Transit Oriented Development in America:
Strategies, Issues, Policy Directions

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

TOD is as well poised as any land-use strategy for breaking the viscous cycle of sprawl and car dependency feeding off one another. By leveraging affordable housing and reducing the need for car ownership, a virtuous cycle can instead be set in motion, with increased transit usage helping to reduced traffic snarls and compact station-area development putting the brakes on sprawl – at least according to theory.

This paper reviews strategies and issues related to TOD in America. Particular focus is given TOD's role in linking public transit, housing policies, and sustainable urbanism. Experiences are drawn mainly from the United States that represents the global extreme of consumerism in both private transportation and housing.

1. TOD in America

TODs in the U.S. usually feature mixed land uses configured around light or heavy rail stations, interlaced by pedestrian amenities. Not all are conducive to transit-riding, however, for such reasons as the continued prevalence of free parking, thus in many instances, the term "transit adjacent development" (TAD) is a more accurate descriptor.

The most prominent TODs, at least visually, are joint developments – i.e., private-sector projects built on transit agency property as a *quid pro quo.* Over 100 joint developments presently exist on, above, or adjacent to U.S. transit-agency property (Figure 1).[1] Most common are ground and air-rights leases followed by operation-cost sharing. U.S. transit properties in continually growing metro 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, having engaged in thirty projects of varying sizes and scope since its inception in the late-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.

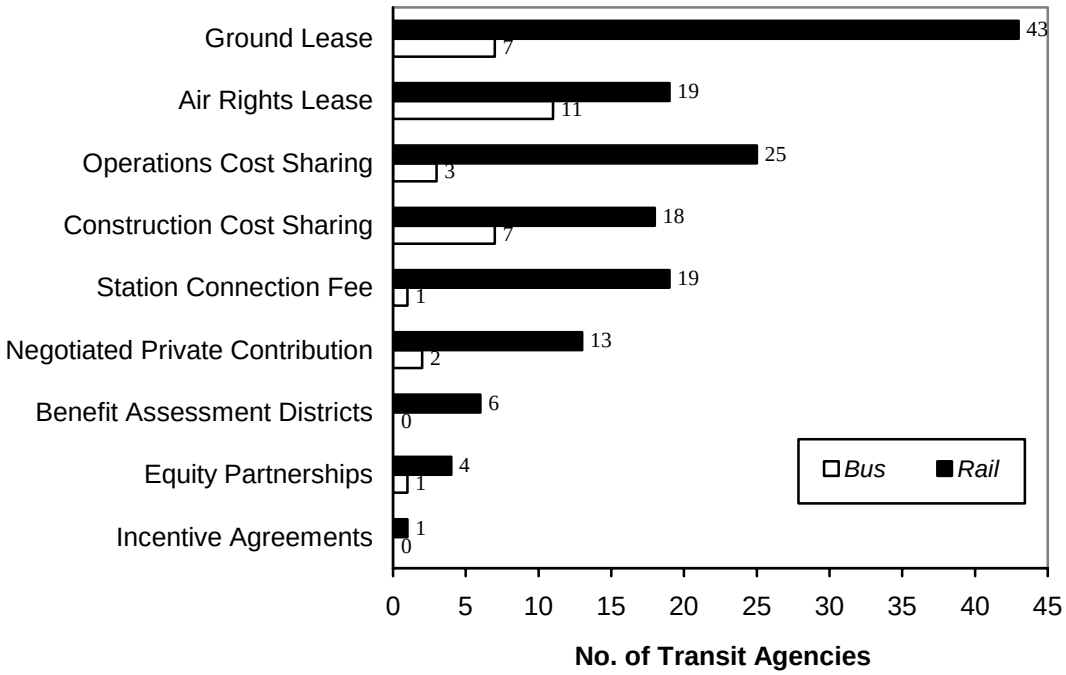


Figure 1. Distribution of Transit Joint Development Projects in the U.S., 2002

2. The TOD-Housing Connection

The connectivity between affordable housing and TOD is under-appreciated. A significant component of increased traffic in the U.S. has been the widening distance between homes and jobs, forcing workers to spend more time on the road in return for affordable housing. Most American's opt to spend more on commuting in return for cheaper housing. A study in Portland, Oregon found that for the same size home, new home buyers could save about $2 a day in mortgage costs for every mile they moved further out.[2] A generous estimate of the cost of driving is 50 cents a mile. So out and back, that's an extra dollar against a $2-a-day reduction in mortgage costs. While from a personal perspective, this means living far away yields net savings, society at-large bears the brunt of increased tailpipe emissions, time losses from traffic jams, and loss of open space. Moreover, most Americans only consider direct out-of-pocket costs of driving, like tolls and the cost of gasoline, when making transportation choices. Infrequent and sunk costs, like car purchases and insurance, are largely ignored, accepted more or less as a subscription fee for participating in car-oriented American society.

In 2001, housing accounted for one-third of spending by U.S. households, twice the amount spent in 1972, which reflects higher homeownership rates and bigger and more expensive houses.[3] Together, housing and transportation costs accounted for 52 percent of annual consumer expenditures nationwide. Differences in metro area expenditures

reflected local variations in costs for housing and transportation, as well as area incomes. The most expensive markets, in terms of combined spending on housing and transportation were San Diego, with a share of 58 percent; Tampa, 56 percent; Los Angeles, 55.7 percent; Miami, 55.1 percent; Denver, 54.9 percent; Atlanta, 54.7 percent; Phoenix, 54.3 percent; San Francisco, 54.1 percent; and Cleveland, 54.0 percent.

From a personal "pocketbook" perspective, smart-growth strategies like housing construction near transit stations means higher housing costs per square foot but because units are usually smaller, net price effects are moderated. However, reduced outlays for transportation can lower the "bundled" cost of housing and transportation. Large U.S. cities with concentrated growth, mixed-use development and transportation options are places where high housing costs are somewhat offset by more affordable transportation, helping to bring down the combined location costs. Moreover, homeowners in these higher-priced housing markets have the advantage of building wealth through home equity, rather than buying cars, which only depreciate.

Residents of affordable units in large U.S. cities average 25% to 35% fewer cars, travel more by transit, and need less parking. Studies suggest the degree of financial savings.[4] Figure 2 shows that in the San Francisco Bay Area, living in low-density residential settings (2 units per residential acre) and receiving minimal transit services translates into an average of around $8,000 per year to own and operate cars. Residing in compact transit-served neighborhood can cut these costs in half or more.

