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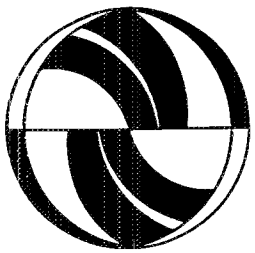

L.A. Story: A Reality Check for Transit-Based Housing

Marlon Boarnet
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Working Paper
UCTC No. 250

The University of California
Transportation Center

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L.A. Story: A Reality Check for Transit-Based Housing

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Working Paper
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Abstract
An increasingly influential planning strategy for leveraging rail transit is high-density residential development near rail stations, or 'Transit-Based Housing'. Proponents argue such projects will get more people onto trains, reduce developers' expenses, and lower commuting costs, housing prices, and air pollution in the bargain. While most of the literature has addressed the merit of such projects, this paper considers a separate question: Whatever virtues transit-based housing may have, what are its prospects?

We find that transit-based housing faces a much steeper uphill battle than the conventional wisdom suggests. Cities' parochial fiscal and economic interests appear to conflict with transit-based housing in several fundamental respects, a view strongly supported by a behavioral analysis of zoning data for all 232 existing and proposed Southern California rail transit stations. Municipalities behave as if they prefer to use rail transit stations for economic rather than residential development, suggesting that transit oriented planning strategies would profit from more attention to their local fiscal and economic benefits.

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I. Introduction

In the Steve Martin movie *L.A. Story*, highways and cars are so ubiquitous in Los Angeles that even personal advice is dispensed from freeway signs. This movie image plays off the popular perception of Los Angeles as the ultimate automobile city. Yet L.A. is also the home of what is possibly this nation's most ambitious rail transit construction program. Already there are 73 rail transit stations operating in the Los Angeles metropolitan area -- a far cry from the zero that existed before the Los Angeles-Long Beach Blue Line opened in 1990. Southern California all together has 108 rail transit stations, with 124 more in various stages of construction or planning, compared to only 34 operating stations in the more extensively studied San Francisco area BART system.

This activity reflects a rebirth in urban rail transit nationwide. Recently, many scholars and planners have begun to ask how land-use policies can best leverage the new urban rail investments. That discussion has led to the concept of transit-based housing -- relatively dense residential areas tied to rail transit the way most urban (and especially suburban) developments are tied to the automobile. In addition to getting more people onto trains, proponents often argue these projects, perhaps in the form of 'transit villages', will reduce developers' expenses and lower commuting costs, housing prices, and air pollution in the bargain (Calthorpe, 1993; Cervero, 1995; Knack, 1995).

The literature has mainly confined itself to discussing the merit of these claims. This paper considers a separate question: Whatever its virtues, what are the prospects for transit-oriented housing? Our approach analyzes the behavior of an all but ignored yet pivotal group of decision makers -- local city planners -- and the conclusion is skeptical. We argue that cities' parochial fiscal and economic interests conflict with transit-based housing in several fundamental respects, a view strongly supported by zoning data for all existing and proposed stations in Southern California. Municipalities behave as if they prefer to use rail transit stations for economic rather than residential development.

This study suggests that transit-based housing, regardless of its ridership impacts, faces more of an uphill battle than previously believed. It also underscores the importance of accounting for local goals and incentives in any attempt to leverage rail transit investments via coordinated land use policies. While housing in station areas certainly has a future in some cases, the lesson from Southern California seems to be that a focus on employment and revenue generation is necessary for transit oriented projects to gain wide acceptance by local officials.

II. Background: Transit Oriented Development and Transit-Based Housing

In the broadest sense, transit oriented development (TOD) is the idea that land near rail transit stations should be developed or redeveloped in ways that encourage the best use of the transit system and that leverage the public investment in rail transit. A variety of strategies have been proposed, including increasing residential densities near urban rail stations (Bernick and Hall, 1990; Bernick 1993; Bernick, Hall, and Shaevitz, 1992), using rail stations as a focus for office development (Cervero, 1994a, 1994b), encouraging public-private development of station-area land with the goal of capturing part of any land value increases created by the rail line (Cervero, 1994b; Cervero, Hall, and Landis, 1992; Landis, Cervero, and Hall, 1991), and building pedestrian-oriented neighborhoods near rail transit stations (Calthorpe, 1993; Cervero, 1993). With the exception of public-private joint development, which is really a rail transit financing scheme, most of the TOD ideas include a prominent role for increased residential development near urban rail transit stations.[1] The perceived benefits of transit-based housing are largely twofold.

First, there is evidence that residents within convenient walking distance of rail transit stations are more likely to commute to work by rail.[2] In some San Francisco Bay Area transit-

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[1] For other studies evaluating transit-based housing ideas, see, e.g., Beimborn, et. al. (1991), Bernick and Hall (1990, 1992), Bernick and Carroll (1991), Bernick and Munkres (1992), Cervero (1994c, 1995), and Glick (1992).

[2] Walking distance is most commonly defined as being within one-quarter mile of a station, although other distances are also used. See, e.g., Bernick and Carroll (1991), who studied eleven projects built within a quarter-mile of San Francisco Bay Area rail transit stations, Bernick and Hall (1992), who discuss the same eleven projects, Cervero (1994c), who surveyed residents in housing developments near rail transit stations,

based housing developments, residents were as much as five times more likely to commute by rail than the average (or typical) person in the surrounding county (Cervero, 1994c).[3] Second, transit-based housing has been offered as one part of a larger set of neotraditional design policies that promote pedestrian-oriented urban neighborhoods. These policies, which also include grid street networks, mixed use development, and pedestrian-friendly environments, are intended to encourage more walking trips and fewer auto trips (Calthorpe, 1992; Duany and Plater-Zyberk, 1991). Putting a pedestrian-oriented, neotraditional neighborhood near a rail transit station is, to some advocates, the *coup de grace* that will encourage persons to walk to the train rather than drive to their destination.

Questions have been raised about TOD, however, ranging from those who doubt the viability of rail transit generally (e.g., Pickrell, 1992) to others who note that the perceived transportation benefits of neotraditional design are largely unproven (e.g., Crane, 1995). While it is true that persons living near rail stations commute more by transit, for example, it does not follow that building more transit-based housing will increase rail ridership proportionately. Indeed, Cervero (1994c) found that 42.5% of rail commuters now living in transit-based housing and commuting by rail also commuted by public transit *before* they moved to their current residence. Second, both residence and work locations seem to influence rail transit commuting, as suggested by the fact that transit-proximate residents are more likely to commute by rail if their job is near a station (Cervero,1994c). Thus transit-based housing, by itself, might not be sufficient to encourage increases in ridership. Providing more residential development near rail stations could give current rail patrons more convenient places to live, but it is less clear that such development will lead to significant system-wide ridership increases.

