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Are Land Use and Development Changes Associated with Value Capture as a Result of Bus Rapid Transit (BRT) Investments? A Longitudinal Land Parcel Data Analysis of the First Phase of the BRT System in Bogota, Colombia

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C. Erik Vergel-Tovar
Universidad del Rosario

Patrick Welch
Volpe National Transportation Systems Center

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Abstract

There has been a rapid growth of bus rapid transit (BRT) systems in the world. Currently, more than 200 cities have this type of mass transportation system. Few studies have examined the association between BRT and land use changes in terms of value capture. What are the impacts of BRT systems on commercial and residential square meters over time? What are the impacts of BRT on cadaster appraisals per land use type over time? How does distance to BRT stations influence these changes? To what extent can positive associations of these impacts be linked to value capture mechanisms? This paper answers these questions with a difference in difference research design with a parcel level longitudinal data analysis approach between 2000 and 2013. This paper includes propensity score weighted regression models to examine the impacts of BRT on built-up area of commercial and residential uses and the impacts on cadaster values per square meters per land use type. Results of the data analysis suggests there are heterogeneous impacts of the first phase of the BRT system in Bogota on land uses, development and commercial appraisals over time. The paper found opposite impacts of BRT on land uses and development in relation to commercial and residential land uses. Commercial land uses show an increase of built-up area and commercial appraisal per square meters over time but with a higher concentration of development and values within an influence area of 100 meters from BRT stations. Residential land uses show a decrease of built-up area and commercial appraisal per square meters over time but with a higher concentration of development and values between 200 and 500 meters from BRT stations. These impacts suggest an increase of values by BRT investments that are not completely captured on appraisal assessments linked to property tax estimations.

Keywords: bus rapid transit, land use, value capture, cadaster appraisals, Latin America.

About the Authors

C. Erik Vergel-Tovar is an assistant professor at the Urban Management and Development Program in the School of Political Science, Government and International Relations at the Universidad del Rosario in Bogota, Colombia. His research focuses on the relationship between transport investments with housing and land policies and the influence of urban form on travel behavior. He can be contacted at erik.vergel@urosario.edu.co

Urban Management and Development Program
School of Political Science, Government and International Relations
Universidad del Rosario
Bogotá, Colombia
Phone: +1-57-297-02-00
erik.vergel@urosario.edu.co

Patrick Welch is a community planner at Volpe, the National Transportation Systems Center in Cambridge, MA. His work and research interests focus on sustainable transportation systems and urban development, community engagement and capacity building, and innovative environmental mitigation. He graduated in 2017 with a Master's in City and Regional Planning, focusing on land use and international development from the University of North Carolina at Chapel Hill.

Center for Policy, Planning, and Environment
Volpe National Transportation Systems Center
55 Broadway
Cambridge, MA 02142
Phone: 617-494-2013
Patrick.Welch@dot.gov

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Are Land Use and Development Changes Associated with Value Capture as a Result of Bus Rapid Transit (BRT) Investments? A Longitudinal Land Parcel Data Analysis of the First Phase of the BRT System in Bogota, Colombia

Introduction

More than 200 cities in the world are implementing bus rapid transit (BRT) systems mobilizing more than 33 million passengers per day, of which 61.46% are in Latin America (BRT+ Centre of Excellence and EMBARQ 2019). BRT is a cost-effective mass transportation system characterized by exclusive bus lanes and reduction of travel times, high-passenger capacity and level boarding, and a relatively short construction process. BRT systems have bus stops and terminals along main transportation corridors where passengers can shift transportation modes or take feeder routes that extend the service into surrounding neighborhoods (Hidalgo and Graftieaux 2008).

The land use and development change effects of BRT are still a subject of study and the empirical evidence to date is mixed rather than conclusive. Few studies have conducted analyses on land use change and development impacts of bus rapid transit systems (Stokenberga 2014). The effect of BRT on land and property prices suggests heterogeneous impacts in terms of space and time (Rodriguez and Mojica 2009; Rodriguez and Targa 2004). The impacts of BRT on land use changes also suggests heterogeneous impacts in terms of higher conversion of land parcels into commercial uses and the increase in multifamily developments within the influence area of BRT trunk corridors (Cervero and Kang 2011; Vergel-Tovar 2016).

There is a gap in the literature regarding the effects of the BRT in Bogota on changes of land uses per square meter and cadaster values per square meter over time for land use types associated with these mass transit investments. There is also a gap in the literature regarding studies measuring the impacts of BRT systems in Latin America at the land parcel level. The paper seeks to fill these gaps by estimating the impacts of the BRT on land uses per square meter and the cadaster value per square meter for land use types with a longitudinal database from 2000 to 2013 of land parcels located within the influence area of the first phase of the BRT trunk corridors of Bogota. Moreover, there is also a gap in the literature regarding the analysis of the effects of BRT systems in Bogota at the land parcel level with a research design that includes treatment and control groups. This research project seeks to contribute to the literature regarding transportation investments and value capture by looking at the impacts of BRT on land use changes as a result of the implementation of the first phase of Transmilenio in Bogota.

Bogota is an international reference on BRT systems and the study of the effects of this system on land use changes per square meters and cadaster appraisals per square meter for land use types constitutes a source of knowledge regarding value capture issues for other cities in the world implementing this type of mass transit system. Therefore, with more than 200 cities in the world in the planning and implementation stages of BRT systems, this project seeks to contribute to the study of the relationship between this type of mass transit and potential value capture mechanisms that may be associated with land use changes.

Literature Review

One of the first studies looking at impacts of BRT on land use and development was conducted with data from Los Angeles County (California, USA) looking at the influence of this type of mass transit system on land values. The hedonic price model developed for properties located in close proximity to BRT stops found that commercial properties experienced a premium on sells in the real estate market while residential properties were sold for less values (Cervero and Duncan 2002).

Since the implementation of the BRT systems in Bogota (Colombia) and Seoul (Korea), these two cities have been the focus of several studies looking at the relationship between BRT investments and development in terms of real estate dynamics. The study of the influence of the BRT system in Bogota on multifamily residential property values found a premium between 6.8% and 9.3% for every five minutes of time closer to a station (Rodriguez and Targa 2004). Another study looking at residential and commercial properties and the influence of the BRT system in Bogota conducted an analysis through a comparison with control areas including properties not served by the BRT. The study found no increase on property values analyzed in several models. However, among those properties with a statistically significant change, the study found a premium of 22% for properties with access to the BRT system (Perdomo et al. 2007).

Another study looking at the capitalization effects of the BRT system in Bogota on non-expansion areas conducted a before-and-after data analysis of properties looking at changes on asking prices. The study found that asking prices of properties offered during the year of inauguration of the extension of the BRT system experienced a premium between 13% and 14% in relation to properties in the control areas, controlling for neighborhood, regional accessibility and property attributes. The study found an appreciation of properties within 500 meters as well as those located within 500 meters and 1 km from the BRT system (Rodríguez and Mojica 2009).

An additional study was conducted with new properties data from Bogota to examine the relationship between property values and access to the BRT system in Bogota. This study found premiums of 8.7% for properties located within walking distance to feeder routes of the BRT system in relation to properties located between five to ten minutes walking distance to feeder routes. The study also found higher premiums for middle-income housing units within walking distance to the BRT system (Munoz-Raskin 2010).

In 2011, a study looking at the impacts of BRT on land uses and land values in Seoul (Korea) found land price premiums of 25% for commercial land uses within 150 meters from BRT stations. The study also found premiums of 10% for residential land uses within 300 meters distance to BRT stations (Cervero and Kang 2011). Another study looking at the impacts of BRT in Soul Korea was conducted looking at redistributive effects on development and property values. The study found residential locations are less sensitive to improvements on accessibility with mass transit than other land uses. The study also found that properties located in the urban core (CBD) experienced the highest premiums on property values (Jun 2012).

More recently, studies looking at the effects of BRT on land values have been conducted for Mexico City. In Mexico, the announcement of a BRT corridor in Ecatepec (Mexico) appeared to have no impact on property values (Flores Dewey 2012). Another study looking at the impacts of BRT on land prices in Mexico City found that Line 1 generated an increase of 15% on land prices while the analysis found no evidence regarding the effects of Line 2 on land prices as a result of BRT investments (Velandia 2013).

A more recent study looking at the relationship between rents and development and BRT investments in Bogota examined cadaster data over time. The study found that multifamily housing units closer to BRT corridors experienced higher rents per square meter than units located further away from the system (Cervero and Dai 2014). Another study looking at the land development impacts of BRT in Quito and Bogota conducted a quasi-experimental design looking at changes on properties with and without access to this type of mass transit investment. In Bogota, the study found a higher concentration of development along BRT corridors in terms of higher square meters and approved licenses in relation to control areas. In Quito, the study found increments on building prices by 3% for Corredor Norte, 5% for properties located along the Trolebus corridor and a decreased of 2.5% along Ecovia corridor. For single family houses along Corredor Norte the study found increments of 9.4% (Rodriguez, Vergel-Tovar, and Camargo 2016).

Other cities with more recent developments of BRT systems have been studied more recently. In the case of Beijing (China), one study conducted a data analysis of residential property values looking at the impacts of the BRT. The study found positive impacts of the BRT system with an appreciation for every 100 meters closer to the stations. The asking prices of residential properties with access to the BRT system experienced an increase between 1.32% and 1.39% (Deng, Ma, and Nelson 2016). A recent study looking at the impacts of BRT investments on land prices in Barranquilla (Colombia), a city where the system took several years for completion. The study found early increments of land prices closer to the BRT system but no evidence (negative or non-detectable) on later stages of the system, suggesting the increments might be affected by the delays of the construction process (Garza 2016). Finally, another more recent study examined 81 stops in seven Latin American cities (Bogota, Curitiba, Goiânia, Guatemala City, Guayaquil, Quito, and São Paulo) to examine a typology of urban development around the stops and conduct factor and cluster analyses. The study identified ten station types, of which 8 are generalizable across cities, and found that stop types with a higher transit orientation and mix of land uses were more likely to have higher ridership than others (Rodríguez and Vergel-Tovar 2017).

Methodology

Research Questions and Hypotheses

This paper extends the methodology developed by the primary author on his doctoral dissertation (Lund, Cervero, and Willson 2004). This paper examines the effects of the first phase of the BRT system of Bogota on land use changes in terms of square meters by land use type (commercial and residential) and compares these estimates with the effect of the BRT on cadaster appraisal

values per square meters on land use types (commercial and residential). This paper answers the following research question: what are the impacts of BRT systems on cadaster values over time?

This study answers the research question above with a mixed methods approach. First, the paper develops a longitudinal quantitative approach by studying land use and development impacts of BRT investments by looking at changes on 56,892 land parcels over time located along treatment corridors (BRT) and 41,284 land parcels located along control corridors (major arterial roads) in Bogota with 14 waves of longitudinal data (from 2000 to 2013). Then, this paper analyzes semi-structured interviews with developers and planners with knowledge regarding the real estate dynamics in the city, the transportation planning process of the BRT system and the land use planning procedures taking place in Bogota since the approval of the Urban Master Plan in 2000.

The main two hypotheses of this project consist of determining to what extent the cadaster appraisal captures the accessibility benefits generated by the BRT and if there is a positive association between BRT and land use changes that can be associated with value capture mechanisms. This paper provides estimates of changes on land uses per square meter and cadaster appraisals per square meter for land use types as a result of BRT investments in Bogota. Based on this, this paper seeks to determine if cadaster appraisals conducted by the local government of Bogotá have been able to capture the accessibility benefits generated by the BRT system over time. Moreover, this paper examines if distances to BRT stations are also playing a role in these relationships.

Study Area

Bogotá, the capital of Colombia, is located at 2,600 meters above sea level. It is the largest city in Colombia with a population of 7,674,366 inhabitants within an area of 4,800/km^2 (DANE 2012). Bogotá began the operations of the BRT system known as "*Transmilenio*" in 2001 based on the experience of Curitiba and Quito. Table 5 shows the four trunk corridors built in the first phase of "*Transmilenio*". The "*Av. Calle 80*" trunk corridor began commercial operations in January of 2001. The "*Av. Caracas*" trunk corridor also opened commercial operations in January 2001, but the expansion towards the BRT terminals ("*Norte*" and "*Usme*") was completed in August of 2001. The "*Autonorte*" trunk corridor began commercial operations once the BRT Terminal Norte was operational. In 2002, an extension bordering the historic center was built from "*Av. Caracas*" to "*Carrera 3*" along "*Av. Jimenez*".

Table 1: Phase One BRT Corridors in Bogotá

BRT Corridor	Length (Km)	Number of stations	Start date (operations)
Calle 80	10.1	12	January 2001
Av. Caracas	11.9	14	January 2001 August 2001† February 2002††
Autonorte	10.3	15	August 2001†
Av. Jiménez	1.9	3	June 2002
Total	34.2	44	

Source: BogotaComoVamos 2016; EMBARQ 2009

†Expansion of Phase 1 with the opening of BRT Terminals *Usme* and *Portal Norte*

††Opening of BRT Terminal *Tunal*

Quantitative Data Analysis

Data

The data at the land parcel level was provided by the Cadaster Department of Bogotá. Additional data was processed from geographic information systems (GIS) data available at the IDECA website of Bogotá. The Census of Building Activity data was provided by the National Department of Statistics of Colombia (*Departamento Administrativo Nacional de Estadística,* DANE in Spanish). This paper conducted intensive data processing at the land parcel level to generate a panel data structure from 2000 to 2013. The completion of this longitudinal data set is further described in the next section. The data corresponds to parcels located within a buffer area of 500 meters (both sides) from the BRT trunk corridors (treatment) and two major arterial roads (controls). Table 1 shows the dependent and independent variables included in the data analysis.

Table 2: Description of Variables

Variable	Definition	Level	Source
Dependent variables			
Ln Value COP million	Natural logarithm of the mean value of the commercial appraisal value in millions of all properties on the land parcel within the buffer area of the BRT corridor from 2000 to 2013	Parcel	Cadaster Department
Ln Value per SQMT	Natural logarithm of the mean value of the commercial appraisal value per square meter of all properties on the land parcel within the buffer area of the BRT corridor from 2000 to 2013	Parcel	Cadaster Department
Independent variables			
Treatment	Treatment=1; Control=0	Parcel	
Location factors of land parcels			
Distance BRT Station 1 *≤100 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) ≤ 100 meters=1; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Distance BRT Station 2 *>100m ≤200 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) > 100 meters and ≤ 200 meters=1; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Distance BRT Station 3 *>200m ≤300 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) > 200 meters and ≤ 300 meters=1; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Distance BRT Station 4 *>300m ≤400 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) > 300 meters and ≤ 400 meters=1; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Distance BRT Station 5 *>400 m ≤500 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) > 400 meters and ≤ 500 meters=1; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Distance BRT Station 6 *>500 m*	If linear distance of land parcel to current BRT station (treatment) or projected station (control) > 500 meters; Otherwise=0	Parcel	GIS (Transmilenio SA[†])
Ln Distance CBD	Natural logarithm straight line distance to the International Center (Av. Calle 26)	Parcel	GIS (City planning department)
Ln Distance BRT corridor	Natural logarithm straight line distance to BRT corridor or major arterial road (future BRT corridor in control area)	Parcel	GIS (City planning department, Transmilenio SA[†])
Land attributes, use and socioeconomic characteristics of land parcels			
Land Uses	Residential=1; Industrial=2; Commercial=3; Facilities=4; Vacant=5; Other=6; Mixed-use=7 from 2000 to 2013	Parcel	Cadaster department
Ln Parcel Size	Natural logarithm of area of parcel in sqmt within buffer area from 2000 to 2013	Parcel	Cadaster department
Ln Properties	Natural logarithm # properties within land parcel from 2000 to 2013	Parcel	Cadaster department

Socioeconomic stratum	Level 1=1; Level 2=2; Level 3=3; Level 4=4; Level 5=5; Level 6=6 from 2000 to 2013	Parcel	Cadaster department
Ln Built-up Area	Natural logarithm of the sum of the total built-up area from 2000 to 2013 within the parcel.	Parcel	Cadaster department
Ln Population density	Natural logarithm of people per hectare at the block level within buffer area in 2000 and 2009	Block	GIS (City planning department)
Ln Block Size	Natural logarithm of block size area in sqmt within buffer area in 2000 and 2009	Block	GIS (City planning department)
Neighborhood attributes			
Ln Roads ratio	Natural logarithm total road area per gross neighborhood area in 2000 (total road area excluding blocks in sqmt/neighborhood area in sqmt)	Neighborhood	GIS (City planning department)
Ln Parks Ratio	Natural logarithm total park area per gross neighborhood area in 2000 (total park area in sqmt/neighborhood area in sqmt)	Neighborhood	GIS (City planning department)
Ln Facilities Density	Natural logarithm density of facilities per gross neighborhood area in 2000 (total number of facilities/ neighborhood area in Ha).	Neighborhood	GIS (City planning department)
Built square meters (completed developments)	Proportion of total built sqmts of developments at the neighborhood level per total built sqmts of developments from 2000 to 2013	Neighborhood	DANE†† (Building activity census)
New square meters (started developments)	Proportion of total new sqmts of new developments at the neighborhood level per total new sqmts of developments from 2000 to 2013	Neighborhood	DANE†† (Building activity census)
Square meters under construction (development on progress)	Proportion of total sqmts under construction of developments at the neighborhood level per total sqmts under development from 2000 to 2013	Neighborhood	DANE†† (Building activity census)

†Transmilenio SA is the Bus Rapid Transit Agency of Bogotá

††DANE is the National Statistics Agency of Colombia (*Departmento Administrativo Nacional de Estadística* in Spanish)

Data Management

Stata Data Analysis and Statistical Software and ESRI's ArcGIS software were used to arrange and process the data into the format and structure needed to conduct the analysis. For each wave and for each BRT trunk and control corridor, the total built-up area and total property area was processed for each property within the 500-meter buffer of the BRT corridor. This property level data was aggregated to the parcel level, adjusting for any parcels that are located within 500 meters of multiple BRT corridors and controls. The socioeconomic level was developed as a categorical variable with six values, taking the classification of strata determined by the Cadaster Department of Bogotá. Seven land use variables were created based on the system used by the Cadaster Department of Bogotá—Residential, Industrial, Commercial, Facilities, Vacant, and Other—and the Mixed-Use category was estimated for parcels where more than one land use were identified in the data processing. Population density was calculated at the block level using GIS and changes over time were estimated with a population rate according to data provided by the City Planning Department for 2005 and 2009. The density of various community facilities and the ratio of parks and roads to the total land area was estimated at the neighborhood level using GIS. The data processing described above was first conducted for each BRT corridor for every year of the analysis before being combined into a single database and reshaped to long format for analysis.

