

Transit Oriented Development in America: Contemporary Practices, Impacts, and Policy Directions

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1. TOD in America

Transit oriented development (TOD) has gained currency in the United States over the past decade as a tool for promoting smart growth, leveraging economic development, and catering to shifting housing market demands and lifestyle preferences. By focusing new construction and redevelopment in and around transit nodes, TOD is viewed by many as a promising tool for curbing sprawl and the car dependence it spawns. By channeling public investments into struggling inner-city settings, some hope TOD can breath new life and vitality into areas of need. And by creating more walkable, mixed-use neighborhoods with good transit connectivity, TOD is thought to appeal to the lifestyle preferences of growing numbers of Americans, like childless couples, Generation X'ers, and empty-nesters.

That elusive concept – quality of life – is another often-heard reason why TOD should be pursued. For many Americans, too much time is spent getting to and from work, robbing them of time at home, with families and friends. Between 1990 and 2000, the average travel time to work nationwide rose by almost three minutes, to 25.5 minutes. Commuters in Atlanta reported the largest increase in commute time, on average 5.2 minutes. The widespread perception of many Atlantans that quality-of-life is rapidly eroding has prompted a number of radical changes in recent years, like the formation of the Georgia Regional Transportation Authority (GRTA), a watchdog state agency with purse-string powers whose principal charge is to coordinate transportation and land use. The recent transformation of Atlanta's Lindbergh station from a predominantly surface parking lot to a vibrant rail-served mini-city signals an abrupt shift in policy, one aimed at exploiting transit's development potential. Rather than passively sitting back and letting the market determine what, if anything, happens around stations, more and more transit agencies and their partners across the United States are today pro-

actively creating new markets for transit riding by targeting growth in and around stations.

This paper, drawn from recent research headed by the author under the Transit Cooperative Research Program (TCRP H-27), paints a national portrait of contemporary TOD practice in the United States, reviews research on impacts, particularly related to ridership and land market performance, and addresses various policy themes and issues, some of them controversial in nature, related to the desirability of promoting TOD.¹ It concludes with discussions on core policy lessons drawn from 10 case studies under TCRP H-27, existing knowledge gaps, and opportunities for collaborative research.

TOD is viewed and defined differently throughout the United States, with its most common traits being compact, mixed-use development near transit facilities and high-quality walking environments. Joint development is a form of TOD that is project specific, taking place on, above, or adjacent to transit-agency property. From a national survey of 90 U.S. transit agencies under TCRP H-27, the principal aim of TOD and joint development is to boost ridership and, relatedly, revenue income. Community economic development and broader smart-growth agendas are generally secondary objectives.

2. Scope of TODs in America

A rich mix of TOD can today be found across America today, and all indications are that their numbers and types will grow and expand in years to come. Over 100 TOD projects currently exist in the United States, found overwhelmingly in and around heavy, light, and commuter rail stations. While typically nodal in form, TOD corridors have or are beginning to take shape, such as the Rosslyn-Ballston axis in Arlington County and the Vermont/Western district in Los Angeles's Hollywood area. Moreover, 100-plus joint development projects today exist on, above, or adjacent to U.S. transit-agency property (Figure 1). The most common joint development arrangements are ground and air-rights leases as well as operation-cost sharing. U.S. transit properties in fast-growing areas like greater Washington D.C., Atlanta, Dallas, San Diego and the San Francisco Bay Area have been particularly aggressive in pursuing joint development. Washington's WMATA is in a league of its own when it comes to joint development, having engaged in thirty projects of varying sizes and scope since its inception in the late-

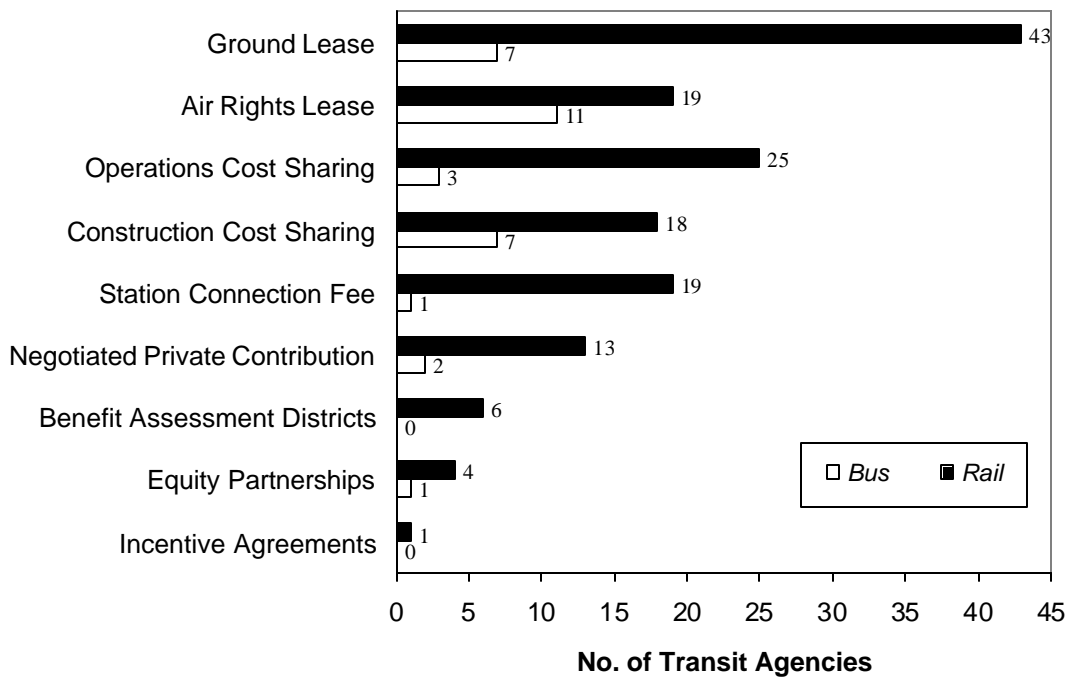


Figure 1. Distribution of Transit Joint Development Projects in the U.S., 2002

1970s (including Bethesda, currently the nation’s biggest joint development money-maker, earning the agency some \$1.6 million in annual lease revenue); two up-and-coming joint development projects, White Flint and New Carrollton, will be the agency’s biggest and most remunerative joint development ventures over the coming decade.

Most often, joint development occurs at rail stations surrounded by a mix of office, commercial, and institutional land uses. However, examples of public-private joint-venturing (e.g., Staple Street bus facility in Corpus Christi, Texas and John Deere Commons in Moline, Illinois) can be found among bus-only systems as well, normally in the form of joint inter-modal transfer and commercial-retail space at central-city bus terminals.

3. TOD Implementation

Going from the theory of TOD to real-world implementation can be a gargantuan leap. Local governments, redevelopment authorities, regional planning organizations, and even public transit agencies have over time accumulated an arsenal of tools and techniques to get the job done.

TOD implementation starts with a vision, cultivated from broad-based public input, and proceeds to strategic station-area planning backed by appropriate zoning as well as policy incentives and regulations. Around half of the 90 U.S. transit properties surveyed in TCRP H-27 stated that their regions have a vision, policy, or plan in place that embraces TOD. Arlington County, Virginia, arguably America’s most successful example of TOD outside of a central business district, is a textbook example of creating a vision (the “bull’s eye” concept plan, shown in Figure 2) and putting in place appropriate implementation tools to achieve the vision. Through a collaborative effort that engaged local stakeholders and an ambitious campaign that targeted supportive infrastructure improvements to rail stops along the corridor, Arlington County managed to transform the Metrorail Orange line into a showcase of transit-supportive development, with mid-to-high rise towers and multiple uses today flanking the Rosslyn, Courthouse, Clarendon, Virginia Square, and Ballston Metrorail stations. Since 1970, over 15 million square feet of office space, several thousand hotel rooms, and 18,000 housing units have been added to these station areas. With the bull’s eye metaphor in place to guide on-going planning, Arlington County proceeded to leverage Metrorail’s presence and transform once dormant neighborhoods into vibrant clusters of office, retail, and residential development.

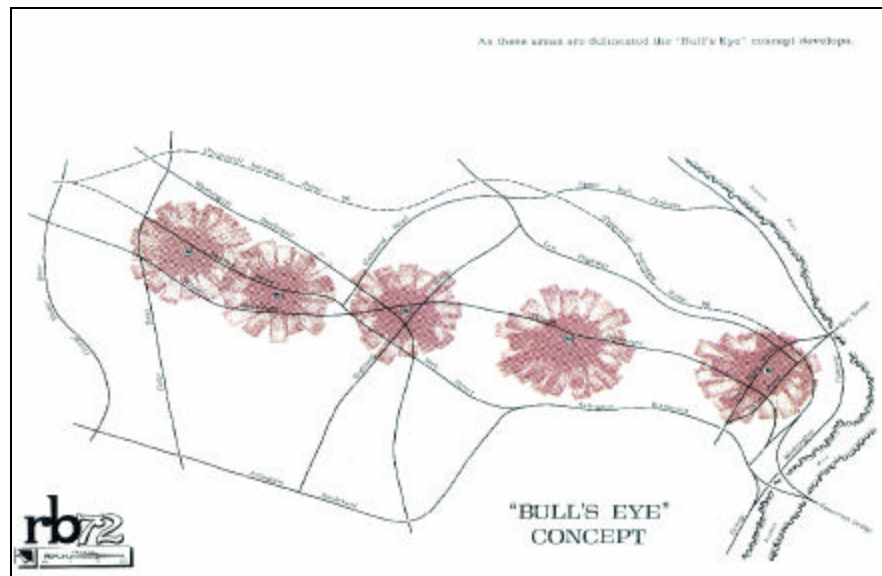


Figure 2. Arlington County, Virginia’s “Bull’s Eye” Vision for the Rosslyn-Ballston Corridor. *Source:* Arlington County Department of Community Planning, Housing and Development.