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with the majority of the developments being within a quarter-mile of a rail transit station, and related work on pedestrian access by Untermann (1984).

[3] When calculating mode splits for station-area residents, Cervero (1994c) found that, for many of the housing sites surveyed, residents were two to five times more likely to use rail than the average for persons in the surrounding county. This is consistent with earlier survey research, reported in Bernick and Carroll (1991, pp. 31-37, 40), which found that 37.5% of residents in East San Francisco Bay transit-based housing commuted to work using BART. The overall BART mode split for the entire East Bay is 8%.

Despite these questions, transit-based housing has caught the fancy of many transportation planners. Policy responses include the approval of TOD guidelines in San Diego (1992) and Los Angeles (1993) among other major cities, as well as the recently enacted California *Transit Village Development Planning Act* (Knack, 1995). The *Act* authorizes municipalities to establish transit village development districts within one-quarter mile of a rail station boundary, and encourages those districts to facilitate the construction of residential projects within that area, including (but not limited to) low and moderate income housing. However, we believe this legislation will have little impact in the absence of a more forceful argument that TOD has positive fiscal and economic development impacts. Enabling cities to build transit-based housing works fine as long as cities want to build such housing. The research presented below suggests that in many instances, they do not. While some observers have noted anecdotally that fiscal and other regulatory obstacles to transit-based housing may exist in some instances (Cervero, Bernick, and Gilbert 1994; Deakin, Bernick, and Chang 1992), this paper is the first to systematically document their importance.

III. What Do Cities Want, Anyway?

We suggest three reasons to doubt whether municipalities, if left to their own devices, would aggressively pursue transit-based housing. The first is financial, based on the increasingly tough economic competition between cities within and across metropolitan areas. The second is historical; transit-based housing advocates, at least in the Los Angeles area, often ignore the economic and political forces that led to the demise of the previous rail transit system. Yet those same economic and political forces are alive and well today, and might cause localities to shy away from transit-based housing. The third is an example of what happened when several suburban city governments had a chance to provide the initial impetus for an urban rail plan. The choices those municipal governments made regarding station sites provide instructive lessons for advocates of transit-based housing.

Economics

The relative neglect of fiscal and economic considerations in the TOD literature is surprising in light of the often explicit links between local planning and communities' economic and fiscal goals. Planners have long recognized that urban and suburban municipalities tend to compete for both employment share and tax base. The term "fiscal zoning" has even been coined to describe zoning behavior that is specifically aimed at boosting a city's revenue position, and the use of fiscal impact analysis to evaluate the merits of one land use over another is now widespread (Wheaton, 1959; Burchell and Listokin, 1980).

Property generates property tax revenue, traditionally the primary source of local government revenue. In addition, municipalities typically recover a portion of all sales tax revenues generated within their borders and levy other miscellaneous taxes and fees. At the same time, different land uses place different levels of demand on public services. Most impact studies have shown that residential development brings expenditure burdens that are neither offset by the associated property and sales tax revenue, nor by the often substantial impact fees and exactions levied on new development (Altshuler and Gómez-Ibáñez, 1993).

Commercial and industrial land uses thus tend to generate a fiscal surplus and residential land a deficit. In California, this tradeoff was made more striking by the late 1970s property tax limitation Proposition 13, which effectively took property tax rates out of local hands and much reduced their importance as both a revenue source and policy instrument. From a fiscal perspective, California cities benefit considerably from an increase in local taxable sales in place of residential development, and it is likely they will lean strongly toward retail development, where an especially large number of taxable transactions will occur, whenever that option does not clash with other community goals.

What seems less likely is that land near rail stations would be zoned for residential development for economic reasons. Some evidence in support of this conclusion comes from a recent study of California light rail lines. While recognizing that a fiscal differential between

residential and commercial development near LRT stations might exist, Bernick (1990) also suggested it would not offset the other merits of transit-based housing. Yet those cost differentials, on the order of hundreds of thousands of dollars at a given site, are easily large enough to encourage fiscally strapped municipalities to zone land near LRT stations for commercial rather than residential or mixed use development.

The advantages of economic development near transit stations also go beyond simple fiscal concerns. Most localities, including those in suburban locations, are increasingly concerned with boosting their employment base. Since rail transit stations are often a logical place to concentrate development, municipalities might easily view rail transit as a way to increase local employment growth. Stated in simple terms, localities might perceive a choice between using rail stations as a way to get their residents out of the city to work elsewhere (which suggests transit-based housing), or a way to get other residents into their city to work (which suggests transit-based employment). Municipalities will likely prefer that the few rail stations within their borders become employment nodes, and decide to leave the residential nodes to other localities. This also suggests a tension toward commercial and office zoning near rail transit stations.

Both the fiscal and the broader economic development arguments suggest that municipalities will prefer commercial and office development near stations over transit-based housing. Yet can the economic development concerns of a large number of often small municipalities really have an impact on the decisions surrounding major transportation systems? History shows that the answer is 'yes'.

History

In the years between World War I and World War II, Los Angeles' renowned urban rail system lost patronage to the automobile and began to fall into disrepair. After World War II, Los Angeles was at a crossroads, having to decide what to do with its urban rail while embarking on an ambitious freeway building program. As Adler (1991) has documented, the answer was to some

extent pre-ordained by the perceived advantages of auto travel. Rail transit was probably destined to lose its dominant role, and in the post-World War II years the question was what, if any, rail service would be preserved in the West's largest metropolis. The answer, it turned out, was none.

Despite the popularity of blaming coalitions of oil companies and automobile manufacturers, Adler (1991) shows that the demise of the Pacific Electric Railway (and likewise the other rail lines in Los Angeles) is best credited to the workings of political coalitions that favored freeways over rail. For many suburban municipalities, the advantage of a highway network was that it supported economic development within their community. Rail, with its hub-and-spoke orientation, was perceived to favor the economic development of downtown Los Angeles. While concentrating business and commercial activity in the central core was attractive to the downtown business community, it was anathema to the developing economic centers in places such as Santa Monica, the San Fernando Valley, the San Gabriel Valley, and Long Beach.

In the end, highways drew support from a broad coalition of suburban municipalities and downtown business interests (Adler, 1991). Most major political actors viewed freeways as supporting economic development in their communities, while rail was perceived as only supporting growth in the downtown. It was almost as if local governments voted in their own economic development interests, and more municipalities perceived freeways as benefitting their local economy. The politics of local economic development helped shaped a transportation system, and in the process led Los Angeles from rail to freeways. Given this history, and the fact that political battles over transportation often are influenced by the spatial pattern of economic benefits, it is reasonable to expect that the current generation of rail transit systems in Los Angeles and other regions will be subjected to the same political pressures.