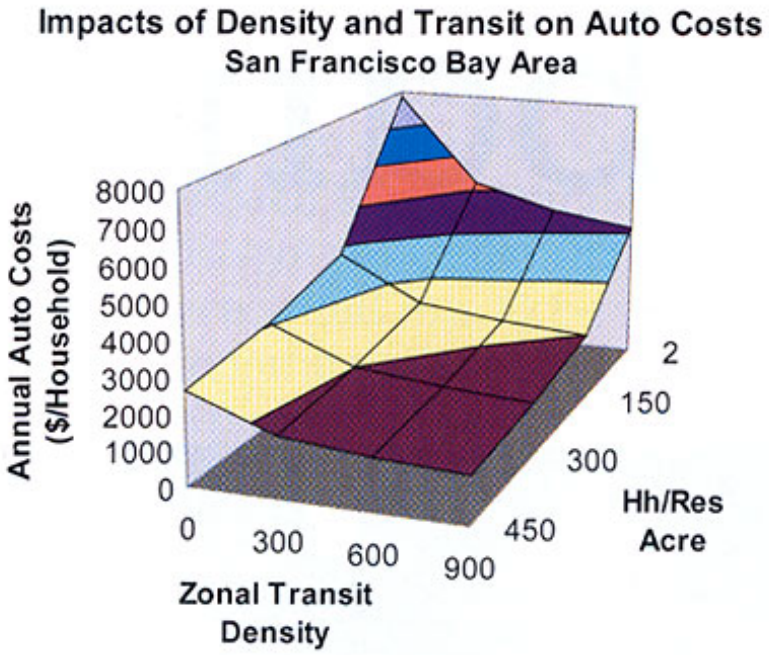


Figure 2. Annual Automobile Costs in Relation to Residential Densities and Transit Service Densities in the San Francisco Bay Area

3. The TOD-Parking Connection

One factor that unnecessarily inflates the cost of housing near transit stops are excessive, or at least inflexible, parking standards and zoning requirements. If there is any spot on the map where it makes sense to revamp parking standards, it is neighborhoods in and around transit stations. Many station-area residents buy into neighborhoods near rail stops for the very reason they want to shed one or more cars, thus freeing up money for other purposes, whether to buy a nicer house or travel more often to the Caribbean. At the Alma Place housing project in upscale Palo Alto, California, just two blocks from the Caltrain commuter rail station, peak-hour parking demand is just four-tenths of a parking space per unit, even though parking is free.[5] Nonetheless, lenders and local planners often insist upon two parking spaces per residential unit (since, in the former case, this is what their financial spreadsheets tell them is necessary, and in the latter case, this is what time-honored parking codes say are needed). In California's biggest cities, podium or tuck-under parking spaces can add $25,000 or more to the cost of a unit. Rigid parking standards can make transit-oriented living financially infeasible. Some developers, however, view the problem as not excessive parking minimums but rather insufficient parking caps. They complain that jurisdictions that are particularly sympathetic to TOD can impose maximum parking limits that fall below market demand. Getting lenders to invest in such projects is virtually impossible.

One way to get the parking ratios "right" is to replace regulatory codes with market prices. This can most easily be done by de-coupling, or unbundling, the price of housing from the price of parking spaces. Most ownership housing and apartments have parking included in the base price of a unit. Those who do not own or may not need a car must pay for a space anyway, needlessly driving up the cost of housing. Unbundling parking can thus promote affordable housing objectives while also creating a more walking friendly environment. Below-grade parking nearly sunk the Pentagon Row mixed-use TOD in Arlington, Virginia because of cost inflation; the project continues to struggle financially despite high occupancy levels. Arlington County planners learned their lesson, de-coupling parking and housing codes for the Market Common mixed-use project at the Clarendon Station. The project's site design was changed accordingly, making extensive use of surface and curbside parking and in so doing improving the project's "bottom line" (Figure 3).

The Mockingbird Station TOD in Dallas, Texas is representative of parking policies found at suburban TODs in the U.S. Located four miles north of downtown Dallas (a 15-minute train ride), Mockingbird Station is a mixed-use, urban "chic" village linked directly to a light rail station (after which it is named) via a welcoming pedestrian bridge. The Mockingbird project's parking facilities do not reflect the presence of transit, though not because of developer resistance. The project has 1400 parking spaces; two double bays of parking for 150 cars are in the center of the project, and the rest is structured or below ground. According to the project's developer, Ken Hughes, the surface parking is not enough to overwhelm pedestrians, but is sufficient (and desired) to activate the project by creating movement. Hughes estimates that he had to build $6 million worth of excess structured parking for the project. While the City gave the project a mixed-use

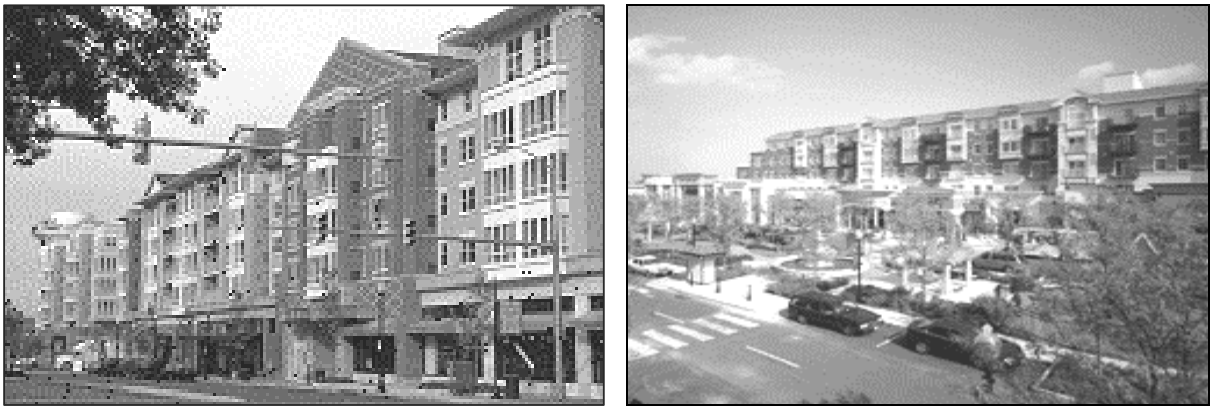


Figure 3. Contrasting Approaches to Parking Standards and Design for Transit-Oriented Housing in Arlington County, Virginia. Pentagon Row, left photo, relied heavily on below-surface podium parking, inflating construction costs. Market Common, right photo, put parking on the street, complemented by nice landscaping, to save costs, even though its building profile is similar.

parking reduction credit, it refused to reduce parking further to reflect transit's proximity. The developer estimates he may have only needed to provide 1300 spaces, though he acknowledges some tenants may have resisted the lower figure. Messing with parking standards could have been risky, given the fact there was no track record for such a development in greater Dallas.

