Ridership and Land Market Impacts of BRT Services:
Experiences in Los Angeles, California

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Abstract

Bus Rapid Transit (BRT) has gained popularity as a cost-effective alternative to expensive metro investments, however relatively little is know about its impacts on land-use changes and land values as well as factors that influence ridership. This paper addresses these questions by modeling empirical relationships for BRT services in Los Angeles, California. A direct ridership model is estimated to probe the influences of transit service and neighborhood attributes of BRT services in Los Angeles. The land price effects of BRT services are then explored using hedonic price models. Particular attention is paid the influences of BRT accessibility and service features (e.g., reliability) on land prices for residential and commercial markets, controlling for neighborhood and contextual factors. In addition, a multi-level discrete-choice model of the influences of introducing BRT services on land-use conversions (e.g., single-family residential to higher density apartments) in Seoul is presented.

1. Introduction

More and more cities are turning to Bus Rapid Transit (BRT) as a way of cost-effectively expanding public transit services to relieve traffic congestion, reduce carbon emissions, and increase mobility options for the poor. Because of the inherent flexibility advantages of rubber-tire buses – e.g., unlike rail systems, the same vehicle that functions as a line-haul carrier can also morph into a neighborhood feeder -- BRT is especially suited for many lower density and non-CBD settings.

BRT has gained increasing popularity worldwide (Levinson et al., 2003). Some of the most advanced and widely heralded BRT services today are found in Latin America, such as Curitiba and Sao Paulo, Brazil, Bogotá and Cali, Columbia, Santiago, Chile, and Lima, Peru. The success of BRT in these cities stems, to a large degree, from the presence of dedicated lanes, which offer significant speed advantages relative to more traditional mixed-traffic services. A U.S. city that is attempting to join the ranks of world-class BRT service-providers is Los Angeles, California and Seoul, Korea. As in cities like Curitiba and Bogotá, Los Angeles today operates dedicated-lane BRT services.

The public sector benefits of BRT should be directly proportional to ridership. Accordingly, this paper starts with an analysis of factors that influence ridership for Los Angeles's BRT, using a direct ridership model (DRM) approach (Cervero, 2006). The private sector benefits of BRT are well expressed by land prices. The second part of this paper probes this matter by looking at experiences in both Los Angeles and Seoul. All else being equal, significant gains in bus speeds afforded by BRT should be followed by significant land-use changes, like densification and property value increases, especially in a congested cities like Los Angelesl. Land markets can be expected to place a high premium on parcels close to transit corridors that enjoy significant travel-time savings since, after all, such settings have scarcity value – i.e., there is a finite, limited supply of settings with superior transit offerings. The paper concludes by reflecting on the policy implications of the key research findings.

2. Modeling Ridership Impacts of BRT in Los Angeles

In the United States, one of the most proactive regions in advancing BRT services has been Southern California. The Metropolitan Transportation Authority (MTA) phased in the Metro Rapid Program in 2000 with the goal of improving bus speeds within urbanized Los Angeles County. Four pilot routes -- along Wilshire Boulevard (720), Broadway (745), Vermont Avenue (754) and Ventura Boulevard (750) – used Next Bus (real-time passenger information) technology at most stops to inform waiting customers of estimated bus arrival times. Metro Rapid consists exclusively of low-floor buses that have their own distinctive color scheme and markings. Other features of Metro Rapid services include signal prioritization, frequent headways, and comparatively long spacings between bus stops.

A new stage in BRT services was reached in 2005 when MTA's Metro Orange

Line opened. The Orange Line is one of the first "full-service" BRT systems in the United States, featuring a dedicated busway (running on a disused rail corridor), high-capacity articulated buses, "rail-like" stations (incorporating level boarding and off-board fare payment), and headway-based schedules. The 14-mile route connects the western terminus of the Red Line subway at North Hollywood with Warner Center, the third largest employment center in Los Angeles County. As of 2009, Southern California's Metro Rapid Program consisted of 28 routes in total, providing 450 directional miles of service. MTA buses operate all but two of the routes. The Santa Monica Big Blue Bus (BBB) operates a BRT service as well: Rapid Blue Line 3, which runs along Lincoln Boulevard, and Rapid Blue 7, which connects downtown Santa Monica to the Rimpau Transit Center in the eastern part of the city.

2.1 Sample Selection

In order to obtain a sample of sufficient size to draw statistically reliable inferences, 50 MTA bus stop locations were sampled across 20 different Metro Rapid lines. Each location had a stop on each side of a road, meaning ridership as well as service-level data were compiled for both stops at each location. In addition, data were compiled for six bus stop locations of BBB's Rapid Blue line 3. Lastly, to reflect the relationships between services and ridership for "high end" BRT services, data for 13 Orange Line stops were obtained. Figure 1 shows the locations of the 69 total bus stop locations that constituted the sample frame for Direct Ridership modeling. Average daily ridership data were obtained for each stop for October 2008. Accordingly, data for explanatory variables were obtained for time periods as close as possible to the October 2008 date.

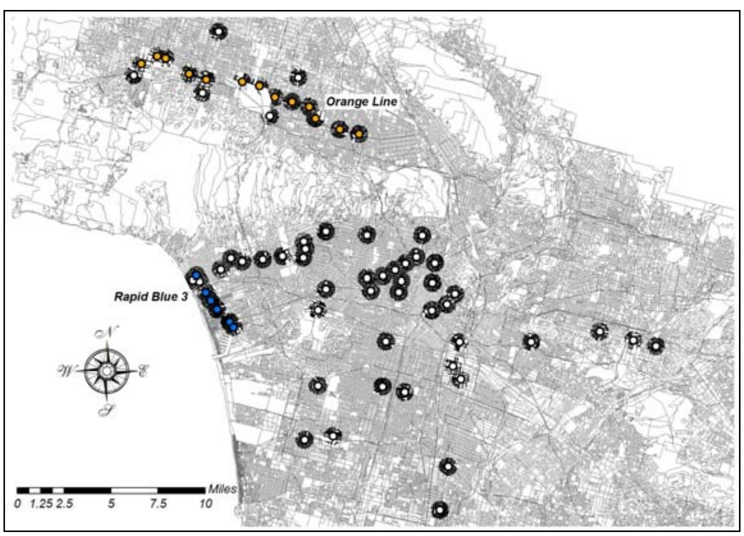

Figure 1. Locations of 69 BRT bus stop observations used for estimating Direct Ridership Model: 50 Metro Rapid stops, 13 Orange Line stops, and 6 Rapid Blue 3 stops.

2.2 Model Specification

Direct Ridership models estimate boardings (and/or exits) at a stop or station for defined periods of time (e.g., daily) as a function of 3 key sets of variables related to the stop or station:

(1) *Service Attributes* – e.g., frequency of buses (headways, buses per hour), operating speeds, feeder bus connections (number of lines or buses), dedicated lane (0-1), vehicle brand/marketing (0-1), etc.;

(2) *Location and Neighborhood Attributes* – e.g., population and employment densities, mixed land use measures (0-1 scale), median household incomes and vehicle ownership levels (as proxies for levels of "transit dependence"), distance to nearest stop (as a proxy for catchment size), accessibility levels (e.g., number of jobs that can be reached within 30 minutes over transit network in peak periods), terminal station (0-1), street density (e.g., directional miles of street divided by land area), connectivity indices (e.g., links/nodes of street network), etc.; and

(3) *Bus Stop/Site Attributes* – e.g., bus shelters (0-1), Next Bus passenger information (0-1), bus benches (0-1), far-side bus stops (0-1), park-and-ride lots (0-1, or number of spaces), bus bulbs (0-10), etc.

Often, service attributes like bus headways do not vary within a bus line though they can and often do vary across lines. Travel-demand theory holds that transit riders, particularly choice users, are more sensitive to service quality and operating features than other factors (Evans, 2004). Accordingly we expected some measures of a bus stop's service quality to enter the Direct Ridership Model (DRM). Other attributes of the operations, like fare levels, are usually so similar across passengers who board buses at each stop that they are not of much use in direct ridership modeling. The one service-related variable that we felt would significantly enter a model was whether a stop received an exclusive-lane service. No factor can begin to make bus-transit more time-competitive with the private car than operating in a bus-only lane. Accordingly, MTA's 13 Orange Line bus stops were dummy-coded (0-1) to denote their qualitatively higher service levels than the other bus stops in the data base.