Data Analysis

The analysis examines changes of 56,892 land parcels located within 500 meters along treatment BRT trunk corridors ("Av Caracas," "Autopista Norte," and "Av Calle 80") and 41,284 parcels along control corridors ("Av Boyaca" and "Av 68") in Bogotá. The data analysis was conducted in four steps following a difference in difference research design. First, the analysis estimated propensity scores of parcels to receive treatment (BRT) in year 2000. Second, the data analysis developed propensity score weighted regression analyses with built-up area per land use type over time using observed data from 14 years, including the base line year of 2000. Third, the data analysis conducted propensity score weighted regression analyses with appraisal value per square meter per land use type over time with observations for all 14 years. Finally, the data analysis examined the spatial heterogeneity effect of land use changes and appraisal values in relation to the distance to BRT stations by including categorical variables according to six distance ranges. All data analyses included tests of the regression coefficients between each year and the base line year.

This paper conducts a comparative analysis in two ways. First, the data analysis estimates the effects for each BRT corridor ("Av Caracas", "Autopista Norte" and "Av Calle 80") in comparison to the control corridors ("Av Boyaca" and "Av 68"). Second, the project compares the effects of the BRT on land use changes and cadaster appraisals in terms of the two main hypotheses related to accessibility benefits with cadaster appraisals and value capture associated with land use changes. This paper runs propensity score weighted regression models with two dependent variables. The regression model to estimate the effect of the BRT on the cadaster assessment value is described below:

$$ln(y_i) = \beta_0 + \vec{\beta}_{distBRTS}\overrightarrow{DistBRTS_\iota} + \sum_j^{12}\beta_j * X_{ij} + \vec{\beta}_{landuses}\overrightarrow{Landuses_\iota} + \vec{\beta}_{strata}\overrightarrow{Strata_\iota} + \alpha_2 * year_{i2} + \alpha_3 * year_{i3} + \alpha_4 * year_{i4} + \cdots + \alpha_t * year_{it} + \lambda_1 * yeart_{i1} * T + \lambda_2 * yeart_{i2} * T + \lambda_3 * yeart_{i3} * T + \lambda_4 * yeart_{i4} * T + \cdots + \lambda_t * yeart_{it} * T + \varepsilon_i$$

Where
$ln(y_i) = logarithm\ of\ cadaster\ assessment\ value\ of\ parcel\ i$
$\beta_0, = intercept$
$\beta_{distBRTS} = is\ a\ vector\ of\ estimated\ coefficients$
$DistBRTS_i = is\ a\ vector\ of\ six\ dummy\ variables, distances\ to\ BRT\ station\ of\ parcel\ i$
$\beta_j = \ estimated\ coefficients\ associated\ with\ independent\ variables\ X_j\ of\ parcel\ i$
$X_{ij} = j\ independent\ variables\ of parcel\ i$
$\beta_{landuses} = is\ a\ vector\ of\ estimated\ coefficient$
$Landuses_i = is\ a\ vector\ of\ seven\ dummy\ variables, land\ uses\ of\ parcel\ i$
$\beta_{strata} = is\ a\ vector\ of\ estimated\ coefficient$
$Strata_i = is\ a\ vector\ of\ six\ dummy\ variables, socioeconomic\ stratum\ of\ parcel\ i$
$\alpha_2, \alpha_3, \alpha_4 \ldots \alpha_t = estimated\ coefficients\ years\ 2001, 2002, 2003, \ldots\ldots\ldots\ 2013\ respectively$
$year_{i2} = \ dummy\ variable\ year\ 2001 = 1;\ otherwise = 0$
$year_{i3} = \ dummy\ variable\ year\ 2002 = 1;\ otherwise = 0$
$year_{i4} = \ dummy\ variable\ year\ 2003 = 1;\ otherwise = 0$
$year_{it} = \ dummy\ variable\ years\ 2004\ to\ 20013 = 1;\ otherwise = 0$
$\lambda_1, \lambda_2, \lambda_3, \lambda_4 \lambda_t = estimated\ coefficient\ of\ treatment\ effect\ on\ years\ 2000, 2001, 2002, \ldots\ldots. 2013$
$yeart_{i1} = dummy\ variable\ year\ 2000, = 1; otherwise = 0$
$yeart_{i2} = dummy\ variable\ year\ 2004, = 1; otherwise = 0$
$yeart_{i3} = dummy\ variable\ year\ 2009, = 1; otherwise = 0$
$yeart_{i4} = dummy\ variable\ year\ 2013, = 1; otherwise = 0$
$yeart_{it} = dummy\ variable\ years\ 2004\ to\ 2013, = 1; otherwise = 0$
$T = dummy\ variable\ \ for\ treatment = 1\ and\ control = 0$

The equation also estimates the effects on the cadaster value per square meter as the second dependent variable. The equation also runs the same model for parcels with commercial land uses, where the land uses categorial variable is excluded. The equation also estimates interactions for the three BRT corridors of phase one of the system (Av Caracas, Autonorte, and Av Calle 80) in all models. The models estimate the interaction with the six-dummy variable regarding the distance of parcels to BRT stations.

Qualitative Data Analysis

This paper includes the analysis of semi-structured interviews with 25 key participants who have been involved in real estate projects in close proximity to BRT investments, transportation planners involved in the design and implementation process of the mass transit system and land use planners who participated in the formulation and implementation of the Urban Master Plan of Bogotá. The qualitative data analysis seeks to explain the results of the quantitative data analysis. The qualitative data analysis includes two approaches. First, the analysis identifies quotes per participant related to the relationship between BRT investments and cadaster values. Then, the analysis developed a cross sectional approach in order to determine relationships between topics across participants. The classification of the data (quotes) seeks to determine associations regarding the relationship between BRT investments and cadaster values through connections across participants (Dey 2003). Second, a data driven analysis was conducted by reading all transcriptions in order to determine explanations of the quantitative data analysis results.

Results

Quantitative Data Analysis

Estimation of Propensity Score

The propensity score was first estimated with the independent variables described in Table 1. Balance was determined using the standardized difference between treatment and controls based on mean and standard deviations (Oakes and Johnson 2006). There is no agreement in the propensity score literature about what threshold determines if the balance property is satisfied. Authors suggest a range between 25% and 10% but there is not an agreement on this matter (Holmes 2013; Pan and Wei 2015). The standardized difference was used to determine balance given that t-tests may be influenced by sample size (Pan and Wei 2015). Balance was achieved for all variables with the only exception being distance to the CBD (Stand. Diff. -0.243). In order to achieve balance between treatment and controls, a second logistic regression model was estimated including interaction variables between selected independent variables. Thus, propensity scores were estimated with the same variables and interaction variables were added in order to achieve the balance property (McCaffrey et al. 2013). The propensity scores obtained in this logistic regression are used in checking the balance between treatment and control parcels across variables. Table 3 shows the results of the logistic regression with interaction terms. The propensity scores are used in the regression models conducted for the data analysis. Table 4 shows the descriptive statistics of the dependent and independent variables weighted with

propensity scores for the year 2000 and 2013. Figure 8 in the appendix shows the values of the dependent variables over time and for each BRT corridor. The dependent variable shows an increase over time for both groups (treatment and control) and the pattern for BRT corridors suggests an important increase for Av Calle 80 parcels over time while Autonorte is the corridor with the higher values. The area served by the BRT corridor Autonorte includes several parcels with higher income groups.

The independent variables suggest a trend related to land uses in both groups (treatment and controls). Commercial land uses tend to increase over time, but the change is higher in the treatment parcels than in the control parcels. This suggests the BRT system attracts this land us change, which is further explored in the quantitative data analysis. The variable socioeconomic level suggests minor changes across parcels and groups over time, with a strong presence of parcels in the socioeconomic level 3. The variable built-up area suggests a significant increase of development in both groups (treatment and controls), but the strong difference in the control areas is related to the higher presence of vacant parcels than in treatment areas. This is an important difference between treatment and control groups because BRT corridors of phase one were implemented in already consolidated areas such as Av Caracas, except for corridors Autonorte and Av Calle 80. The Autonorte corridor is characterized by larger parcel sizes with single-family attached developments that during recent years have experienced redevelopment dynamics, while Av Caracas is characterized by a high fragmentation of ownership with multiple parcels within each block. The data suggests a higher concentration of population in the treatment corridors while block size is similar between both groups.

Table 3: Logistic Regression Results of BRT (treatment=1; otherwise=0) with Interactions, Bogotá

	Estimated coefficients[†]		**Standard errors**
Distance BRT Station			
≤100 m	(reference)		
>100 m ≤200 m	-0.466	***	0.055
>200 m ≤300 m	-0.774	***	0.055
>300 m ≤400 m	-1.180	***	0.057
>400 m ≤500 m	0.080		0.462
>500 m	-2.006	***	0.062
Ln Distance CBD	-2.464	***	0.153
Ln Distance BRT corridor	0.521	***	0.017
Land Uses			
Residential	(reference)		
Industrial	0.124	***	0.024
Commercial	0.477	***	0.047
Facilities	0.433	***	0.078
Vacant	-0.370		0.526
Other	0.121		0.168
Mixed-use	-0.169	**	0.052
Ln Parcel Area	-2.306	***	0.253
Ln Properties	-1.612	***	0.243
Socioeconomic Level			
One	(reference)		
Two	-6.547	***	0.579
Three	3.569	***	0.813

Four	-15.052	***	0.893
Five	-5.631	***	0.581
Six	-7.775	***	0.583
Ln Built-up Area	-0.008		0.008
Ln Population Density	-0.047	**	0.017
Ln Block Size	-0.095	***	0.012
Ln Roads Ratio	4.631	***	0.119
Ln Parks Ratio	-0.120	***	0.005
Ln Facilities Density	1.033	***	0.016
Built square meters	-0.514	***	0.053
New square meters	-1.901	***	0.048
Square meters under construction	-0.215	***	0.026
Distance CBD* Socioeconomic level 3	-1.177	***	0.063
Distance CBD* Socioeconomic level 4	0.628	***	0.071
Roads * Socioeconomic level 3	-7.625	***	0.334
Distance CBD * Distance BRTS >400 m ≤500 m	-0.186	***	0.052
Distance CBD * Land Use Vacant	0.147	**	0.056
Distance CBD * Properties	0.226	***	0.027
Distance CBD * Parcel Area	0.242	***	0.028
Constant term	32.092	***	1.514
N	98,176		
Log likelihood	-54,323.80		
LR chi2(36)	24961.32		
Prob > chi2	0.000		
Pseudo R2	0.187		

* p<0.05, ** p<0.01, *** p<0.001

Table 4: Descriptive Statistics, Years 2000 and 2013 (weighted with propensity scores)

	Year 2000								Year 2013							
	Treatment (N=56,892)				Control (N=41,284)				Treatment (N=56,892)				Control (N=41,284)			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Dependent variable																
Ln Value COP million	4.019	0.908	-2.03	10.56	4.100	0.763	0.18	10.74	5.294	0.974	-1.90	12.61	5.441	0.746	2.11	13.94
Ln Value per SQMT	9.109	2.195	-6.64	21.69	9.169	2.101	-4.42	22.08	10.485	2.381	-6.50	24.22	10.760	1.800	-2.38	25.66
Independent variables																
Distance BRT Station																
≤100 mts	0.025	0.156	0.00	1.00	0.024	0.152	0.00	1.00	0.025	0.156	0.00	1.00	0.024	0.152	0.00	1.00
>100mts ≤200 mts	0.114	0.317	0.00	1.00	0.112	0.316	0.00	1.00	0.114	0.317	0.00	1.00	0.112	0.316	0.00	1.00
>200mts ≤300 mts	0.201	0.400	0.00	1.00	0.216	0.411	0.00	1.00	0.201	0.400	0.00	1.00	0.216	0.411	0.00	1.00
>300mts ≤400 mts	0.251	0.434	0.00	1.00	0.243	0.429	0.00	1.00	0.251	0.434	0.00	1.00	0.243	0.429	0.00	1.00
>400 mts ≤500 mts	0.262	0.440	0.00	1.00	0.251	0.434	0.00	1.00	0.262	0.440	0.00	1.00	0.251	0.434	0.00	1.00
>500 mts	0.147	0.354	0.00	1.00	0.154	0.361	0.00	1.00	0.147	0.354	0.00	1.00	0.154	0.361	0.00	1.00
Ln Distance CBD	8.847	0.552	4.32	9.67	8.929	0.117	8.52	9.35	8.847	0.552	4.32	9.67	8.929	0.117	8.52	9.35
Ln Distance corridor	5.466	0.684	2.36	6.21	5.411	0.674	2.87	6.21	5.466	0.684	2.36	6.21	5.411	0.674	2.87	6.21
Land Uses																
Residential	0.790	0.407	0.00	1.00	0.794	0.405	0.00	1.00	0.694	0.461	0.00	1.00	0.744	0.437	0.00	1.00
Industrial	0.152	0.359	0.00	1.00	0.138	0.345	0.00	1.00	0.003	0.050	0.00	1.00	0.009	0.096	0.00	1.00
Commercial	0.042	0.200	0.00	1.00	0.049	0.216	0.00	1.00	0.269	0.444	0.00	1.00	0.232	0.422	0.00	1.00
Facilities	0.024	0.154	0.00	1.00	0.021	0.142	0.00	1.00	0.022	0.147	0.00	1.00	0.015	0.120	0.00	1.00
Vacant	0.008	0.087	0.00	1.00	0.011	0.105	0.00	1.00	0.008	0.091	0.00	1.00	0.006	0.078	0.00	1.00
Other	0.023	0.150	0.00	1.00	0.022	0.145	0.00	1.00	0.023	0.151	0.00	1.00	0.011	0.102	0.00	1.00
Mixed-use	0.036	0.187	0.00	1.00	0.030	0.171	0.00	1.00	0.019	0.137	0.00	1.00	0.016	0.124	0.00	1.00
Ln Parcel Area	5.023	0.891	-4.61	13.21	5.018	0.901	-4.61	13.14	5.026	0.891	-4.61	13.21	5.023	0.898	-4.61	13.14
Ln Properties	0.264	0.745	0.00	9.52	0.249	0.787	0.00	8.05	0.253	0.740	0.00	9.52	0.238	0.784	0.00	8.05
Socioeconomic Level																
One	0.009	0.093	0.00	1.00	0.021	0.142	0.00	1.00	0.010	0.100	0.00	1.00	0.021	0.142	0.00	1.00
Two	0.193	0.395	0.00	1.00	0.180	0.384	0.00	1.00	0.195	0.396	0.00	1.00	0.175	0.380	0.00	1.00
Three	0.618	0.486	0.00	1.00	0.621	0.485	0.00	1.00	0.630	0.483	0.00	1.00	0.634	0.482	0.00	1.00
Four	0.111	0.314	0.00	1.00	0.106	0.307	0.00	1.00	0.098	0.298	0.00	1.00	0.103	0.304	0.00	1.00
Five	0.048	0.213	0.00	1.00	0.051	0.220	0.00	1.00	0.049	0.216	0.00	1.00	0.046	0.209	0.00	1.00
Six	0.022	0.146	0.00	1.00	0.022	0.147	0.00	1.00	0.017	0.130	0.00	1.00	0.021	0.145	0.00	1.00
Ln Built-up Area	5.090	1.719	-4.61	11.37	5.068	1.753	-4.61	11.43	5.191	1.868	-4.61	11.61	5.319	1.471	-4.61	12.13
Ln Population Density	5.390	0.588	-4.27	6.31	5.424	0.749	-1.06	6.18	5.761	1.375	-7.06	16.67	5.639	1.897	-8.41	16.83
Ln Block Size	8.378	0.795	-3.87	13.36	8.398	0.814	-1.93	13.32	8.378	0.817	-2.04	12.74	8.396	0.821	-1.93	13.01
Ln Roads Ratio	-0.367	0.087	-0.76	-0.01	-0.363	0.070	-0.57	-0.01	-0.367	0.087	-0.76	-0.01	-0.363	0.070	-0.57	-0.01
Ln Parks Ratio	-3.611	1.813	-9.21	-0.08	-3.512	1.769	-9.21	-1.35	-3.611	1.813	-9.21	-0.08	-3.512	1.769	-9.21	-1.35
Ln Facilities Density	-1.420	0.754	-4.61	0.06	-1.443	0.565	-4.61	-0.41	-1.420	0.754	-4.61	0.06	-1.443	0.565	-4.61	-0.41
Completed sqmt Ratio	0.095	0.120	0.00	0.79	0.096	0.153	0.00	1.00	0.165	0.152	0.00	1.00	0.184	0.161	0.00	0.92
New sqmt Ratio	0.145	0.182	0.00	1.00	0.149	0.152	0.00	1.00	0.177	0.159	0.00	1.00	0.212	0.194	0.00	1.00
Progress sqmt Ratio	0.442	0.348	0.00	1.00	0.438	0.312	0.00	1.00	0.439	0.274	0.00	1.00	0.450	0.237	0.00	0.94