Experiences even in U.S. cities regarded as leaders in the smart-growth movement, notably Portland, Oregon, underscore the risks faced in lowering parking standards in car-dominated societies. In the case of the Center Commons project near Portland's light rail station, minimal parking gave TOD a black eye. The project of 314 housing units five miles east of downtown Portland was parked at 0.6 spaces per unit. The tight ratios were justified in part by the high proportion of senior units in the project. Almost 30 percent of tenants, surveys show, own fewer cars now than they did at their previous residence. Still, parking often spills into the adjacent neighborhood. Residents complain there is not enough visitor parking. Also, all of the parking is above ground which, according to some residents, makes the development feel denser than it actually is.

TOD developers generally favor leaving the decision of how much parking to provide to the private sector. This was the prevalent view of 35 developers involved with TOD projects in large U.S. metro areas who were recently interviewed.[6] Developers feel that they know the market best and will take advantage of cost savings from curtailing parking supplies when justified.

4. TOD Infill: California Projections

California offers a glimpse into the promise that transit districts hold for targeting infill development, and particularly, affordable housing construction. During the next few decades, California is expected to grow at a rate of 4 to 5 million new residents every ten

years. If housing needs are to be met without irrevocably harming the state's ecosystems and natural resources, a good deal of it must occur within existing urban and suburban areas. However, unless housing becomes more affordable, new subdivisions will likely be built where land is cheapest – current-day agricultural lands and open spaces. The problem is exacerbated by the fact that California's faces a severe affordable housing crunch. Only one in five California households can today afford a typical single-family home. Infill development near transit nodes offers the best hope of heading off the threat of car-oriented sprawl and allowing affordable housing to be produced.

If infill housing makes sense anywhere, it is near a rail transit station, a bus line, or a ferry terminal. A recent study estimated that California has approximately 8,000 acres of potential infill land within one-third mile (an acceptable walking distance) of its 300-plus rail transit stations or ferry terminals (Figure 4).[7] Another 25,600 potential infill acres, or 12 percent of the state's potential infill inventory, is within one-quarter mile of a high-frequency bus line (defined as 10 minutes headway frequencies).

Based on an assumed average unit size of 1,500 square feet, Figure 5 indicates that statewide, 550,000 additional infill units could be accommodated on potential infill sites within one-third mile of existing rail stations. Altogether, rail transit-accessible infill accounts for 14 percent of California's total infill housing potential. The ability of rail-accessible sites to accommodate infill housing is not due to their great number or size. Rather, it is because so many potential infill sites are located in higher density neighborhoods. Thus, the "density-bump" associated with proximity to rail transit serves to only further increase their density potential. In the case of San Francisco, fully 64% of the city's potential infill housing units are located within one-third mile of a BART or Muni Metro station. This lofty figure reflects San Francisco's compactness and Muni Metro's extensive coverage.

Figure 4. Infill Housing Potential Infill by Transit Type and Service Quality for Selected California Counties

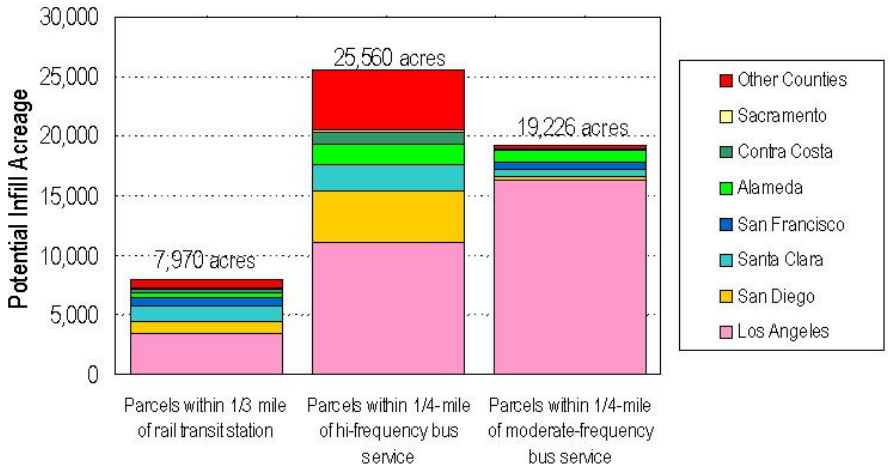
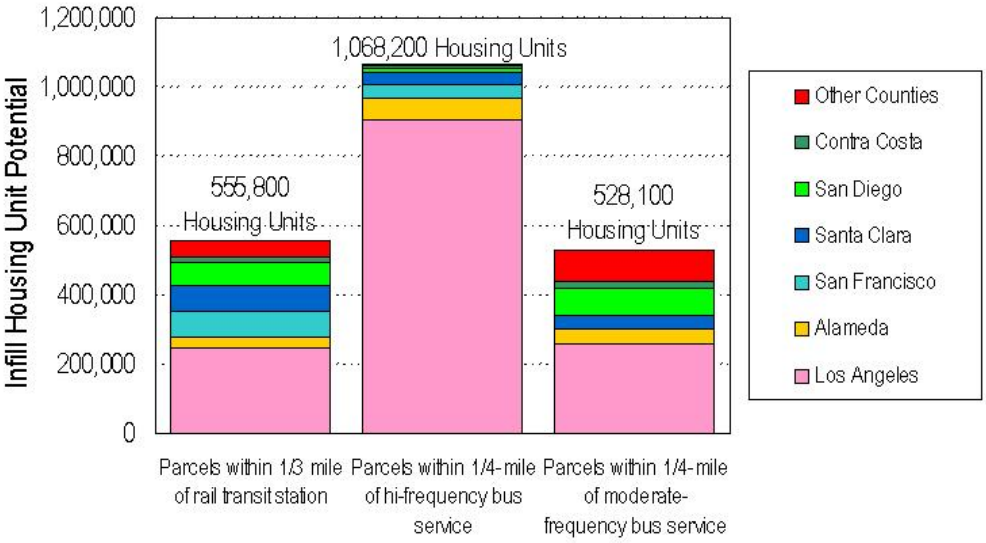


Figure 5. Potential Infill Acreage by Transit Type and Service Quality for Selected California Counties



Though less glamorous, bus corridors also provide high-dividend settings for targeting housing construction. There are more than 25,600 acres of potential infill land throughout California that are within a quarter-mile's distance of a bus line offering high-frequency service. Altogether, these sites could potentially accommodate nearly 1.1 million infill housing units. Most of this total is in one county—Los Angeles. The Los Angeles County Metropolitan Transportation Authority emerged as a national leader in advancing high-frequency bus service, including Bus Rapid Transit (BRT); nearly a million potential infill housing units—almost half of all potential infill units in Los Angeles County—could be constructed on potential infill sites that are within a quarter mile of one of MTA's high-frequency bus lines.