Today, the most common means of controlling land uses, densities, and site designs of TOD in the United States is overlay zones. Most overlays, often introduced on an interim basis to head-off auto-oriented uses that might compromise a TOD, specify desired land uses as-of-right, such as housing and convenience shops. For urban TODs, densities of 20 to 30 dwelling units per residential acre and floor area ratios of 1.0 and above are not uncommon. Some of the more progressive TOD zoning districts, such as found in Portland, Oregon, Seattle, San Diego, and Denver, also lower requirements for car parking and sometimes even for bicycles. The city of San Diego, for instance, recommends parking reductions as high as 15 percent for urban TODs.

The TCRP H-27 survey of 90 transit agencies revealed that, besides zoning (including overlays), the most frequently used tools introduced to leverage TOD are: funding for station-area planning and ancillary capital improvements; density bonuses, sometimes used to encourage affordable housing; and relaxation of parking standards. These measures, moreover, received high marks in terms of their overall effectiveness among transit professionals who responded to the survey (see Figure 3 which breaks

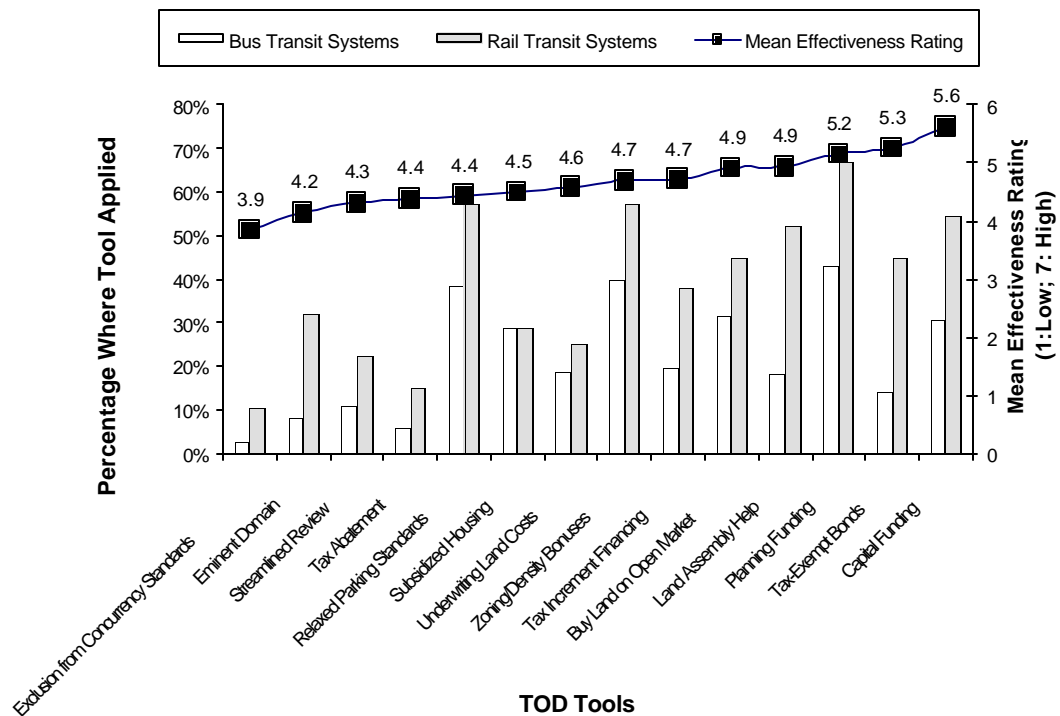


Figure 3. Transit Agencies' Experience with and Perceived Effectiveness of TOD-Supportive Policy and Planning Tools

down the relative frequency of use of tools by rail and bus systems). Next in the order of frequency of usage have been land-based tools, like land purchases on the open market (for land-banking and potential “deal-making”) and assistance with land assemblage. For the most part, redevelopment agencies have applied these tools, meaning their role in leveraging TOD has been mainly limited to economically depressed or blighted neighborhood settings. Because of the higher risk involved, redevelopment tools have often been accompanied by other funding sources, sometimes with a dozen or more participants involved in the process.

In the San Francisco Bay Area, for instance, redevelopment agencies have been instrumental in assembling and delivering to master-builders large plots of land that accommodated major mixed-use projects at Pleasant Hill, El Cerrito del Norte, and Fruitvale rail stations. In the case of El Cerrito del Norte, the city’s redevelopment agency forged a workable partnership to create Del Norte Place, a mixed-use project with 135 multifamily units (20 percent of which are affordable) and 21,000 square feet of street-level commercial space. The redevelopment agency acquired a site next to the Bay Area Rapid Transit (BART) station for \$3 million through the issuance of qualified redevelopment bonds, and then leased it to the Ibex Group, the project owner-developer, for a 65-year period. The redevelopment agency in return will receive 20 percent of the net project cash flow (after the fifth year) and 20 percent of the share of retail-sales proceeds. Construction and permanent financing of some \$11 million was provided through 40-year, fixed-rate, tax-exempt mortgage revenue bonds issued by Contra Costa County. The loan proceeds were insured through the FHA coinsurance program, 221(d)(4), which gives the bonds a federal (GNMA) guarantee and thus a superior bond rating. Remaining funds were in the form of equity provided by the Del Norte Place Limited Partnership. The Ibex Group contributed approximately \$3.2 million. Low-income housing tax credits were syndicated to 30 individual limited partners for a further \$1.8 million in equity contributions. Moreover, the Contra Costa County Department of Community Development kicked in \$200,000 in block grants. BART joined the partnership by selling an easement for parking under the adjoining elevated track.

Implementation strategies that are procedural in nature, like expediting entitlement reviews and excluding TODs from concurrency requirements, have been

applied less often in practice and are also viewed by public-sector interests as less effective than other measures in jump-starting TOD. This view, however, does not square with that of many TOD developers. Interviews with 35 real-estate developers from across the U.S. (all with firsthand experience with TOD) revealed that tools which increase certainty, reduce turn-around time, and upgrade transit services are generally preferred. Streamlining the project review process falls within this realm. However, developers also generally agree that supportive zoning, help with land assembly, funding set-asides for streetscape improvements, and other tools within the sphere of public-sector control can be a boon to TOD implementation in some circumstances.

4. Building and Bankrolling TOD

Ultimately, TOD is an outcome of one or more developers putting up their hard-earned money, or the money of lenders and investors, to create a new form of urbanism around transit stations. The interviews of 35 developers revealed that many view TOD in positive terms. When asked to rate the overall financial record of TOD, interviewed developers on average gave it a five on a one to seven scale, indicating that they think it performs better than most products. Developers were especially optimistic about TOD's prospects in areas where traffic congestion continues to worsen and there is a pro-TOD political sentiment.

While there were substantial areas of agreement among developers who were interviewed, a number held conflicting views of certain elements of TOD. An example is parking. On the one hand, many relate to the idea that parking standards should be lowered to the degree that significant numbers of residents, shoppers, and workers ride transit. On the other hand, many have been reared on the principle that parking is an effective marketing tool and can sometimes make or break a project. Regardless, most favor leaving the decision of how much parking to provide to the private sector. Developers feel that they know the market best and will take advantage of cost savings when justified.

On balance, many developers feel that being near major transit stops is advantageous to the degree it provides rent premiums. Some also feel being close to transit can improve the ability to secure equity finance, particularly for certain product

types in pioneering locations (e.g., office development in suburban locations). Most developers realize that more is needed than spatial proximity, however. Making sure that the walk between a project and a station portal is safe and reasonably attractive matters to many. Putting in complementary land uses, like convenience shops and service retailers, is particularly important to TOD homebuilders. Nonetheless, developers realize that regardless of what they think, access to funds is often dependent upon the views of lenders. While many developers embrace TOD as a concept, when it comes to securing conventional debt financing, there was a general agreement that TOD offers little help. Loan decisions, they noted, are governed by fundamentals, not urban planning concepts. Interviewed lenders echoed this sentiment.

5. The Odds of TODs: Barriers

Many roadblocks stand in the way of TOD in the United States, just as they do with most forms of compact, mixed-use development. Some barriers are fiscal in nature, such as the higher costs and risks of dense, infill development, the alignment of rail lines along low-cost corridors that have minimal development potential, and fiscal/exclusionary zoning policies that restrict housing production. Others are in the form of political roadblocks, like NIMBY opposition to infill. Still others are institutional and organization in character, such as the difficulty of coordinating TOD activities among multiple and stakeholders.

While many of these barriers are generic to all forms of dense, infill development, some are fairly unique to TODs. One is the “congestion conundrum”: the fact that nodal development around a transit station increases spot congestion, prompting some jurisdictions to downzone. Another is the logistical dilemma of accommodating multi-modal access needs, which often results in station road designs and parking layouts that detract from the quality of walking. More fundamentally, this represents a conflict between the role of a station as a functional “node” (particularly in the minds of transit managers) and a desirable “place” (particularly in the minds of urban planners). Still another stumbling block unique to TODs is the rationalization of parking. By their very nature, transit stations offer “location efficiency”, enabling residents to get by with fewer cars than they might otherwise own. For example, at the Alma Place housing project in

upscale Palo Alto, California, just two blocks from a Caltrain commuter rail station, peak-hour parking demand is just four-tenths of a parking space per unit, even though parking is free. Yet lenders and planners often insist that code-standard parking be provided in station areas regardless. One mediating approach is to unbundle the price of housing and parking, creating separate markets for each. Within transit station boundaries, clashes are also found between the preferences of professional-class suburbanites who park-and-ride and other groups who would prefer more human-scale station designs. Many transit officials side with car-using patrons, invoking one-to-one replacement policies to insure parking is in ample supply. Lastly, mixed land uses, which are a characteristic trait of TODs, pose difficulties in lining up funding, investors, and contractors. Vertical mixing is particularly problematic; most developers call for horizontal mixing instead. Quite often, the ground-level retail component of mixed-use TODs suffer the most, in part because they are poorly laid out.

While the developers interviewed for this study were enthusiastic about TOD, their views on what is “transit oriented” did not always square with urban design principles that call for mixed-use buildings clustered in close proximity to a transit station. Notably, a handful of developers felt strongly that TOD design guidelines should not overemphasize vertically mixed uses, such as ground-floor retail and upper-level residential. They explained that outside of dense urban locations, building mixed-use products in today’s marketplace can be a complex and risky proposition; few believe that being near a train station fundamentally changes this market reality. Those interviewed did welcome certain public sector efforts to incentivize development including land assembly, infrastructure provision, strategic investments to improve neighborhood image, and expedited development review processes. In general, developers cautioned against over-regulation and identified actions that could be taken well in advance of development which would reduce risks and encourage more TOD.