Location variables aim to capture attributes of the immediate operating environment, such as nearby densities and distances to nearest stop. The farther a bus stop is from the next nearest stop, for instance, typically the stop's geographical catchment area increases in size. Being a terminal station often boosts ridership even more since end-line stations also serve big geographic catchments. If stops with large catchments average high population densities, boardings at the stop should go up even more. And if nearby residents average relatively low incomes and car ownership rates, then boarding can be expected to further rise. Factors like dense street networks with high connectivity (i.e., link-to-node ratios) can bump up ridership, at the margin, by expediting pedestrian flows to stops.

One measurement issue all direct ridership models face is the appropriate size of the geographic buffer drawn around bus stops to capture neighborhood attributes. In keeping with other research on distance thresholds for walking to transit (Loutzenheiser, 1997; Cervero, 2001), I opted to create ½ mile buffers around stops. Overlaying these buffers onto census tract polygons allowed variables like population density within ½ mile of a stop to be estimated using GIS techniques.

Lastly, some of the bus-stop attribute variables – such as the presence of bus shelters or far-side bus stops – are binary (0-1) and thus are used in the models as dummy variables. These variables largely represent the presence of passenger amenities and in comparison to variables that traditional choice theory holds influences utility are thought to have fairly marginal influences on ridership levels. While the presence of a bench at a bus stop might be appreciated by a waiting customer, its presence or absence is unlikely to cause or deter people from making a transit trip. In light of the relatively small sample size, we were prepared for such variables not to enter the best-fitting model.

One other possibility allowed for in direct ridership modeling was interactive terms – specifically, the interaction between operating on a bus-only lane and other factors, like urban densities. That is, does the combination of having an exclusive bus lane and high nearby densities give a proportionally bigger boost to ridership than the sum of these two individual influences? Accordingly, a number of variables that captured the joint occurrence of bus-only services and other predictors like feeder bus connections were created.

The general modeling approach involved including variables that traditional travel-demand theory holds are significant predictors of transit ridership – namely, measures of service quality (e.g., number of daily buses, number of feeder connections), location (e.g., distance to the nearest bus stop), and neighborhood density. Once a best-fitting "core" model was developed, other variables were stepped in related to bus-stop attributes (e.g., bus shelters, far-side bus stops) to see if they provided marginal explanatory benefits to the core model. Last, we sought to introduce interactive terms that captured potential boosts in ridership from combining dedicated-lane services with other predictors. Only interactive terms that marginally improved the predictive power of the model were added. In all cases, variables were retained in the model if the signs on coefficients met a prior expectations and the t statistics were reasonably significant, preferably with probability values less than 0.05.

2.3 Direct Model of BRT Ridership

Ordinary least squares (OLS) regression was used to estimate a BRT direct ridership model based on Southern California experiences. Since a number of BRT bus stops in the data base share the same bus line, we also attempted Hierarchical Linear Model (HLM) estimation to account for the nested nature of the data. In theory, HLM accounts for the statistical non-independence of bus stops that share the same bus lines. Although interclass correlations suggested significant nesting of bus stops within bus lines, the HLM models yielded results with poorer fits than OLS and a more limited set of predictor variables with statistical significance.

Table 1 presents descriptive statistics for the dependent variable (average daily boardings) and eight explanatory variables that entered into the Direct Ridership Model. Among predictor variables, the largest variation (standard deviation/mean) was with the number of feeder rail trains (only 3 of the 63 Metro Rapid stops had rail connections) and park-and-ride capacity (10 of the 69 bus stops had nearby parking lots). Bus service frequency varied the least across the 69 bus-stop observations.

The best performing multiple regression model for directly measuring BRT ridership is presented in Table 2. From the summary statistics, a model with good overall statistical fit was obtained: 95 percent of the variation in average daily boardings across the 69 bus stop locations was explained by the nine variables in the model.

The BRT direct ridership model for Southern California yielded results that conform to expectations. All of the service quality variables positively contribute to ridership. As Metro Rapid bus service frequency increases, so does ridership – each Metro Rapid bus arriving at a bus stop increases average daily boardings at that stop by 5.1 passengers (or stated another way, the average number of boardings per bus at a stop was a little over 5 passengers). In addition, daily boardings increased with the intensity of both bus and rail-train feeder services. Also notably significant were the two interactive terms for bus service quality: Full-service BRT & Feeder Bus as well as Full-service BRT & Feeder Rail. (In Table 2, "Full-Service BRT" denotes dedicated-lane services, notably MTA's Orange Line operations.) Based on the beta weight (standardized regression coefficient), the combination of dedicated-lane services and rail connections had the strongest predictive power of any variable in the model (reflecting the ridership boost received at two Orange Line stops served by rail). For example, the model results indicate that each feeder train that arrives increases average daily ridership by 6.7 passengers. However, if the daily train connects to a stop with a dedicated-lane Metro Rapid service, it increases average daily ridership by another 52.8 passengers, for a total of nearly 60 passengers. Clearly, the ability to make a rail-bus intermodal transfer has significantly increased BRT ridership in Los Angeles County. While BRT no doubt supplements rail services in parts of Los Angeles County, for dedicated-lane services on MTA's Orange Line, it without question has been a complement as well.

The primary neighborhood attribute that influenced BRT ridership in Los Angeles County was population density within ½ mile of a bus stop (an area of around 503 acres in size). Metro Rapid stops surrounded by denser residential areas averaged appreciably higher ridership, controlling for other factors. This is consistent with a body of literature that shows density to be the most important built-environment attribute for predicting travel demand in general (Ewing and Cervero, 2001) and transit ridership in particular (Cervero et al., 2004)). As the saying goes, "mass transit" needs "mass", or density. The model suggests that doubling the population within one-half mile radius of a Metro Rapid bus stop from 5,000 to 10,000 inhabitants (or from around 10 to 20 persons per

Table 1. Descriptive Statistics for Dependent Variable and Independent Variables that enter the Direct Ridership Model. All values are for bus stop observations

	Minimum	Maximum	Mean	Std. Deviation	Coefficient of Variation
Dependent Variable: Average Number Daily Boardings	0	8,703	743.9	1,194.9	1.61
Independent Variables:					
Number of daily buses (each direction)	40	185	88.6	40.9	0.46
Number of perpendicular daily feeder bus lines	0	7	1.56	1.29	0.83
Number of perpendicular daily rail feeder trains	0	100	5.49	22.31	4.06
Distance to Nearest BRT Stop (in miles)	0.17	1.48	0.73	0.277	2.63
Park-&-Ride Lot Capacity (number of spaces)	0	1,205	76.2	231.6	3.04
Population density (people within 1/2-mile buffer)	19.4	53,488.8	13,809.5	9,300.5	0.67
Total density (population + employment within ½ mile buffer)	6,238.0	115,808.4	24,746.6	18,409.1	0.74

TABLE 2. Direct Ridership Model for BRT in Los Angeles County. Estimated using OLS for 69 Bus Stop Locations in Los Angeles County

	Coefficient	Std. Error	Beta	t statistic	Sig.
Service Attributes					
Number of Daily Metro Rapid Buses (both directions)	5.103	1.353	.176	3.771	.000
Number of perpendicular daily feeder bus lines (both directions)	73.921	36.045	.080	2.051	.045
Number of Perpendicular Daily Rail feeder trains	6.722	1.934	.126	3.476	.001
Neighborhood Attribute					
Population density (1/2-mile buffer)	0.017	0.004	.134	4.303	.000
Distance to nearest BRT stop (in miles)	261.705	150.751	.060	1.736	.088
Interactive Terms:					
Full-Service BRT & Feeder Bus: Dedicated Lane (0-1) * Number of perpendicular daily feeder bus lines	124.557	62.121	.123	2.005	.050
Full-Service BRT & Feeder Rail: Dedicated Lane (0-1) * Number of Perpendicular Daily Rail feeder trains	52.891	3.831	.533	13.807	.000
Full-Service BRT & Parking Capacity: Dedicated Lane (0-1) * Park-&-Ride Lot Capacity	0.514	0.249	.093	2.067	.043
Full-Service BRT & Total Density: Dedicated Lane (0-1) * (Population + Employment density within 1/2-mile buffer)	.036	.011	.185	3.202	.002
Constant	-541.164	154.71	--	-3.50	.001

Summary Statistics:
R Square = .952
F Statistic (prob.) = 129.011 (.000)
N = 69

gross acre) could be expected to increase daily BRT boardings by 170 passengers, holding all other factors constant. This equates to a midpoint elasticity of 0.32 [i.e., coefficient times the ratio of the mean density to the mean boardings, or 0.017*(13,809/744)] – i.e., all else being equal, a doubling of population densities increases BRT ridership by 32 percent. This value, we note, exceeds the elasticity between density and ridership estimated for U.S. light-rail transit (LRT) systems drawn from the Transit Cooperative Research Program (TCRP) H-1 database (Cervero, 2006).