A Suburban Example

Forty years after the decisions that led to the demise of the Pacific Electric, the Los Angeles metropolitan area began to reconstruct the rail transit system that they no longer had. While

most of the activity was focused in Los Angeles (and, even earlier, in San Diego), other areas within the metropolis also pursued rail transit plans. Orange County, a densely developed residential and employment center to the south of Los Angeles, began to seriously consider an urban rail system in the early 1990s.

The original Orange County plan was developed not by county government, but by a coalition of cities (COCFGP, 1990). Those cities, Anaheim, Costa Mesa, Irvine, Orange, and Santa Ana, all are of comparable size and political influence within the county. The cities are also located along a north-south line in the central part of the county which contains the county's most dense development.

The document produced by the coalition of cities suggested using an elevated fixed guideway technology (e.g. a monorail). The elevated guideway greatly reduced right-of-way acquisition costs, making right-of-way a less important issue in siting a rail line and rail stations.[4] Having been freed from some of the most difficult siting constraints, Orange County was not tied to building rail transit on historical routes or on current freight lines. Given that, it is telling that the cities in Orange County chose to use their rail system to connect employment centers, rather than residential centers.[5]

Many of the coalition cities perceived urban rail as a potential catalyst for local economic development. While the cities might have given some thought to residential development near stations, the early planning documents, and the proposed station locations, give no evidence that residential development was an important consideration in rail station siting (COCFGP, 1990;

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[4] Many Southern California rail lines use existing right-of-way. In Orange County, the right-of-way that could most easily be converted to urban rail was the old Pacific Electric right-of-way that extends from Watts in southeast Los Angeles to Santa Ana. Earlier rail studies had concluded that such a route did not serve the county's growing employment and population centers, and that right-of-way, which was owned by the Orange County Transportation Commission (OCTC) at the time, was never seriously considered in the latest round of rail transit planning (OCTC, 1980).

[5] The station sites used in this study are the ones suggested in OCTA (1991), the most recent planning document to give station locations. Currently, the OCTA is conducting an alternatives analysis that focuses on a mile-wide planning corridor centered around the preferred alignment developed in COCFGP (1990) and OCTA (1991).

OCTA, 1991). Rail would be a tool for local economic development, and stations were proposed for the County's largest commercial and employment centers, with at best secondary consideration given to siting stations near residential development. This is reflected both by the language of the early planning documents, and by the evidence presented below.[6]

IV. Evidence from Southern California

Orange County is certainly unique in many respects. Yet our comprehensive study of all rail transit stations in Southern California suggests that Orange County's behavior toward rail stations is actually typical of the larger region as well. Orange County is merely the clearest example of a tension toward commercial development near transit stations that exists throughout the Los Angeles and San Diego metropolitan areas.

Most aspects of the TOD argument have received some study. Ridership impacts are the focus of Cervero (1994c) and are also discussed in Bernick and Carroll (1991). The incentives of rail authorities and private developers have been studied by Bernick and Carroll (1991), Bernick and Munkres (1992), Cervero (1993), and Landis, Cervero, and Hall (1991). Yet the incentives of municipalities have yet to be systematically reviewed.

For insight into local incentives toward land use near transit stations, we gathered zoning data for land surrounding each of the 232 existing or proposed stations in the greater Los Angeles and San Diego metropolitan areas. (Those areas are composed of Los Angeles, Orange, Riverside, San Bernardino, Ventura, and San Diego counties.) We chose zoning, rather than actual use, because zoning is the best available measure of local land use regulations.

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[6] As of December, 1994, feasibility studies for the OCTA lines have been temporarily suspended due to the recent Orange County financial crisis (Reza, 1994). The uncertainty surrounding the OCTA urban rail project is unimportant for this study. Our concern is understanding municipal incentives regarding land use near stations. The proposed OCTA station sites give us information about the incentives of municipalities, some of which were influential in the early planning process. Thus those sites reflect municipal preferences regarding possible future rail transit. The question of whether that transit will be built does not decrease the extent to which municipal incentives affected early siting decisions, and thus land use patterns near proposed stations. To that extent, the proposed stations can give us information about municipal incentives regarding rail transit in their communities.

There are three transportation authorities currently operating rail transit in Southern California. The existing and proposed rail lines are described in Table 1. The oldest existing system is operated by the Metropolitan Transit Development Board (MTDB) in San Diego, best known for its trolleys running from downtown to the Mexican border. The Los Angeles County Metropolitan Transportation Authority (MTA) opened the Blue Line in 1990, the Red Line (the city's first subway) in 1993, and is scheduled to open the Green Line in 1995. The Southern California Regional Rail Authority (SCRRA) operates the Metrolink interurban system, which opened in the early 1990s. Both the Orange County Transportation Authority (OCTA) and San Diego County's North County Transit District (NCTD) are planning commuter rail lines.

For each existing and proposed station, we gathered zoning data for quarter-mile radius circles centered on the station. This required gathering zoning information from the 80 municipalities that have land use authority over part or all of a station quarter-mile area. Zoning data were gathered for six categories: (1) low density residential, (2) high density residential, (3) all residential, (4) commercial, (5) mixed use, and (6) industrial. Some effort was required to group zoning data which are not necessarily consistent across municipalities. The criteria used to group the zoning data are described in the Appendix.

Discrepancies in the ways cities classify and report low and high density residential cause the "all residential" category to not be the simple sum of "low density residential" and "high density residential". Also, many municipalities either do not have a "mixed use" zoning classification or do not report the percentage of municipal land that is zoned for mixed use development. Thus the "mixed use" data are missing for many stations and lines.

In examining zoning data near stations it was clear that station areas in suburban and predominantly residential municipalities had more residential zoning than stations in more centrally located cities. Obviously, zoning near stations will, first and foremost, reflect the general land use character of the city. To control for that, we compare zoning patterns near the station to zoning patterns in the rest of the city. The meaningful question is how zoning patterns near

stations resemble or depart from zoning patterns in the rest of the city.

Table 2 describes zoning patterns near each station, relative to zoning patterns in the surrounding municipality. We call this measure the "Station/City Land Use Ratio," abbreviated as STATION RATIO. The STATION RATIO is the percent of land within a quarter-mile of the station in a particular zoning category divided by the percent of land in the entire municipality that is in the same category. For example, if 25% of the land within a quarter-mile of a station is zoned residential, while 50% of the land in the surrounding city is residential, the STATION RATIO for residential land near that station is 0.5. In that case, the station area is half as residential as the jurisdiction as a whole. If the STATION RATIO for a zoning category is less than one, the area near the station has a smaller share of its land zoned in that use than does the surrounding city. If the STATION RATIO for a zoning category is greater than one, the area near the station has more of that land use (as a percent of land area) than the surrounding city.