5. The Odds of TODs: Unique Barriers

As dense, mixed-use forms of development, many of the barriers to TOD are generic to all forms of compact growth – NIMBY resistance, higher risks and costs, institutional inertia, and so on. Still, some of the barriers to smart growth are more pronounced when it comes to TOD. 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 on-site parking. Many transit officials side with the needs of car-using patrons versus the preferences of TOD tenants and pedestrians, invoking one-to-one replacement policies to insure parking is in ample supply.

Mixed land uses, a characteristic trait of TODs, pose a host of difficulties not only in terms of design but also in lining up funding, investors, and contractors. 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 much trickier to design, finance, and sometimes lease than single-use ones. Finding the right formula for mixed land uses can be every bit as difficult as rationalizing parking policies. Vertical mixing is particularly problematic. Quite often, the ground-level retail component of mixed-use TODs suffer the most, in part because they are poorly laid out. Ground-floor retail, for example, is doomed to fail unless it opens onto a street with busy foot traffic and convenient car access. Mixed housing-retail projects also pose unique design challenges. Ground-floor retail needs greater floor-to-floor height (typically 15 to 18 feet) to be marketable, compared with the 8 to 10 feet between residential floors. This means the entire ground floor, including multifamily areas, must have higher ceilings, which increases project costs. Ground-floor restaurants pose problems such as where to put the exhaust shafts for kitchens. The exact size and location of restaurant space may not be known until leases are signed. Designers must thus allow exhaust shafts to be put in several potential locations, which can reduce net leasable space. And ground-floor restaurants might be unappealing to upper-level residences seeking quiet and privacy in the evening. Local governments need to be sensitive to these issues and focus more on achieving a desired land-use mix within a transit station area as opposed to individual parcels – i.e., pursue "horizontal" neighborhood-scale mixes versus "vertical" within-building mixes.

5. The Mobility Benefits of TOD

If there is any single aspect 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 (as opposed to making new trips or switching from bus to rail).

I recently collaborated on a study that recently measured the ridership bonus of transit-oriented housing in California. For 26 residential projects within ½ mile of a California rail station that were studied, the mean share of commute trips by transit was 27%.[8] 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. Ridership rates varied dramatically by circumstances. 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 privileges at the workplace 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 was available, the probability shot up to 90% (Figure 6).

Ridership gains tied to transit-based housing 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.

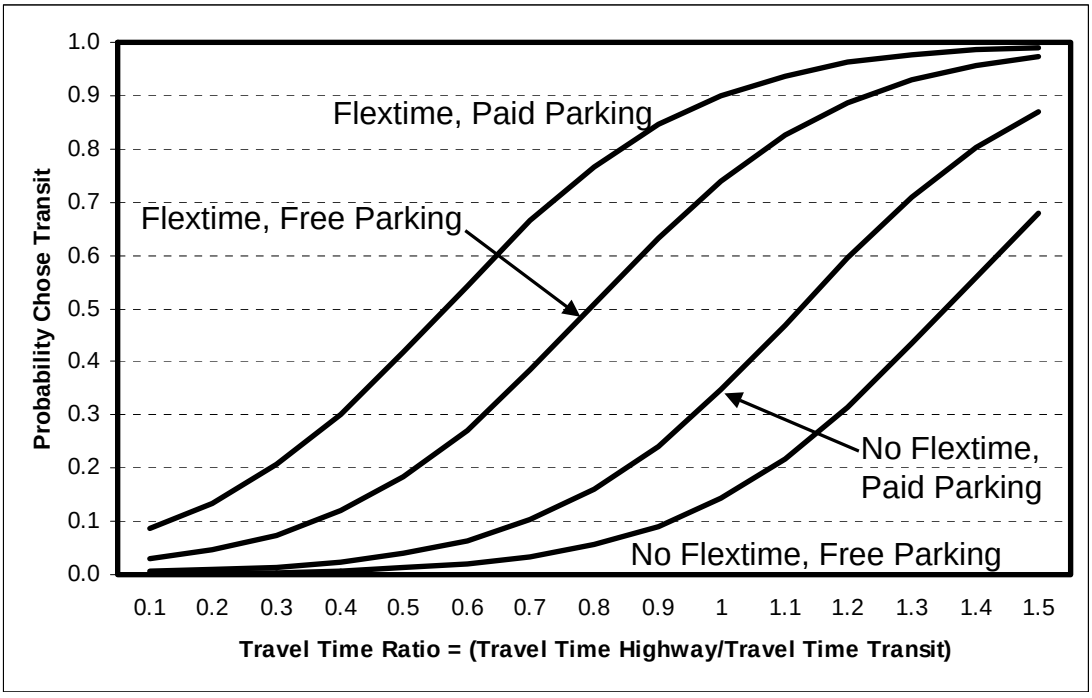


Figure 6. Sensitivity of Rail Commuting to Parking Prices, Availability of Flextime Work Schedules, and Travel Time Ratios via Highway versus Transit, Based on Model for Predicting the Likelihood of California Station-Area Residents Commuting by Rail Transit in 2003.

Residential Self-Selection and Ridership

A recent study I conducted explicitly examined residential self-selection as a primary determinant of ridership rates among TOD residents.[9] 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 7, 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. 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-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 come from those with relatively few – i.e., under two – cars in the household. This lends credence to the flexing of parking standards for housing near rail stations