The interactive term shown in Table 2 modified the relationship between density and ridership. If the Metro Rapid stop had a dedicated-lane service, the combination of both population and employment densities further boosted ridership. We suspect the addition of employment counts in addition to residential population (as a measure of total density) was significant in this interactive form because workers were likely to respond to BRT services most noticeably only when dedicated-lane services that yielded significant commute-time savings were available.

Two bus-stop attributes also entered the best-fitting ridership model. One was the distance to the nearest BRT stop. Lengthy spacing between stops enlarges a stop's catchment area which tends to increase daily boardings. In the case of Metro Rapid, a stop 1.5 miles from the near BRT stop could expect some 260 additional daily boardings than one a half mile away, all else being equal. The second attribute of bus-stop settings that influenced patronage was the capacity of Park & Ride lots, though only in the case of Metro Rapid stops with dedicated-lane bus services. As shown in Table 2, this interactive term has a positive coefficient indicating that bundling high-quality BRT services with parking-lot capacity boosted ridership in Los Angeles County. Again, a BRT service's opportunities for inter-modality – be they connections with private cars, rail-transit cars, or surface-street buses – emerged as a significant predictor of BRT ridership in Southern California.

We note that several bus-stop attributes that are commonly viewed as essential to running high-quality BRT services did not enter the ridership model. One quarter (17 of 69) of the surveyed bus stops had NextBus passenger information services. Thus while some waiting customers had real-time information on how soon the next bus would arrive, most did not. Statistically, however, the presence or absence of NextBus information had no discernible effect on ridership. The same held for factors like the presence of far-side bus stops (which allow buses to clear signalized intersections before stopping), protective bus shelters, and bus-stop logos/branding.

3. BRT and Land Market Impacts in Los Angeles

If transit investments create benefits, real-estate markets tell us. Location theory holds that land prices rise in synch with travel-time savings, thus to the degree transit expedites travel, properties near stations should sell for more. Transit's "capitalization benefits" are thought to be especially pronounced in highly congested areas.

This section examines the land-value impacts of BRT in Los Angeles along with other forms of high-performance transit services – heavy rail, commuter rail, and light rail.

3.1 Data Sources

The primary data source used to study land-value impacts in Los Angeles was *Metroscan*, a proprietary data base maintained by and available from First American Real Estate Solutions, headquartered in Sacramento, California. *Metroscan* contains monthly information on all real-estate sales transactions recorded in county assessor offices. For purposes of this analysis, data observations for commercial and residential properties were selected – in the case of commercial parcels, data were acquired for calendar years 1999, 2000, and 2001 (in order to create a sufficient size data base); for residential parcels, there were enough year-2000 observations to support the analysis. It should be noted that these time points pre-date the introduction of dedicated-lane, "high-end" BRT services in Los Angeles County (i.e., the Orange Line). The two semi-dedicated BRT services that operated at the time – the 26-mile Wilshire-Whittier Boulevards corridor (between Santa Monica and East Los Angeles) and the 16-mile Ventura Boulevard corridor (from University City to the edge city of Warner Center) The analysis can be viewed as gauging the impacts of BRT "lite" on sales prices. Moreover, both lines had only been in operations for a year or so of the 1999-2001 time frame. Thus impacts are necessarily viewed as short-term as well.

Hedonic price models that gauged the land-value premiums associated with transit were estimated for four types of land uses: Residential – multi-family housing; Residential – condominiums; Residential – single-family housing; and Commercial. Since capitalization effects are thought to vary across these land-use categories, separate analyses were conducted for each.

To ensure assessed values reflected transacted sales prices, records were only selected for parcels that sold in the year of analysis: 2000 for residential and 1999-2001 for commercial properties. The following numbers of records were available across each of the land uses:

- Residential – multi-family housing: 3,803 parcel records
- Residential – condominiums: 13,462 parcel records
- Residential – single-family housing: 40,966 parcel records
- Commercial: 1,241 parcel records.

For year-2000 commercial properties, the following land uses (and shares of year-2000 sales transactions) were examined:

- Office-Professional (31.1%)
- Commercial Restaurant (8.1%)
- Commercial Retail (37.9%)
- Commercial: Other (22.9%)

Besides price information, *Metroscan* provided various data on parcels, including structure and lot sizes, year built, numbers of bedrooms and bathrooms (for residential parcels), types of use (for commercial parcels), dates of sale, and address information. Address data were used to pinpoint the longitudinal-latitudinal coordinates of parcels, from which various metrics of location, including the municipality or census designated place (CDP) of a parcel, were computed.

Other key data used in the analysis came from the Southern California Associations of Governments (SCAG) and the year-2000 U.S. census (from summary table file 1A). The primary SCAG data used in the analysis were 1997 peak-period travel times for a matrix of traffic analysis zones (TAZs). Travel-time estimates were available for both highway and transit networks. Data on population, housing units, and various socio-demographic attributes of census blocks were obtained from the year-2000 census.

3.2 Methodology: Hedonic Price Modeling

To gauge impacts – i.e., values-added or values-subtracted -- associated with being near light, heavy, commuter rail transit or BRT in Los Angeles County, hedonic price models were estimated. Models took the form: $P_i = f(T, A, S, C)$, where: P_i equals the estimated price of parcel i; T is a vector of transportation services, including proximity to transit and highways and accessibility via highway and transit networks; A is a vector of property (e.g., structure size and age) and land-use (e.g., type of commercial) attributes; S is a vector of neighborhood socio-demographic characteristics (e.g., mean household income); and C is a vector of controls (e.g., municipality and time-series fixed effects). Municipality fixed-effect (dummy) variables were used to statistically capture the unique attributes of communities, such as quality of schools and degree of regulatory restrictiveness.

Many of the variables related to location, proximity to transit, neighborhood attributes, and accessibility were measured using Geographic Information System (GIS) tools. One-quarter and one-half mile buffers were created around all rail stations and BRT stops in Los Angeles County as well as all freeway and grade-separated interchanges. The one-quarter to one-half mile range is generally considered to be an acceptable walking distance to major transit stops. Whichever radius yielded the best statistical fit, regardless of the direction of a coefficient's sign, was used for each of the dummy variables used to denote walking access to transit. For purposes of gauging neighborhood attributes (such as neighborhood median household income and racial composition), one-mile buffers around parcels were digitally overlaid onto census blocks. This allowed neighborhood attributes to be gauged for areas of consistent size (around 2,010 acres) for each parcel

One of the key control variables that accounted for the relative location of parcels was accessibility indices. For residential properties, accessibility to jobs was estimated. Isochronic measures of accessibility gauged the number of jobs within designated travel-time intervals of 15 minutes, 30 minutes, 45 minutes, and one-hour over the highway and transit networks. Thus, separate accessibility indicators were computed for auto-highway and transit access to jobs. For commercial properties, accessibility to households (as indicators of relative proximity to consumers and workers) was measured. Accessibility analyses were conducted at the Traffic Analysis Zone (TAZ) level using year-1997 travel-time estimates provided by the Southern California Association of Governments (SCAG). Thus, indices gauged levels of accessibility for the TAZ that a particular parcel lies within.