6. The Benefits of TOD

The potential benefits of TOD are wide-ranging, spanning across social, environmental, and fiscal concerns. TOD, as one of the more visible forms of smart growth, is increasingly viewed as an antidote to traffic congestion, the isolation and

detachedness felt in many suburban communities, affordable housing shortages, and inner-city decline and disinvestment. TOD, proponents maintain, can contribute toward creating a sustainable built form, functioning as a counter-magnet to auto-induced sprawl. Under the right conditions, it can be a boon to local communities, especially when coupled with pro-active public assistance, by: spurring the redevelopment of declining neighborhoods (e.g., downtown Long Beach, California and Arlington Heights, Illinois), spawning new suburban villages (e.g., Pleasant Hill, California and Orenco, Oregon), breathing life into older suburban downtowns (e.g., Bethesda, Maryland and Plano, Texas), and speeding up the transition of places suffering from slow commercial encroachment (e.g., Ballston, Virginia and Rutherford, New Jersey). Even larger aspirations have been attached to TOD, such as its potential for building human capital by increasing day-to-day social interaction and strengthening the bond between residents and their community.

The literature is replete with platitudes that have been heaped upon the TOD concept, however relatively few serious studies have been carried out that assign benefits to TOD in any quantitative or monetary sense. For the most part, anecdotes and story-lines are relied upon. Two benefits for which quantitative impacts have been measured – ridership increases and property value gains – are discussed below in more detail, drawing upon recent research I and others have been involved with.

Impacts of TOD vary by time and circumstances. In a boom economy when highways are jam-packed, the benefits of living, working, and running a business near a grade-separated, high-performance transit line are likely much greater than during an economic downturn. (Nothing does more to relieve rush-hour traffic congestion than unemployment.) TOD is also likely more highly valued in big congested cities than small uncongested ones. It is because of these variations that our knowledge of benefits remains partial. Such variation has also given rise to harsh debates and conflicting signals on TODs benefits, especially in “best case” settings like Portland, Oregon. Take Portland’s much-vaunted Orenco TOD, for instance. On the rosy side are surveys showing that nearly 80% of residents living near the Orenco station said they ride transit more since moving to their new residence.² Another researcher estimated that 22% of Orenco commuters regularly use public transit, higher than the 5% average for the

region.³ The Orenco TOD's popularity is underscored by the fact that, according to one observer, homes are selling 60% faster than comparable units in non-TOD projects.⁴ As a further testament to its success, TOD boosters point out that Orenco was voted America's Best Planned Community by the National Association of Home Builders in 1999.

In striking contrast, a critical perspective on Orenco is offered by analysts from the Cascade Policy Institute:

"Most of (Orenco's) earliest construction took place adjacent to Cornell Road, while the land immediately surrounding the rail stop remained vacant...In terms of transit use, Orenco Station has largely proven to be a disappointment. Most people who take the train...arrive by car. Three large employers...provide free shuttles for their employees to get to and from the light-rail station. This inflates light rail ridership, but adds to local traffic – shuttles circulate for hours, often empty, thereby diminishing the alleged environmental benefits of rail."⁵

Based on a separate survey of Orenco's residents, another critic claims that: "Three-quarters...always drive; and only one out of six use transit (including bus) more than twice a week."⁶ She further notes that: "Orenco Station fails the housing affordability test", with housing going around 30% higher than the county average."⁷

Suffice to say, many different "spins" have been placed on the impacts of TOD. For this very reason, TOD was called "a much-hyped concept" in a recent national publication and, the author cautioned, "with a predictable amount of misinformation and misrepresentation within the policy and development worlds".⁸ Conflicting interpretations and research findings stem in part from methodological differences and vagaries but also from the ideological leanings of analysts. With research findings poles apart, informing policy-makers about the benefits of TOD is fraught with difficulties. Invariably, decisions regarding TOD get driven more by political and ideological considerations than objective research.

7. TOD and Ridership

If there is any single benefit of TOD that all sides agree is beneficial to society as a whole, it is increased ridership. TOD is poised to relieve traffic congestion, improve air

quality, cut down on tailpipe emissions, and increase pedestrian safety in transit-served neighborhoods by coaxing travelers out of their cars and into trains and buses. However, congestion relief and environmental benefits accrue to an appreciable degree only if TODs result in people who formerly drove alone now switch over to transit. While some critics charge rail transit investments generally lure former bus riders to rail, experiences show that TOD can attract significant shares of former motorists. A California study found that among those who drove to work when they lived away from transit, 52.3% switched to transit commuting upon moving within ½ mile walking distance of a rail station.⁹ On balance, research to date shows that TOD yields an appreciable ridership bonus: well-designed, concentrated, mixed-use development around transit nodes can boost patronage as much as five to six times higher than comparable development away from transit.

While the chief environmental benefit of TOD comes from coaxing motorist over to mass transit, a secondary benefit is the inducement of more walk and bicycle access trips to and from transit. Larger shares of rail trips accessed by walk-and-ride and bike-and-ride can reduce the need for parking, improve air quality, and promote physical activity. All transit trips involve some degree of walking, however recent research makes clear that attending to the mobility and design needs to those who exclusively walk to and from stations is especially important.¹⁰

Another important ridership dimension of TODs is their mixed-use attributes. Some activities, like offices and residences, produce trips during peak hours when trains and buses are often full. Others, like entertainment complexes, restaurants, and retail shops, generate trips mainly during off-peak hours, helping to squeeze efficiencies in the deployment of costly rail services. When mixed-use TODs are aligned along linear corridors – like “pearls on a necklace” – they result in trip origins and destinations being evenly spread, producing efficient bi-directional flows. This has been the case in world-class transit metropolises like Stockholm, Copenhagen, and Curitiba, Brazil wherein mixed-use TODs have given rise to 55%-45% directional splits.¹¹ In contrast to many American settings where peak-period trains and buses are filled to the brim in one direction but nearly empty in the other, mixed and balanced land uses ensure mixed and balanced traffic flows.

Why is it important to know about the ridership impacts of TOD? The main reason is that evidence can be useful in informing public policy. One application is the setting of credits and waivers against transportation impact fees. Los Angeles, Orlando, and Santa Clara County (CA) currently employ sliding-scale programs, adjusting impact fees downward for TODs. The Santa Clara County Congestion Management Agency recommends a 9 percent reduction in estimated trip generation levels when setting impact fees for new housing projects that lie within 2000 feet of a light rail or commuter rail station. Research can also help inform policy initiatives like Location Efficient Mortgage (LEM) programs by shedding light on the commuting cost savings of transit-based housing. And it can be of value to long-range modeling whose outputs weigh heavily on how scarce transportation dollars are allocated in Transportation Improvement Programs (TIPs). The recent scenario testing in Sacramento, California using an integrated land-use and transportation model, for example, showed rail investments combined with TOD and road pricing was more cost-effective and environmentally benign than a beltway scenario.¹² The region's TIP followed suit by giving high priority to several major transit projects.

TOD Residences and Ridership

Most of the evidence on the ridership impacts of TOD is for residential land uses. Past studies have mostly compared transit modal shares between those living within a walkable distance of a station versus those who live farther away. Among the research findings to date are the following.

Surveys from 1993 of San Francisco Bay Area workers living near heavy-rail stations (i.e., BART) found, on average, 32% rail-commuted compared to a regional average of just 5% -- more than a six-fold differential. Car availability and parking prices had a huge bearing on ridership rates. Station-area residents from zero-car households were 14 times more likely to rail-commute than those from three-car households. And 42% of station-area residents who paid for parking commuted by rail compared to just 4.5% who received free parking.¹³ And if a commute was to downtown San Francisco and a station-area resident from a one-car household had to pay for parking, there was an 82% likelihood he or she would take transit; if, on the other hand, the person commuted to a non-San Francisco destination and could park for free, the probability plummeted to

just 4%.

I was involved in a study that updated the 1993 research using 2003 ridership data of California TOD residents. For 26 residential projects within ½ mile of a California rail station that were studied, the mean share of commute trips by transit among 624 surveyed tenants was 27%.¹⁴ For those living between ½ and 3 miles of a station, the mean share was 7%. Thus, those living within walking distance of a rail stop were around 4 times as likely to rail-commute as those living within a distance more oriented to bus access (i.e., ½ to 3 miles) and nearly 6 times as likely as those living beyond 3 miles but within the same city as the housing projects under study. And like the 1993 findings, ridership rates varied dramatically by circumstances: not just according to parking policies at the workplace but also whether residents are able to flex their work schedules and other factors. A sensitivity analysis from a binomial logit model that predicted the likelihood of station-area residents rail-commuting showed, for example, in situations where journey-to-work travel times were comparable by transit and highway, the absence of flex-time and availability of free parking was associated with a 14% likelihood of taking transit to work; if parking was no longer free and flex-time privileges were available, the probability shot up to 90% (Figure 4).