Table 2 shows the average STATION RATIO for each rail transit line in Southern California. First compare the ratios for residential and commercial land. Note that, *for every rail line save one*, the STATION RATIO is larger for commercial zoning than for total residential. (The exception is the MTDB North line, which has a STATION RATIO of 0.19 for commercial and 0.21 for residential.) Likewise, for every line save two, the STATION RATIO for commercial zoning is larger that for high density residential. (The exceptions in this case are the Metrolink San Bernardino lines to Los Angeles and to Riverside. These have STATION RATIOs of 2.18 for commercial and 2.38 for high density residential, and 3.82 for commercial and 6.80 for high density residential, respectively.) When controlling for existing municipal zoning patterns, there is a stronger tension toward commercial than toward residential zoning near rail stations. This pattern is consistent across existing and proposed lines, lines in central and suburban communities, lines that use heavy and light rail, indeed essentially all lines in Southern California. Also note that the STATION RATIO is generally greater than one for commercial zoning, but often less than one for residential. This bolsters our claim that cities view stations

more as sites for economic development than as residential locations.

Table 3 shows that the results in Table 2 are not due to large outliers that could skew line averages. Table 3 lists the number of stations on each line that have RCOMM (the station ratio for commercial) greater than RRES (the station ratio for residential).[7] The last column in Table 3 shows the percent of stations on each line for which RCOMM is greater than RRES. Stated differently, the last column shows the percent of stations on each line where the trend toward commercial zoning is more pronounced than the tension toward residential, when controlling for municipal land use character. On only three lines do less than 50% of the stations have RCOMM greater than RRES. (Those are the MTA Green line, the MTDB North line, and the Metrolink Riverside line.)

The good news for transit-based housing proponents is the large STATION RATIO for mixed use zoning. (See Table 2.) Yet most cities do not report mixed use zoning for the municipality, and the STATION RATIO for mixed use represents little other than the proposed lines in Orange County and north San Diego County. Also, the STATION RATIO for mixed use is relative to a very small base of mixed use development (often zero) in most municipalities. Perhaps cities are receptive to mixed use zoning near stations, but the clearer pattern is that cities are receptive to commercial, not residential, zoning near rail transit stations.

V. Interpreting the Evidence

Our argument is that the large values of STATION RATIO for commercial zoning reflect municipal desires to use rail transit stations as centers of economic rather than residential development. This assumes either that municipalities adjust their zoning code once rail transit plans have been unveiled, or that municipalities exert some influence on the siting process. Note

[7] There are 30 stations with missing data in Table 3. That includes 13 stations that have no residential or commercial land use within a quarter mile, and thus are not ranked for purposes of Table 3. It also includes 17 stations for which the municipal data needed to construct RCOMM and RRES are missing.

that either could lead to the observed tension toward commercial zoning near transit stations.[8] For our purposes it is somewhat unimportant to determine whether the observed data are the result of zoning changes once stations are sited or municipal influence on the station siting process.

There is also a third possibility that could give rise to the pattern discussed in the previous section, but which would give no information on municipal behavior. It is possible that a tension toward commercial zoning near stations reflects nothing more than the historical accident that Southern California rail lines often used existing freight rail right-of-way. Since industrial land uses are common and residential land uses somewhat rare near freight rail, it is possible that the existing right-of-way used for rail transit was near land that was used primarily for business rather than residential purposes.

Yet there are several reasons why we believe that historical right-of-way patterns are not driving the results described in the previous section. First, the case of Orange County, which planned a line without consideration of existing right-of-way and sited stations in economic centers, is a clear counter-example. In particular, note that the STATION RATIO data reported in Table 2 show an especially pronounced tension toward commercial zoning near the stations on the OCTA main line (where the average STATION RATIO for commercial is 14.11). Second, the consistency of the data in the previous section argue strongly for a behavioral interpretation. While some lines were constrained by right-of-way, many were not. The fact that virtually all lines show a tension toward commercial suggests that something broader than right-of-way explains that trend. Third, we developed a behavioral model that predicts land use patterns near rail transit stations, and that model confirms our hypothesis that municipalities will desire concentrations of commercial zoning near stations. That result holds when the model is fit only on data from stations on lines not constrained to use existing right-of-way, as shown in the next section.

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[8] The most likely explanation in our view is that municipalities exert some influence on the station siting decision. Given that rail transit systems often create small changes in region-wide accessibility, those lines would be expected to induce small land use changes. See, e.g., Meyer and Gómez-Ibáñez (1981) and Giuliano (1989). Others have noted that land use responses, if they occur, often follow the inauguration of rail transit service or other interventions by several years. See, e.g., Knight and Trygg (1977) and Wachs (1993a, 1993b).

VI. A Behavioral Model of Zoning Near Stations

If municipalities influence zoning patterns near rail transit stations, either through changes in the code or through station siting decisions, there ought to be systematic relationships between municipal characteristics and the observed zoning patterns. We tested for this by developing a regression model of municipal zoning behavior.

For the reasons mentioned in Section IV, we measured land use patterns within one quarter mile of stations **relative to** land use patterns in the entire municipality. Specifically, the dependent variable for the model is RCOMM, which is the STATION RATIO for commercial zoning. Choosing the independent variables for the model required some theory regarding municipal intentions for stations. So far, we have argued that municipalities will prefer to use stations to concentrate commercial and other employment-related activity. This gives us no ability to distinguish between municipalities since they all want the same thing -- more commercial near stations.

Yet even if it is true that all municipalities want more commercial land near stations, different municipalities will be better able to successfully act on their desire to use stations as economic centers. In particular, some localities might have a disproportionate amount of political influence, and thus be better able to influence station siting decisions. Similarly, some localities might be better suited to develop station areas into commercial and economic centers. We hypothesize that the greatest tension toward commercial zoning near stations will be in those places where the municipal government has a large influence over the line and where the local economy is well suited to economic development.

Given that, two variables were developed that measure the ability of municipalities to emphasize commercial zoning near stations. Those are (1) a measure of the importance of the municipality in rail line planning, and (2) a measure of past economic growth in the municipality that contains the station. For each station, those variables are

LINESHARE = the number of stations on the line located in the municipality that contains that particular station, divided by the total number of stations on the line

$EMP_{90\text{-}80}$ = employment change from 1980 to 1990 in the municipality that contains the station.