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

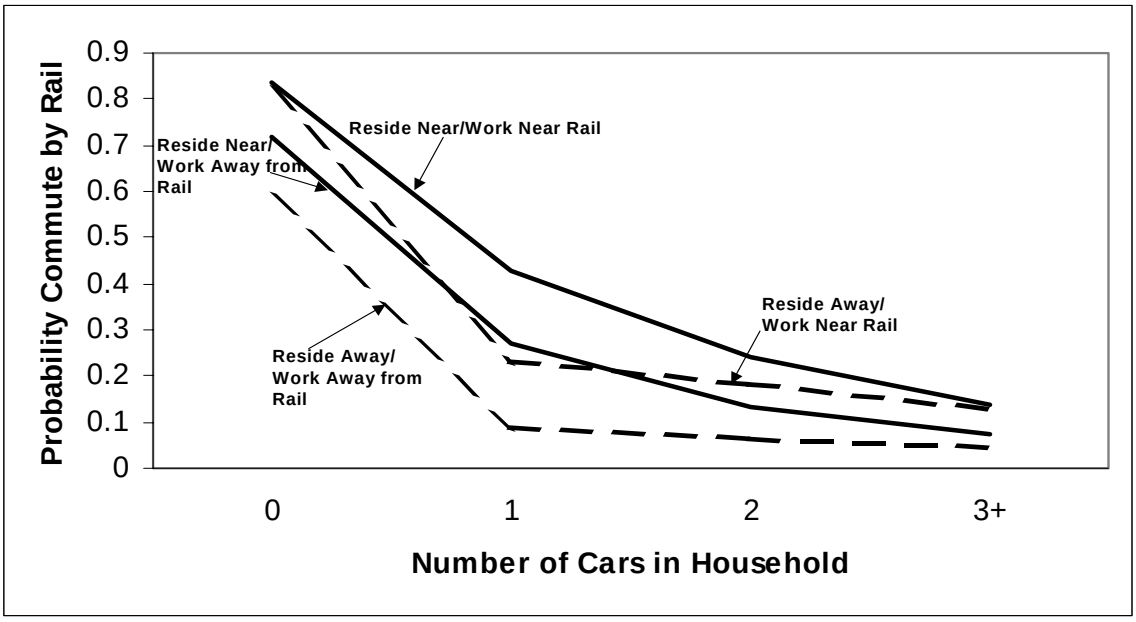


Figure 7. Sensitivity Plots of Rail-Commute Probabilities by Number of Cars in Household for Those Living and Working Near and Away from Stations. Reside Near = ½ mile or less; Work Near = ½ mile or less.

due to NIMBY resistance, exclusionary zoning, imperfect information, or negative externalities. Accordingly, findings of self-selection underscore 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.

Office/Mixed-Use TODs and Ridership

Research suggests that TOD workplaces also yield ridership dividends, though not because of self-selection but rather proximity and convenience. Parking policies and designs are particularly important determinants of whether those working in TODs ride transit or not.

A recent survey of 877 workers in 10 office buildings near suburban rail stations in California found, on average, 19 percent of commute trips were by public transit, with considerable variation.[10] 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 8, 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 transit costs). Clearly, successful TODs are far more than physical design challenges: the policy "software" that accompanies the built-design "hardware" matters tremendously.

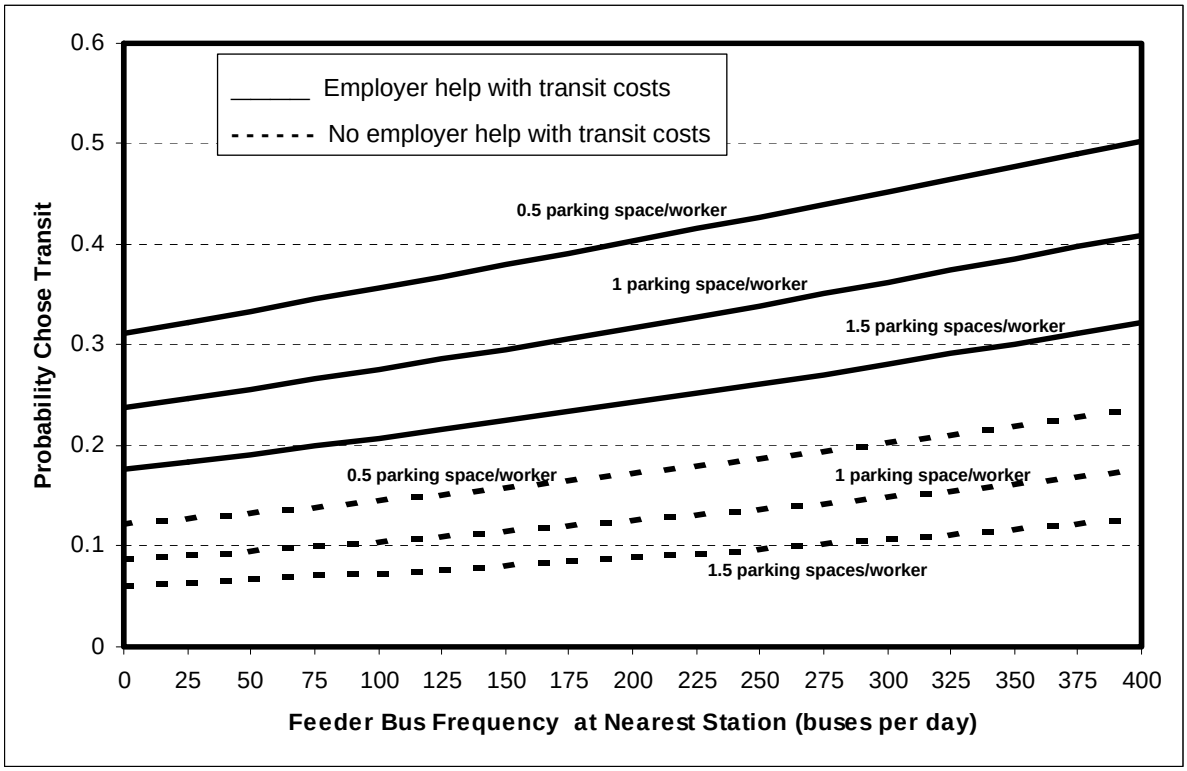


Figure 8. Sensitivity Test: Influences of Employer Parking and Transit Cost Policies and Feeder Bus Frequencies on Probability of Transit Commuting Among Office Workers

For ridership benefits to accrue from TOD, it is essential that both origins and destinations – i.e., housing as well as workplaces, shops, and other venues – be aligned along transit corridors. Mixed-use TODs can produce temporal benefits. Offices and residences, for example, produce trips during peak hours when trains and buses are often full. Other uses, 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.

5. TOD and Land Market Impacts

Another way to gauge the benefits of TOD is to examine impacts on the value of affected properties. To the degree that housing and commercial uses near rail stops reap accessibility benefits, these projects should sell for substantially more on the open marketplace. This, however, can work against the goal of affordable housing. Public policies, however, are available to redress unintended consequences – namely gentrification and displacement of working class households.

The weight of evidence in areas experiencing healthy rates of growth is 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. 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. Most tenants are 30- to 45-year-old professionals who can afford to own but prefer to rent. Six top-floor penthouses at the Mockingbird project rent for up to $4600 per month. In Englewood, Colorado, apartments rented at CityCenter – a transit-oriented village with civic uses, a cultural and performance center, and retail – were twice as expensive as comparable units elsewhere in the city.

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.

Preconditions for Premiums

Experiences 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 values[12], though this generally corresponded to a recessionary period; by the system's tenth anniversary, when the real-estate market had revved up, traffic congestion had markedly worsened, station area densities had been up-zoned, and the system's track mileage had doubled, land-value benefits were appreciable. I recently 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.[13] This study found that in 1999 substantial benefits accrued to residential parcels within a quarter-mile distance of a light rail station. Large apartments near 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).[14] 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.