How important are attributes of a TOD's built environment in influencing ridership – i.e., once people are within a walkable distance of a station, do factors like quality of landscaping and the presence of mixed land uses really matter? The 1993 study of 27 transit-based housing projects in California found density to be the most important land-use predictor of ridership rates.¹⁵ Factors like land-use mixes and the quality of walking environment, however, had relatively little impact on transit usage once controlling for density. The 2003 update study reached a similar conclusion. In fact, the only neighborhood-design variable that entered the logit model for predicting transit commuting in the updated study was the level of street connectivity at the destination end of a trip. It could be that within a quarter to a half mile radius of a station, features of the built environment (ignoring issues of safety and urban blight) matter little – as long as places are near a station, the physical characteristic of the immediate neighborhood are inconsequential.¹⁶ In our comprehensive review of empirical studies on travel and built environments, Reid Ewing and I concluded:

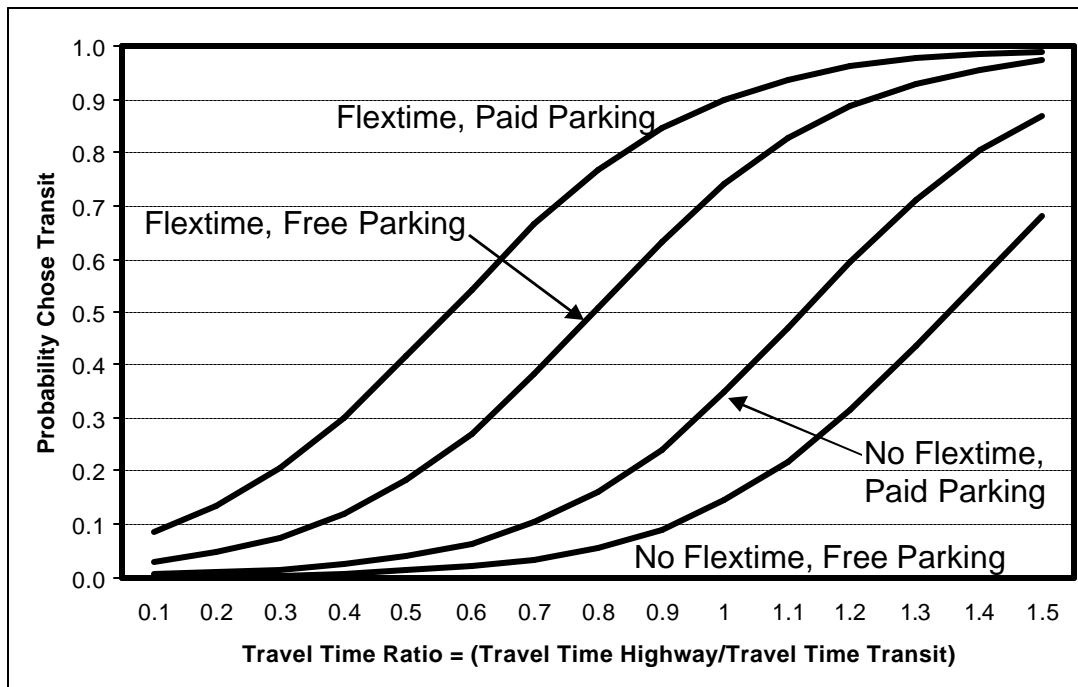


Figure 4. Sensitivity of Rail Commuting to Parking Prices, Availability of Flextime Work Schedules, and Travel Time Ratios via Highway versus Transit, Based on Model for Predicting the Likelihood of California Station-Area Residents Commuting by Rail Transit in 2003. *Source:* H. Lund, R. Cervero, R. Willson, *Travel Characteristics of Transit-Focused Development in California*, Oakland, Bay Area Rapid Transit District and California Department of Transportation, 2004.

“transit use depends primarily on local densities and secondarily on the degree of land use mixing.”¹⁷ Still, several studies show that the influences of mixed uses and urban design on transit ridership are not inconsequential, although these studies were conducted across all land-use settings, not just TOD. Using data on over 15,000 households from the 1985 American Housing Survey, I found in an earlier study that the presence of retail shops within 300 feet of one’s residence increased the probability of transit commuting, on average, by 3% -- ostensibly because transit users could pick up convenience items when heading home after work.¹⁸ Recent research using data from rail-served Montgomery County, Maryland reached a similar conclusion: mixed uses at both origins and destinations induce rail travel for all trip purposes, with elasticities between transit usage and land-use diversity ranging from 0.45 to 0.62.¹⁹

Ridership and Self-Selection

Ridership gains tied to TOD are significantly a product of self-selection. Those with a lifestyle predisposition for transit-oriented living conscientiously sort themselves into apartments, townhomes, and single-family units within an easy walk of a transit node. That is, being near transit and being able to regularly get around via trains and buses weighs heavily in residential location choice. High ridership rates are simply a manifestation of this lifestyle preference.

A recent study I conducted explicitly examined residential self-selection as a primary determinant of ridership rates among TOD residents.²⁰ Using data on travel diaries and locations of residences and workplaces from the 2000 Bay Area Travel Survey (BATS), a nested logit model was estimated. The selection of rail transit for commuting was nested within the choice of whether to reside within ½ mile distance of a rail station or not. Factors used to explain whether someone lived near transit included workplace location, job accessibility via highway and transit networks, and household and personal characteristics (e.g., whether a traditional two-adult household, type of occupation, and car ownership levels). Using records for more than 11,000 individuals, it was found that 19.6% of those living within ½ mile of a rail stop got to work by rail transit; among those living beyond the ½ mile radius, the share was 8.6%. For the residential-location component of the nested choice model, whether one worked within ¼ mile of a rail station was the most significant predictor of whether one lived near transit. In addition to residential location, car ownership levels were found to have a strong bearing on whether workers rail-commuted. All three factors – residential location, car ownership levels, and rail-commuting – were closely inter-dependent. Using conditional probabilities, the study suggested that upwards of 40% of the ridership bonus associated with TOD is a product of residential location – i.e., self-selection.

From the nested logit results of the Bay Area study, a sensitivity test was conducted to show how probabilities of rail commuting varied as a function of three policy variables: residential location (within ½ mile of a station or beyond); workplace location (within ¼ mile of a station or beyond); and household car-ownership levels (0, 1, 2, 3+). The resulting sensitivity plot, shown in Figure 5, shows probabilities of rail commuting are very high among all groups when the worker lives in a zero-car

household. Adding one car results in probabilities plummeting; they fall most precipitously for those residing and working away from stations. For residents of transit-based housing, probabilities fall more gradually with car-ownership levels. For those living away from transit, the likelihood of rail-commuting is not much different between two-car and three-or-more-car households. And for those living and working away from a rail stop, the odds of commuting by a non-rail mode is about the same for a one and 3+ car household – less than 1 to 10.

Figure 5 also reveals that working near transit interacts with car-ownership levels to produce different probabilities among station-area dwellers and their counterparts. Working near transit and having no cars means there is a very high likelihood, well over 80%, of rail-commuting for both groups. Adding a car to the household results in the probability dropping far more sharply for non-station-area residents, however – notably, to below the probability (0.28) for station-area residents who work beyond ¼ mile of station. This suggests that an appreciable share of station-area dwellers who rail-

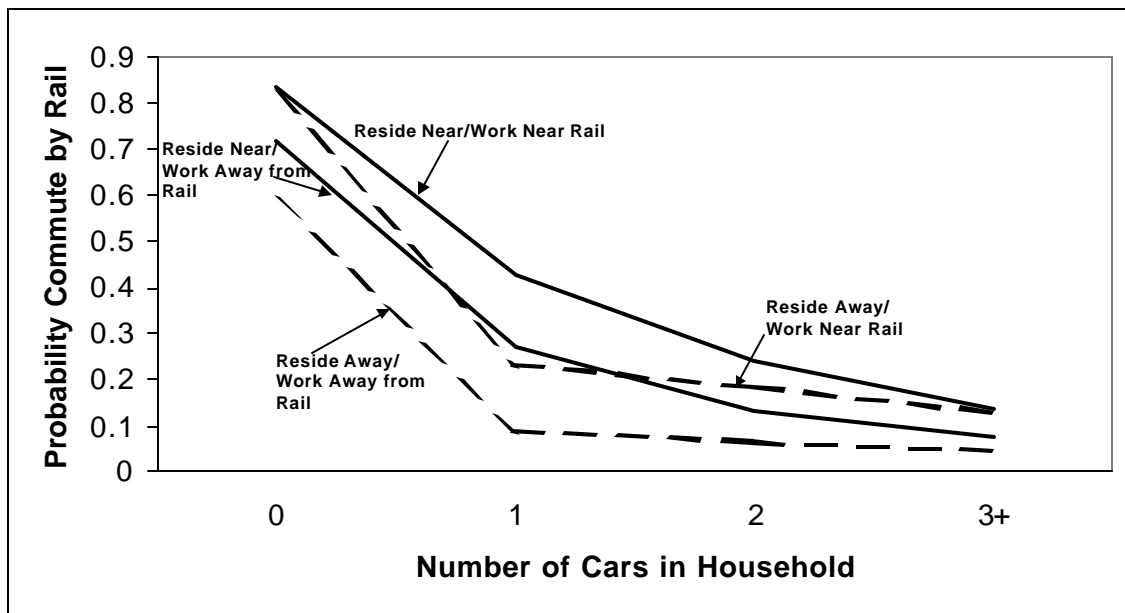


Figure 5. Sensitivity Plots of Rail-Commute Probabilities by Number of Cars in Household for Those Living and Working Near and Away from Stations. Reside Near = ½ mile or less; Work Near = ½ mile or less. *Source:* R. Cervero and M. Duncan, *Residential Self Selection and Rail Commuting: A Nested Logit Analysis*, Berkeley, University of California Transportation Center, Working Paper 604, 2002.

commute do so out of choice rather than necessity, further hinting that self-selection has taken place. Adding a second car to a station-area household, however, lowers the probability of rail-commuting sharply, below that of a non-station-area worker from a two-car household whose job site is near a rail stop. This indicates that the transit-ridership benefits of transit-based housing comes from those with relatively few – i.e., under two – cars in the household. In terms of public policy, this argues for flexing parking standards for housing projects near rail stations.

More recent research has confirmed that those living in compact, transit-accessible locations tend to own fewer cars and log fewer vehicle miles of travel (VMT) per year. As part of an evaluation of the Location Efficient Mortgage (LEM) concept, John Holtzclaw and a team of collaborators recently studied travel behavior and car ownership levels as functions of land-use and transit accessibility characteristics of neighborhoods in three regions with LEM programs: Chicago, Los Angeles, and San Francisco.²¹ A doubling of residential density was found to reduce household auto ownership and VMT per capita in the 32% to 43% range. The influence of transit accessibility on car ownership was less than that of density, but still appreciable.