The LINESHARE variable is best explained by an example. Suppose a station is on a line with nine other stations. Also suppose that the station is in a municipality that has three other stations (for the same line) within its borders. Thus LINESHARE for that station (and all other stations on the same line within the same municipality) is 0.4 (the four stations within the city, divided by the ten total stations in the line). LINESHARE must be greater than zero but less than or equal to one. Larger values of LINESHARE indicate that the station is within a municipality that contains a larger fraction of the line's stations. Stated differently, larger values of LINESHARE show that the station is within a municipality that is important within the context of the rail line.

Presumably municipalities that contain large portions of a line will have more influence over siting and coordinated land use near stations. Thus the tension toward commercial zoning should be more pronounced in stations with large values of LINESHARE.[9] We also assume that cities with more employment growth in the 1980s are also those places that are best suited for future economic growth. Given that, larger values of $EMP_{90\text{-}80}$ should be associated with larger values of RCOMM.

We included other independent variables in the model as well. Population density in 1990 (DENSITY) was included since density is often thought to be linked to the land use (and zoning) character of a city. We did not have an *a priori* expectation about the sign of the coefficient on DENSITY. Dense cities might already have large concentrations of commercial, and thus commercial concentrations near stations might look more like the rest of the city, so that high

[9] Note that if our hypothesis does not hold, LINESHARE is a nonsense variable, and there would be no systematic relationship between LINESHARE and zoning patterns, RCOMM included. Thus a test of whether LINESHARE is consistently significantly positive is a powerful test of our hypothesis.

DENSITY is associated with low RCOMM. On the other hand, dense cities might be centrally located economic centers, and they might be especially able to establish economic and commercial centers near stations. This could lead not only to large amounts of commercial zoning near stations in dense cities, but large RCOMM (STATION RATIO for commercial) for stations in dense cities.

Finally, we included three variables that would be correlated with LINESHARE and thus would bias the coefficient on LINESHARE if they were omitted from the model. By definition, stations in large cities are more likely to have large values of LINESHARE. (It is more likely that a large city is important in the context of any particular rail line.) Likewise, stations on small rail lines are more likely to have large values of LINESHARE. (It is more likely that any particular city can be important in the context of a small line.) To be certain that LINESHARE does not measure a large city or small line effect, we included the following variables in the model.

AREA = Land area for the city that contains the station

POP90 = 1990 population for the city that contains the station

NSTATION = number of stations on the line

VII. Results

In fitting the regression model for RCOMM, we were mindful of the issues discussed in the section V:

1. The zoning pattern near stations could reflect some mix of zoning code changes and transit station siting decisions.

2. The zoning pattern near stations could reflect the historical accident that some lines used existing right-of-way, which generally was not near residential concentrations.

To control for each of those two difficulties, we fit the regression model on different subsets of stations. The distinction between code changes and station siting suggests fitting the model separately on stations that are currently operating and on the proposed stations. The regression

results for all stations are reported in the first column of Table 4, and the next two columns show regression results for existing and proposed stations. The problem with right-of-way constraints is best handled by omitting stations on lines that were constrained to use existing right-of-way.

We used two measures of lines that were constrained to use existing right-of-way.[10] The first measure is based on industrial land use near stations. Lines that used existing freight rail would presumably have large concentrations of industrial land nearby. We identified all stations with the STATION RATIO for industrial (RIND) greater than 4. (That value is approximately the 80th percentile for RIND). Those stations were concentrated on five lines -- the Metrolink Riverside to Los Angeles line, the Metrolink San Bernardino to Los Angeles line, the MTA Blue line, the MTA Green line, and the NCTD Oceanside to San Diego line. Since the MTDB South and Centre City lines were also known to have used existing right-of-way, we added those two lines to the other five. All seven lines were excluded from the regression results reported in the fifth column of Table 4.

An alternative measure of industrial land use near stations is to look for large amounts of industrial land within a quarter-mile of the station. All stations that had more than 40% of the land within one quarter mile zoned industrial were identified. (The 40% value is approximately the 75th percentile for industrial land use within one quarter mile of stations.) Those stations were all on one of five Metrolink lines. For that reason, the second measure of lines that used existing right-of-way was to exclude all SCRRA Metrolink stations from the analysis. The results of excluding those stations are reported in the sixth column of Table 4. Lastly, we excluded all lines that were right-of-way constrained according to either criteria, and those results are reported in the seventh column of Table 4.

We also excluded all stations in Los Angeles and San Diego (fourth column in Table 4) and all stations in Orange County (last column in Table 4.) These show that the regression results are

[10] While we had some right-of-way information for lines, we preferred measures that were constructed based on nearby zoning characteristics. That is because we could not determine what effect a particular right-of-way would have on land use. Thus we preferred to infer the extent to which right-of-way constrained observed zoning patterns by developing measures based on zoning near lines.

not driven by the stations in the large central cities (Los Angeles and San Diego) or by the stations in Orange County.

The results reported in Table 4 are consistent with the descriptive data in Section IV, and strongly support our argument. The coefficients on LINESHARE and EMP_{90-80} are positively significant in most cases, suggesting that station area land is more commercial than the surrounding community when controlling not only for the land use character of that community but other relevant community characteristics as well. High employment growth communities are associated with a higher concentration of commercial land use near station areas, all things considered. This pattern holds up across virtually all city and rail line types. In addition, the more influence a city has over station siting and coordination, as measured by higher values of LINESHARE, the more likely a station area will concentrate economic development activities in the station areas.

Taken together, both facts suggest that the observed tension toward commercial zoning near stations reflects municipal intentions. At least one of the two coefficients (LINESHARE or EMP_{90-80}) are significant in all regressions but one, and the tension toward commercial zoning appears somewhat insensitive to the nature of the rail lines, the right-of-way used, or the size or character of the cities containing these lines. This pattern agrees with the consistency of the data in Tables 2 and 3, and supports our hypothesis that municipalities will tend to view stations as centers of economic development, with residential development being a less important municipal goal.

VIII. Policy Lessons

The moral of this story is that some caution is in order when assessing the feasibility of transit-oriented housing as a general policy prescription, and that transit-oriented planning strategies would benefit from more attention to their fiscal and economic development impacts. Most research on transit-based housing has focused on the motives of commuters, developers and regional planners, all important players in this process. But in our view too little thought has been

given to the kind of development municipalities want near rail stations. This is awkward, given that municipalities have almost complete land use authority in most states in the U.S. Furthermore, economic and political arguments suggest that municipalities have incentives to prefer commercial development near rail stations, not residential. The zoning evidence and the regression model discussed above both support that argument.