Because capitalization effects were thought to vary by transit corridors, the analyses were stratified to measure differences in land-value impacts for each of the major transit lines. Across the four modes (heavy rail, light rail, commuter rail, and BRT) are 10 separate high-capacity/high-performance transit lines. Since real-estate transactions did not always occur near each line for each of the land-use types, in some instances no land-value impacts could be measured for particular lines.

3.3 Hedonic Price Model Results for Los Angeles's BRT

The hedonic price model results for the four land uses are presented below, along with graphs that summarize measured land-value premiums or discounts. Because our focus is on BRT, the marginal impacts of BRT proximity on sales prices are shown in bold. Also, land-value impacts were gauged using sensitivity-analysis techniques. For each corridor, this involved inputting mean or modal (i.e., most frequently occurring) values in the corridor (defined as five-mile radii of rail or BRT lines) into the explanatory variables of hedonic price models to come up with price estimates for the "typical" property. In all instance, base-case estimates assumed properties were not within one-half mile of a rail station or BRT stop. Holding other factors constant, the price estimates were then revised based on the assumption that the property was within one-half mile of a station on each rail line or BRT stop. Statistically, this amounted to converting the dummy variable for the rail or BRT line of interest from a value of 0 to a value of 1. The percentage change in estimated land value under this sensitivity analysis represented the premium, or discount, associated with being near a transit stop.

3.3.1 Multi-Family Housing Model

The effects of being near transit stops on the sales prices of apartments and other multi-family units were uneven. Table 3 reveals that both positive and negative impacts were recorded. None of the associations with proximity to transit were statistically significant at the 5 percent probability level, however. This is a red flag, signaling that it is difficult to draw any firm inferences from these results. All one can comfortably say that, so far, there is no evidence of large and appreciable premiums having accrued to multi-family housing from the presence of high-performance transit in Los Angeles County.

Table 3. Multi-Family Housing Properties: Hedonic Price Model Results — Factors Influencing Year 2000 Multi-Family Housing Sales Price in Los Angeles County; Year 2000 data, unless otherwise noted

Variable	Coeffi-cient	Standard Error	Prob. Value
Transit/Highway Proximity			
Subway (Red Line); within ½ mile of rail station (1=yes; 0=no)	21,707.4	21,129.6	.304
Metrolink Antelope Valley Line: within ½ mile of station (1=yes; 0=no)	-12,554.8	24.732.9	.612
Metrolink Riverside Line: within ½ mile of station (1=yes; 0=no)	13,168.8	23,269.3	.571
Metrolink San Bernardino Line: within ½ mile of station (1=yes; 0=no)	-12,309.4	25,678.5	.632
Metrolink Ventura Line: within ½ mile of station (1=yes; 0=no)	1,888.7	29,661.8	.950
LRT Blue Line: within ½ mile of rail station (1=yes; 0=no)	4,349.9	7,501.7	.562
LRT Green Line: within ½ mile of rail station (1=yes; 0=no)	12,228.9	11,815.3	.301
BRT Ventura Line: within ½ mile of bus stop (1=yes; 0=no)	**-21,386.8**	**21,803.6**	**.329**
BRT Wilshire-Whittier Line: within ½ mile of bus stop (1=yes; 0=no)	**-5,574.2**	**10,128.2**	**.582**
Highway/Freeway: within ¼ mile of grade-separated highway or freeway	-3,673.5	4,812.4	.445
Interchange Ramp: network distance, in miles, to nearest freeway ramp	10,585.3	2,236.7	.000
Accessibility and Location			
Regional Job Accessibility by Auto: No. jobs (in 1,000s, 1995) within 45 minutes peak-period auto travel time on highway network	43.5	5.1	.000
Regional Job Accessibility by Transit: No. jobs (in 1,000s, 1995) within 30 minutes peak-period transit travel time, walk access	104.1	47.2	.000
Distance to Downtown, in straightline miles	1,376.5	836.1	.100
Pacific coastline: within ½ straightline miles	85,215.9	10,007.3	.000
Property Attributes			
Structure Size: Square feet	48.4	2.2	.000
Lot Size: Square feet of Usable Space	0.95	0.10	.000
Units, total number on parcel	-3,087.0	1,755.1	.079
Bathrooms, total number on parcel	28,938.6	4,523.3	.000
Neighborhood Attributes			
Population Density: Persons per gross acre within one mile radius of parcel	552.0	315.6	.080
Mean Household Income within one mile radius of parcel, $, 2000	2.01	0.47	.000
White Households: proportion of households within one mile radius of parcel of white race	132,025.5	18,246.9	.000
Youth: proportion of population residing within one mile radius of parcel that is age 18 or less	-466,665.0	58,244.2	.053
Seniors: proportion of population residing within one mile radius of parcel that is age 65 or more	-173,022.1	89,455.9	.000
City (or CDP) Fixed Effects (1=yes, 0=no)			
Arcadia	88,980.2	24,797.0	.000
Artesia	-47,881.8	29,376.5	.103
Azusa	45,353.8	21,284.9	.033
Baldwin Park	51,328.2	26,490.9	.053
Bell	15,015.1	13,197.7	.255
Bell Gardens	18,128.9	12,623.6	.151
Beverly Hills	427,562.3	29,701.1	.000
Carson	-47,896.5	23,618.9	.043
Claremont	46,948.9	38,522.2	.223
Cudahy	11,789.1	21,663.1	.586

Table 3 (continued)			
Culver City	22,330.9	16,412.7	.174
Duarte	-54,715.3	85,280.9	.521
El Monte	30,559.6	10,526.6	.004
El Segundo	58,749.7	22,542.0	.009
Gardena	-27,618.1	14,921.9	.064
Hawaiian Gardens	-63,611.3	22,430.2	.005
Hawthorne	-16,671.7	10,551.4	.114
Hermosa Beach	197,722.1	19,362.6	.000
Inglewood	-29,424.2	8,835.1	.001
La Canada	117,030.5	42,995.3	.007
La Mirada	-86,345.2	84,986.4	.310
La Puente	30,558.5	49,354.4	.536
La Verne	-42,211.5	39,545.4	.286
Lakewood	-60,625.5	23,656.1	.010
Lancaster	-132,796.9	46,939.9	.005
Lawndale	-27,596.6	14,489.4	.057
Lomita	12,319.5	21,835.2	.573
Long Beach	-31,638.4	7,702.9	.000
Los Angeles	-12,927.4	4,969.4	.009
Malibu	443,727.5	63,717.8	.000
Manhattan Beach	457,592.9	22,490.9	.000
Monrovia	20,946.2	14,319.8	.144
Monterey Park	22,744.8	16,069.7	.157
Norwalk	-31,293.8	23,395.4	.181
Palmdale	-85,197.8	8,6021.1	.322
Pomona	17,330.5	14,388.8	.228
Redondo Beach	36,303.2	14,182.9	.011
Rosemead	28,883.7	14,077.5	.040
San Dimas	-31,802.9	35,601.7	.372
San Fernando	56,125.4	35,458.5	.114
San Gabriel	48,158.8	18,128.2	.008
Santa Monica	195,927.6	14,717.5	.000
South El Monte	27,186.3	23,895.8	.255
South Gate	13,315.0	9,658.4	.168
South Pasadena	66,367.9	19,607.7	.001
Temple City	30,695.3	17,210.8	.075
Torrance	11,497.3	12,488.8	.357
West Hollywood	39,344.3	16,649.3	.018
Whittier	-18,913.4	11,209.3	.092
Month Fixed Effects (1=yes, 0=no)			
February	-6,686.6	7,918.7	.399
March	1,572.6	7,298.5	.829
April	10,426.6	7,674.6	.174
May	9,065.2	7,268.0	.212
June	16,183.0	7,307.4	.027
July	9,800.0	7,570.4	.196
August	21,051.4	7,121.0	.003
September	16,632.4	7,183.2	.021
October	16,840.9	7,660.6	.028
November	12,937.7	7,294.5	.076
December	2,3441.2	7,196.6	.001
Constant	-31,768.6	39,781.8	.425

Table 3 (continued)
Summary Statistics
No. observations = 3,803
F Statistic (prob.) = 111.3 (.000)
R-Squared = .715

While Table 3 presents results for all forms of transit, our focus here is on BRT. In the case of BRT, land prices for multi-family projects tended to be lower in both corridors, however poor statistical fits muddy interpretations. The best we can say is the effects of first-generation BRT services on multi-family housing prices were indeterminant.