Data Analysis 1: Cadaster Value over Time

The first data analysis consists of looking at the effects of BRT investments on cadaster appraisal values (commercial assessments) at the parcel level over time. Results of the regression models are included in table 5. The two models are looking at the impacts on the cadaster appraisal values and values per square meter. Figure 1 shows the effect of the BRT investments of phase one of the system on cadaster appraisal values. Changes suggest an increase on values for Autonorte in relation to control corridors. The trend for Autonorte parcels suggests an increase from 2002 until 2010, then there is a decrease change until 2013. In the case of Av Caracas, although the changes are lower than in control corridors and Autonorte, there is a significant increase on values between 2003 and 2004 and between 2009 and 2010. In the case of Av Calle 80, the cadaster appraisal values are lower than controls and the other two BRT corridors, while the changes are minimum over time with a decrease trend since 2009 until 2013. These findings might be related to the fact that the BRT system has not been expanded since the opening of phase three in 2012 (construction work took several years to complete), and thus the quality of service of the system has declined over time due to the high demand.

Figure 1: Average Treatment Effects Cadaster Value Coefficients for BRT Corridors (N=1,374,464)

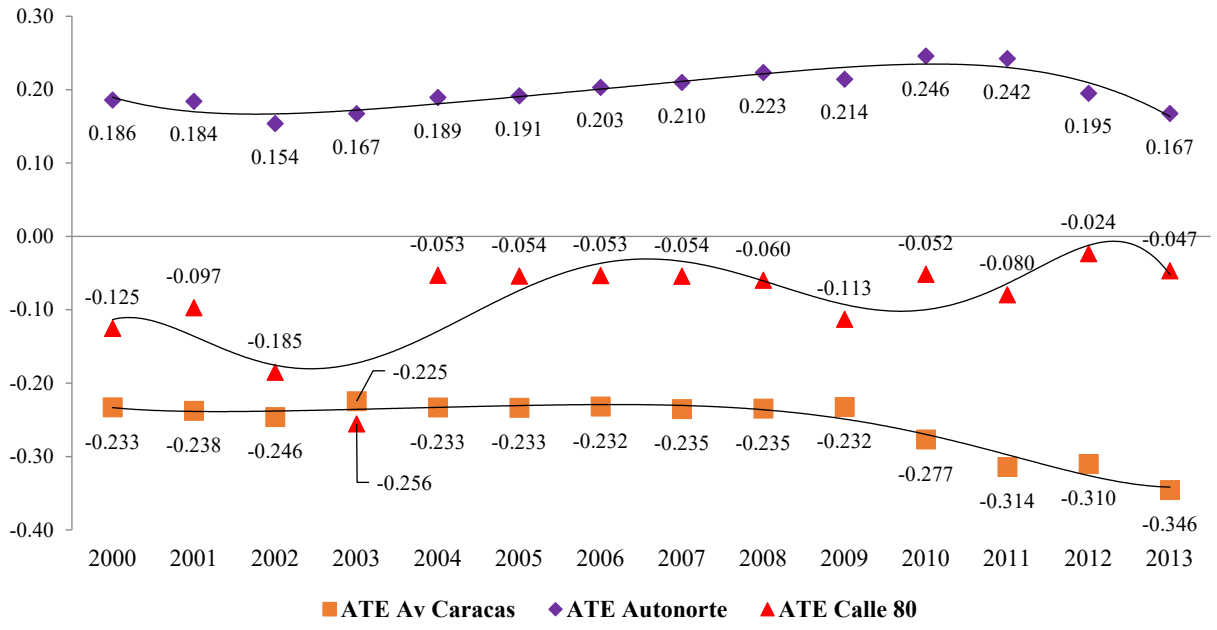


Figure 2 shows the effects of the BRT system on cadaster appraisal values per square meter over time. The results are consistent with the previous model (figure 1). The effects on Av Caracas suggest lower values than in the control corridors, which is consistent with the decay dynamics that have characterized this corridor, especially in downtown Bogotá. The model confirms that positive and strong impacts on Autonorte, a phenomenon that explains the higher development that is taking place along that corridor after the implementation of the BRT system. These findings confirm that BRT impacts on values are not homogenous across space and time.

Figure 2: Average Treatment Effects Cadaster Value per Square Meter Coefficients for BRT Corridors (N=1,374,464)

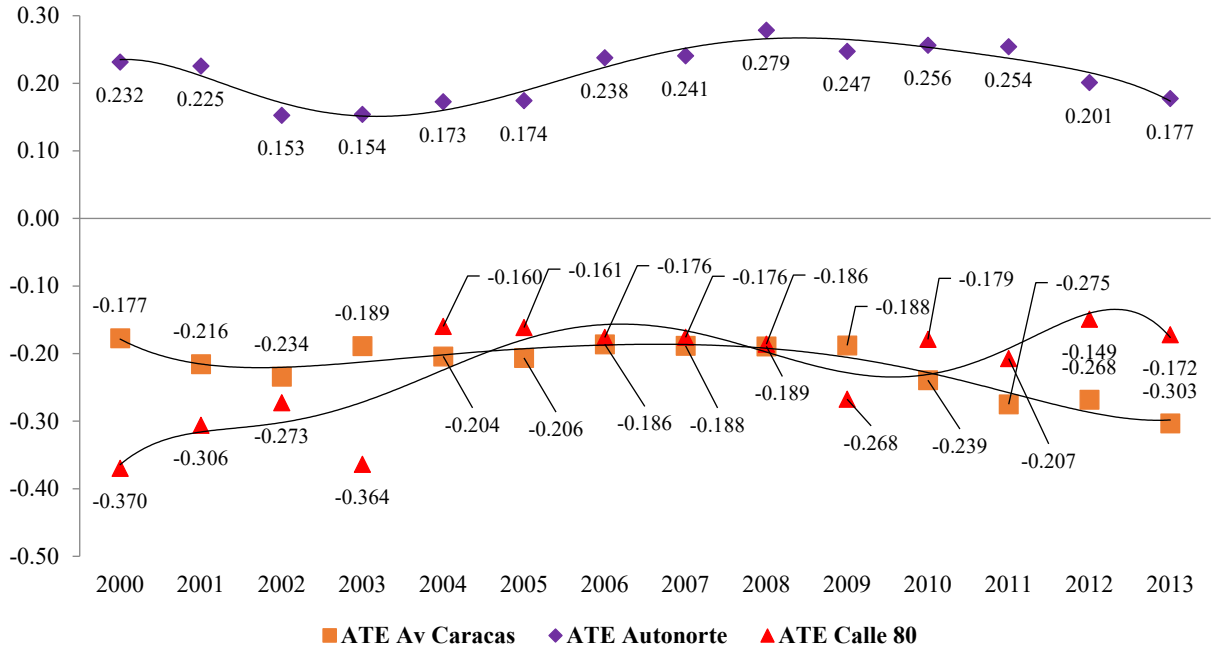


Table 5: Propensity Score Weighted Regression Results, Cadaster Values and Treatment Effects per BRT Corridor over Time

	Model 1 Dependent variable: Ln Cadaster Value					Model 2 Dependent variable: Ln Cadaster Value per SQMT				
	Estimated coefficients†		Standard errors	Wald Test†		Estimated coefficients†		Standard errors	Wald Test†	
				F†	Prob > F				F††	Prob > F
Distance BRT Station										
≤100 m	(reference)					(reference)				
>100m ≤200 m	-0.011	*	0.004			0.001		0.009		
>200m ≤300 m	-0.006		0.004			-0.006		0.009		
>300m ≤400 m	-0.029	***	0.004			-0.022		0.009		
>400 m ≤500 m	-0.009		0.005			-0.003		0.010		
>500 m	0.061	***	0.005			-0.047	***	0.010		
Ln Distance CBD	-0.185	***	0.003			-0.270	***	0.004		
Ln Distance BRT corridor	-0.020	***	0.002			-0.036	***	0.003		
Land Uses										
Residential	(reference)									
Industrial	0.707	***	0.020			0.988	***	0.029		
Commercial	0.404	***	0.003			0.504	***	0.005		
Facilities	0.551	***	0.013			-0.538	***	0.075		
Vacant	-0.774	***	0.011			-9.962	***	0.032		
Other	-0.996	***	0.057			-11.324	***	0.062		
Mixed-use	0.059	***	0.007			-0.043	*	0.019		
Ln Parcel Area	0.506	***	0.005			1.191	***	0.006		
Ln Properties	-0.401	***	0.003			-0.097	***	0.003		
Socioeconomic stratum										
One	(reference)									
Two	0.003		0.057			0.345	***	0.080		
Three	0.282	***	0.059			0.610	***	0.084		
Four	0.649	***	0.061			0.840	***	0.086		
Five	0.975	***	0.061			1.230	***	0.087		
Six	1.310	***	0.063			1.594	***	0.090		
Ln Population Density	-0.048	***	0.004			-0.036	***	0.006		
Ln Block Size	-0.008	***	0.002			-0.012	***	0.003		
Ln Roads Ratio	0.037		0.021			-0.149	**	0.043		
Ln Parks Ratio	-0.002	**	0.001			-0.010	***	0.001		
Ln Facilities Density	0.072	***	0.005			0.147	***	0.010		
Built square meters	0.008		0.006			-0.031	***	0.011		
New square meters	-0.034	***	0.006			-0.075	***	0.016		

Square meters under const.	0.040	***	0.005			0.011		0.008		
Year										
Year 2001	0.063	***	0.014			0.156	***	0.021		
Year 2002	0.167	***	0.014			0.325	***	0.021		
Year 2003	0.295	***	0.013			0.472	***	0.020		
Year 2004	0.369	***	0.012			0.566	***	0.019		
Year 2005	0.425	***	0.012			0.621	***	0.019		
Year 2006	0.480	***	0.012			0.713	***	0.019		
Year 2007	0.553	***	0.012			0.786	***	0.019		
Year 2008	0.609	***	0.012			0.841	***	0.019		
Year 2009	0.750	***	0.014			1.010	***	0.020		
Year 2010	0.906	***	0.013			1.173	***	0.020		
Year 2011	1.036	***	0.013			1.314	***	0.021		
Year 2012	1.141	***	0.013			1.426	***	0.020		
Year 2013	1.373	***	0.012			1.674	***	0.019		
Average Treatment Effect										
T Year 2000*Caracas*	-0.233	***	0.011	ref		-0.177	***	0.018	ref	
T Year 2001*Caracas*	-0.238	***	0.011	442.27	0.000	-0.216	***	0.017	122.54	0.000
T Year 2002*Caracas*	-0.246	***	0.010	472.22	0.000	-0.234	***	0.015	152.71	0.000
T Year 2003*Caracas*	-0.225	***	0.009	515.30	0.000	-0.189	***	0.013	138.76	0.000
T Year 2004*Caracas*	-0.233	***	0.008	627.96	0.000	-0.204	***	0.012	179.60	0.000
T Year 2005*Caracas*	-0.233	***	0.008	619.87	0.000	-0.206	***	0.012	181.46	0.000
T Year 2006*Caracas*	-0.232	***	0.008	621.55	0.000	-0.186	***	0.013	147.75	0.000
T Year 2007*Caracas*	-0.235	***	0.008	623.55	0.000	-0.188	***	0.013	148.53	0.000
T Year 2008*Caracas*	-0.235	***	0.008	614.06	0.000	-0.189	***	0.013	148.45	0.000
T Year 2009*Caracas*	-0.232	***	0.009	489.30	0.000	-0.188	***	0.014	129.92	0.000
T Year 2010*Caracas*	-0.277	***	0.009	678.17	0.000	-0.239	***	0.013	207.14	0.000
T Year 2011*Caracas*	-0.314	***	0.010	679.40	0.000	-0.275	***	0.015	202.54	0.000
T Year 2012*Caracas*	-0.310	***	0.010	695.60	0.000	-0.268	***	0.015	203.64	0.000
T Year 2013*Caracas*	-0.346	***	0.008	1018.56	0.000	-0.303	***	0.013	292.31	0.000
T Year 2000*Autonorte*	0.186	***	0.011	ref		0.232	***	0.021	ref	
T Year 2001*Autonorte*	0.184	***	0.011	315.64	0.000	0.225	***	0.018	144.09	0.000
T Year 2002*Autonorte*	0.154	***	0.011	258.53	0.000	0.153	***	0.019	97.88	0.000
T Year 2003*Autonorte*	0.167	***	0.010	286.42	0.000	0.154	***	0.018	101.53	0.000
T Year 2004*Autonorte*	0.189	***	0.009	375.82	0.000	0.173	***	0.016	125.75	0.000
T Year 2005*Autonorte*	0.191	***	0.009	377.99	0.000	0.174	***	0.016	126.48	0.000
T Year 2006*Autonorte*	0.203	***	0.009	411.97	0.000	0.238	***	0.018	153.62	0.000
T Year 2007*Autonorte*	0.210	***	0.009	425.93	0.000	0.241	***	0.018	156.75	0.000
T Year 2008*Autonorte*	0.223	***	0.009	440.99	0.000	0.279	***	0.018	188.95	0.000

T Year 2009*Autonorte*	0.214	***	0.011	349.62	0.000		0.247	***	0.019	150.72	0.000
T Year 2010*Autonorte*	0.246	***	0.011	425.44	0.000		0.256	***	0.017	173.68	0.000
T Year 2011*Autonorte*	0.242	***	0.012	355.56	0.000		0.254	***	0.019	153.81	0.000
T Year 2012*Autonorte*	0.195	***	0.012	289.79	0.000		0.201	***	0.019	118.90	0.000
T Year 2013*Autonorte*	0.167	***	0.011	270.07	0.000		0.177	***	0.018	109.92	0.000
T Year 2000*Calle 80*	-0.125	***	0.016	ref			-0.370	***	0.084	ref	
T Year 2001*Calle 80*	-0.097	***	0.014	58.75	0.000		-0.306	***	0.085	17.04	0.000
T Year 2002*Calle 80*	-0.185	***	0.052	40.07	0.000		-0.273	***	0.057	21.85	0.000
T Year 2003*Calle 80*	-0.256	***	0.052	46.26	0.000		-0.364	***	0.057	31.07	0.000
T Year 2004*Calle 80*	-0.053	***	0.014	39.40	0.000		-0.160	***	0.017	56.94	0.000
T Year 2005*Calle 80*	-0.054	***	0.014	40.03	0.000		-0.161	***	0.017	59.07	0.000
T Year 2006*Calle 80*	-0.053	***	0.014	39.99	0.000		-0.176	***	0.017	68.06	0.000
T Year 2007*Calle 80*	-0.054	***	0.014	40.36	0.000		-0.176	***	0.017	69.12	0.000
T Year 2008*Calle 80*	-0.060	***	0.014	42.05	0.000		-0.186	***	0.017	72.80	0.000
T Year 2009*Calle 80*	-0.113	***	0.015	62.25	0.000		-0.268	***	0.018	127.38	0.000
T Year 2010*Calle 80*	-0.052	***	0.011	44.52	0.000		-0.179	***	0.015	88.67	0.000
T Year 2011*Calle 80*	-0.080	***	0.013	52.84	0.000		-0.207	***	0.017	90.17	0.000
T Year 2012*Calle 80*	-0.024	***	0.013	33.96	0.000		-0.149	***	0.017	52.14	0.000
T Year 2013*Calle 80*	-0.047	***	0.013	39.20	0.000		-0.172	***	0.016	71.14	0.000
Constant term	3.415	***	0.082				5.607	***	0.124		
N	1,374,464					**N**	1,374,464				
F (83,1374380)	19,575.77					**F (83,1374380)**	16,011.93				
Prob > F	0.0000					**Prob > F**	0.0000				
R-squared	0.7342					**R-squared**	0.7922				
Root MSE	0.4880					**Root MSE**	0.9851				

†F statistic: (2,1374380)

††F statistic: (2,1374380)

* p<0.05, ** p<0.01, *** p<0.001

Data Analysis 2: Commercial Cadaster Values per Square Meter over Time

The second data analysis is looking at the effects of BRT investments on cadaster appraisal values on parcels with commercial land uses over time. Results of the regression models are shown in table 6. Figure 3 shows the effect of the BRT investments of phase one of the system on cadaster values for each BRT corridor over time. Changes suggest an increasing trend on Autonorte since 2005, while in BRT corridor Av Caracas there is a significant increase in 2001, after the opening of the system, but since then there is a decrease pattern. Parcels along Av Calle 80 show values lower than the control corridors with few changes until 2013, which marks a decrease change in relation to 2012.