Transit-based housing certainly exists, and various state and local policy documents attest to the support at many levels for this and related ideas. Just the same, our data do not indicate anything but an uphill battle in all but very few cases. It may well be that Southern California, as the movies often suggest, is unique, and land use zoning will be more receptive to transit-based housing elsewhere. Yet we do not think so. The cross-jurisdiction economic competition that makes transit-based commercial attractive in Southern California is also characteristic of many other urban areas. Los Angeles, and most other American cities, are automobile cities because coalitions of jurisdictions thought highways would best promote their economic interests. The tensions that prompt municipalities to think first of their own economic development, if anything, have grown stronger over time.

Transit-based housing will struggle to be accepted unless municipalities can be convinced that residential, not commercial, development is the key to their economic success. For the most part, that seems unlikely to happen. On the other hand, transit-oriented strategies do have a good chance of finding receptive communities whenever they feature dense concentrations of employment and retail activity. Residential development is likely more viable as a secondary, rather than primary, element of such plans. Even if personal advice is found at the train station in some future Los Angeles, it is likely to be near large office developments rather than transit-based housing.

References

Adler, Sy. 1991. The Transformation of the Pacific Electric Railway: Bradford Snell, Roger Rabbit, and the Politics of Transportation in Los Angeles, *Urban Affairs Quarterly 27*, 1: 51-86.

Altshuler, Alan A. and José A. Gómez-Ibáñez. 1993. *Regulation for Revenue: The Political Economy of Land Use Exactions*. Washington, D.C.: The Brookings Institution and the Lincoln Institute of Land Policy.

Bernick, Michael. 1990. The Promise of California's Rail Transit Lines in the Siting of New Housing, Report to the California Senate Transportation Committee and the Senate Housing and Urban Affairs Committee.

Bernick, Michael. 1993. The Bay Area's Emerging Transit-Based Housing, *Urban Land 52*, July, pp. 38-41.

Bernick, Michael and Peter Hall. 1990. Land Use Law and Policy for Maximizing Use of California's New Inter-Regional Rail Lines, IURD Working Paper 523, UC Berkeley, September.

Bernick, Michael, Peter Hall, et al. 1992. The New emphasis on Transit-Based Housing throughout the United States, IURD Working Paper 580, UC Berkeley.

Bernick, Michael, Peter Hall and R. Shaevitz, et al. 1992. New Planning Strategies for Transit-Based Housing in Northern California, IURD Working Paper 582, UC Berkeley.

Bernick, Michael and Michael Carroll. 1991. A Study of Housing Built Near Rail Transit Stations: Northern California, IURD Working Paper 546, UC Berkeley, October.

Bernick, Michael and Jason Munkres. 1992. Designing Transit-Based Communities, IURD Working paper 581, UC Berkeley.

Burchell, Robert W. and David Listokin. 1980. *The Practioner's Guide to Fiscal Impact Analysis*, Center for Urban Policy Research, Rutgers University.

Calthorpe, Peter. 1993. *The Next American Metropolis: Ecology, Community, and the American Dream*, New York: Princeton Architectural Press.

Central Orange County Fixed Guideway Project. 1990. *Prospectus for the COCFGP*, Cities of Santa Ana, Anaheim, Costa Mesa, Irvine, and Orange.

Cervero, Robert. 1993. Transit Supportive Development in the United States: Experiences and Prospects, Report to the Federal Transit Administration and IURD monograph number 46, UC Berkeley.

Cervero, Robert. 1994a. Rail-Oriented Office Development in California: How Successful?, *Transportation Quarterly 48*, 33-44.

Cervero, Robert. 1994b. Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta, *Journal of the American Planning Association 60*, 83-94.

Cervero, Robert. 1994c. Transit-Based Housing in California: Evidence on Ridership Impacts, *Transport Policy 3*, 174-183.

Cervero, Robert. 1995. Transit Villages: From Idea to Implementation, *Access* No. 5, Fall.

Cervero, Robert, Peter Hall, and John Landis. 1992. *Transit Joint Development in the United States*. IURD Monograph 42, UC Berkeley, August.

Cervero, Robert, Michael Bernick and Jill Gilbert. 1994. Market Opportunities and Barriers to Transit-Based Development in California, UCTC Working Paper No. 223.

Crane, Randall. 1995. Cars and Drivers in the New Suburbs: Linking Access to Travel in Neotraditional Planning, *Journal of the American Planning Association,* forthcoming.

Deakin, Elizabeth, Michael Bernick and Tilly Chang. 1992. Implementation of Residential Development at Rail Transit Stations in California: Case studies and Policy Options, California Dept. of Transportation, Division of Transportation Planning.

Duany, Andres and Elizabeth Plater-Zyberk. 1991. *Towns and Town-Making Principles*, New York: Rizzoli.

Giuliano, Genevieve. 1989. New Directions for Understanding Transportation and Land Use, *Environment and Planning A 21,* 145-159.

Glick, Fred. 1992. Light Rail transit and Effective Land Use Planning: Portland, Sacramento, and San Diego, *Transportation Research Record 1361.*

Knack, Ruth E. 1995. BART's Village Vision, *Planning 61,* 18-21 (January).

Knight, R. and L. Trygg. 1977. Evidence of Land Use Impacts of Rapid Transit Systems, *Transportation 6,* 231-247.

Landis, John, Robert Cervero and Peter Hall. 1991. Transit Joint Development in the USA: An Inventory and Policy Assessment, *Environment and Planning C: Government and Policy 9*, 431-452.

Los Angeles. 1993. *Proposed Land Use/Transportation Policy*. Planning Department, City of Los Angeles, July.

Meyer, John and José A. Gómez-Ibáñez. 1981. *Autos, Transit, and Cities*. Cambridge: Harvard University Press.

Orange County Transportation Authority. 1991. *Long Range Transit Systems Plan and Development Strategy*, Final Report of the Countywide Rail Study, submitted by Parsons Brinckerhoff, October, 1991.

Orange County Transportation Commission. 1979. *Orange County Multimodal Transportation Study*, Draft Final Report, October, 1979.

Orange County Transportation Commission. 1980. *Orange County Multimodal Transportation Study Refinement Project*, Analysis and Evaluation of MMTS Selected System Technical Report, October, 1980.

Pickrell, Don H. 1992. A Desire Named Streetcar: Fantasy and Fact in Rail Transit Planning, *Journal of the American Planning Association 58*, 158-176.

Reza, H.G. 1994. OCTA Outlines Plan for Next 100 Days, *Los Angeles Times*, December 13, 1994, p. A-29.

San Diego, City of. 1992. *Transit-Oriented Development Design Guidelines*, Prepared by Calthorpe Associates. October.

Untermann, Richard K. 1984. *Accommodating the Pedestrian: Adapting Towns and Neighborhoods for Walking and Bicycling*. New York: Van Nostrand Reinhold.