Figure 2 reveals that in percentage terms, apartments and other multi-family units near the Metro Red subway line reaped the large value-added premium – more than 6 percent. Other premiums were in the 0.5 to 4 percent range. The largest "dis-value" was the -6 percent registered for multi-family units along the Ventura BRT corridor. While one might argue this is due to negative impacts of being near the busy Ventura Freeway, we note that proximity to freeways was a control variable entered into the analysis, as was road-network distance to the nearest freeway interchange. As of a year or so into Los Angeles County's BRT experiment, we conclude there was no evidence of benefits having accrued to nearby multi-family parcels.

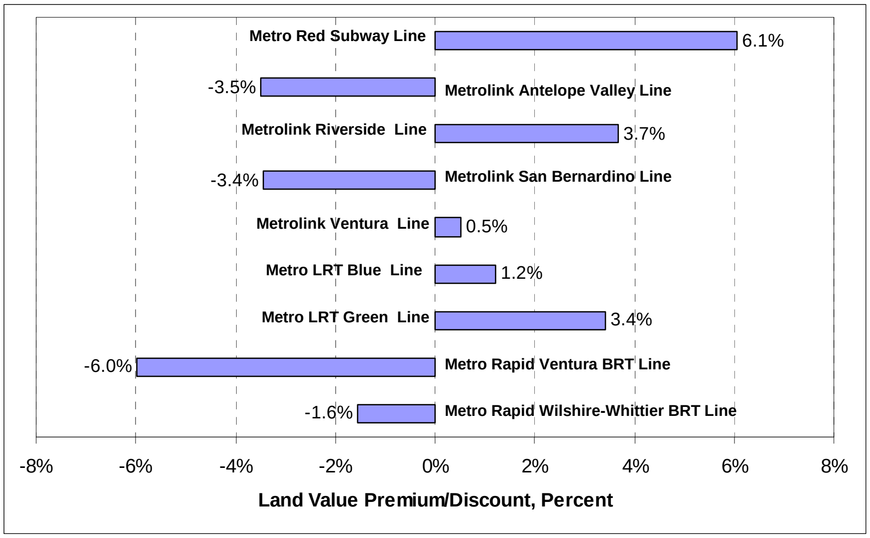

Figure 2. Multi-Family Housing Land-Value Premiums or Discounts in Los Angeles County, by Rail Line

3.3.2 Condominiums

Did for-sale higher density housing perform any better than multi-family rental properties? Table 4 and Figure 3 shows only with respect to Metrolink commuter-rail stops, excluding the Ventura Line. Fairly substantial dis-benefits were recorded for condominiums sold near the Wilshire-Whittier BRT Line. One possibility is that lying near transit stops, especially along the Wilshire corridor of the Red Line and BRT line, corresponded with lying within a redevelopment district. This latter association could have very well depressed condominium sales prices. These findings suggest that for-sale housing units, like condominiums, that lie in built-up urban districts suffer from the association of being in "blighted" districts, the very definition used to designate redevelopment zones.

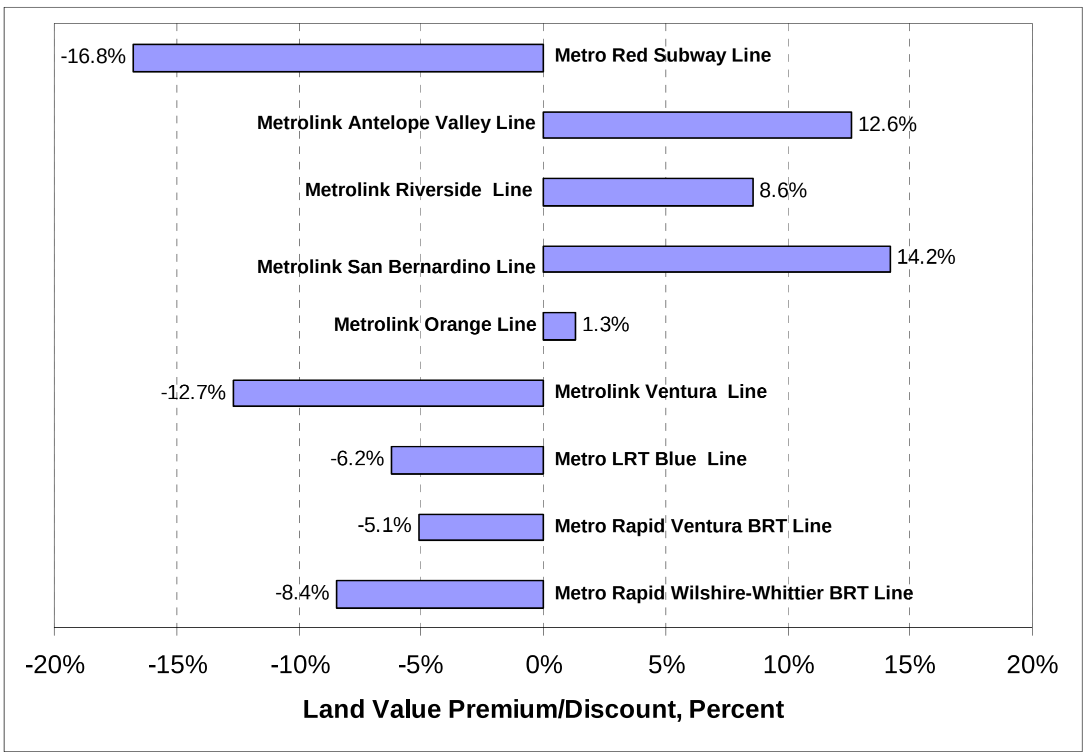

Figure 3. Condominium Land-Value Premiums or Discounts in Los Angeles County, by Rail Line

Table 4. Condominium Properties: Hedonic Price Model Results — Factors Influencing Year 2000 Condominium Sales Price in Los Angeles County; Year 2000 data, unless otherwise noted

Variable	Coeffi-cient	Standard Error	Prob. Value
Rail/Highway Proximity			
Subway (Red Line); within ½ mile of rail station (1=yes; 0=no)	-38,192.1	5,830.0	.000
Metrolink Antelope Valley Line: within ½ mile of station (1=yes; 0=no)	28,683.8	9,100.5	.002
Metrolink Orange County Line: within ½ mile of station (1=yes; 0=no)	3,019.2	19,548.5	.877
Metrolink Riverside Line: within ½ mile of station (1=yes; 0=no)	19,555.5	26,078.7	.453
Metrolink San Bernardino Line: within ½ mile of station (1=yes; 0=no)	32,381.9	15,575.8	.037
Metrolink Ventura Line: within ½ mile of station (1=yes; 0=no)	-28,903.7	7,237.6	.000
LRT Blue Line: within ½ mile of rail station (1=yes; 0=no)	-14,174.0	7,654.3	.064
BRT Ventura Line: within ¼ mile of bus stop (1=yes; 0=no)	**-11,541.9**	**7,830.0**	**.140**
BRT Wilshire-Whittier Line: within ½ mile of bus stop (1=yes; 0=no)	**-19,239.1**	**7,323.5**	**.009**
Highway/Freeway: within ½ mile of grade-separated highway or freeway	-5,281.5	2,035.0	.009
Interchange Ramp: network distance, in miles, to nearest freeway ramp	7,043.3	858.7	.000
Accessibility and Location			
Regional Job Accessibility by Auto: No. jobs (in 1,000s, 1995) within 45 minutes peak-period auto travel time on highway network	35.1	2.2	.000
Regional Job Accessibility by Transit: No. jobs (in 1,000s, 1995) within 30 minutes peak-period transit travel time, walk access	47.3	28.3	.096
Distance to Downtown, in straightline miles	1,307.8	352.7	.000
Pacific coastline: within ½ straightline miles	117,209.5	4,620.5	.000
Property Attributes			
Structure Age, Years	-1,097.0	100.4	.000
Structure Size, Square feet	228.4	3.0	.000
Bathrooms, total number	-3,980.5	1,669.3	.017
Bedrooms, total number	-18,246.0	1,648.3	.000
Condo Conversion Parcel, from apartments (1=yes, 0=no)	-2,168.0	2,515.1	.389
Neighborhood Attributes			
Population Density: Persons per gross acre within one mile radius of parcel	470.1	172.8	.007
Employment Density: Workers per gross acre within one mile radius of parcel	2,058.6	161.2	.000
Mean Household Income within one mile radius of parcel, $, 2000	2.82	0.14	.000
White Household: proportion of households within one mile radius of parcel of white race	31,279.3	7,883.7	.000
Youth: proportion of population residing within one mile radius of parcel that is age 18 or less	-136,287.0	26,315.0	.000
City (or CDP) Fixed Effects (1=yes, 0=no)			
Agoura Hills	24,706.1	9,185.5	.007
Artesia	-40,564.9	23,829.3	.089
Azusa	50,175.3	9,716.7	.000
Bellflower	-36,155.8	11,524.9	.002
Beverly Hills	55,269.7	11,237.8	.000
Carson	-29,282.3	8,822.4	.001
Cerritos	12,099.8	11,479.6	.292
Compton	-16,713.4	21,786.7	.443
Culver City	-21,396.6	6,064.6	.000