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

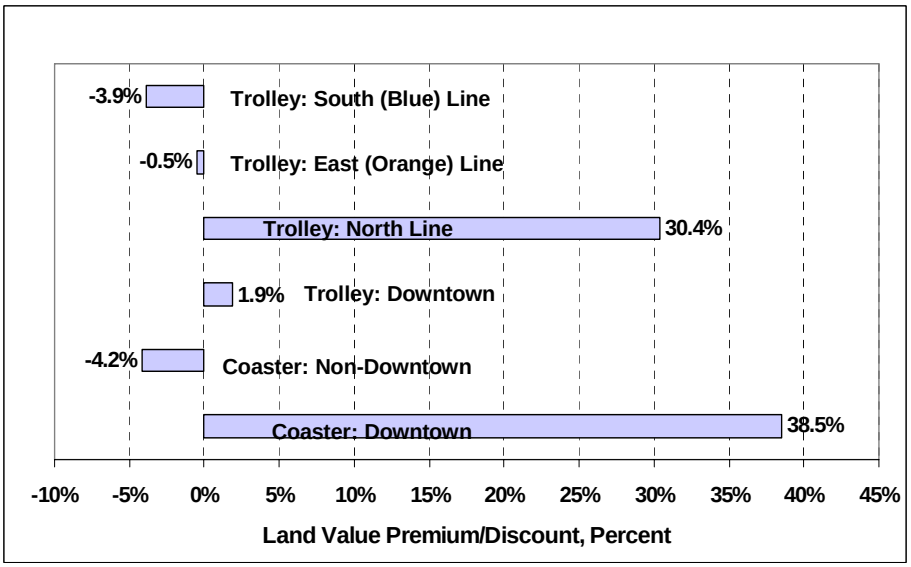


Figure 10. Commercial Land-Value Premiums or Discounts in San Diego County, by Rail Line

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 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.[15] Since 1995, these figures have trended steadily upward.

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. Proceeds can also go to redress maldistributive effects – such as tax abatements for the construction of below-market-rate units near transit, as has been done in Portland, Oregon. While recapturing value in practice is difficult, Los Angeles's transit authority 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 in the Washington metropolitan area, 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. In Hong Kong, te only place in the developed world where public transit nets a profit, air-rights leases generate around 7 percent of the city's transit revenue in-take.

6. Revitalizing Suburban Towns with Commuter Rail

In 1964, William Alonso advanced the "trade-off" theory to explain residential settlement patterns in industrialized societies. Middle-class households, Alonso theorized, tended to substitute lower-cost suburban living for higher-cost transportation. Accordingly, residential land prices taper with distance from urban centers matched by rising commuting cost curves.[16]

Due to major rail enhancements and an affordable housing crunch, Alonso's trade-off model is "alive and well" along the New York-Northeast New Jersey axis of the United States. New York's position as the pre-eminent center on the urban hierarchy has held its own over the past several decades; as a command-and-control post in the global economy and an international center of culture, arts, and entertainment, the city's, and particularly Manhattan's, economic future remains bright. This is reflected in high residential rents. Today, a two-bedroom, 1200-square-foot, unfurnished apartment in the average price range in midtown Manhattan goes for around $3200 per month. Manhattan workers pay

a high premium in return for minimal commuting costs (both monetarily and in time investments). Alternatively, one can live across the Hudson River in a waterfront apartment in Hoboken, New Jersey and pay under $2000 for the same unit. Ferry-oriented housing projects, such as Port Imperial, just north of Hoboken, have been built in the past few years on former industrial brownfields to serve this very market – namely, New York City workers who would prefer to pay less for housing (or get more for their money) and are willing to take a 10-minute ferry ride to and from Manhattan each workday (Figure 11). Go out farther to townships like South Orange, Rahway, and Rutherford – all within a 30-minute rail commute of Penn Station in Midtown Manhattan – and one finds even better housing bargains. In neighborhoods surrounding recently refurbished traditional train stations in these places, the residential rent gradient falls to a typical range of $800 to $1200 per month for similar housing. Thus, within a half-hour commuteshed of midtown Manhattan, one finds a fairly differentiated housing-transportation marketplace, enabling households to trade-off housing and commuting costs according to lifestyle preferences. With the help of good planning practice and supportive public policies, these unfolding market dynamics have given rise to rail- and ferry-oriented developments in a diversity of settings.

Evidence on the pent-up market demand for highly accessible housing near commuter-rail nodes is underscored by Morristown, New Jersey. There, a development of 10 new town houses costing close to $1 million each sold out within a week of being listed."[17] With state funding assistance, the city of Morristown has "adaptively reused" a 300-space surface parking lot. Situated next to the train station, the lot was converted to 228 rental apartments, 8000 square feet of retail space, and a three-level parking deck for 700 cars. Of the 700 total, 274 parking spaces went to apartment units, coming in at 1.2 spaces per unit.

In a recent interview in On Common Ground, a publication of the National Association of Realtors, a Morristown agent recently quipped about the seemingly insatiable demand for living in small rail-served New Jersey towns like Morristown:

> "One of my clients absolutely would not sign a contract with me until he took a ride into Penn Station…I told him, 'Don't worry, it's 51 minutes'…'It better be,' he said. 'If it's 52 minutes, I'm not going to buy it.' It turns out the buyer was only kidding. He said, 'It was 72 minutes, but there was a delay along the way. Where do I sign the contract?'[18]

7. The Challenges of TOD Implementation in the U.S.

Moving from the theory to the practice of TOD can be fraught with difficulties, especially in car-dependent America. The strongest tool at the disposal of local governments in the U.S. to shape and control TODs is zoning, usually in the form of overlays. Most overlay zones are introduced on an interim basis to head-off auto-oriented uses that might compromise a TOD and specify desired land uses as-of-right, such as

Figure 11. Ferry-Oriented Housing Development on former industrial sites in Hoboken. With rents that are half or less of what tenants pay in Midtown Manhattan, stunning vistas, and a 10-minute ferry ride to the city, Hoboken's apartment/condo market is red hot.

Port Imperial. As viewed from a ferry shuttle, the master-planned, mixed-use project—with a range of housing products targeted to a professional clientele—enjoys nearly one mile of Hudson River frontage.

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.

Besides zoning, other tools frequently used in the U.S. to leverage TOD include: funding for station-area planning and ancillary capital improvements; density bonuses, sometimes used to encourage affordable housing; and relaxation of parking standards.[19] These measures, moreover, received high marks in terms of their overall effectiveness among transit professionals who responded to a national survey on TOD in America (see Figure 11 which breaks 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.