Self selection in no ways diminishes the importance of planning for and building transit oriented residences. If the marketplace was perfectly functioning, then a case might be made for governments to get out of the way so that producers and consumers can sort themselves into station areas unfettered. However, marketplaces are not perfect, whether due to NIMBY resistance to new construction, exclusionary zoning, imperfect information, or negative externalities. Accordingly, findings of self selection underscores the importance of breaking down barriers to residential mobility and introducing market-responsive zoning in and around transit nodes — zoning that acknowledges that those living near transit tend to be in smaller households with fewer cars. Flexible parking standards and location efficient mortgages would further “grease the path” toward self selection into TODs.

Office TODs and Ridership

Research generally shows high ridership rates for those working in U.S. office buildings situated near rail stops, though this largely holds for downtown settings.

Outside of CBDs, office complexes often provide free parking which in turn dramatically erodes transit's ridership premium. For example, surveys of rail commuting in metropolitan Washington, D.C. found that nearly 50% of those working in offices within 1000 feet of downtown Metrorail stations rail-commuted; in the case of offices that were comparable distances from the more suburban Crystal City and Silver Spring stations, the shares were 16% to 19%.²² Besides the affects of parking prices, the absence of self-selection (i.e., few non-CBD office projects are sited with reference to transit) also diminishes ridership impacts of office TODs.

A 2003 survey of 877 workers in 10 office buildings near non-CBD California rail stations found, on average, 19 percent of commute trips were by public transit, with considerable variation.²³ The two surveyed office buildings averaging the highest transit commute shares – both over 30 percent – were also, compared to the other eight, the closest to stations (within 170 feet), in the highest density settings (40 workers per acre), and charged the most for parking (over \$100 per month). As part of this study, a binomial logit model was estimated that shed light on policy factors that influences transit ridership levels of workers in office-oriented TODs. Three transportation policy variables emerged as significant predictors: parking supplies, employer assistance with transit costs, and frequency of feeder bus services at the work-end station. Figure 6, a sensitivity plot prepared from the logit results, shows the estimated probability of a surveyed office worker commuting by transit given changes in these three variables. With 25 feeder buses per day, an office setting with 50% more parking spaces than workers, and no employer help with transit costs, the model predicts that just 8% of office workers near a rail station will commute by transit. At the other extreme, for a worker heading to a station with 400 daily feeder buses who work for an employer who provides transit-pass assistance and provides one parking space for every two workers, the likelihood he or she will commute by transit is 50%. Over the range of feeder bus frequencies, the differential in transit commuting probabilities is 30% to 40% depending on how generous employers are in promoting transit (i.e., minimal parking and help with transit costs) or in accommodating the automobile (i.e., ample parking and no help with

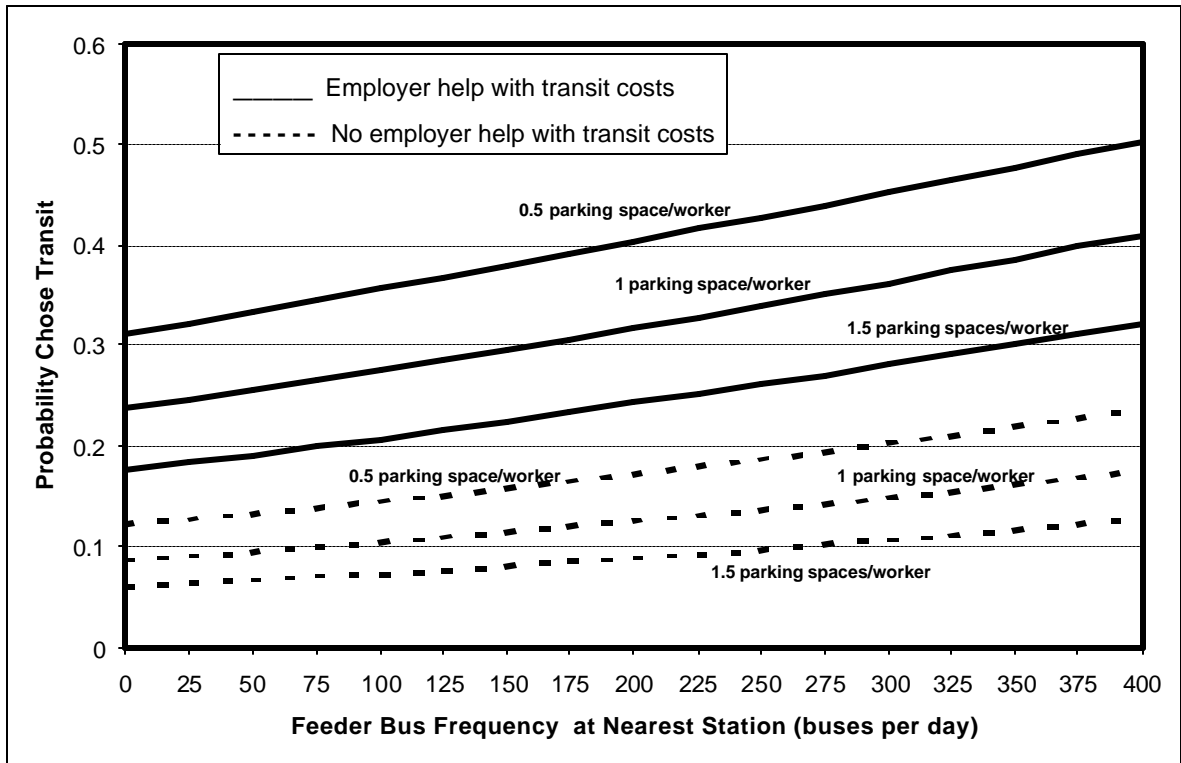


Figure 6. Sensitivity Test: Influences of Employer Parking and Transit Cost Policies and Feeder Bus Frequencies on Probability of Transit Commuting Among Office Workers

transit costs). Clearly, successful TODs are far more than physical design challenges: the policy “software” that accompanies the built-design “hardware” matters tremendously.

8. America’s TOD Ridership Success Story: Arlington County, Virginia

No place in the United States has witnessed more high-rise, mixed-use development along a rail corridor over the past three decades than Arlington County, Virginia. Accordingly, there is no better place to examine TOD’s potential ridership bonus, even in a car-dependent country like the United States. Arlington County’s two major rail corridors – Rosslyn-Ballston and Jefferson Davis (see Figure 7) – have experienced a tremendous increase in building activity since Metrorail’s 1978 opening:

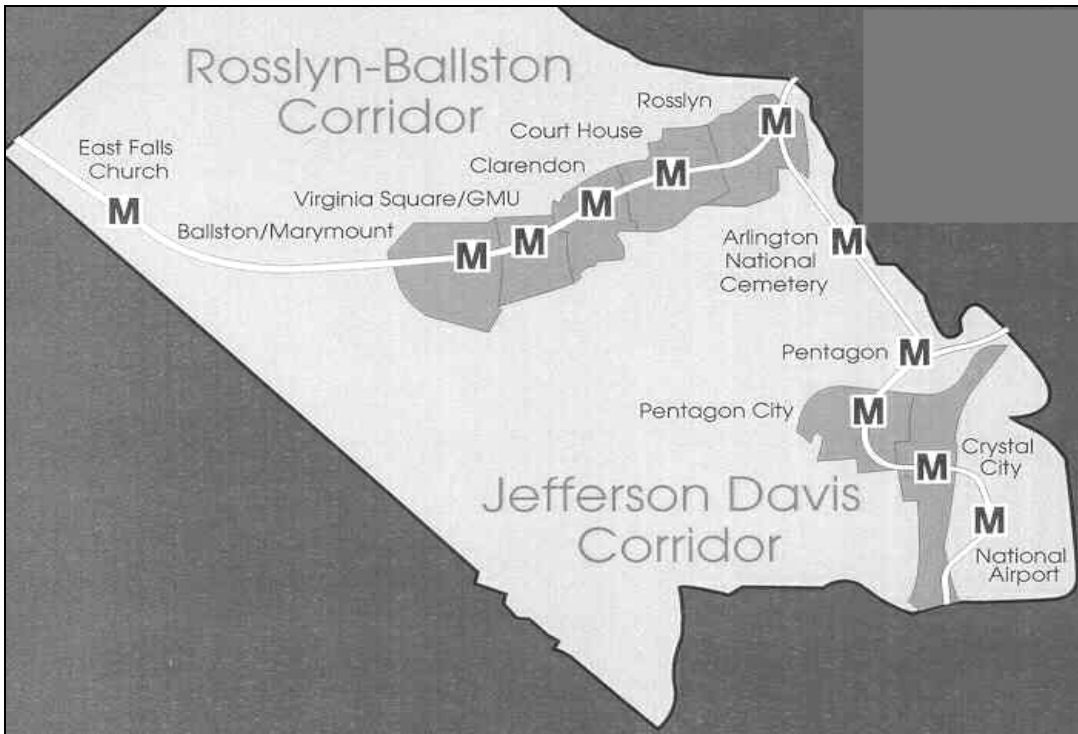


Figure 7. Washington Metrorail Rail Stations in Arlington County. The station areas of the seven Metrorail stations with significant development activity since 1970 are shaded.