Table 4 (continued)

Diamond Bar	-20,748.6	6,309.4	.001
Downey	-56,392.5	11,398.4	.000
Duarte	39,932.4	16,612.1	.016
El Segundo	9,816.0	13,826.8	.478
Gardena	-37,013.8	11,953.8	.002
Hawthorne	-83,720.0	17,271.8	.000
Hermosa Beach	26,103.8	12,070.8	.031
Huntington Park	-30,990.5	14,424.8	.032
Inglewood	-21,544.7	7,149.2	.003
Irwindale	62,272.3	28,062.3	.026
La Canada	30,819.0	44,259.0	.486
La Verne	48,099.9	29,670.8	.105
Lakewood	-37,394.8	25,674.2	.145
Lawndale	-25,211.0	18,212.6	.166
Lomita	12,763.8	12,478.8	.306
Long Beach	-20,733.1	5,482.9	.000
Los Angeles	9,060.2	2,345.2	.000
Manhattan Beach	176,362.4	15,229.2	.000
Monrovia	33,328.8	12,324.5	.007
Montebello	-10,971.8	12,042.2	.362
Norwalk	-28,857.6	11,960.7	.016
Palmdale	-41,476.9	16,840.9	.014
Palos Verdes	-40,948.7	34,201.7	.231
Paramount	-17,771.4	9,052.3	.050
Pasadena	21,836.8	5,233.2	.000
Pico Rivera	-27,046.7	19,517.6	.166
Rancho Palos Verdes	-27,147.1	8,977.6	.003
Redondo Beach	-7,627.0	5,052.7	.131
Rolling Hills Estates	113,704.2	88,463.4	.199
San Fernando	13,237.1	23,730.2	.577
San Clarita	20,350.4	5,142.6	.000
Santa Monica	97,034.6	5,627.0	.000
Signal Hill	-10,815.8	11,818.8	.360
South Gate	-34,657.7	44,311.6	.434
Temple City	-19,180.8	15,540.1	.217
West Covina	-6,905.1	7,422.7	.352
West Hollywood	32,670.4	6,312.7	.000
Whittier	-19,006.4	14,945.4	.203
Month Fixed Effects (1=yes, 0=no)			
February	4,540.2	4,864.1	.351
March	9,147.5	4,465.3	.041
April	11,530.2	4,480.4	.010
May	15,290.8	4,467.0	.001
June	16,336.4	4,407.3	.000
July	18,335.9	4,473.3	.000
August	15,838.8	4,417.6	.000
September	21,396.3	4,450.2	.000
October	24,765.9	4,510.3	.000
November	27,298.4	4,386.7	.000
December	24,597.5	4,387.6	.000
Constant	-28,758.2	7,045.4	.000

Table 4 (continued)
Summary Statistics
No. observations = 13,462
F Statistic (prob.) = 309.2 (.000)
R-Squared = .657

3.3.3 Single-Family Housing

How about detached for-sale housing units? Did their experiences mirror those of condominiums? Table 5 and Figure 4 suggest generally "yes". As before, prices were lower for properties near BRT stops. Single-family homes near both BRT corridors had the largest "value-losses", as high as 15 percent in the case of the Wilshire-Whittier BRT corridor. While BRT services had generally been in existence for less than one year at the time of these sales transactions, nevertheless the marketplace appeared to be attaching negative values to homes sold near Metro Rapid bus stops. Clearly, no measurable price capitalization effects had occurred early into Los Angeles's foray with BRT services one year into the program.

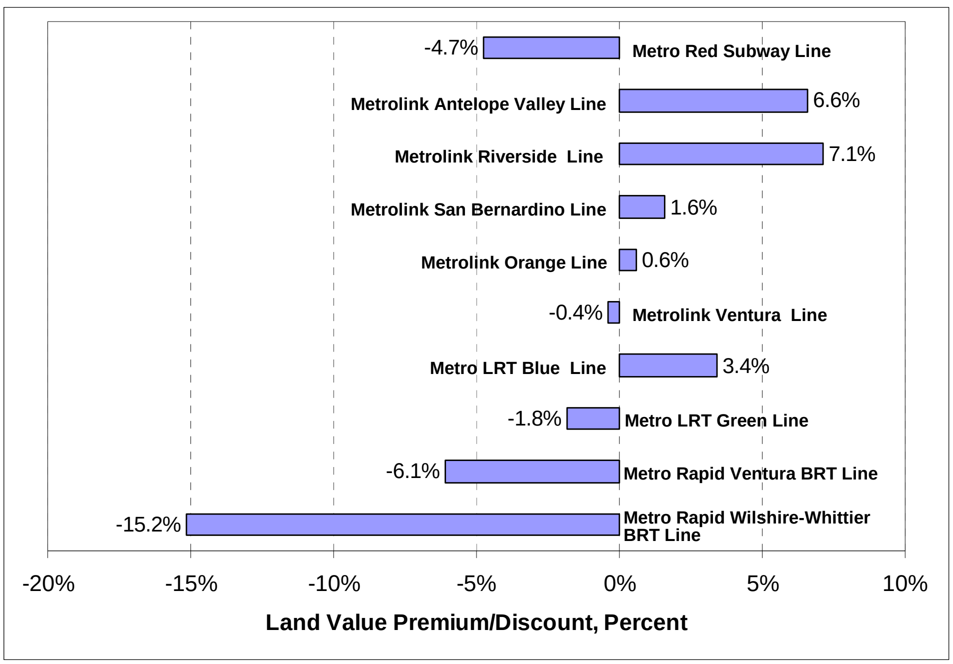

Figure 4. Single-Family Housing Land-Value Premiums or Discounts in Los Angeles County, by Rail Line

Table 5. Single-Family Housing Properties: Hedonic Price Model Results — Factors Influencing Year 2000 Condominium Sales Price in Los Angeles County; Year 2000 data, unless otherwise noted