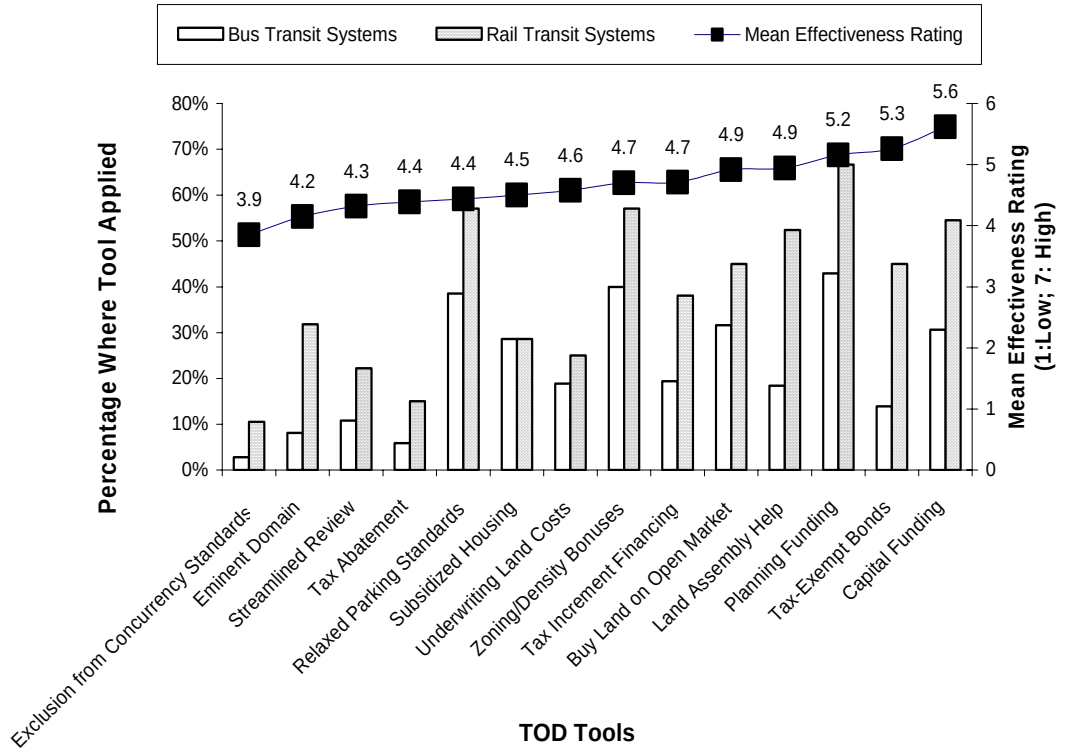


Figure 12. Transit Agencies' Experience with and Perceived Effectiveness of TOD-Supportive Policy and Planning Tools

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 TOD developers from across the U.S. revealed that tools that 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.

The remainder of this section focuses on U.S. experiences with specific implementation tools. Strategies involving both government-initiated incentives and market-based measures are discussed.

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Targeted Infrastructure Investment and Supportive Planning

One means of leveraging transit-based housing is to target public infrastructure investment in rail-served corridors. This was the model used by Arlington County, Virginia over the past few years. Through an ambitious planning campaign that targeted supportive improvements, like road, sewer, and water trunkline expansion as well as public amenities like landscaping and improved street lighting, to rail stops, 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 1980, Arlington County's two major rail corridors – Rosslyn-Ballston and Jefferson Davis – have witnessed the addition of some 24,000 mixed-income dwelling units and over 6300 hotel rooms as well as office and retail space.[20]: Of the nearly 190,000 people today living in Arlington County, 26 percent reside in Metrorail corridors even though these corridors 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. Moreover, in order to reduce the displacement effects of higher rents near rail stations, the County grants density bonuses of up to 20 percent for projects that include an affordable housing component. Even higher bonuses are possible when housing is combined with retail and office space.

Adaptive Re-Use

Another strategy used with success to leverage housing production near rail stops has been the adaptive re-use of former industrial buildings and other types of urban spaces. Near the Cedars Station on the south line of Dallas's light-rail system lies Southside on Lamar, the primary catalyst behind the area's urban renewal. Southside is a ten-story, mixed-use "live and work" center that reused an abandoned Sears Roebuck & Co. Catalogue Merchandise Center built in 1913. With over 1.4 million square feet, the project includes 455 lofts, retail space (e.g., coffee shop, small grocery, drycleaner), offices, and live-performance space. Over 90 percent of the loft units are occupied, primarily by young professional couples and empty nesters attracted to the district's arts focus. Around half of the commercial space is presently leased.

Another form of adaptive re-use has been the construction of housing atop former asphalt parking around rail stations. This was done at the Ohlone-Chynoweth light rail station in San Jose, California. The original Ohlone Chynoweth light rail station, located south of downtown San Jose, had an over-supply of parking: only 25 percent of spaces were utilized on a typical workday. The city's transit agency released a Request for Proposals to build on part of the parking lot. Tepid developer interest prompted a change of focus to constructing affordable units on the site, and a not-for-profit developer, Eden Housing, was selected as master developer of the site. Initially, there was considerable community opposition to this project because of the proposed concentration of affordable housing in the area. Numerous advocacy groups, representing environmental interests on one

extreme and high-tech industry interests on the other, supported the link between affordable housing and transit. With such a breadth of support for TOD, NIMBY resistance was quelled.

Given a 75-year ground lease from VTA with annual payment of $250,000 (subject to increases in AMI), Eden Housing constructed 195 affordable housing units, a retail center, community center, and childcare facility on the former surface park-and-ride lot. The project's residential density comes in at 27 units per acre and just under two parking spaces per dwelling unit. All of the housing units were rented before construction was completed.

Central-City Redevelopment Around Streetcar Lines

Portland is known internationally as America's most progressive city in integrating transportation and land-use. While considerable attention has gone to Portland's use of light-rail investments to shape new development on suburban greenfields, in the past few years, the focus has shifted to upgrading and adaptively developing in-city housing along corridors served by a refurbished and expanded downtown streetcar system. Portland has taken a chapter from other global cities, notably Melbourne (Australia), Zurich (Switzerland), and Munich (Germany), in leveraging housing production along central-city streetcar and tramway lines.

The Pearl District is the most dramatic transformation of downtown Portland in the last 20 years. Once home to a large artist community and an "incubator" for start-up businesses in abandoned warehouses, the Pearl District is now an emerging mixed-use neighborhood of upscale loft housing, parks, art galleries, boutiques, cafes, and restaurants. Since 2001, 1600 condominiums and apartments have been built.

A major catalyst to the transformation of the Pearl District was the construction of the Portland Streetcar, the first modern streetcar system to be built in the United States. The streetcar has been equal parts housing and transportation tool, as streetcar construction was explicitly linked to high-density development via an innovative developer agreement. As a result of this agreement, the average density of the District is now 120 housing units per acre, the highest in the city. Tax incentives were introduced to moderate possible gentrification effects. Many affordable housing projects in Portland get 10-year property tax abatements. While the abatements are loosely related to projected price levels and affordability, their primary purpose is to ensure denser development (as specified in the developer agreement) than the market would otherwise support.