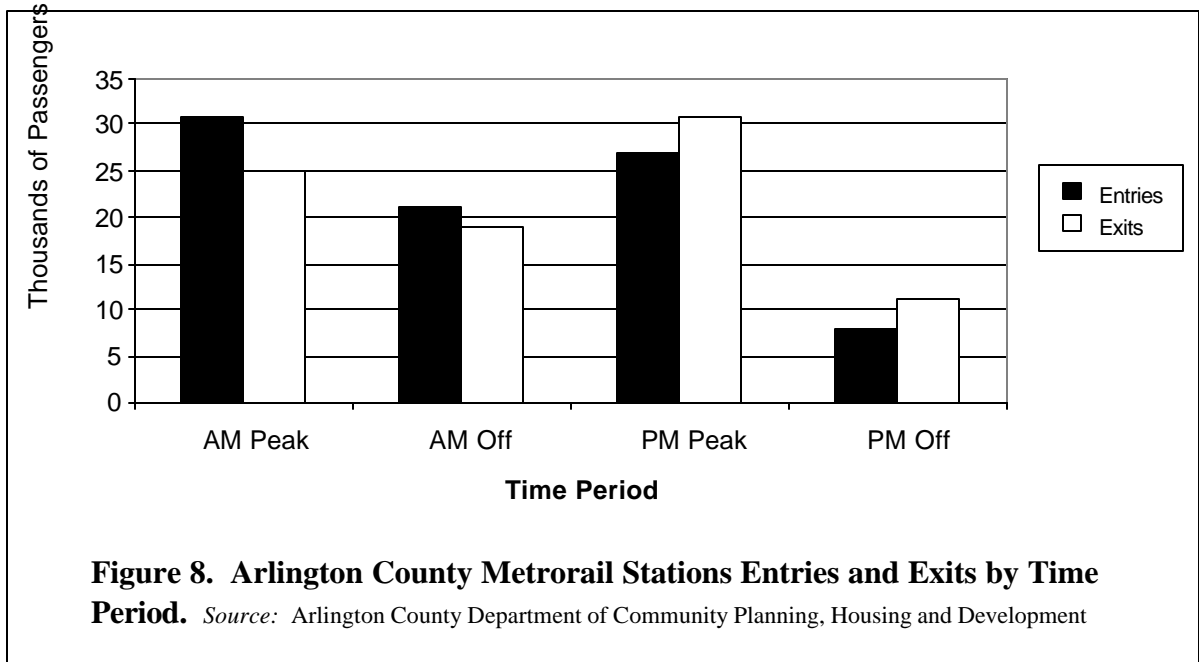
24.4 million square feet of office space, 3.8 million square feet of retail space, some 24,000 mixed-income dwelling units, and over 6300 hotel rooms.²⁴ Of the nearly 190,000 people today living in Arlington County, 26 percent reside in Metrorail corridors even though these corridors (as represented by darker areas in Figure 7) comprise only 8 percent of county land area. If the development added to these two corridors had been built at suburban density standards, such as in neighboring Fairfax County, Virginia, seven times as much land area would have been required.

The addition of 35+ million square feet of new development along two rail-served radial axes was hardly the result of good fortune or happenstance. The transformation of once-rural Arlington County into a showcase of compact, mixed-use TOD has been the product of ambitious, laser-focused station-area planning and investment. Prior to Metrorail’s arrival, Arlington County planners understood that high-performance transit provided an unprecedented opportunity to shape future growth and proceeded to introduce various strategies — targeted infrastructure improvements, incentive zoning,

development proffers, permissive and as-of-right zoning — to entice private investments around stations. After preparing countywide and station-area plans on desired land-use outcomes, density and setback configurations, and circulation systems, zoning classifications were changed and developments that complied with these classifications could proceed unencumbered. The ability of complying developers to create TODs “as-of-right” was particularly important for it meant developers could line up capital, secure loans, incur upfront costs, and phase-in construction without the fear of local government “changing its mind.”

The pay-off of concentrated growth along rail corridors is revealed in Arlington County’s transit ridership statistics. The County today boasts one of the highest percentages of transit use in the Washington, D.C. region, with 39.3 percent of Metrorail corridor residents commuting to work by public transit.²⁵ This is twice the share of County residents who live outside of Metrorail corridors. Self-selection is evident in that around two-thirds of employed-residents in several apartments and condominium projects near Rosslyn and Ballston stations take transit to work.²⁶ An important outcome of promoting mixed-use development along rail corridors has been balanced jobs and housing growth which in turn has produced balanced two-way travel flows. Figure 8 shows that counts of station entries and exits in Arlington County were nearly equal during peak hours as well as the off-peak. During the morning rush hours, many of the county’s Metrorail stations are both trip origins and destinations, meaning trains and buses are full in both directions. The presence of so much retail-entertainment-hotel activities along the County’s metrorail corridors has further filled trains and buses during the midday and on weekends. Arlington County averages higher shares of transit boardings and alightings at its stations in off-peak hours than other jurisdiction in the region with the exception of downtown Washington, D.C. Balanced, mixed-use development has translated into as close to 24/7 ridership profile as any U.S. setting outside of a CBD.

As part of the national TCRP H-27 study, we obtained yearly data on building activities and station entries/exits for Arlington County station areas over the 1985 to 2002 period. Using multiple regression equations that simultaneously estimated ridership, development, and service levels as joint functions of each other, the analysis



revealed the following. Ridership has been most responsive to increases in office and retail development. Every 100,000 square feet of added office and retail floorspace increased average daily boardings by 50. Residential development increased ridership in part by prompting increases in service frequency. In combination, the two factors – new housing and more frequent headways – boosted patronage: every 100 additional residential units, when combined with 100 additional rail-car passenger spaces per day, led to more than 50 additional boardings per day.

9. TOD and Land Market Impacts

Another means of gauging the benefits of TOD is to examine impacts on the value of affected properties. To the degree that TODs enhance accessibility, this benefit gets capitalized into the sales price of land. The weight of evidence to date shows that development near transit stops enjoys land-value premiums and generally out-performs competitive markets. This generally holds for residential housing (especially condominiums and rental units) as well as office, retail, and other commercial activities. At Dallas’s Mockingbird station TOD, for instance, residential rents in mid-2003 were going for \$1.60 per square foot per month; other comparable nearby properties not served by transit were getting \$1.30, or 20% less. In Englewood, Colorado, apartments rented at CityCenter – a transit-oriented village with civic uses, a cultural and performance center, and retail – are more than twice as expensive as comparable units elsewhere in the city.

CityCenter's Class A office space is also leasing at a premium: gross annual lease rates of \$21 to \$25 per square foot in mid-2002 compared to \$13.50 to \$17 per square foot for Class A space elsewhere in the city.²⁷ Moreover, CityCenter's office occupancy rate is close to 100%, compared to 90% for the Denver metropolitan area. The project's retail sector is also out-performing its competitors: annual rents for stores averaged \$18 to \$20 per square foot in 2002 versus \$8 to \$14 per square foot for the city of Englewood. About 90% of CityCenter's retail space was leased and occupied in mid-2002 compared to a citywide average of 80%.

These and other experiences tell us that while proximity to good-quality transit is an important trait of TOD, this is not the only factor that adds value. When combined with higher-than-typical densities, consumer retail and services, and pedestrian amenities, proximity to transit can confer land-value benefits that are well above those of competitive markets. TOD's synergy of proximity, density, mixed uses, and walking-friendliness, under the right conditions, gets expressed through geometric gains in property values.

Experiences also show that the price premium effects of TOD are not automatic and quite often a number of preconditions must be in place. One is that there be an upswing in the economy, with plentiful demand for real estate and, importantly, worsening traffic congestion. Only then will there be market pressures to bid up land prices and a clear benefit of having good rail access as an alternative to fighting highway traffic. Also important are public policies, such as zoning bonuses, which further leverage TOD and system expansion that produces the spillover benefits of a highly integrated network. Because TODs take time to evolve, experiences also suggest land-value benefits take time to accrue.

The importance of these factors – a robust economy, supportive zoning, network expansion, and maturation – is underscored by experiences in Santa Clara County, California. During its infancy, the Santa Clara County light rail system had no measurable effects on land values²⁸, though this was generally a recessionary period; by the system's tenth anniversary, when the real-estate market had revved up, congestion had markedly worsened, station area densities had been up-zoned, and the system's track mileage had doubled, land-value benefits were appreciable. Michael Duncan and I

estimated a hedonic price model that netted out the effects of proximity to transit from other factors that influence land values in Santa Clara County.²⁹ This study found that in 1999 substantial benefits accrued to residential parcels within a quarter-mile distance of a light rail station. Large apartments that were within a ¼ mile distance of light-rail stops, for example, commanded a premium of around \$9 per square foot. Compared to parcels that were within four miles of a light-rail station, this translated into an overall land-value premium of 28%.

Which part of a region a station lies in can also have a bearing on land market impacts. Transit needs to be in a neighborhood with a reasonably healthy real-estate market and free from signs of stagnation or distress if significant premiums are to accrue. In San Diego, I found significant land-value premiums for commercial properties in the Mission Valley light-rail corridor (see Figure 9), an area that has generally enjoyed sustained growth over the past decade, again using hedonic price modeling (see Figure 10 for summary of premium effects for six corridors in San Diego County).³⁰ Pro-development policies introduced by local governments, like overlay zoning to encourage mixed land uses and targeted infrastructure investments, had a hand in bolstering commercial property values in the Mission Valley, however what mattered most was this happened to be the region's primary growth axis. This stands in marked contrast to the South Line wherein little effort has been made so far to leverage TOD, in large part because of stagnant growth, and predictably no meaningful land-use changes have occurred. For this first-leg of the light-rail system, funded solely with local monies, the overriding objective was cost minimization. The South Line operates on disused freight track that abuts sagebrush and an odd mix of warehouses, factories, a military complex, and various auto-oriented uses. Moreover, the South County area has not been "where the action is". Employment has barely increased in this part of San Diego County since 1980. Accordingly, transit was not poised to induce appreciable land-use changes.

