, pp. 261-278.

- 104)** A. Nelson (1992), “Effects of Elevated Heavy Rail Transit Stations on House Prices with Respect to Neighborhood Income,” *Transportation Research Record*, 1359, TRB ([www.trb.org](http://www.trb.org)), pp. 127-132.
- 105)** Parsons Brinkerhoff (2001), “*The Effect of Rail Transit on Property Values: A Summary of Studies*,” Reconnecting America ([www.reconnectingamerica.org](http://www.reconnectingamerica.org)); at [www.reconnectingamerica.org/public/download/bestpractice162](http://www.reconnectingamerica.org/public/download/bestpractice162)
- 106)** Reconnecting America, *Hidden In Plain Sight: Capturing The Demand For Housing Near Transit*, Reconnecting America for the Federal Transit Administration ([www.fta.dot.gov](http://www.fta.dot.gov)), 2004; at [www.reconnectingamerica.org/html/TOD/newReport.htm](http://www.reconnectingamerica.org/html/TOD/newReport.htm). Market analysis finds a significant and growing portion of households value living near transit stations. Concludes that the market for TOD will exceed supply, resulting in price premiums near transit stations that provide appropriate amenities.
- 107)** Scheurer, Jan, Peter Newman, Jeff Kenworthy, and Thomas Gallagher (2000), *Can Rail Pay? Light Rail Transit and Urban Redevelopment with Value Capture Funding and Joint Development Mechanisms*, Institute for Science and Technology Policy (Australia).
- 108)** J. Strand and M. Vågnes (2001), “The Relationship Between Property Values And Railroad Proximity: A Study Based On Hedonic Prices And Real Estate Brokers' Appraisals,” *Transportation*, Vol. 28, No. 2, pp. 137-156.
- 109)** TRB (2010), *Relationships Between Streetcars And The Built Environment*, TCRP Synthesis 86, Transportation Research Board ([www.trb.org](http://www.trb.org)); at [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_syn\\_86.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_syn_86.pdf).
- 110)** Tisato, P., “A Comparison of Optimisation Formulations in Public Transport Subsidy”, *Rivista Internazionale di Economia dei Trasporti*, Vol. 27, No. 2 (June 2000).
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- 112)** B. Vladimir (1983), “The Effects of a New Subway Line on Housing Prices in Metropolitan Toronto,” *Urban Studies*, Vol. 20, No. 2, pp. 147-158.
- 113)** Richard Voith (1993), “Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia, 1970-1988”, *Journal of Urban Economics*, Vol. 33, pp 361-376.
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*Transit Oriented Development Website* ([www.transittown.org](http://www.transittown.org)) disseminates best practices, case studies, tools and techniques, and other resources to TOD practitioners.

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