Residents in the Pearl District fit the demographic profile found in other Portland area TODs – childless, and either young people seeking smaller lofts, older professionals looking for an urban lifestyle with little upkeep ("downsizing boomers"), or retiring seniors. This variety of homeowner types has contributed to the depth of the market.

Creative Partnerships and Co-Financing

Targeting affordable housing production in distressed neighborhoods served by transit requires strong partnerships between the public and private sectors to spread risks and, if all works well, to share in the down-stream rewards. This was done in the case of the Fruitvale transit village project in Oakland, California. The uncertainties inherent in massively redeveloping a declining retail district from the 1950s required that costs be shared among many interests and stakeholders if the transit village idea was to move forward. In the end, more than 20 different sources were used to fund the $100 million mixed-use project. The project received considerable public-sector support, including a Federal Livable Communities grant and funds from the City of Oakland. A new zoning classification, a Transit Oriented District (TOD), was created specifically for the Fruitvale station area to encourage balanced, mixed-use development. The zoning district permits residential, commercial, and civic (such as childcare, education, and healthcare) activities and allows the highest residential densities in the city. Fruitvale also lies within Oakland's Empowerment Zone that provides potential tax benefits to new businesses locating there. Additionally, the city reduced the parking requirements for both residential and commercial uses in the Fruitvale District. Instead of requiring one space for every unit (the city's minimum standard), a special overlay zone was created that required one space for every two units. BART contributed land transfer and in-kind staff support. To supplement the public funding, organizations and businesses, including the Ford Foundation, Levi-Strauss Foundation, and PG&E Corporation, contributed $20 million dollars to the transformation of the Fruitvale neighborhood.

Since 2000, more than 300 housing units have been built on former surface parking area of the Fruitvale station, served by the Bay Area Rapid Transit (BART) heavy-rail system. The project's first phase contained 47 below-market-rate units. Also, over 100 businesses have received small-business loans and grants for façade improvements. While the jury is still out as to whether Fruitvale village will become a financially self-supporting district, the fact that nearly all housing units have been leased or sold and housing absorption rates are 40 percent above the city's average bodes well for the project's future.

Municipal and County Initiatives

In California, cities and counties have gotten into the act of promoting affordable transit-based housing. The City of Long Beach, for example, spearheaded an affordable housing lending program that provides loans to low- and moderate-income homebuyers to cover the down payment of home purchases. The loan is "silent" because it does not require repayment until the home is sold, allowing the homebuyer to qualify for a larger principle loan amount. This loan program helped the city justify the financial viability of projects to lenders by increasing the population of potential buyers.

Another strategy has been for higher levels of government, like counties, to reward municipalities that produce housing near transit stations. This has occurred in San Mateo County, California. Faced with housing shortfalls and increased traffic congestion, the County offered direct financial incentives to local governments that

demonstrated a commitment to transit-based housing. For projects within one-third mile of a transit station and with a density of at least 40 units per residential acre, a municipality receives up to $2000 per bedroom constructed. With money in hand, localities can prepare specific plans for station areas and fund various amenities, like pedestrian ways and civic spaces, that can help "spruce up" a neighborhood and leverage private investment. Money can also go to encourage affordable housing units.

Redevelopment

Redevelopment agencies also represent a potential source of funding for transit-based housing. Increasingly, they are being required by the state of California to contribute a portion of their special assessment revenues (such as Tax Increment Financing, or TIF, funds) to affordable housing projects. In the case of Los Angeles's Community Redevelopment Agency (CRA), the agency contributes 20 percent of its TIF funds to a citywide affordable housing trust fund account. The city then uses these funds to issue grants to non-profit housing developers to build below-market-rate housing. Until recently, these funds could be used anywhere in the city. To encourage transit-oriented housing TOD in the Hollywood/Highland area, the CRA increased its contribution to 25 percent and specified that TIF funds collected in Hollywood/Highlands be spent in close proximity to the rail stop.

This affordable housing contribution requirement has both positive and negative implications for TOD projects. On the positive side, placing residences in redevelopment areas that would have, under normal conditions, been built-out with high-revenue, high profit uses such as office and retail space, ensures that TODs are more balanced in character. The greater jobs/housing balance a development provides, the less residents will travel outside their neighborhood to shop and commute. Furthermore, TODs with permanent residents instill a sense of security by supplying an area with 24-hour "eyes on the street." Finally, residential uses provide commercial uses on-site with potential customers throughout the week, and not just the five days a week, nine hours a day that employment centers provide.

Market-Based Approaches

Market-based approaches toward leveraging transit-based housing are also being pursued. The "Location Efficient Mortgage" is currently being pilot-tested in Los Angeles and other metropolitan areas around the U.S. The idea is to acknowledge the lower cost of transportation inherent in living near transit stations which means households have more money available to purchase housing. This makes it easier for those living near transit stops to qualify for a home mortgage. To increase housing affordability and promote public transit use for homebuyers in the high-cost housing market of Los Angeles, Montage Development and American City Vista — two developers — as well as Fannie Mae (the federal home mortgage insure) and the MetroLink commuter-rail authority have developed an innovative housing-transportation partnership. American City Vista and Fannie Mae created the "LA Transit Mortgage," with flexible credit guidelines and a down payment requirement as low as 1 percent or $500 for buying a home at Montage at

Village Green. In addition, MetroLink provides each new homebuyer with up to two free MetroLink monthly passes as a further inducement.

8. TOD's Promising Future

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. Mixed-use TODs in such diverse settings as suburban Englewood, Colorado and the inner-city Oakland's Fruitvale district would have been unimaginable in the 1980s. 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 – even in car-dependent America.

In America, TOD resonates with the general public and often finds support across political and ideological lines. Nearly everyone understands if there is a logical place for targeting compact mixed-use growth, it is in and around transit stations. In America today, transit-oriented housing stands as one of the most promising mechanisms for promoting multiple urban policy objectives – affordable housing construction, sprawl containment, and reduced car-dependence. Bold new policies are beginning to surface across the U.S., ones that push conventional boundaries and acknowledge the unique market niches that are being served. These include market-based initiatives like Location Efficient Mortgages and unbundling of parking and housing costs as well as government incentives such as targeted infrastructure investments and the flexing of parking standards. Standard designs, cost *pro formas*, and building code templates need to be challenged for each and every transit-oriented project in large part because the TOD market is not "standard". Experiences show that new housing built near rail stops often appeals to singe 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. To the degree that market-responsive policies are introduced, shifting demographics and lifestyle preferences will reduce the need for government subsidies and regulatory interventions, save for those that aim to help the poor. Ultimately, the marketplace will drive station-area planning and designs, with policy interventions

focused mainly on making neighborhoods surrounding transit nodes better places to live, recreate, shop, and do business.

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