The light-rail extension to Mission Valley has been an entirely different story. The North County area was abuzz with real-estate construction when the Mission Valley rail extension. The Mission Valley extension, moreover, represented a sea change in the thinking of the region's transit decision-makers. Rather than trying to minimize

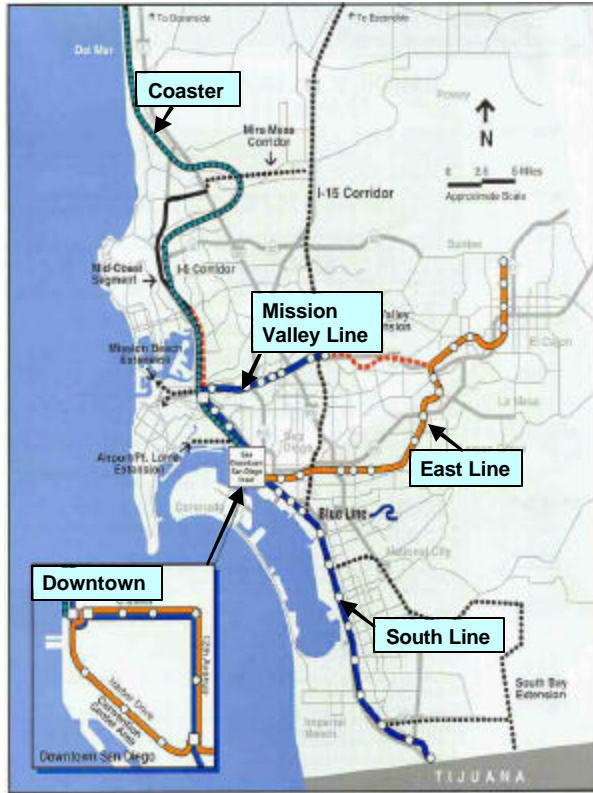


Figure 9. Regional Rail Network and Planned Extensions in San Diego County

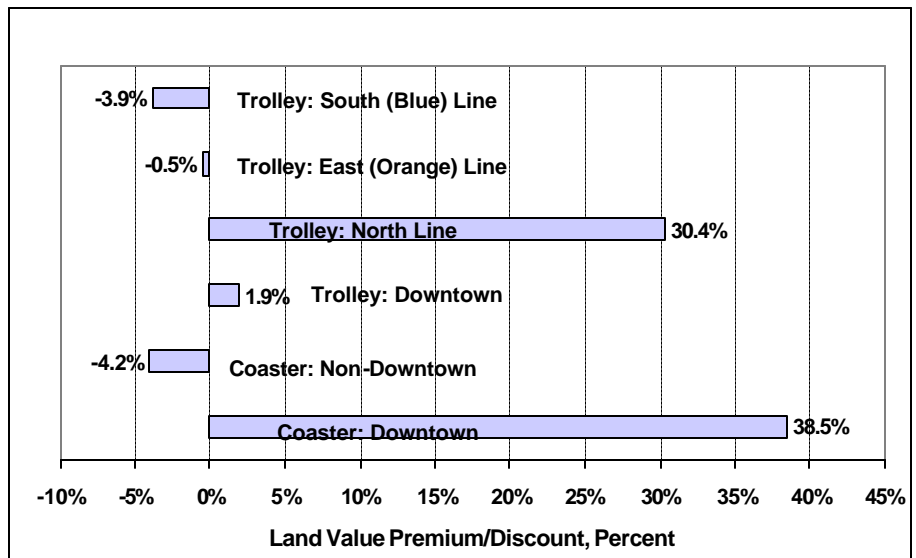


Figure 10. Commercial Land-Value Premiums or Discounts in San Diego County, by Rail Line.

costs, the mindset became one of maximizing development potential. The Mission Valley line, for example, crosses the San Diego River three times in order to site development on the flat valley floor and preserve the sensitive hillsides that define the valley. Further helping to promote station-area growth in Mission Valley was the city of San Diego's progressive TOD ordinance that incentivizes compact, infill development near light-rail stops. These efforts paid off. Between 1982 (when the light-rail extension was first proposed) and 1995, the Mission Valley saw the addition of 7000 new housing units, 2375 new hotel rooms, 1.6 million square feet of retail space, and some 6 million square feet of office inventory.³¹ Since 1995, these figures have trended steadily upward.

Measuring TOD's land-value impacts is more than an academic exercise. Evidence on value premiums has policy significance. For one, public entities are in a position to recapture some of the value-added, such as through benefit assessments, land acquisitions and re-sales, and ground/air-rights leases. Some areas of the U.S., such as metropolitan Washington, D.C., Los Angeles and Portland, have been particularly aggressive in recapturing some of the value created by transit investments, however legal and institutional concerns continue to impede progress in most of the United States.

Savvy developers increasingly understand the long-term nature of profiteering from TOD. In the words of one active TOD developer in the Denver region: "we're not here to 'flip' properties in the search for quick profits; with TOD and infill in general, we're in it for the long haul". More and more, developers are using long-term *pro formas* when evaluating the potential pay-off of TOD. Like any long-term investment, *asset management* is essential to reaping handsome profits. And for this, the public sector needs to do its part to ensure that transit-served neighborhoods are and will continue to be viable places. Through effective partnerships with transit agencies, local government, and others, and under the right conditions, all parties are in a position to reap the financial gains conferred by well-planned and well-managed TOD.

10. Policy Lessons Drawn from Ten Case Studies

As part of the TCRP H-27 study, 10 TOD case studies were carried out in a variety of settings with an eye toward ferreting out policy lessons. The 10 case study areas are: Boston, New Jersey, metropolitan Washington, D.C., Miami, Chicago, Dallas, Colorado, Portland, San Francisco Bay Area, and Southern California. This section summarizes core lessons regarding five aspects of TOD: political and institutional factors; planning and land-use strategies; benefits and impacts; fiscal considerations and partnerships; and design challenges and considerations.

Political and Institutional Factors

- ***Political leadership is vital to TOD implementation.*** Having someone step up as the political champion of a TOD proposal is critical in marshalling resources, building a coalition, and resolving disputes that invariably crop up along the way. Mixed-use TODs like the Fruitvale Transit Village in Oakland, California and Arvada in suburban Denver owe a lot to the dedication and savvy of one or more local leaders who were willing to put their political careers on the line for TOD. Leadership need not always come from the public domain. In the case of Dallas’s Mockingbird station, a developer led the charge in building an eminently walkable, European-style mixed-use complex that broke the stereotype of suburban projects. Mockingbird’s success has ignited efforts to emulate the project elsewhere in the region, such as in Plano and Richardson.
- ***Inclusiveness and on-going public input in TOD planning, design, and implementation is essential to success.*** Outreach not only helps to fend off a possible NIMBY backlash but also gives those who live and work in a TOD neighborhood a vested stake in ensuring what is built is consonant with neighborhood goals, has a human-scale “feel”, and is of the highest caliber possible. Experiences show that neighborhood meetings, workshops, charrettes, and similar venues offer the

best hope of building a base of support and converging on some degree of consensus.

- ***Institutional coordination and streamlining are especially crucial to TOD implementation where multiple agencies govern different elements of land development and transit-service delivery.*** Red tape, institutional bickering, and multiple levels of review are sometimes enough to frighten away the hardest of developers from station locations. Regions like the metropolitan Baltimore, Philadelphia, San Francisco-Oakland, and Denver have formed inter-agency working groups and committees to streamline the TOD review and coordinate decision-making.
- ***More permissive regulatory environments and enabling legislation are often needed if transit agencies, local governments, and regional planning organizations are to proactively implement TOD.*** The absence of authorizing legislation or simple avoidance of the issue of how far transit agencies can go in pursuing land development has many times cast a cloud of suspicion as to whether TOD is a legitimate public-sector undertaking. Without clearly articulated legislation that enables transit agencies and other local actors to assemble and bank land and enter into joint-development arrangements, TOD either gets ignored or ends up on the back-burner, lost in the pressing day-to-day needs of running a transit organization. Where state governments have taken a leadership role, passing permissive authorizing legislation (such as in California in the case of the Los Angeles Metropolitan Transit Authority (MTA) and through trilateral agreements that formed the Washington Metropolitan Area Transit Authority (WMATA), transit agencies have proactively pursued TOD and joint development.

Planning and Land Use Strategies

- ***Successful TODs start with shared visions that guide planning and implementation for years to come.*** The enterprise of creating a TOD over an extended period of time is subject to so many distractions and interruptions that the ability to “keep the eyes

on the ball” is pivotal to success. As noted earlier, Arlington County’s articulation of a land-use future (using a “bull’s eye” metaphor) was an essential in creating a highly functional, ridership-inducing TOC – i.e., transit-oriented corridor.

- ***Start TOD planning early.*** TODs are often the cumulative products of many individual development decisions, some of which unfold slowly and in fits and starts. Areas with successful TOD track records, like Portland, Arlington County, and Montgomery County, have been at it a long time.
- ***TOD success can hinge on rewarding developers through measures that grant more latitude in designing projects, allows mixing of uses, increases density envelopes, and offers certainty, clarity, and built-in assurances that the public sector will follow through on planning commitments.*** Because of the risks sometimes encountered in building near transit stations, especially infill and redevelopment projects, and because of the public good conferred by TOD, “business as usual” should not apply to TOD developers. Zoning must often be revised to allow higher-than-average densities and a land-use program and mix that satisfy market demands. In cities like Seattle, San Diego, and Atlanta, zoning overlays have been successfully used to increase permissible densities, prevent auto-oriented uses for pre-empting TOD possibilities, and diversify uses.
- ***Successful TODs emphasize “place-making”: attractive, memorable, human-scale environs with an accent on quality-of-life and civic spaces.*** Increasingly, projects built around up-and-coming transit nodes, like Dallas’s Mockingbird Station, Portland’s Pearl District, and metro Chicago’s Arlington Heights, are targeted at individuals, households, and businesses seeking locations that are vibrant and interesting places, usually with an assortment of restaurants, entertainment venues, art shops, cultural offerings, public plazas, and civic spaces.
- ***TODs invite bold new policies that push conventional boundaries and acknowledge the unique market niches that are being served, with initiatives like Location***

Efficient Mortgages, unbundling parking costs, flexing parking standards, and sliding-scale impact fees representing good examples of “out of the box” thinking.

Standard designs, cost pro formas, and building code templates need to be challenged for each and every TOD project in large part because the TOD market is not “standard”. Experiences show that new housing built near rail stops often appeals to single professionals, childless couples, and empty-nesters who value amenities as much as the amount of living space and who often own fewer cars and log fewer miles on their odometers than the typical urban household. Standards for mortgage qualifications, building designs, and parking supplies need to reflect these market realities.

- ***Station-area plans and planning matter.*** Given the risks and uncertainties associated with TOD, developers, residents, and merchants expect, and indeed deserve, carefully crafted, forward-looking plans that orchestrate how, when, and where a TOD will evolve. Good TODs begin with good textbook planning practice.