Wachs, Martin. 1984. Autos, Transit, and the Sprawl of Los Angeles: The 1920s, *Journal of the American Planning Association 50*, 297-310.

Wachs, Martin. 1993a. Learning From Los Angeles: Transport, Urban Form, and Air Quality, *Transportation 20*, 329-354.

Wachs, Martin. 1993b. The Role of Land Use Strategies for Improving Transportation and Air Quality, Working Paper, UCLA, November.

Wheaton, William L.C. 1959. Applications of Cost-Revenue Studies to Fringe Areas, *Journal of the American Institute of Planners 25*, 170-174.

Table 1: Operating Status of Stations in Southern California

Operating Authority & Line	#Stations in Dataset	In Operation*	Proposed Start Date		
			late 1995	Later	No start date
MTA	**70**	**26**	**13**	**26**	**5**
Blue	35	22	0	13	0
Red	18	4	0	13	1
Green	17	0	13	0	4
MTDB	**41**	**35**	**6**	**0**	**0**
East	15	12	3	0	0
North	3	0	3	0	0
Center	11	11	0	0	0
South	12	12	0	0	0
NCTD	**22**	**0**	**6**	**16**	**0**
OCTA	**44**	**0**	**0**	**0**	**44**
SCRRA	**55**	**47**	**0**	**8**	**0**
Total	**232**	**108**	**25**	**50**	**49**

*This number includes some Metrolink stations on operating lines planned to open in early 1995.

Table 2: Ratio of Land Use Shares Within 1/4 Mile of Stations

"Station/City Land Use Ratio" (STATION RATIO)

Rail Line	Low Density Residential	High Density Residential	All Residential	Commercial	Mixed Use	Industrial
MTA	**0.44**	**0.87**	**0.56**	**1.95**	**-**	**1.78**
Blue	0.47	0.97	0.62	1.28	0	2.17
Green	0.63	0.58	0.47	1.97	0	0.88
Red	0.21	0.89	0.51	3.14	-	1.72
MTDB	**0.59**	**1.29**	**0.68**	**3.39**	**-**	**2.84**
East	0.66	2.86	1.08	3.00	1.14	1.73
North	0.31	-	0.21	0.19	-	2.19
Center	0.06	0.02	0.05	5.57	-	5.37
South	1.07	0.96	0.88	2.66	-	2.08
NCTD	**0.66**	**4.04**	**0.75**	**4.65**	**10.99**	**4.26**
OCTA	**0.31**	**0.88**	**0.40**	**8.37**	**11.85**	**1.35**
main	0.22	0.48	0.31	14.11	8.34	0.33
alternate	0.45	0.72	0.58	1.32	17.80	1.33
extension	0.35	1.39	0.43	3.71	15.25	3.22
SCRRA	**1.67**	**1.97**	**0.57**	**4.37**	**-**	**9.21**
ml hemet	0.83	2.20	1.07	5.16	-	8.30
ml moorpark	0.86	4.52	0.98	9.21	-	4.06
ml oceanside	0.18	1.73	0.30	5.30	1.29	4.44
ml redlands	0.10	-	0.10	5.03	-	0.29
ml riverside	0.48	0.10	0.45	3.27	0	7.23
ml san bernardino	6.23	2.38	0.56	2.18	0	3.99
ml santa clarita	0.55	-	0.52	4.73	-	2.34
ml san bern-riverside	0.07	6.80	0.46	3.82	-	5.64
All	**0.75**	**1.42**	**0.57**	**4.37**	**8.61**	**3.79**

Table 3: Comparison of commercial and residential ratio variables, by line

Rail Line	#Stations with rcomm > rres	#Stations with rres > rcomm	#Stations in line	% Stations with rcomm > rres
MTA				
Blue	19	10	35	54%
Green	7	4	17	41%
Red	15	2	18	83%
MTDB				
East	9	6	15	60%
North	1	1	3	33%
Center	8	0	11	73%
South	7	2	12	58%
NCTD	15	6	22	68%
OCTA				
main	20	2	22	91%
alternate	6	3	10	60%
extension	9	3	12	75%
SCRRA				
ml hemet	4	4	8	50%
ml moorpark	3	0	4	75%
ml oceanside	9	0	11	82%
ml redlands	3	0	3	100%
ml riverside	5	4	11	45%
ml san bernardino	8	2	12	67%
ml santa clarita	4	0	4	100%
ml san bern-riverside	1	0	2	50%
All	**153**	**49**	**232**	**66%**

Table 4: Regression Results for Dependent Variable: RCOMM

(The share of station area land zoned commercial relative to the share of city land zoned commercial)

independent variable	all stations	existing stations	proposed stations	exclude L.A. and S.D.	exclude right-of-way constrained	exclude SCRRA Metrolink	exclude SCRRA and right-of-way constrained	exclude Orange County
LINESHARE	**7.68 (2.74)**	4.17 (1.78)	**13.48 (2.34)**	9.68 (1.67)	7.30 (1.40)	**9.96 (2.62)**	**24.80 (2.96)**	**3.86 (2.30)**
EMP_{90-80}	**1.74x10^{-4} (3.75)**	**1.26x10^{-4} (2.12)**	**1.84x10^{-4} (2.44)**	**2.56x10^{-4} (4.31)**	1.43x10^{-4} (1.86)	**1.85x10^{-4} (2.79)**	1.22x10^{-4} (1.03)	3.79x10^{-4} (1.04)
DENSITY	-0.88 (-5.75)	-0.61 (-3.11)	-0.93 (-4.15)	-0.07 (-0.24)	-1.21 (-4.95)	-0.99 (-5.40)	-1.39 (-4.87)	-0.33 (-2.191)
AREA	-1.52x10^{-4} (-4.50)	-1.10x10^{-4} (-2.47)	-1.51x10^{-4} (-2.67)	2.29x10^{-4} (1.91)	-1.33x10^{-4} (-2.37)	-1.63x10^{-4} (-3.55)	-1.10x10^{-4} (-1.38)	-4.53x10^{-4} (-1.65)
POP90	-5.15x10^{-6} (-4.82)	-3.71x10^{-6} (-2.56)	-6.21x10^{-6} (-3.61)	-6.08x10^{-5} (-3.43)	-4.79x10^{-6} (-2.61)	-5.82x10^{-6} (-4.15)	-8.20x10^{-6} (-3.41)	-1.59x10^{-6} (-1.76)
NSTATION	0.10 (1.45)	-0.02 (-0.34)	0.28 (1.97)	0.22 (2.12)	0.59 (3.46)	0.16 (1.64)	1.21 (4.62)	-0.04 (-1.02)
CONSTANT	8.68 (4.72)	8.95 (5.28)	4.05 (1.00)	-1.79 (-0.48)	6.22 (1.91)	8.06 (2.79)	-7.07 (-1.15)	6.77 (5.82)
R^2	0.20	0.20	0.21	0.24	0.29	0.22	0.42	0.15
R^2_{adj}	0.17	0.15	0.17	0.21	0.25	0.19	0.37	0.12
N	211	101	110	145	107	164	79	167

T-statistics are shown in parentheses.