Variable	**Coeffi-cient**	**Standard Error**	**Prob. Value**
Rail/Highway Proximity			
Subway (Red Line); within ½ mile of rail station (1=yes; 0=no)	-18,469.4	12,960.0	.154
Metrolink Antelope Valley Line: within ½ mile of station (1=yes; 0=no)	25,675.3	12,608.3	.059
Metrolink Orange County Line: within ½ mile of station (1=yes; 0=no)	2,273.3	31,402.7	..942
Metrolink Riverside Line: within ½ mile of station (1=yes; 0=no)	27,770.7	27,037.8	.304
Metrolink San Bernardino Line: within ½ mile of station (1=yes; 0=no)	6,164.2	10,480.1	.556
Metrolink Ventura Line: within ½ mile of station (1=yes; 0=no)	-1,591.7	14,410.3	.912
LRT Blue Line: within ½ mile of rail station (1=yes; 0=no)	13,351.5	7,654.0	.081
LRT Green Line: within ½ mile of rail station (1=yes; 0=no)	-7,073.6	7,419.1	.340
BRT Ventura Line: within ¼ mile of bus stop (1=yes; 0=no)	**-23,810.7**	**12,900.0**	**.065**
BRT Wilshire-Whittier Line: within ¼ mile of bus stop (1=yes; 0=no)	**-59,053.2**	**8,372.1**	**.000**
Highway/Freeway: within ½ mile of grade-separated highway or freeway	-10,831.5	1,561.7	.000
Accessibility and Location			
Regional Job Accessibility by Auto: No. jobs (in 1,000s, 1995) within 45 minutes peak-period auto travel time on highway network	53.6	1.4	.000
Pacific coastline: within ½ straightline miles	146,082.2	7,328.3	.000
Property Attributes			
Structure Age, Years	558.2	55.8	.000
Structure Size, Square feet	190.9	1.9	.000
Bathrooms, total number	21,481.7	1,490.7	.000
Bedrooms, total number	-22,788.0	1,077.9	.000
No. Stories	-21,830.3	2,366.6	.000
Neighborhood Attributes			
Population Density: Persons per gross acre within one mile radius of parcel	-1,187.8	160.5	.000
Employment Density: Workers per gross acre within one mile radius of parcel	-1,509.8	219.5	.000
Mean Household Income within one mile radius of parcel, $, 2000	3.14	0.23	.000
White Household: proportion of households within one mile radius of parcel of white race	231,957.6	5,999.1	.000
Youth: proportion of population residing within one mile radius of parcel that is age 18 or less	-529,605.0	21,696.8	.000
Seniors: proportion of population residing within one mile radius of parcel that is age 65 or more	-542,444.3	31,369.5	.000

Table 54 (continued)

City (or CDP) Fixed Effects (1=yes, 0=no)

Arcadia	46,249.7	7,243.4	.000
Artesia	-30,231.0	14,398.3	.036
Azusa	63,577.3	11,716.4	.000
Baldwin Hills	57,314.7	7,603.1	.000
Bell	8,753.1	16,416.9	.594
Bellflower	-63,619.9	8,006.4	.000
Beverly Hills	660,717.7	12,888.1	.000
Bradbury	85,021.2	36,763.6	.021
Carson	-24,131.0	6,544.7	.000
Claremont	-31,124.3	9,549.4	.001
Diamond Bar	-32,235.8	8,658.0	.000
Downey	-63,185.6	5,284.9	.000
Duarte	35,821.3	13,189.4	.007
El Monte	22,042.3	7,886.7	.005
El Segundo	-25,289.9	15,653.6	.106
Gardena	-14,084.5	10,502.4	.180
Glendale	-17,948.5	5,121.5	.000
Glendora	-23,382.6	7,399.1	.002
Hawaiian Gardens	-15,106.0	20,918.3	.470
Hermosa Beach	75,952.2	13,602.6	.000
Hidden Hills	522,375.3	35,488.2	.000
Industry	99,715.8	65,955.7	.131
Inglewood	-8,753.1	7,928.3	.270
Irwindale	58,071.0	59,001.7	.325
La Canada	192,713.8	9,206.5	.000
La Habra Heights	-72,492.8	20,251.1	.000
La Mirada	-59,053.3	7,426.6	.000
La Puente	63,937.5	9,770.0	.000
La Verne	-31,995.8	10,112.3	.002
Lakewood	-61,823.3	4,994.7	.000
Long Beach	-45,893.8	3,467.3	.000
Los Angeles	6,992.0	1,868.9	.000
Malibu	1,094,412.4	24,382.8	.000
Manhattan Beach	225,129.2	8,560.3	.000
Norwalk	-23,247.7	4,892.8	.000
Palos Verdes	421,009.0	21,153.8	.000
Paramount	-13,191.1	11,933.0	.269
Pasadena	47,930.5	5,130..2	.000
Pico Rivera	-4,506.1	8,181.9	.582
Pomona	37,788.5	4,926.9	.000
Rancho Palos Verdes	21,581.6	8,483.3	.000
Rolling Hills	495,602.7	93,338.7	.000
Rolling Hills Estates	265,969.5	18,095.5	.000
Rosemead	11,440.0	10,427.6	.273
San Dimas	-38,898.6	12,271.8	.002
San Fernando	78,907.1	12,561.5	.000
San Marino	262,225.6	101,54.5	.000
San Clarita	-8,280.7	6,381.1	.194
Santa Monica	396,385.9	10,427.2	.000
Sierra Madre	-14,036.7	16,025.8	.381
South El Monte	25,174.9	18,204.1	.167
South Pasadena	51,109.5	13,275.7	.000

Table 5 (continued)

Torrance	54,033.7	5,440.2	.000
West Covina	13,607.9	5,415.6	.012
Westlake	87,173.8	93,292.7	.350
Whittier	-39,348.8	5,965.6	.000
Month Fixed Effects (1=yes, 0=no)			
February	3,817.3	3,939.0	.333
March	9,980.1	3,607.9	.006
April	9,888.6	3,684.8	.007
May	16,358.3	3,552.5	.000
June	15,150.2	3,562.7	.000
July	18,808.1	3,639.6	.000
August	20,827.9	3,528.0	.000
September	26,080.9	3,593.5	.000
October	20,947.0	3,779.6	.000
November	23,646.1	3,633.7	.000
December	23,267.5	3,606.7	.000
Constant	-35,355.0	11,770.7	.003
Summary Statistics			
No. observations = 40,966			
F Statistic (prob.) = 1,048.9 (.000)			
R-Squared = .698			

3.3.4 Commercial Properties

Commercial real estate should reap benefits from being near transit stops to the degree that proximity increases job access and retail sales. Table 6 and Figure 5 show that offices, shops, hotels, and other commercial properties benefited from being near both BRT lines. Relationships were statistically significant only in the case of the Wilshire-Whittier Metro Rapid bus corridor. The presence of large premiums for commercial properties along the Wilshire-Whittier BRT corridor stand out, in contrast to the discounts registered for commercial properties along the Red Line subway. Because the Wilshire Boulevard corridor contains some of Southern California's most prestigious office and retail addresses, parcels sold near BRT could have reflected this association. In that some of the control variables, like city of sale, picked up the influences of locational factors, there would appear to be some value-added to commercial properties well-served by Metro Rapid buses. The fact that commercial properties capitalized benefits from being near BRT services, even only one year into the program, bodes favorably for introducing value-capture schemes to help pay for BRT investments.

Table 6. Commercial Properties: Hedonic Price Model Results — Factors Influencing Commercial Sales Price in Los Angeles County; Year 2000 data, unless otherwise noted