Benefits and Impacts

- ***TOD’s ridership bonuses is substantially a product of residential self-selection, suggesting policy reforms should focus on allowing residents to sort themselves into transit-served neighborhoods unimpeded.*** Research evidence continues to demonstrate that self-selection is a major factor behind higher transit ridership among those living near rail stations. It follows that public policy should focus on breaking down barriers to residential mobility and introducing market-responsive zoning in and around transit stations.
- ***TOD benefits are not automatic and generally accrue during upswings in local economies when traffic congestion worsen.*** Favorable conditions must exist for TOD to produce significant economic benefits, as discussed previously for the California cases of Santa Clara County and San Diego County. Experiences show that if compact, mixed-use development around transit nodes is to attract significant

numbers of motorists to transit so as to reduce traffic congestion and impart environmental benefits, areas need to be experiencing rapid growth and traffic conditions need to be bad and getting worse. Since TODs increase accessibility among those living, working, and shopping near transit, an extensive transit network is also often necessary for the benefits of TOD to materialize.

Fiscal Considerations and Partnerships

- ***TODs benefit from efforts to recapture some of the value-added conferred by transit investments to generate revenues needed for ancillary improvements.*** Recapturing some of the land-value premium conferred by transit investments provides much-needed revenues that can go to seed various station-area improvements like landscaping, pedestrian-way upgrades, and public spaces. While recapturing value in practice is difficult, Los Angeles managed to cover nearly a tenth of the cost of the first phase of the Red Line subway through special assessments levied on benefiting parcels. Entrepreneurial transit agencies, like Washington’s WMATA, have over the years recaptured value through aggressive joint development activities, including land leases and station interface programs. WMATA pegs lease revenues to the values of surrounding properties thus ensuring that it benefits from land appreciation after a lease with a developer has been invoked.
- ***Creative financing is essential to spreading the risks, expanding the base of knowledge and experience, and tapping into the fiscal advantages that certain partners, such as local governments’ superior bond ratings and guarantees, to make projects “pencil out”.*** Partnerships are pivotal to successful TODs. In redevelopment districts that suffer from a poor marketing and performance image, multiple partners are often necessary to raise sufficient capital to spread financial risks. Each partner can bring something unique and of value to the table. A private developer might offer years of experience and business savvy. Private interests also offer a wide array of potential funding sources such as equity capital, conventional debt, real estate investment trust (REIT) funds, and venture-capital Redevelopment

agencies also offer something unique. Most are empowered to condemn, acquire, and assemble parcels and to fund such ancillary improvements as sidewalk upgrades and utility relocations. Local governments are often in a position to offer revenue bonds at favorable rates, use tax-exempt fiscal instruments, and secure loan guarantees backed by the Federal government. A transit agency might be in a position to contribute critical parcels through land swaps or the provision of easements. Experiences with risky mixed-use investments in marginal urban districts like Barrio Logan in San Diego, Overtown in Miami, and El Cerrito del Norte in the San Francisco Bay Area underscore the importance of creative multi-lateral financing.

- ***Market fundamentals, not a TOD label, govern whether private capital gets invested around transit stations.*** The availability of equity and loans to fund projects near transit is primarily driven by capital market conditions and perceived market demand, not a project's status as a TOD. Lenders involved with TOD projects (not all of who even realize they are funding a "TOD") rarely adjust lending standards to reflect proximity to transit.

Design Challenges

- ***In urban setting, rationalizing parking policies in relation to TOD is essential to avoiding conflicts – between cars and pedestrians, regarding whether land goes to parking or development, and in influencing means of accessing TOD stations.*** If not properly dealt with, parking can form a huge obstacle to TOD: separating a station from the neighboring community, diminishing the quality of walking environment, and precluding station-site air-rights or joint development. Transit Boards need to rationalize parking policies beyond a *carte blanche* one-to-one replacement mandate. This might take the form of siting parking more peripherally to a station or away from a community and toward an active highway corridor. Chicago's Metra minimized the impact of parking by using a number of small lots sited away from the station as opposed to a single large lot. Where affordable housing is being built near stops, reduced parking quotas or at least flexible standards

should be considered to reflect the tendency of many TOD households to own fewer cars. Unbundling the cost of parking from the cost of a dwelling can make transit-based residency all the more affordable.

- ***Even though mixed land uses are a trademark of TOD, arriving at a workable program poses design challenges that need to be overcome for a successful TOD.*** Quite often, finding the right formula for mixed land uses is every bit as difficult as rationalizing parking policies. Planners sometimes impose a design template of ground-floor retail and upper-level housing or offices – i.e., vertical mixing – on any and all development proposals within a TOD. Mixed-use projects are trickier to design, finance, and sometimes lease than single-use ones. Ground-floor retail, for example, is doomed to fail unless it opens onto a street with busy foot traffic and convenient car access. Ground-floor restaurants might be unappealing to upper-level residences seeking quiet and privacy in the evening. Local governments need to be sensitive to such challenges and focus more on achieving a desired land-use mix within a transit station areas as opposed to individual parcels – i.e., horizontal mixing.
- ***Walking access and quality of circulation and the overall pedestrian environment are critical to successful TODs however the conflict of stations as “nodes” and “places” often make this difficult.*** Research shows the majority of residents living within ¼ mile of a transit station arrive by foot or bicycle, however this share plummets markedly if there are significant physical as well as symbolic and psychological barriers like wide busy roads and incomplete sidewalk networks. With the help of smart-growth planning monies and pedestrian-sensitive zoning ordinances, San Diego’s Mission Valley, San Mateo County, California, and suburban Denver provide good examples where design attention was given and resources directed to improving the quality of circulation, aesthetics, and basic provisions (e.g., crosswalks, benches) of areas surrounding rail stations.
- ***Transit service improvements and system upgrades can trigger TOD activities, especially in settings with expensive housing markets and a pent-up demand for***

transit-oriented living. “Choice” transit users are highly sensitive to service quality thus running frequent and reliable trains, and importantly minimizing the need to transfer, can be critical to the future of TOD. In northeast New Jersey, the through extension of NJ TRANSIT’S Northeast Corridor to New York Penn Station unleashed a flurry of building activities around century-old commuter rail stations. In Boulder, Colorado, the integrated Community Transit Network (CTN) – known for its colorful “Hop, Skip, Jump, Leap, and Bound” buses – triggered bus-based TOD (typically second and third floor offices and lofts above street-level retail) along several routes.

11. Policy Reflections and Future Research

America’s state of practice with transit oriented development is generally a healthy one. There are many promising examples of TOD currently on the ground and at least as many on the drawing boards. Mixed-use TODs like downtown Plano, Texas and Englewood, Colorado’s CityCenter project would have been unimaginable in the 1980s when these and other suburban communities were hosting a boom in campus-style office development and car-oriented shopping plazas. America is in the midst of a sea change when it comes to linking transit and urbanism. In more and more once car-dominant settings, yesterday’s design templates are being discarded in favor of TOD. Atlanta’s mammoth Bell South TOD at the Lindbergh Station (1.3 million square feet of office space and retail shops) is the result of taking scattered auto-oriented development and transforming it into a concentrated transit-oriented project. Attention has been given to every detail, like citing additional Bell South employee parking around other Metropolitan Atlanta Rapid Transit Authority (MARTA) stations to enable workers to rail-commute for part of their trip. The company’s aim is for at least 30 percent of its workforce to arrive by transit, a huge change from the current market share of under 5 percent.

Also different from the past is that it is not just public policies and interventions that are paving the way for TOD. Unfettered market forces are also having a profound impact. The less desirable features of sprawl – car dependence, congestion, excessive amounts of time behind the wheel, and a feeling of isolation from cultural offerings – are

prompting more and more Americans to leave the suburban edge and head to transit-served sub-city nodes and even the traditional inner-city.

As long as TOD confers both public and private benefits, there is no replacement for public-private partnerships in advancing TOD implementation. Each party brings unique talents, insights, and resources to the table. Creating an in-house capability within transit agencies to pursue partnerships, hammering out fair and mutually-rewarding risk- and revenue-sharing agreements, and building in contingencies that allow projects to change course as needed, experiences show, can produce win-win outcomes. As TOD's talent pool and knowledge base expands, lessons will be learned and put to good use on new and up-and-coming projects. Disseminating and cross-pollinating knowledge offers the best hope of achieving future generations of TOD and joint development projects that are robust, smartly designed, and financially viable.

While considerable progress has been made in our understanding of TOD, knowledge gaps remain. Areas that hold future research promise include studies that: monetize TOD's benefits under a range of conditions; set cost-effectiveness thresholds for TODs at varying densities and transit services at various levels of intensity; evaluate impacts of TOD-friendly measures like location efficient mortgages, flexible parking standards, and bus-based initiatives; and compare fully loaded costs of pursuing TOD versus standard patterns of suburban development.

Quantifying benefits of TOD is especially important to building credibility and legitimacy, and is best pursued collaboratively between the research community and public agencies. Some progress in putting a monetary figure on TOD's societal benefits has been made as part of scenario forecasting – e.g., examining land-use scenarios “with versus without TOD” – for greater Sacramento. More telling might be an enumeration for a region like Portland, Oregon that has a strong tradition of TOD and for which transit-land use relationships are apt to be more elastic. Still, *ex ante* forecasts are inherently speculative. Forecasts hinge on numerous assumptions that powerfully shape travel behavior, like the future cost of gasoline and presumed technological futures, which are exogenous in nature, outside the sphere of local policy influence.

Gaining insights into the impacts of TOD on regional VMT reduction based on grounded realities rather than future simulations would be helpful. One way to do this

would be to take a region that has been at the forefront of TOD and for which good longitudinal data are available, such as Portland, Oregon, Arlington County, Virginia, or Montgomery County, Maryland. An *ex post* evaluation could be conducted by comparing current recorded VMT levels in the region versus what would have been expected had TOD projects like Portland's Orenco Station not been implemented (i.e., the "actual" versus "counter-factual"). Assuming a full social-cost per vehicle mile of travel (ideally partitioned by time of day) would allow the VMT-related benefits of TOD to be imputed. External social costs of auto-motoring in the United States have been pegged at between 18 and 37 cents per mile (in 1998 currency), thus VMT reductions attributable to TODs could be applied to such figures to impute an economic benefit.³²

Finding ways of effectively disseminating research results is also important in further moving TOD from concept to reality. Research reports, professional journal publications, and conference presentations are obvious channels. So is the Internet. A national TOD web site that showcases "best practices" and highlights the latest research findings would be welcomed by many professionals and practitioners.

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