Figure 3: Average Treatment Effects Cadaster Value Coefficients for Commercial Land Uses Across BRT Corridors (N=245,658)

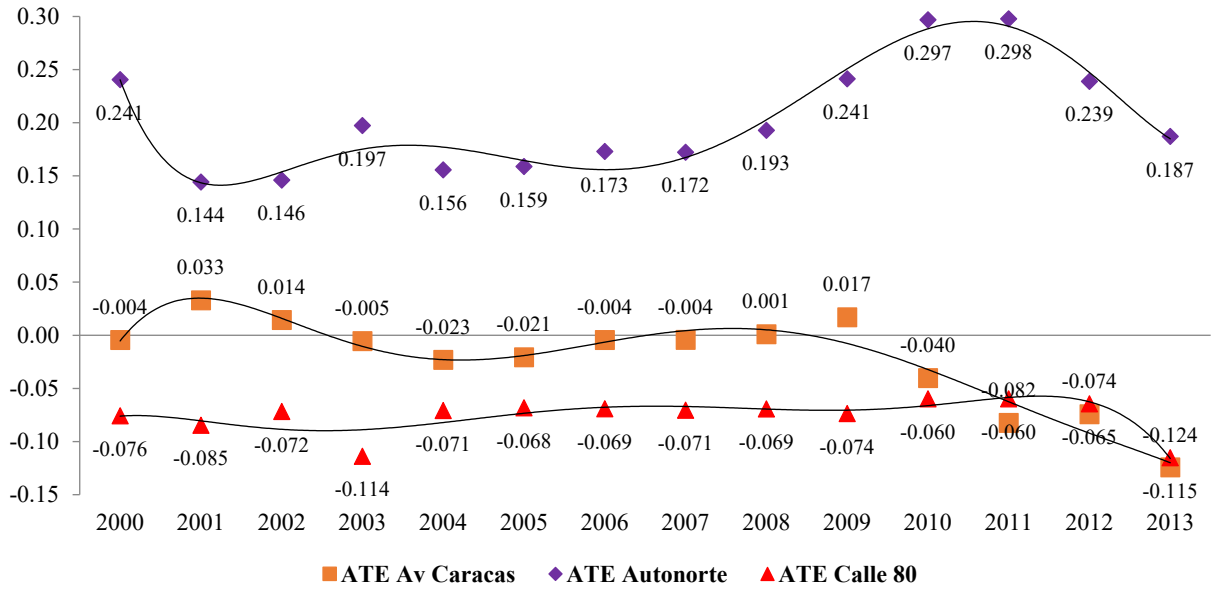


Figure 4 shows the results of the effects of the BRT system on cadaster appraisal values per square meter for commercial land uses. Results suggest parcels along Av Caracas and Autonorte experienced higher values than control corridors during the first decade of operations of the system. Although the effects on Av Caracas suggest a decrease between 2000 and 2005, there is an increase trend between 2005 and 2008, then there is a decrease that shows values that are lower than control corridors in 2013. The trend on Autonorte suggest also a decrease during the first three years of operations of the system and then there is an increase pattern that reach the maximum between 2010 and 2011, then there is a decrease pattern. Av Calle 80 shows values lower than control corridors but the decrease pattern takes place especially between 2010 and 2013. These findings suggest that, after the opening, the accessibility benefits generated by the system influenced positively cadaster values on commercial land uses, but these effects are not stable over time and the recent issues faced by the BRT system due to the lack of expansion with additional corridors and the continued increase on demand might be related to the decreasing trends observed in the data analysis.

Figure 4: Average Treatment Effects Cadaster Value per Square Meter Coefficients for Commercial Land Uses Across BRT Corridors (N=245,658)

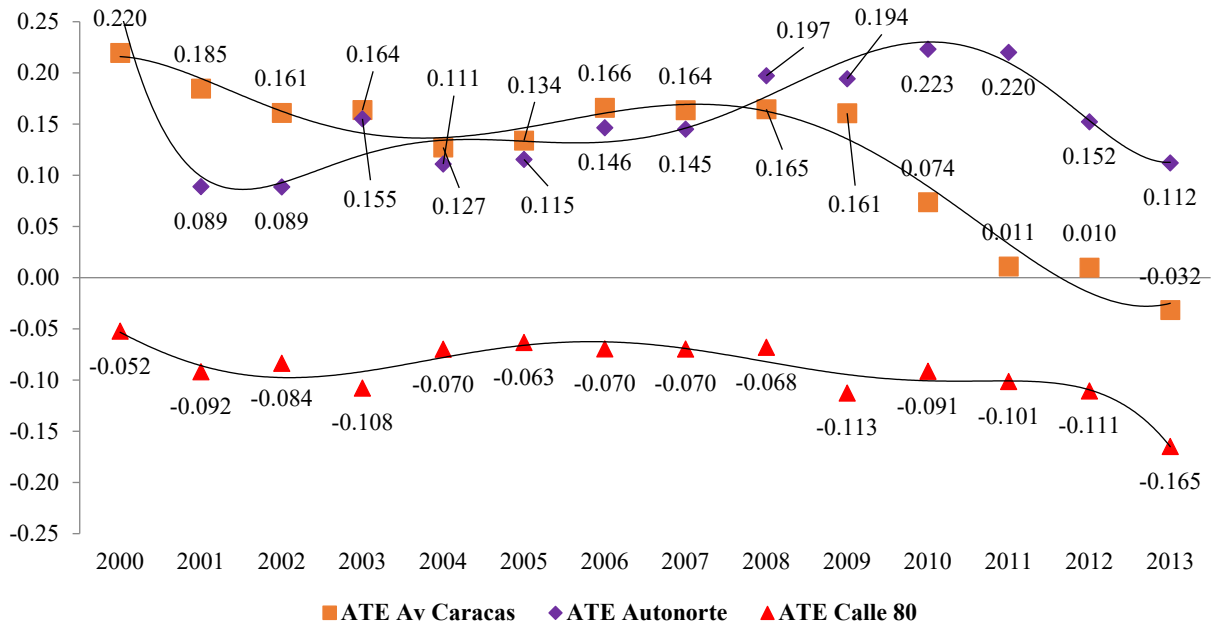


Table 6: Propensity Score Weighted Regression Results, Cadaster Values for Commercial Land Uses and Treatment Effects per BRT Corridor over Time

	Model 1 Dependent variable: Ln Cadaster Value (commercial land uses)					Model 2 Dependent variable: Ln Cadaster Value per SQMT (commercial land uses)				
	Estimated coefficients[†]		Standard errors	Wald Test[†]		Estimated coefficients[†]		Standard errors	Wald Test†	
				F[†]	Prob > F				F[††]	Prob > F
Distance BRT Station										
≤100 m	(reference)					(reference)				
>100m ≤200 m	-0.016	*	0.007			0.014		0.013		
>200m ≤300 m	-0.032	***	0.007			0.003		0.014		
>300m ≤400 m	-0.038	***	0.008			0.040	**	0.015		
>400 m ≤500 m	0.002		0.009			0.086	***	0.017		
>500 m	0.152	***	0.011			0.073	***	0.017		
Ln Distance CBD	-0.087	***	0.004			-0.047	***	0.007		
Ln Distance BRT corridor	-0.025	***	0.003			-0.062	***	0.006		
Ln Parcel Area	0.576	***	0.008			1.273	***	0.009		
Ln Properties	-0.507	***	0.004			-0.225	***	0.006		
Socioeconomic stratum										
One	(reference)									
Two	-0.357	***	0.065			0.081		0.138		
Three	-0.097		0.066			0.271	*	0.139		
Four	0.185	**	0.068			0.437	**	0.140		
Five	0.563	***	0.070			0.800	***	0.141		
Six	0.970	***	0.070			1.192	***	0.143		
Ln Population Density	-0.068	***	0.003			-0.072	***	0.007		
Ln Block Size	-0.055	***	0.005			-0.064	***	0.006		
Ln Roads Ratio	0.018		0.028			-0.659	**	0.048		
Ln Parks Ratio	0.012	**	0.001			0.025	***	0.002		
Ln Facilities Density	0.086	***	0.005			0.105	***	0.006		
Built square meters	0.040	**	0.012			0.003		0.023		
New square meters	0.026	***	0.011			0.029		0.018		
Square meters under const.	0.057	***	0.007			-0.001		0.012		
Year										
Year 2001	0.077	***	0.021			0.134	**	0.040		
Year 2002	0.155	***	0.021			0.212	***	0.039		
Year 2003	0.251	***	0.022			0.289	***	0.043		
Year 2004	0.327	***	0.022			0.375	***	0.043		

Year 2005	0.385	***	0.022			0.426	***	0.044		
Year 2006	0.456	***	0.022			0.538	***	0.044		
Year 2007	0.516	***	0.022			0.599	***	0.044		
Year 2008	0.581	***	0.022			0.665	***	0.044		
Year 2009	0.710	***	0.023			0.830	***	0.044		
Year 2010	0.897	***	0.022			1.035	***	0.041		
Year 2011	1.011	***	0.030			1.171	***	0.053		
Year 2012	1.117	***	0.029			1.288	***	0.051		
Year 2013	1.320	***	0.028			1.496	***	0.049		
Average Treatment Effect										
T Year 2000*Caracas*	-0.004		0.025	ref		0.220	***	0.047	ref	
T Year 2001*Caracas*	0.033	*	0.014	2.77	0.063	0.185	***	0.025	38.42	0.000
T Year 2002*Caracas*	0.014		0.013	0.68	0.506	0.161	***	0.022	37.34	0.000
T Year 2003*Caracas*	-0.005		0.014	0.09	0.913	0.164	***	0.028	27.8	0.000
T Year 2004*Caracas*	-0.023		0.014	1.37	0.254	0.127	***	0.029	19.69	0.000
T Year 2005*Caracas*	-0.021		0.014	1.1	0.333	0.134	***	0.029	20.81	0.000
T Year 2006*Caracas*	-0.004		0.014	0.06	0.940	0.166	***	0.029	26.32	0.000
T Year 2007*Caracas*	-0.004		0.014	0.06	0.940	0.164	***	0.029	26.28	0.000
T Year 2008*Caracas*	0.001		0.014	0.02	0.981	0.165	***	0.029	26.33	0.000
T Year 2009*Caracas*	0.017		0.015	0.65	0.524	0.161	***	0.029	25.68	0.000
T Year 2010*Caracas*	-0.040	**	0.014	4.15	0.016	0.074	**	0.025	14.94	0.000
T Year 2011*Caracas*	-0.082	***	0.024	6.1	0.002	0.011		0.040	10.8	0.000
T Year 2012*Caracas*	-0.074	**	0.023	5.41	0.005	0.010		0.038	10.79	0.000
T Year 2013*Caracas*	-0.124	***	0.023	14.94	0.000	-0.032		0.037	11.22	0.000
T Year 2000*Autonorte*	0.241	***	0.029	ref		0.267	***	0.051	ref	
T Year 2001*Autonorte*	0.144	***	0.018	67.66	0.000	0.089	**	0.033	17.25	0.000
T Year 2002*Autonorte*	0.146	***	0.018	69.06	0.000	0.089	**	0.034	17.06	0.000
T Year 2003*Autonorte*	0.197	***	0.018	97.75	0.000	0.155	***	0.036	22.73	0.000
T Year 2004*Autonorte*	0.156	***	0.017	75.78	0.000	0.111	**	0.037	17.91	0.000
T Year 2005*Autonorte*	0.159	***	0.017	77.96	0.000	0.115	**	0.037	18.4	0.000
T Year 2006*Autonorte*	0.173	***	0.017	85.7	0.000	0.146	***	0.035	21.89	0.000
T Year 2007*Autonorte*	0.172	***	0.017	85.12	0.000	0.145	***	0.035	21.84	0.000
T Year 2008*Autonorte*	0.193	***	0.017	101.93	0.000	0.197	***	0.035	29.55	0.000
T Year 2009*Autonorte*	0.241	***	0.018	128.03	0.000	0.194	***	0.034	30.14	0.000
T Year 2010*Autonorte*	0.297	***	0.017	196.24	0.000	0.223	***	0.031	39.84	0.000
T Year 2011*Autonorte*	0.298	***	0.026	101.67	0.000	0.220	***	0.044	26.33	0.000
T Year 2012*Autonorte*	0.239	***	0.025	82.19	0.000	0.152	***	0.043	20.05	0.000
T Year 2013*Autonorte*	0.187	***	0.024	64.59	0.000	0.112	**	0.042	17.16	0.000
T Year 2000*Calle 80*	-0.076	*	0.033	ref		-0.052		0.069	ref	

T Year 2001*Calle 80*	-0.085	***	0.018	13.49	0.000		-0.092	**	0.032	4.31	0.013
T Year 2002*Calle 80*	-0.072	***	0.016	12.12	0.000		-0.084	**	0.030	4.12	0.016
T Year 2003*Calle 80*	-0.114	***	0.019	21.17	0.000		-0.108	**	0.036	4.71	0.009
T Year 2004*Calle 80*	-0.071	***	0.019	9.78	0.000		-0.070		0.038	1.98	0.138
T Year 2005*Calle 80*	-0.068	***	0.019	9.26	0.000		-0.063		0.038	1.68	0.187
T Year 2006*Calle 80*	-0.069	***	0.018	9.65	0.000		-0.070		0.037	2.08	0.125
T Year 2007*Calle 80*	-0.071	***	0.018	10.04	0.000		-0.070		0.037	2.05	0.129
T Year 2008*Calle 80*	-0.069	***	0.018	9.81	0.000		-0.068		0.037	2.02	0.133
T Year 2009*Calle 80*	-0.074	***	0.019	9.75	0.000		-0.113	**	0.036	5.13	0.006
T Year 2010*Calle 80*	-0.060	*	0.017	8.86	0.000		-0.091	**	0.032	4.43	0.012
T Year 2011*Calle 80*	-0.060	**	0.025	5.67	0.003		-0.101	*	0.043	3.08	0.046
T Year 2012*Calle 80*	-0.065	***	0.024	6.38	0.002		-0.111	**	0.042	3.85	0.021
T Year 2013*Calle 80*	-0.115	***	0.023	14.48	0.000		-0.165	***	0.040	8.59	0.000
Constant term	3.500	***	0.098				4.745	***	0.155		