Variable	Coeffi-Cient	Standard Error	Prob. Value
Rail/Highway Proximity			
Subway (Red Line); within ½ mile of rail station (1=yes; 0=no)	-272,451.7	99,635.6	.000
Metrolink Antelope Valley Line: within ¼ mile of station (1=yes; 0=no)	136,928.6	259,948.7	.598
Metrolink Riverside Line: within ¼ mile of station (1=yes; 0=no)	-594,334.0	252,741.0	.019
Metrolink San Bernardino Line: within ¼ mile of station (1=yes; 0=no)	217,779.0	199,371.5	.275
Metrolink Ventura Line: within ¼ mile of station (1=yes; 0=no)	-45,640.8	158,225.0	.773
LRT Blue Line: within ¼ mile of rail station (1=yes; 0=no)	14,876.6	45,055.5	.532
LRT Green Line: within ¼ mile of rail station (1=yes; 0=no)	2,573.6	8,422.3	.766
BRT Ventura Line: within ¼ mile of bus stop (1=yes; 0=no)	**46,411.9**	**72,158.6**	**.520**
BRT Wilshire-Whittier Line: within ¼ mile of bus stop (1=yes; 0=no)	**176,044.7**	**74,672.3**	**.019**
Interchange Ramp: network distance, in miles, to nearest freeway ramp	-22,761.4	10,066.4	.024
Accessibility and Location			
Regional Labor Force Accessibility by Auto: No. employed residents (in 1,000s, 1995) within 45 minutes peak-period auto travel time on highway network	148.1	70.4	.034
Regional Labor Force Accessibility by Transit: No. employed residents (in 1,000s, 1995) within 30 minutes peak-period transit travel time, automobile access (park-and-ride)	435.2	120.0	.000
Distance to Downtown, in straightline miles	-15,122.1	3,073.2	.000
Pacific coastline: within ½ straightline miles	180,576.5	61,607.7	.003
Property Attributes			
Structure Age, Years	-2,510.9	596.9	.000
Structure Size, Square feet	75.6	2.4	.000
Lot Size, Square feet	5.9	0.9	.000
Land Use Attributes			
Office (1=yes; 0=no)	-138,908.2	80,887.3	.086
Bank (1=yes; 0=no)	510,244.6	161,552.3	.002
Professional Building (1=yes; 0=no)	-147,030.4	87,638.1	.094
Restaurant (1=yes; 0=no)	-48,288.9	84,965.8	.570
Neighborhood Shopping Center (1=yes; 0=no)	-376,545.7	125,633.2	.003
Retail Store	-80,380.2	78,715.7	.307
Store and Office Combined (1=yes; 0=no)	-117,047.9	88,351.5	.185
Store and Residence Combined (1=yes; 0=no)	-130,085.0	79,716.7	.103
City (or CDP) Fixed Effects (1=yes, 0=no)			
Agoura Hills	16,659.9	205,270.1	.417
Alhambra	245,333.0	77,017.7	.001
Arcadia	78,522.1	104,172.6	.451
Artesia	281,666.7	174,222.0	.106
Beverly Hills	917,715.9	248,707.5	.000
Carson	239,982.1	123,242.5	.052
Cerritos	462,424.2	246,345.1	.061
Compton	144,164.3	78,534.0	.067
El Monte	122,568.0	74,163.9	.099
Glendora	-170,210.4	96,857.5	.079
Hawaiian Gardens	-108,931.5	201,003.6	.588
Los Angeles	97,125.6	28,476.9	.001

Table 6 (continued)

Malibu	696,685.5	229,366.7	.002
Manhattan Beach	244,516.7	133,586.8	.067
Monterey Park	181,744.0	15,5242.5	.242
Palmdale	334,743.1	34,7917.0	.336
Palos Verdes	508,162.4	254,516.2	.046
Paramount	83,806.3	111,319.8	.452
Pasadena	73,836.7	62,576.4	.238
Pico Rivera	-296,923.4	116,676.2	.011
Pomona	183,495.9	79,525.6	.021
Rosemead	233,681.0	154,524.0	.131
San Gabriel	175,062.3	87,895.9	.047
San Marino	198,510.7	154,821.6	.200
Santa Clarita	-109,242.6	186,558.8	.558
Santa Monica	329,676.9	97,029.2	.001
Signal Hill	240,600.0	243,062.1	.322
South Gate	60,283.8	72,450.6	.406
West Covina	-111,349.4	124,563.5	.372
West Hollywood	163,203.7	176,998.4	.357
Annual Fixed Effects (1=yes, 0=no)			
2000	35,176.9	30,210.5	.245
2001	5,946.8	47,532.9	.211
Constant	397,686.4	168,209.9	.018
Summary Statistics			
No. observations = 1,241			
F Statistic (prob.) = 47.58 (.000)			
R-Squared = .700			

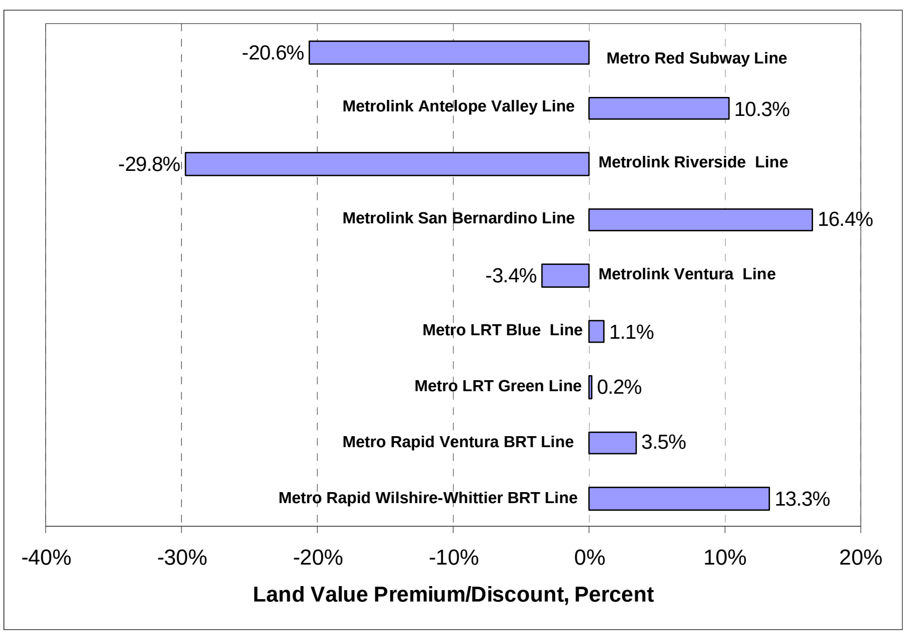

Figure 5. Commercial Land-Value Premiums or Discounts in Los Angeles County, by Rail Line

4. Conclusion

This paper framed the study of BRT services in Los Angeles as a probe into the benefits to the public sector – expressed in terms of ridership – and to private interest as reflected by land-value impacts. That said, the ridership analysis was more favorable because it was based on gauging impacts at a point when BRT services had been in existence for a decade and "high-end" services existed in the form of the Orange Line. Data from 69 BRT stops – from mixed-traffic BRT operations to exclusive-lane services – revealed several important factors that are associated with high BRT ridership. One, service intensity matters. As the frequencies of both BRT and feeder bus services increase, so will BRT patronage. Second, high levels of intermodal connections can be a boon to BRT usage. Adding inter-modal options – notably, rail-transit connections and park-and-ride provisions in addition to surface-street feeder buses – is associated with significant gains in daily patronage. Third, surrounding population densities also matter. In the case of exclusive-lane BRT services, employment densities are also important contributors to ridership. Clearly, transit-oriented development (TOD) can add riders to not only rail-transit operations but to BRT as well, something that is obvious to anyone who has ridden the exclusive busways of Curitiba or Ottawa.

Converting from mixed-traffic, low-end BRT operations ("BRT lite") to full-service, exclusive-lane services can significantly boost ridership, reflecting not only appreciable travel-time savings but also factors like better on-time performance and perceived comfort. Based on experiences in Los Angeles County, the bonus could be as high as a six-fold increase in ridership.

The analysis of "private sector" benefits was admittedly less favorable, mainly because BRT services were relatively new for the time-points of the analysis, high-end exclusive-lane (Orange Line) services had yet to be introduced, and the Metro Rapid network was not as extensive as found today. Thus the analysis was clearly focused on short-term impacts for BRT "lite" services. Hedonic price models showed no capitalization effects for residential properties and indeed the presence of a discount. Commercial properties near BRT stops, however, generally sold for more than otherwise comparable properties away from BRT. One explanation for the absence of premiums and in instances the ostensible presence of discounts is that the half-mile rings around many of the County's BRT stops correspond to redevelopment districts. Lying in distressed inner-city settings apparently lowers land values in many instances despite transit's presence. For the time period of the empirical analysis, Los Angeles County's Community Redevelopment Agency today operated 31 redevelopment projects covering 21,065 acres, many of which are situated BRT stops. However the Ventura BRT line operated substantially outside of the redevelopment zones, thus other factors, including nuisances from proximity to transit itself, are explaining value-losses. The presence of even short-term capitalization benefits from BRT services near commercial properties suggests some meaningful benefits have accrued and augurs for possibilities like introducing value-capture financing.

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