Those coefficients on LINESHARE AND EMP_{90-80} that are statistically significant using a 0.05 two-tailed test area are shown in boldface.

Appendix: Data and Data Collection

This appendix describes the methods used in collecting zoning and land use data.

Transit Authorities

As described in the text, there are five transportation authorities that operate or are planning passenger rail lines in Southern California: MTA (Metropolitan Transportation Authority - Los Angeles), OCTA (Orange County Transportation Authority - Orange County), NCTD (North County Transit District - Northern San Diego County), MTDB (Metropolitan Transit Development Board - Central and Southern San Diego County), and SCRRA (Southern California Regional Rail Authority - Metrolink). Each of these authorities were contacted to request rail line maps, station addresses, and dates at which time stations would become operational.

Stations

Many of the most recent rail transit studies indicate that the sphere of influence on adjacent development for light rail transit stations (LRTs) is approximately one quarter mile in radius (e.g., Bernick and Carroll, 1991; Bernick and Hall, 1992; Cervero, 1994c). The Thomas Guide Street Guide and Directory (1994) was used to locate the 232 proposed or existing rail transit stations in Southern California and identify jurisdictions. Although the half-mile circle centered on a station was often within one municipality, the area for some stations included up to three separate jurisdictions. Eighty jurisdictions were identified as being within the quarter mile radius of existing or proposed rail transit stations in Southern California. Once the initial identification was made, each jurisdiction was phoned and a request was made for appropriate and recent zoning maps.

Zoning: Categories and Measurements

We have organized zoning data within one the quarter mile of each transit station into six categories. All cities organize their zoning into more precise categories, but for our purposes, we

use only the six listed below. These six categories allow us to compare land use data between the target jurisdictions by creating uniform categories that apply to land use in each jurisdiction.

- *Low to Medium Density Residential*: less than or equal to 15 dwelling units (d.u.s) per acre.
- *High Density Residential*: greater than or equal to 15 d.u.s per acre.
- *Commercial*: all commercial and office professional, not including heavy commercial zoning.
- *Mixed Use*: any area where commercial and residential uses occur simultaneously.
- *Industrial / Manufacturing*: industrial, manufacturing, heavy commercial and any other commercial/industrial zoning classifications. [11]
- *Other*: including open space, rights of way, government properties, public properties, waterways, streets and highways, and unzoned areas.

It was problematic to categorize residential land use according to densities across multiple jurisdictions. Most jurisdictions apply the terms high, medium, or low density, or combinations of the three, to residential zoning. A lesser number of cities combine the aforementioned terms with the terms single-family, two family or multi-family to categorize residential properties. The densities attached to these terms can vary greatly, especially between urban and rural locations. In urban locations, high density zoning may allow 60-70 d.u.'s per acre, while in rural areas high density zoning may only allow 10-12 d.u.'s per acre.

For most jurisdictions, the categorization of residential land can be characterized as follows: Estate Density (0-2 d.u./ac.), Low Density (3-4 d.u./ac.), Medium Density (4-8 d.u./ac.), Medium-High Density (8-14 d.u./ac.), and High Density (more than 15 d.u./ac.). In jurisdictions that use single-

[11] Land within the zoning categories of heavy commercial and commercial/industrial is included in our industrial/manufacturing category. Commercial uses in most areas that are zoned heavy commercial or commercial/industrial are wholesale warehouses. Sales tax revenues are generally collected at the point of sale and not at the distribution center, thus these warehouses do not typically generate sales tax revenues for their city of residence. From a municipality's perspective, the fiscal and economic characteristics of warehouses are more likely to be similar to industrial/manufacturing land uses than to commercial land uses.

family, two-family, and multi-family zoning categories, densities are generally less than 8 d.u. per acre in single-family, less than 15 d.u. per acre in two-family, and greater than 15 d.u. per acre in areas zoned for multi-family residential. The density range in the residential classifications in the following thirty-five municipalities do not match the previously mentioned general classifications.[12]

[12] These exceptions have been assigned to either the "low to medium density" or "high density" category based on information received from each municipality on the average densities of each zoning classification. If the average density in the classification is below 15 d.u./ac., that classification is included in the low density category, and if the average density of the area is above 15 d.u./ac., the area is included in the high density category.

Municipality / County	*High Density Designation in d.u./acre*
Baldwin Park	Multi-Family 12.1-20
Brea	High Density 9.7-24.9
Carson	Multi-Family 8-25
Cerritos	Medium Density >15.5
Commerce	Medium Density Multi-Family 0-27
	High Density Multi-Family > 21.78
Costa Mesa	High Density 13-20
Covina	Multi-Family >14.6
Downey	Two Family 9-17, Multi-Family 18-24
El Segundo	Two Family > 15, Multi-Family > 33.9
Escondido	Medium Multi-Family 16-22
Hawthorne	Medium Density 8.1-17 High Density 17.1-40
Huntington Beach	Multi-Family Townhouse 14.7
	Multi-Family Apartment 14.52-21.78
Irvine	Medium-High Density 10-25, High Density 25-40
Laguna Niguel	No density range. All specific plan projects.
Loma Linda	High Density 9.1-13, Very High Density 13.1-20
Lynwood	Multi-Family 14.1-18
Mission Viejo	High Density 6.5 -14
National City	Two Family 17.4 Multi-Family >22.8
Ontario	Medium Density 16, High Density 25
Orange	Medium-Low Density 6-15, Medium-High Density 15-24
Pasadena	Multi-Family 12-48
Rancho Cucamonga	Medium-High Density 14-24
Redlands	Medium Density < 17.4
Redondo Beach	Medium-High Density > 15
Rialto	Multi-Family 13-21
San Bernardino	Medium-High Density 24, High Density 36
San Clemente	Medium Density > 15
San Diego City	High Density > 14.5
Santa Clarita	Medium-High Density 15.1-25
Santa Fe Springs	Multi-Family Townhouse 14.7
	Multi-Family Apartment 20.7
Santee	Medium-High Density 14 -22, High Density > 22
Simi Valley	Medium-High Density 8-16, High Density >16
Solana Beach	High Density 13-20
Upland	Multi-Family 9.9 -30
Vista	Multi-Family 6.6 - 21.8