N	245,658	**N**	245,658
F (77,245580)	1,705.71	**F (77,245580)**	1,705.71
Prob > F	0.0000	**Prob > F**	0.0000
R-squared	0.6342	**R-squared**	0.6342
Root MSE	0.9446	**Root MSE**	0.9446

†F statistic: (2,245580)

††F statistic: (2,245580)

* p<0.05, ** p<0.01, *** p<0.001

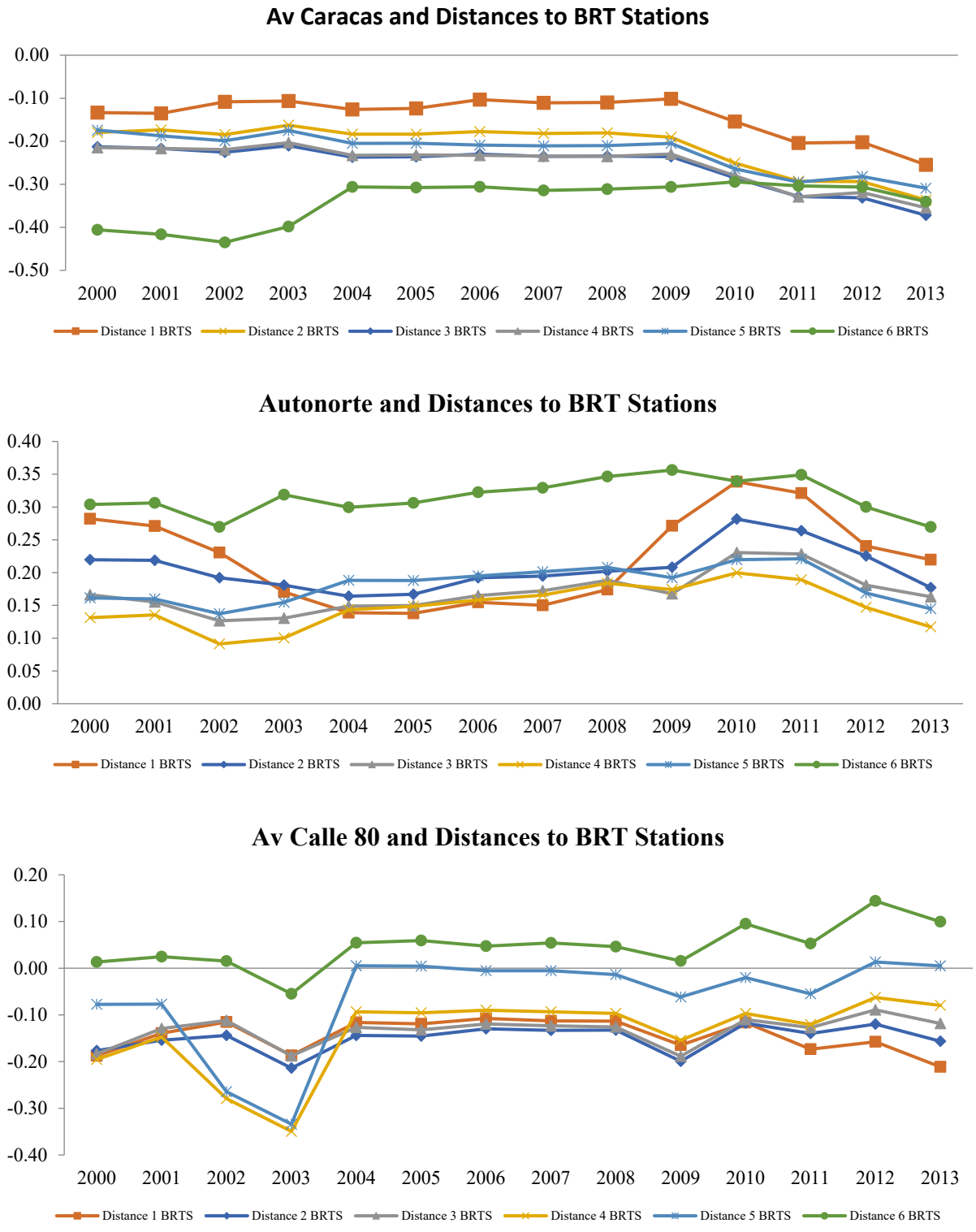
Data Analysis 3: Interactions with Distances to BRT Stations

The third data analysis consists on interactions between treatment effects coefficients and the dummy variable for distances to BRT stations. For a mass transit system operating on the surface of cities, the accessibility benefits generated by the BRT can be more intense when looking at the proximity to stations. Results of the regression models are shown in the appendix (table 7). The models include interactions between the three BRT corridors and the six categories for distances to BRT stations.

Figure 5 shows the coefficients from the first model looking at the effects on cadaster appraisal values within each range of distances to BRT stations for each corridor of phase one of the system. Results for Av Caracas suggest that values are higher for parcels within 100 meters from the stations, but the coefficients also suggest these values are lower than control corridors (where distances to future or planned stations where estimated based on data provided by Transmilenio). The results for Autonorte suggest that values are higher than in control corridors, especially for parcels farther than 500 meters from BRT stations; but, in 2010, parcels located within 100 meters reached a similar value than those located farther than 500 meters. Since 2011 there is a decreasing trend for all parcels, which is consistent with previous data analysis. In the case of Av Calle 80, parcels located farther than 500 meters show positive values, and parcels located between 400 and 500 meters experienced a positive effect in 2004 and 2012. These findings suggest that trunk corridors such as Av Calle 80, which has been a transportation corridor with a road section smaller than the section of Autonorte, tend to have a positive effect when there is proximity to stations but not exactly in front of this type of infrastructure, or when the road section generates additional space such as the case of Autonorte.

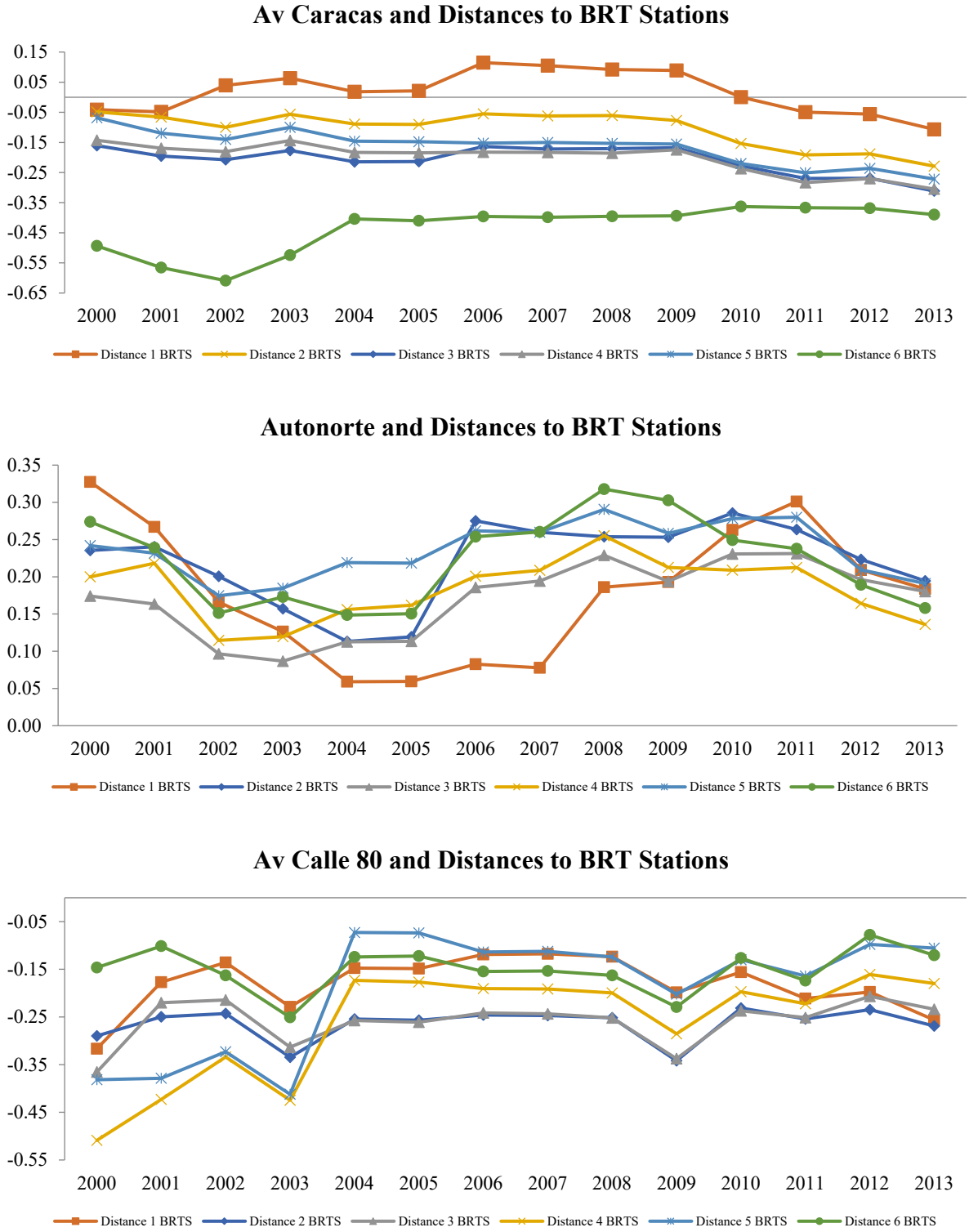
Figure 6 shows an interesting trend for parcels within 100 meters along Av Caracas, where there is a positive effect on values per square meter, but since 2010 there is a decreasing trend. Although all parcels along Autonorte show positive values, parcels located within 100 meters from stations experienced an increase just after 2007 and reached a maximum in 2011, when redevelopment dynamics emerged along the corridor. Parcels located between 400 meters and 500 meters along Av Calle 80 experienced an increase over time, but these changes are lower than the other corridors, as well as in relation to control corridors.

Figure 5. Cadaster Values and Interactions with Distances to BRT Stations



DS1= Distance BRT station ≤100 m; DS2= Distance BRT station >100m ≤200 m; DS3= Distance BRT station >200m ≤300 m; DS4= Distance BRT station >300m ≤400 m; DS5= Distance BRT station >400 m ≤500 m; DS6= Distance BRT station >500 m

Figure 6: Cadaster Values per Square Meter and Interactions with Distances to BRT Stations

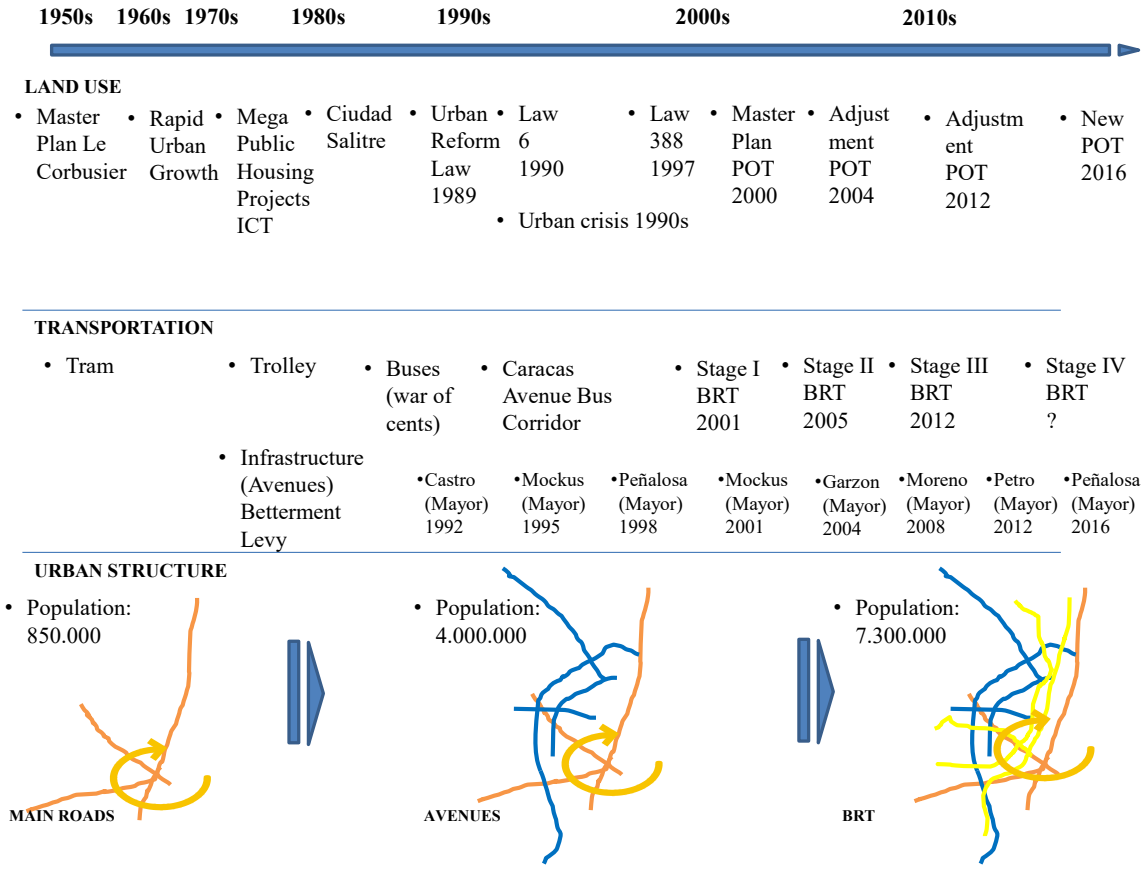


DS1= Distance BRT station ≤100 m; DS2= Distance BRT station >100m ≤200 m; DS3= Distance BRT station >200m ≤300 m; DS4= Distance BRT station >300m ≤400 m; DS5= Distance BRT station >400 m ≤500 m; DS6= Distance BRT station >500 m

Qualitative Data Analysis

The qualitative data analysis provides some insights that explain the heterogenous impacts of BRT investments on cadaster appraisal values over time. The analysis of interviews is conducted based on an overview of transportation and land use planning in the city of Bogotá (Vergel-Tovar 2016). As shown in figure 7, land use planning has followed key milestones since the Urban Master Plan developed by Le Corbusier. Since Law 388 was issued in 1997, Bogotá formulated its Urban Master Plan, known as POT (Plan *de Ordenamiento Territorial* POT), at the same time the BRT system was designed and planned. Both, the POT and the BRT began their implementation in 2000, with commercial operations of the mass transit systems starting on 2001. Although both processes were conducted at the same time, there was little coordination between the land use planning and the transportation planning processes as it will be discussed below.

Figure 7: Overview of Land Use and Transportation Planning, Bogotá



Sources: Ardila 2004; Bogotá 2000; Ferro 2007

From the land use planning side, the implementation of the POT included the division of the city into zone planning units (*Unidades de Planeamiento Zonal* in Spanish, or UPZ). Figure 10 in the appendix shows the UPZ polygons and the BRT corridors, which cross 39 of these polygons. Land use regulations were established at the UPZ level so that the possibility of developing projects depends on the regulations established within each of these polygons. These regulations

received the information regarding the BRT system as a given as a result of a process in which land use planners received the outcomes of the transportation planning process. The formulation of regulations for each UPZ focused mostly on the urban spatial structure, but the influence of the BRT system as a potential factor to change land use regulations was minimum. One key participant summarizes the implications of changing land use regulations by taking into account the influence of transportation investments: "A decision by an urban planner could make several people very rich, and I think the people of that period of time, in urban planning, were very honest people, which means very good and professional people, […] they did the most they could, but I think the [urban] norm did not help them" (Personal communication).

In the absence of coordination between land use and transportation planning, the implementation of the BRT system along mostly already consolidated areas implied not only the uncertainty of the fragmentation of land use planning regulations but also a higher impact around BRT terminals where there were land developments opportunities at the end of the corridors. In words of a key participant:

> Zones close to BRT terminals or close to BRT stations are zones highly consolidated. Its [urban] norm is applied to an existent reality at one point in time, the existent [urban] norm, which basically represented a very horizontal city […] I think the local government [Distrito] should coordinate the possibility to work on regulations, in which those [higher] floor area ratios could be seen, at least something higher, in order to provide the financial balance ['cierre financiero' in Spanish] for that type [redevelopment or renewal]) of projects. At this moment, enclosed in the consolidation issue, which is that the city is completely consolidated towards the sides where these Portals are located, the land values, well, obviously they are too high. (Personal communication)

Studies looking at the impacts of BRT systems on land values have shown a positive impact due to proximity. However, the cadaster values analyzed in this paper suggest these values—closely connected to the assessments for property tax purposes—are reflecting poorly the accessibility benefits generated by the BRT system. The access to destinations in a shorter period of time is one of the key benefits of the BRT system. In the words of a key participant:

> Transmilenio improves access, which is evident due to the increase on speed and mobility for system users. It has generated value on its influence area. It is much more attractive to have access to Transmilenio, especially for stratum three and four […] because it [the system] gives them the opportunity to access quickly to destinations in the city. (Personal communication)

The asymmetry between cadaster appraisal values, tested in this paper, and the influence of the BRT system on real estate dynamics tested in previous studies, suggest that the city has difficulties in capturing the benefits generated by the system, which have been clearly reflected in land development and redevelopment dynamics near BRT stations. In the words of a key participant:

> Once the system is operational and its initial functioning is seen, and especially once it is expanded to those areas where there is some available land close by […] there is also some renewal one by one [parcel by parcel], which has been done in Av Caracas, and similarly towards Autopista Norte. And let's mention the transport needs that people have, and [consider] that the city did not expand roads and that there has been a collapse in terms of transportation [for all modes in general], which has been a big difficulty in the last five years or something within that range. Then people began to give more value to be closer to this type of mass transit system and this is how developers perceive it, and developers know it, so they [developers] start to develop projects very close [to bus rapid transit stations]. (Personal communication)

The success of the BRT in terms of reaching a demand of more than 2 million passengers per day, but without the expansion of corridors such as Av Boyaca and Av 68 (controls in the quantitative data analysis), generated shortcomings that have led to a lower quality of service. At the beginning, the system was a success and, thus, people were interested in living in close proximity to the infrastructure. In words of a key participant: "Independently of the socioeconomic stratum, what bolsters sectors [in the city] is the opportunity for people to have access to a mass transit service close to their residency. It is clear that the developments that have had more dynamism in the city are those that are very close to BRT stations" (Personal communication). However, the difficulties faced by the system in terms of accessibility were experienced by residents in the periphery, especially in neighborhoods generated from informal urban growth. In words of a key participant:

> We have to walk a lot, this is an issue when we had medical appointments with our children because there are not feeder routes in our neighborhood […] I would say people is not coming to the neighborhood [informal settlement] due to Transmilenio, people come because of different circumstances in life, some are [forced] displaced people from other places [out of the city] and they have found shelter in 'Usme.' (Personal communication)

The lower quality of the service due to a permanent increase in demand is one of the factors that can explain the decline on cadaster appraisal values seen in the quantitative data analysis, especially after the year 2010.

Discussion

This paper developed a quantitative data analysis looking at the impacts of BRT systems on cadaster values over time. The results of the analyses suggest that these impacts are heterogenous across space. Parcels located along Autonorte experienced positive impacts on cadaster values as a result of BRT investments while areas with a smaller road section, such as Av Calle 80 and corridors crossing already consolidated areas such as Av Caracas, experienced mixed results on cadaster values. Along Av Calle 80, parcels located between 400 meters and 500 meters away from BRT stations experienced positive impacts of the BRT system, which shows a contrast with those located within 100 meters. Results for Av Caracas suggests that during the first decade of

operations of the system, there were positive impacts on cadaster values per square meter for parcels located within 100 meters from BRT stations.

The quantitative data analysis also reflects the asymmetry between the impacts of BRT on commercial values in the real estate market analyzed in previous studies and the influence of this type of mass transit system on cadaster values over time. This asymmetry suggests that although the cadaster assessment procedure in Bogotá has been improving over time (including an updating system that takes place every year), the cadaster assessment is not capturing the benefits generated by the BRT system. In fact, the results suggest that the cadaster appraisal captures this benefit mostly when there is a conversion into commercial land uses of parcels served by this type of mass transit system. However, the positive impact is not homogeneous and there are certainly other factors that are explaining this asymmetry. This asymmetry is crucial for value capture purposes considering that some planners in Bogotá have suggested that land value increments generated by the BRT system can be "captured" via the property tax. Nevertheless, the findings of this paper suggest that cadaster appraisals capture partially the accessibility benefit generated by the BRT system.

The qualitative data analysis provides insights to explain the asymmetry identified in this study on the differences between real estate values and cadaster appraisal values in relation to the influence of BRT systems. The initial success of the system is reflected in cadaster appraisal values near stations in Av Caracas and Autonorte, while the road section of Av Calle 80 suggests the increments observed are taking place for properties located 400 meters away from the stations. The lack of coordination between land use planning and transportation planning is one of the reasons that explains not only the heterogeneity of the impacts of the system but also the differences in terms of land development dynamics, considering that the Autonorte corridor has experienced more redevelopment dynamics due to larger parcel sizes and the composition of neighborhoods with higher income groups. Certainly, the decision of transportation planners to extend the BRT system along Autonorte, where higher income groups are located, implied a positive impact on cadaster values, but this trend is not the same in the other two corridors.

The recent shortcomings of the BRT system in terms of quality of service due to a lack of expansion also explains the declining trend on cadaster values since 2010, as observed in the quantitative data analysis. This suggests that changes on cadaster values are also dependent on the quality of service provided by the BRT system.

Conclusions

This paper found the impacts of BRT on cadaster values are heterogeneous over time. Even though cadaster values are lower along Av Caracas and Av Calle 80 in relation to control corridors, the analysis found positive impacts along Autonorte corridor. The analysis also found that there is a heterogeneity in terms of distances to BRT stations, cadaster values per square meter experienced positive impacts of BRT investments for parcels located within 100 meters from BRT stations along Av Caracas for one decade. The positive impacts along Av Calle 80 were observed for parcels located 400 meters away from BRT stations. This paper also identified the asymmetry between the impacts of BRT systems on real estate values and cadaster values,

which suggests that the accessibility benefits generated by the BRT system have been "captured" via property tax in some cases, mostly along Autonorte and some parcels in Av Caracas and Av Calle 80. However, the capitalization of accessibility benefits has been experienced in real estate values according to previous studies looking at the BRT impacts. This implies a public policy challenge considering that the cadaster appraisal values are still not capturing the increments on values generated by BRT systems.

The heterogeneity found in this paper resembles the findings of previous research examining the relationship between BRT investments and land values, land use and development in Bogotá (Munoz Raskin 2010; Rodriguez and Mojica 2009; Rodriguez and Targa 2004; Rodriguez, Vergel-Tovar, and Camargo 2016). However, the finding regarding cadaster values per square meter suggests that there is a gap between land value increments from market and rent prices identified by previous research and the impacts of BRT on the appraisals analyzed in this paper. Though this is not a surprise, considering that the updating process of appraisal assessments in Bogotá has been changing over time toward a closer assessment in relation to market values, it is an interesting finding considering that land use changes—such as conversions to commercial land uses—are closely linked to BRT investments but the cadaster values are capturing a marginal value regarding these changes. These findings suggest that the property tax might be a useful instrument to capture such land value increments, but in the study time frame of this paper those increments have not been captured completely by the public sector.

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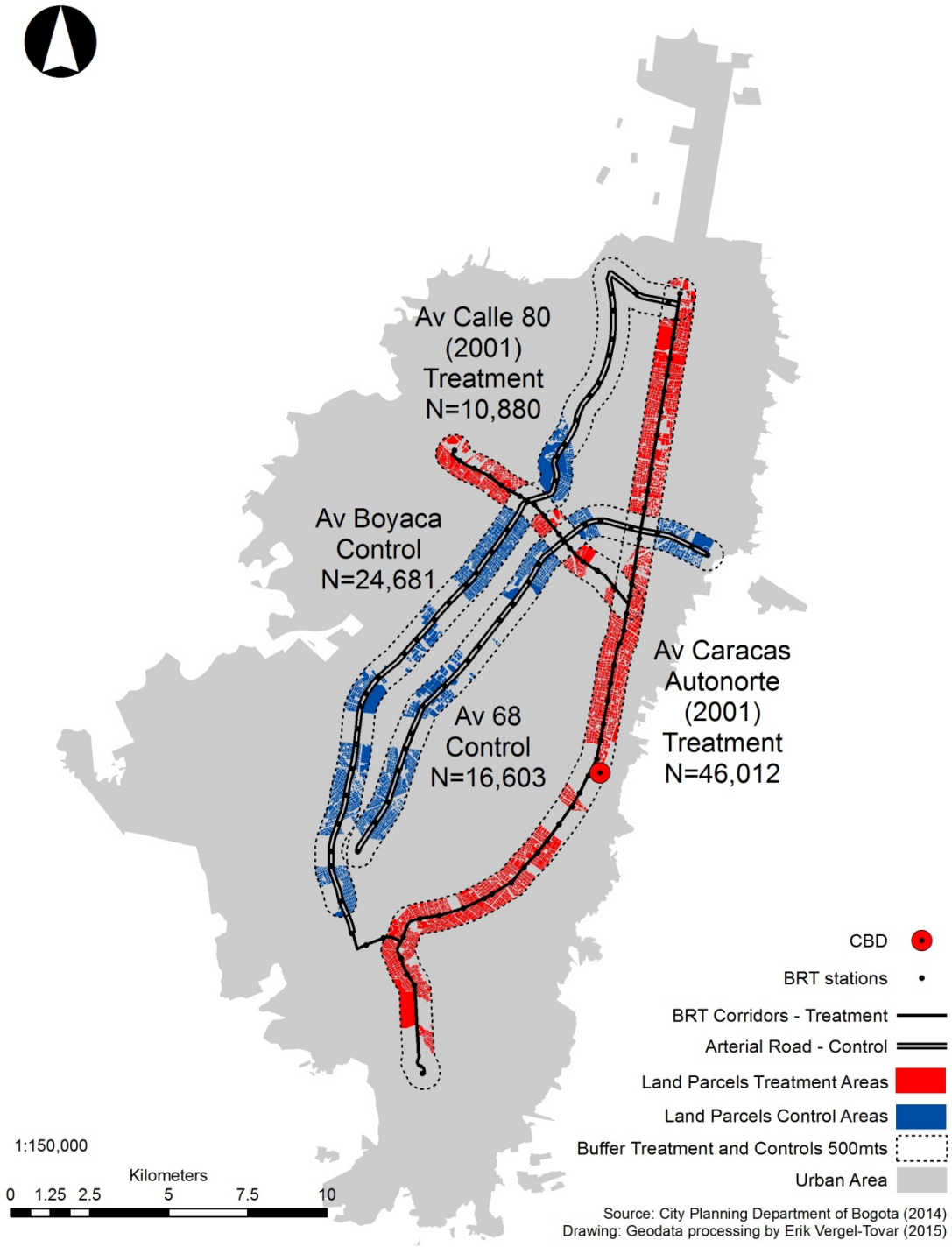
Appendix

Figure 8: Map of Study Area, Bogota, Colombia



Source: Vergel-Tovar 2016

Figure 9: Mean Values, Dependent Variables

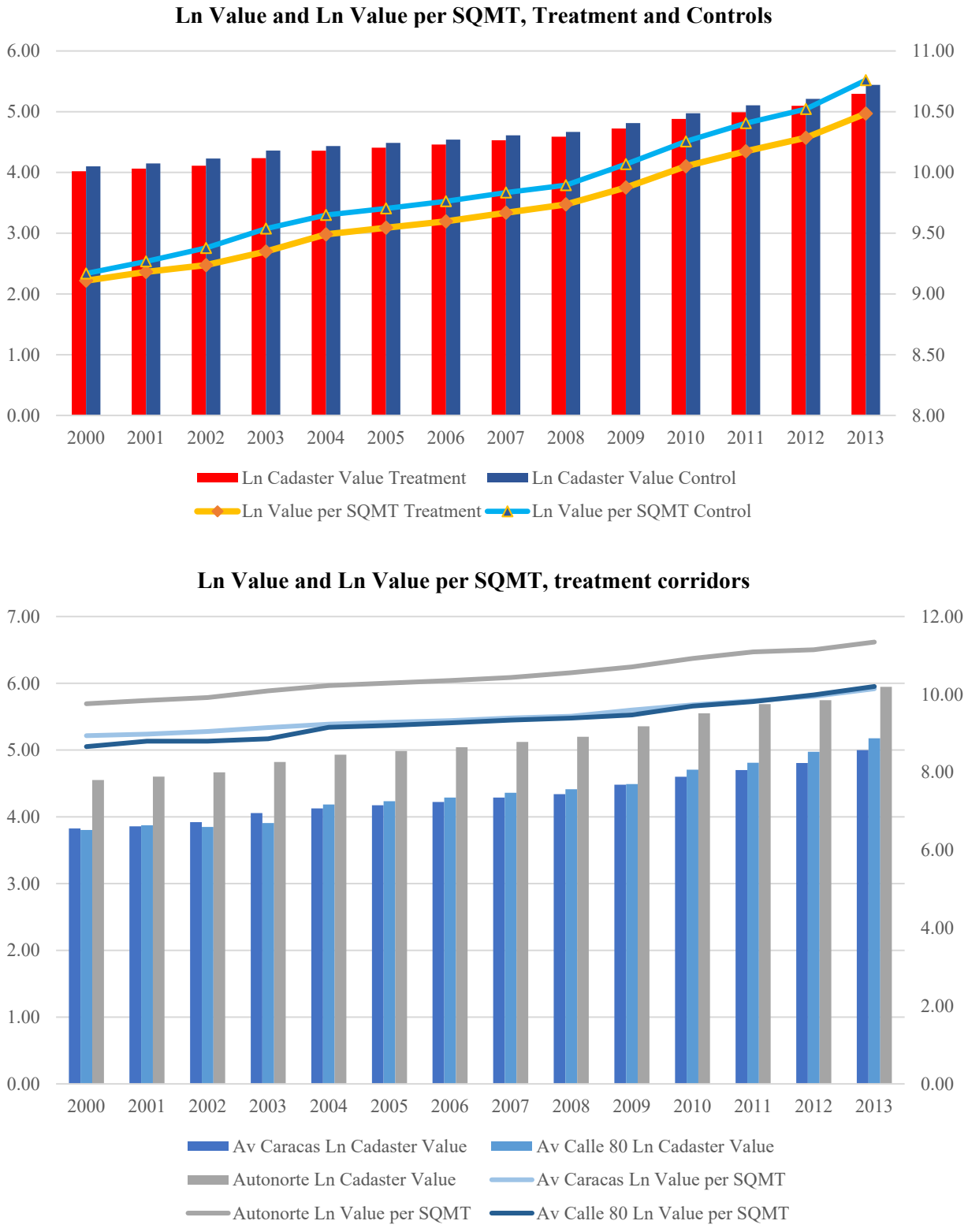
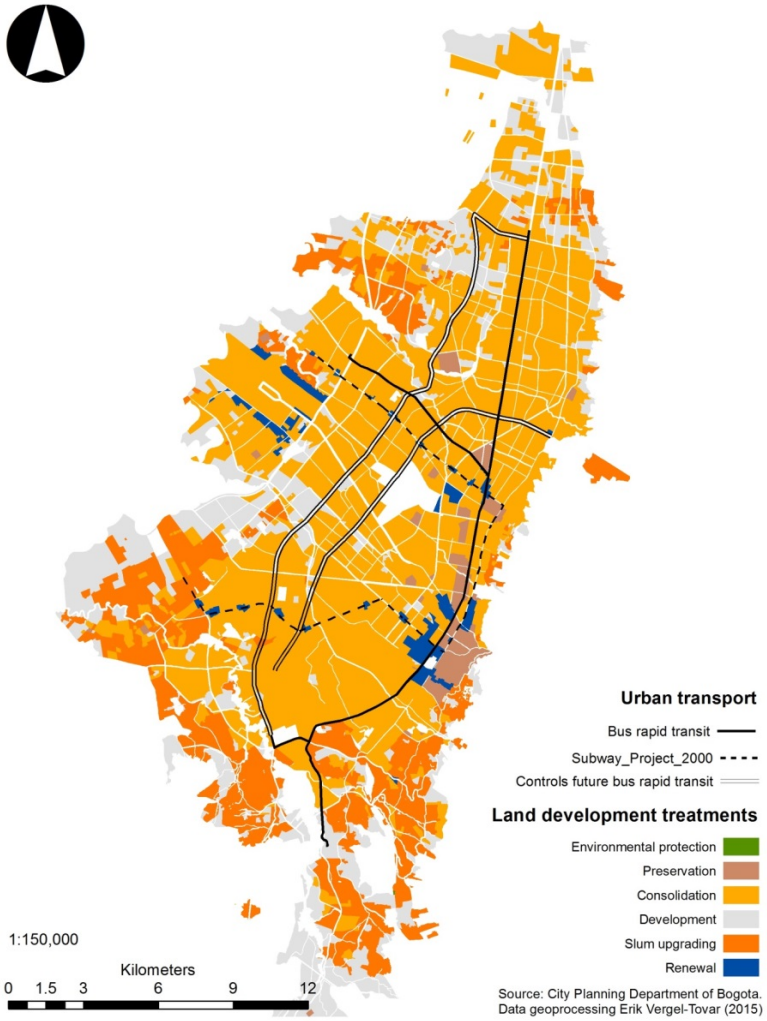


Figure 10. BRT System Phase One and Land Use Planning Measures

BRT System Phase One and Urban Master Plan 2000



BRT System Phase One, UPZ(*Unidades de Planeamiento Zonal*)

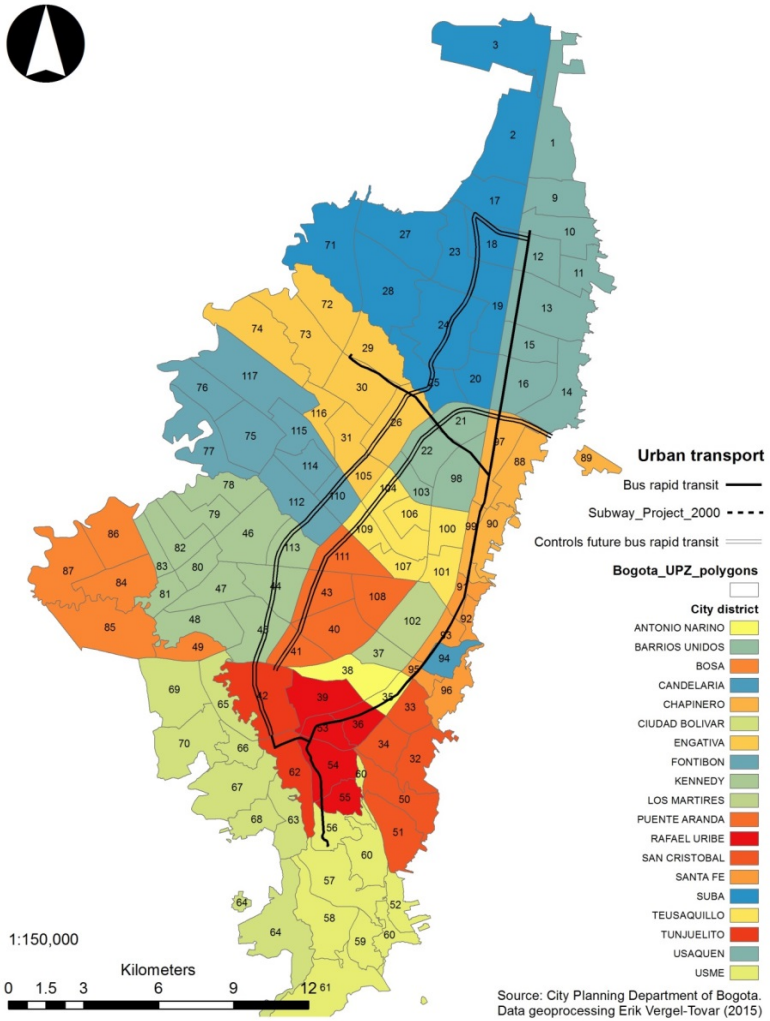


Table 7. Propensity Score Weighted Regression Results, Cadaster Values and Treatment Effects per BRT Corridor over Time (interactions with distances to BRT stations)

	Model 1 Dependent variable: Ln Cadaster Value (interactions with distances to BRTS)					Model 2 Dependent variable: Ln Cadaster Value per SQMT (interactions with distances to BRTS)				
	Estimated coefficients[†]		Standard errors	Wald Test[†]	F[†] Prob > F	Estimated coefficients[†]		Standard errors	Wald Test†	F[††] Prob > F
Ln Distance CBD	-0.175	***	0.003			-0.257	***	0.004		
Ln Distance BRT corridor	-0.007	***	0.001			-0.026	***	0.003		
Land uses										
Residential	(reference)									
Industrial	0.707	***	0.020			0.981	***	0.029		
Commercial	0.408	***	0.003			0.506	***	0.005		
Facilities	0.558	***	0.013			-0.536	***	0.075		
Vacant	-0.766	***	0.011			-9.954	***	0.032		
Other	-0.999	***	0.056			-11.335	***	0.061		
Mixed-use	0.059	***	0.007			-0.043	*	0.019		
Ln Parcel Area	0.501	***	0.005			1.188	***	0.005		
Ln Properties	-0.401	***	0.003			-0.098	***	0.004		
Socioeconomic stratum										
One	(reference)									
Two	-0.036		0.056			0.292	***	0.080		
Three	0.236	***	0.059			0.551	***	0.084		
Four	0.605	***	0.060			0.791	***	0.086		
Five	0.930	***	0.061			1.166	***	0.087		
Six	1.273	***	0.063			1.542	***	0.089		
Ln Population Density	-0.049	***	0.004			-0.037	***	0.006		
Ln Block Size	-0.010	***	0.002			-0.011	***	0.003		
Ln Roads Ratio	0.031		0.020			-0.170	***	0.042		
Ln Parks Ratio	-0.001	*	0.001			-0.010	***	0.001		
Ln Facilities Density	0.068	***	0.005			0.136	***	0.010		
Built square meters	0.009		0.006			-0.031	**	0.011		
New square meters	-0.021	**	0.006			-0.057	***	0.016		
Square meters under const.	0.045	***	0.005			0.014	*	0.008		
Year										
Year 2001	0.063	***	0.014			0.155	***	0.021		
Year 2002	0.166	***	0.014			0.324	***	0.021		
Year 2003	0.295	***	0.013			0.471	***	0.020		
Year 2004	0.369	***	0.012			0.565	***	0.019		
Year 2005	0.424	***	0.012			0.620	***	0.019		
Year 2006	0.479	***	0.012			0.712	***	0.019		

Year 2007	0.553	***	0.012			0.784	***	0.019
Year 2008	0.608	***	0.012			0.840	***	0.019
Year 2009	0.750	***	0.014			1.009	***	0.020
Year 2010	0.906	***	0.013			1.172	***	0.020
Year 2011	1.035	***	0.013			1.312	***	0.020
Year 2012	1.140	***	0.013			1.424	***	0.020
Year 2013	1.372	***	0.012			1.672	***	0.019
Average Treatment Effect								
T Y2000*Caracas*DS1*	-0.133	***	0.020	ref		-0.041		0.051
T Y2001*Caracas*DS1*	-0.135	***	0.019	43.86	0.000	-0.048		0.048
T Y2002*Caracas*DS1*	-0.108	***	0.017	39.69	0.000	0.040		0.033
T Y2003*Caracas*DS1*	-0.107	***	0.016	44.11	0.000	0.063	*	0.033
T Y2004*Caracas*DS1*	-0.126	***	0.015	55.22	0.000	0.018		0.032
T Y2005*Caracas*DS1*	-0.124	***	0.015	53.61	0.000	0.021		0.032
T Y2006*Caracas*DS1*	-0.103	***	0.015	43.76	0.000	0.115	**	0.037
T Y2007*Caracas*DS1*	-0.111	***	0.015	47.03	0.000	0.105	**	0.037
T Y2008*Caracas*DS1*	-0.110	***	0.015	46.50	0.000	0.092	**	0.036
T Y2009*Caracas*DS1*	-0.101	***	0.016	41.79	0.000	0.089	**	0.034
T Y2010*Caracas*DS1*	-0.154	***	0.015	70.53	0.000	0.000		0.032
T Y2011*Caracas*DS1*	-0.204	***	0.017	99.60	0.000	-0.050		0.033
T Y2012*Caracas*DS1*	-0.202	***	0.016	98.47	0.000	-0.056		0.035
T Y2013*Caracas*DS1*	-0.255	***	0.015	159.91	0.000	-0.107	**	0.034
T Y2000*Caracas*DS2*	-0.180	***	0.013	ref		-0.049	*	0.025
T Y2001*Caracas*DS2*	-0.173	***	0.012	193.42	0.000	-0.066	**	0.022
T Y2002*Caracas*DS2*	-0.184	***	0.012	213.59	0.000	-0.100	***	0.020
T Y2003*Caracas*DS2*	-0.163	***	0.010	214.50	0.000	-0.056	**	0.018
T Y2004*Caracas*DS2*	-0.183	***	0.010	274.15	0.000	-0.089	***	0.017
T Y2005*Caracas*DS2*	-0.183	***	0.010	269.25	0.000	-0.090	***	0.017
T Y2006*Caracas*DS2*	-0.177	***	0.010	261.76	0.000	-0.055	*	0.018
T Y2007*Caracas*DS2*	-0.182	***	0.010	268.86	0.000	-0.062	**	0.018
T Y2008*Caracas*DS2*	-0.180	***	0.010	263.20	0.000	-0.061	**	0.018
T Y2009*Caracas*DS2*	-0.191	***	0.011	242.62	0.000	-0.077	***	0.019
T Y2010*Caracas*DS2*	-0.250	***	0.010	382.66	0.000	-0.154	***	0.018
T Y2011*Caracas*DS2*	-0.293	***	0.012	423.07	0.000	-0.191	***	0.020
T Y2012*Caracas*DS2*	-0.294	***	0.012	420.51	0.000	-0.188	***	0.020
T Y2013*Caracas*DS2*	-0.336	***	0.010	623.35	0.000	-0.229	***	0.019
T Y2000*Caracas*DS3*	-0.213	***	0.012	ref		-0.161	***	0.023
T Y2001*Caracas*DS3*	-0.217	***	0.011	329.40	0.000	-0.195	***	0.020
T Y2002*Caracas*DS3*	-0.225	***	0.011	353.69	0.000	-0.207	***	0.018

T Y2003*Caracas*DS3*	-0.210	***	0.010	377.49	0.000	-0.177	***	0.017
T Y2004*Caracas*DS3*	-0.237	***	0.009	500.34	0.000	-0.214	***	0.016
T Y2005*Caracas*DS3*	-0.236	***	0.009	485.77	0.000	-0.214	***	0.016
T Y2006*Caracas*DS3*	-0.230	***	0.009	476.16	0.000	-0.164	***	0.017
T Y2007*Caracas*DS3*	-0.235	***	0.009	487.49	0.000	-0.172	***	0.017
T Y2008*Caracas*DS3*	-0.234	***	0.009	478.85	0.000	-0.171	***	0.017
T Y2009*Caracas*DS3*	-0.236	***	0.010	410.99	0.000	-0.167	***	0.017
T Y2010*Caracas*DS3*	-0.285	***	0.010	586.57	0.000	-0.228	***	0.017
T Y2011*Caracas*DS3*	-0.328	***	0.011	606.70	0.000	-0.270	***	0.019
T Y2012*Caracas*DS3*	-0.331	***	0.011	615.64	0.000	-0.269	***	0.018
T Y2013*Caracas*DS3*	-0.372	***	0.010	875.96	0.000	-0.311	***	0.017
T Y2000*Caracas*DS4*	-0.215	***	0.012	ref		-0.143	***	0.023
T Y2001*Caracas*DS4*	-0.217	***	0.011	324.30	0.000	-0.169	***	0.021
T Y2002*Caracas*DS4*	-0.219	***	0.011	340.44	0.000	-0.180	***	0.019
T Y2003*Caracas*DS4*	-0.203	***	0.010	362.91	0.000	-0.144	***	0.017
T Y2004*Caracas*DS4*	-0.233	***	0.009	487.56	0.000	-0.183	***	0.015
T Y2005*Caracas*DS4*	-0.232	***	0.009	476.63	0.000	-0.185	***	0.016
T Y2006*Caracas*DS4*	-0.233	***	0.009	483.68	0.000	-0.182	***	0.016
T Y2007*Caracas*DS4*	-0.234	***	0.009	488.51	0.000	-0.183	***	0.016
T Y2008*Caracas*DS4*	-0.235	***	0.009	480.14	0.000	-0.186	***	0.016
T Y2009*Caracas*DS4*	-0.230	***	0.010	404.00	0.000	-0.174	***	0.017
T Y2010*Caracas*DS4*	-0.280	***	0.010	565.39	0.000	-0.237	***	0.016
T Y2011*Caracas*DS4*	-0.329	***	0.011	604.59	0.000	-0.283	***	0.018
T Y2012*Caracas*DS4*	-0.319	***	0.011	600.35	0.000	-0.270	***	0.018
T Y2013*Caracas*DS4*	-0.355	***	0.009	846.08	0.000	-0.305	***	0.017
T Y2000*Caracas*DS5*	-0.174	***	0.012	ref		-0.068	**	0.023
T Y2001*Caracas*DS5*	-0.187	***	0.011	228.48	0.000	-0.119	***	0.021
T Y2002*Caracas*DS5*	-0.199	***	0.011	248.73	0.000	-0.140	***	0.019
T Y2003*Caracas*DS5*	-0.175	***	0.010	240.55	0.000	-0.100	***	0.017
T Y2004*Caracas*DS5*	-0.205	***	0.009	348.07	0.000	-0.146	***	0.016
T Y2005*Caracas*DS5*	-0.205	***	0.009	342.89	0.000	-0.148	***	0.016
T Y2006*Caracas*DS5*	-0.209	***	0.009	351.00	0.000	-0.152	***	0.017
T Y2007*Caracas*DS5*	-0.211	***	0.009	346.26	0.000	-0.150	***	0.017
T Y2008*Caracas*DS5*	-0.210	***	0.009	341.26	0.000	-0.153	***	0.017
T Y2009*Caracas*DS5*	-0.205	***	0.010	296.80	0.000	-0.155	***	0.017
T Y2010*Caracas*DS5*	-0.264	***	0.010	455.42	0.000	-0.220	***	0.016
T Y2011*Caracas*DS5*	-0.295	***	0.011	458.57	0.000	-0.251	***	0.018
T Y2012*Caracas*DS5*	-0.282	***	0.011	442.39	0.000	-0.236	***	0.018
T Y2013*Caracas*DS5*	-0.309	***	0.009	633.39	0.000	-0.272	***	0.016

T Y2000*Caracas*DS6*	-0.406	***	0.015	ref		-0.493	***	0.027			
T Y2001*Caracas*DS6*	-0.416	***	0.015	681.56	0.000	-0.565	***	0.027			
T Y2002*Caracas*DS6*	-0.435	***	0.015	710.28	0.000	-0.609	***	0.025			
T Y2003*Caracas*DS6*	-0.398	***	0.014	688.25	0.000	-0.524	***	0.024			
T Y2004*Caracas*DS6*	-0.306	***	0.012	608.96	0.000	-0.404	***	0.021			
T Y2005*Caracas*DS6*	-0.307	***	0.012	620.15	0.000	-0.410	***	0.020			
T Y2006*Caracas*DS6*	-0.306	***	0.013	609.51	0.000	-0.396	***	0.024			
T Y2007*Caracas*DS6*	-0.314	***	0.013	612.75	0.000	-0.398	***	0.024			
T Y2008*Caracas*DS6*	-0.311	***	0.013	613.04	0.000	-0.395	***	0.025			
T Y2009*Caracas*DS6*	-0.306	***	0.014	553.26	0.000	-0.393	***	0.026			
T Y2010*Caracas*DS6*	-0.294	***	0.013	564.30	0.000	-0.363	***	0.021			
T Y2011*Caracas*DS6*	-0.304	***	0.014	538.57	0.000	-0.367	***	0.022			
T Y2012*Caracas*DS6*	-0.306	***	0.013	553.88	0.000	-0.368	***	0.022			
T Y2013*Caracas*DS6*	-0.340	***	0.012	662.95	0.000	-0.390	***	0.022			
T Y2000*Autonorte*DS1*	0.282	***	0.040	ref		0.327	***	0.083	ref		
T Y2001*Autonorte*DS1*	0.271	***	0.039	48.70	0.000	0.267	**	0.086	0.79	0.456	
T Y2002*Autonorte*DS1*	0.231	***	0.039	42.00	0.000	0.166	**	0.064	1.08	0.340	
T Y2003*Autonorte*DS1*	0.170	***	0.039	34.41	0.000	0.126	*	0.062	2.23	0.108	
T Y2004*Autonorte*DS1*	0.139	***	0.038	31.61	0.000	0.059		0.069	0.49	0.610	
T Y2005*Autonorte*DS1*	0.138	***	0.038	31.43	0.000	0.059		0.069	0.56	0.572	
T Y2006*Autonorte*DS1*	0.155	***	0.038	33.17	0.000	0.083		0.076	5.31	0.005	
T Y2007*Autonorte*DS1*	0.150	***	0.038	32.64	0.000	0.078		0.076	4.51	0.011	
T Y2008*Autonorte*DS1*	0.174	***	0.039	34.88	0.000	0.186	*	0.087	3.67	0.026	
T Y2009*Autonorte*DS1*	0.271	***	0.044	44.20	0.000	0.193	*	0.081	3.73	0.024	
T Y2010*Autonorte*DS1*	0.339	***	0.043	55.66	0.000	0.263	***	0.074	0.32	0.726	
T Y2011*Autonorte*DS1*	0.321	***	0.043	52.77	0.000	0.301	***	0.081	1.45	0.234	
T Y2012*Autonorte*DS1*	0.240	***	0.050	36.34	0.000	0.209	*	0.089	1.63	0.196	
T Y2013*Autonorte*DS1*	0.220	***	0.052	33.99	0.000	0.184	*	0.093	5.34	0.005	
T Y2000*Autonorte*DS2*	0.220	***	0.019	ref		0.235	***	0.048	ref		
T Y2001*Autonorte*DS2*	0.219	***	0.018	144.76	0.000	0.240	***	0.035	6.00	0.003	
T Y2002*Autonorte*DS2*	0.192	***	0.018	124.92	0.000	0.201	***	0.034	14.26	0.000	
T Y2003*Autonorte*DS2*	0.181	***	0.019	116.25	0.000	0.157	***	0.035	6.46	0.002	
T Y2004*Autonorte*DS2*	0.164	***	0.018	111.89	0.000	0.113	**	0.034	14.90	0.000	
T Y2005*Autonorte*DS2*	0.167	***	0.018	113.44	0.000	0.119	***	0.034	15.20	0.000	
T Y2006*Autonorte*DS2*	0.192	***	0.018	127.47	0.000	0.275	***	0.049	6.22	0.002	
T Y2007*Autonorte*DS2*	0.195	***	0.018	130.83	0.000	0.260	***	0.045	7.31	0.001	
T Y2008*Autonorte*DS2*	0.202	***	0.018	133.71	0.000	0.254	***	0.043	7.09	0.001	
T Y2009*Autonorte*DS2*	0.208	***	0.020	123.43	0.000	0.253	***	0.047	10.14	0.000	
T Y2010*Autonorte*DS2*	0.282	***	0.022	155.69	0.000	0.286	***	0.044	37.76	0.000	

T Y2011*Autonorte*DS2*	0.264	***	0.022	140.88	0.000	0.263	***	0.046	47.49	0.000
T Y2012*Autonorte*DS2*	0.225	***	0.021	127.56	0.000	0.223	***	0.046	46.10	0.000
T Y2013*Autonorte*DS2*	0.177	***	0.020	107.99	0.000	0.195	***	0.043	76.33	0.000
T Y2000*Autonorte*DS3*	0.166	***	0.014	ref		0.174	***	0.035	ref	
T Y2001*Autonorte*DS3*	0.155	***	0.015	129.91	0.000	0.163	***	0.032	67.77	0.000
T Y2002*Autonorte*DS3*	0.126	***	0.016	105.67	0.000	0.097	**	0.032	88.65	0.000
T Y2003*Autonorte*DS3*	0.130	***	0.015	109.07	0.000	0.087	**	0.031	80.09	0.000
T Y2004*Autonorte*DS3*	0.149	***	0.012	144.03	0.000	0.113	***	0.024	117.74	0.000
T Y2005*Autonorte*DS3*	0.150	***	0.013	142.71	0.000	0.113	***	0.025	116.00	0.000
T Y2006*Autonorte*DS3*	0.165	***	0.013	157.60	0.000	0.186	***	0.033	69.95	0.000
T Y2007*Autonorte*DS3*	0.172	***	0.013	166.20	0.000	0.194	***	0.033	74.81	0.000
T Y2008*Autonorte*DS3*	0.188	***	0.013	181.71	0.000	0.229	***	0.033	73.53	0.000
T Y2009*Autonorte*DS3*	0.168	***	0.014	141.21	0.000	0.194	***	0.035	71.59	0.000
T Y2010*Autonorte*DS3*	0.231	***	0.015	193.35	0.000	0.231	***	0.029	116.22	0.000
T Y2011*Autonorte*DS3*	0.228	***	0.016	174.47	0.000	0.231	***	0.028	128.79	0.000
T Y2012*Autonorte*DS3*	0.181	***	0.016	137.17	0.000	0.196	***	0.033	130.83	0.000
T Y2013*Autonorte*DS3*	0.163	***	0.015	132.25	0.000	0.180	***	0.032	188.64	0.000
T Y2000*Autonorte*DS4*	0.131	***	0.013	ref		0.200	***	0.031	ref	
T Y2001*Autonorte*DS4*	0.135	***	0.012	119.07	0.000	0.218	***	0.024	48.31	0.000
T Y2002*Autonorte*DS4*	0.091	***	0.015	74.52	0.000	0.115	***	0.033	63.41	0.000
T Y2003*Autonorte*DS4*	0.100	***	0.015	75.88	0.000	0.119	***	0.032	54.10	0.000
T Y2004*Autonorte*DS4*	0.143	***	0.011	140.91	0.000	0.156	***	0.028	86.49	0.000
T Y2005*Autonorte*DS4*	0.149	***	0.011	146.74	0.000	0.162	***	0.028	86.77	0.000
T Y2006*Autonorte*DS4*	0.158	***	0.011	158.86	0.000	0.201	***	0.032	81.22	0.000
T Y2007*Autonorte*DS4*	0.165	***	0.011	167.13	0.000	0.209	***	0.032	81.81	0.000
T Y2008*Autonorte*DS4*	0.184	***	0.011	194.23	0.000	0.255	***	0.032	82.87	0.000
T Y2009*Autonorte*DS4*	0.174	***	0.013	151.35	0.000	0.213	***	0.031	71.85	0.000
T Y2010*Autonorte*DS4*	0.200	***	0.013	181.72	0.000	0.209	***	0.030	120.01	0.000
T Y2011*Autonorte*DS4*	0.189	***	0.014	148.08	0.000	0.212	***	0.029	136.87	0.000
T Y2012*Autonorte*DS4*	0.147	***	0.014	114.01	0.000	0.164	***	0.029	130.92	0.000
T Y2013*Autonorte*DS4*	0.117	***	0.013	96.35	0.000	0.136	***	0.028	181.64	0.000
T Y2000*Autonorte*DS5*	0.161	***	0.014	ref		0.242	***	0.031	ref	
T Y2001*Autonorte*DS5*	0.160	***	0.014	132.96	0.000	0.232	***	0.025	19.58	0.000
T Y2002*Autonorte*DS5*	0.137	***	0.015	112.41	0.000	0.175	***	0.025	32.40	0.000
T Y2003*Autonorte*DS5*	0.155	***	0.014	123.39	0.000	0.185	***	0.023	20.73	0.000
T Y2004*Autonorte*DS5*	0.188	***	0.013	171.24	0.000	0.219	***	0.022	46.03	0.000
T Y2005*Autonorte*DS5*	0.188	***	0.013	168.14	0.000	0.218	***	0.022	47.06	0.000
T Y2006*Autonorte*DS5*	0.195	***	0.013	177.46	0.000	0.262	***	0.026	44.63	0.000
T Y2007*Autonorte*DS5*	0.201	***	0.013	183.35	0.000	0.260	***	0.025	42.91	0.000

T Y2008*Autonorte*DS5*	0.208	***	0.015	163.72	0.000	0.291	***	0.026	45.71	0.000
T Y2009*Autonorte*DS5*	0.192	***	0.015	151.84	0.000	0.258	***	0.026	47.71	0.000
T Y2010*Autonorte*DS5*	0.220	***	0.015	168.99	0.000	0.278	***	0.023	97.07	0.000
T Y2011*Autonorte*DS5*	0.221	***	0.016	154.14	0.000	0.280	***	0.025	101.42	0.000
T Y2012*Autonorte*DS5*	0.169	***	0.016	117.96	0.000	0.209	***	0.026	92.21	0.000
T Y2013*Autonorte*DS5*	0.145	***	0.016	104.20	0.000	0.191	***	0.026	139.65	0.000
T Y2000*Autonorte*DS6*	0.304	***	0.019	ref		0.274	***	0.033	ref	
T Y2001*Autonorte*DS6*	0.306	***	0.019	250.48	0.000	0.239	***	0.031	368.20	0.000
T Y2002*Autonorte*DS6*	0.270	***	0.020	221.34	0.000	0.151	***	0.033	439.69	0.000
T Y2003*Autonorte*DS6*	0.319	***	0.022	225.63	0.000	0.173	***	0.035	387.22	0.000
T Y2004*Autonorte*DS6*	0.299	***	0.018	253.96	0.000	0.149	***	0.030	331.22	0.000
T Y2005*Autonorte*DS6*	0.306	***	0.018	259.74	0.000	0.150	***	0.030	343.26	0.000
T Y2006*Autonorte*DS6*	0.323	***	0.018	275.37	0.000	0.254	***	0.040	281.93	0.000
T Y2007*Autonorte*DS6*	0.329	***	0.018	280.61	0.000	0.260	***	0.040	279.75	0.000
T Y2008*Autonorte*DS6*	0.346	***	0.018	297.70	0.000	0.318	***	0.039	272.79	0.000
T Y2009*Autonorte*DS6*	0.356	***	0.020	276.95	0.000	0.303	***	0.039	259.88	0.000
T Y2010*Autonorte*DS6*	0.339	***	0.021	246.44	0.000	0.249	***	0.036	287.26	0.000
T Y2011*Autonorte*DS6*	0.349	***	0.022	245.52	0.000	0.238	***	0.031	270.02	0.000
T Y2012*Autonorte*DS6*	0.300	***	0.022	212.32	0.000	0.189	***	0.032	275.89	0.000
T Y2013*Autonorte*DS6*	0.270	***	0.022	196.78	0.000	0.158	***	0.030	299.95	0.000
T Y2000*Calle 80*DS1*	-0.188	***	0.025	ref		-0.317	**	0.100	ref	
T Y2001*Calle 80*DS1*	-0.139	***	0.022	45.79	0.000	-0.177	**	0.053	12.48	0.000
T Y2002*Calle 80*DS1*	-0.115	***	0.025	39.08	0.000	-0.136	**	0.050	11.06	0.000
T Y2003*Calle 80*DS1*	-0.187	***	0.024	57.97	0.000	-0.229	***	0.050	9.81	0.000
T Y2004*Calle 80*DS1*	-0.116	***	0.023	40.52	0.000	-0.147	**	0.048	8.10	0.000
T Y2005*Calle 80*DS1*	-0.119	***	0.023	41.11	0.000	-0.149	**	0.048	8.10	0.000
T Y2006*Calle 80*DS1*	-0.108	***	0.022	40.16	0.000	-0.119	*	0.047	8.32	0.000
T Y2007*Calle 80*DS1*	-0.113	***	0.022	41.17	0.000	-0.118	*	0.047	8.25	0.000
T Y2008*Calle 80*DS1*	-0.113	***	0.022	41.52	0.000	-0.124	**	0.047	10.00	0.000
T Y2009*Calle 80*DS1*	-0.165	***	0.022	57.24	0.000	-0.198	***	0.047	10.52	0.000
T Y2010*Calle 80*DS1*	-0.116	***	0.023	40.98	0.000	-0.156	**	0.046	14.05	0.000
T Y2011*Calle 80*DS1*	-0.174	***	0.023	57.86	0.000	-0.211	***	0.046	14.61	0.000
T Y2012*Calle 80*DS1*	-0.158	***	0.023	52.94	0.000	-0.198	***	0.046	10.49	0.000
T Y2013*Calle 80*DS1*	-0.211	***	0.022	74.32	0.000	-0.256	***	0.046	9.65	0.000
T Y2000*Calle 80*DS2*	-0.177	***	0.016	ref		-0.290	***	0.039	ref	
T Y2001*Calle 80*DS2*	-0.154	***	0.016	106.50	0.000	-0.250	***	0.034	35.81	0.000
T Y2002*Calle 80*DS2*	-0.144	***	0.016	104.47	0.000	-0.243	***	0.030	29.40	0.000
T Y2003*Calle 80*DS2*	-0.214	***	0.015	159.13	0.000	-0.334	***	0.030	22.06	0.000
T Y2004*Calle 80*DS2*	-0.144	***	0.013	121.57	0.000	-0.254	***	0.026	17.38	0.000

T Y2005*Calle 80*DS2*	-0.146	***	0.013	122.41	0.000	-0.257	***	0.026	18.12	0.000
T Y2006*Calle 80*DS2*	-0.130	***	0.013	112.46	0.000	-0.246	***	0.027	27.30	0.000
T Y2007*Calle 80*DS2*	-0.133	***	0.013	113.35	0.000	-0.247	***	0.028	28.55	0.000
T Y2008*Calle 80*DS2*	-0.133	***	0.013	115.14	0.000	-0.252	***	0.027	29.40	0.000
T Y2009*Calle 80*DS2*	-0.199	***	0.014	172.48	0.000	-0.342	***	0.028	26.05	0.000
T Y2010*Calle 80*DS2*	-0.118	***	0.013	106.71	0.000	-0.231	***	0.026	33.36	0.000
T Y2011*Calle 80*DS2*	-0.140	***	0.013	125.16	0.000	-0.254	***	0.026	27.91	0.000
T Y2012*Calle 80*DS2*	-0.120	***	0.013	110.33	0.000	-0.235	***	0.026	23.81	0.000
T Y2013*Calle 80*DS2*	-0.157	***	0.012	153.06	0.000	-0.269	***	0.025	21.83	0.000
T Y2000*Calle 80*DS3*	-0.183	***	0.022	ref		-0.366	***	0.040	ref	
T Y2001*Calle 80*DS3*	-0.129	***	0.016	67.99	0.000	-0.220	***	0.035	25.57	0.000
T Y2002*Calle 80*DS3*	-0.112	***	0.016	60.75	0.000	-0.214	***	0.027	16.75	0.000
T Y2003*Calle 80*DS3*	-0.188	***	0.016	107.30	0.000	-0.313	***	0.027	15.89	0.000
T Y2004*Calle 80*DS3*	-0.127	***	0.012	88.12	0.000	-0.257	***	0.024	22.70	0.000
T Y2005*Calle 80*DS3*	-0.132	***	0.012	91.93	0.000	-0.261	***	0.025	22.55	0.000
T Y2006*Calle 80*DS3*	-0.119	***	0.012	84.66	0.000	-0.241	***	0.027	27.69	0.000
T Y2007*Calle 80*DS3*	-0.123	***	0.012	86.46	0.000	-0.243	***	0.027	29.28	0.000
T Y2008*Calle 80*DS3*	-0.126	***	0.012	87.34	0.000	-0.252	***	0.027	35.99	0.000
T Y2009*Calle 80*DS3*	-0.189	***	0.014	130.16	0.000	-0.338	***	0.028	27.53	0.000
T Y2010*Calle 80*DS3*	-0.110	***	0.013	73.40	0.000	-0.237	***	0.022	44.33	0.000
T Y2011*Calle 80*DS3*	-0.127	***	0.013	85.60	0.000	-0.251	***	0.023	45.06	0.000
T Y2012*Calle 80*DS3*	-0.089	***	0.013	60.59	0.000	-0.207	***	0.023	30.08	0.000
T Y2013*Calle 80*DS3*	-0.118	***	0.012	80.56	0.000	-0.234	***	0.023	28.22	0.000
T Y2000*Calle 80*DS4*	-0.195	***	0.035	ref		-0.509	*	0.201	ref	
T Y2001*Calle 80*DS4*	-0.147	***	0.029	29.16	0.000	-0.423	*	0.205	63.96	0.000
T Y2002*Calle 80*DS4*	-0.279	**	0.119	18.31	0.000	-0.334	**	0.128	27.05	0.000
T Y2003*Calle 80*DS4*	-0.350	**	0.119	19.88	0.000	-0.425	**	0.129	27.49	0.000
T Y2004*Calle 80*DS4*	-0.093	***	0.013	41.65	0.000	-0.173	***	0.022	36.66	0.000
T Y2005*Calle 80*DS4*	-0.096	***	0.013	44.40	0.000	-0.177	***	0.022	37.93	0.000
T Y2006*Calle 80*DS4*	-0.090	***	0.012	43.53	0.000	-0.191	***	0.022	40.29	0.000
T Y2007*Calle 80*DS4*	-0.093	***	0.012	46.18	0.000	-0.191	***	0.022	41.81	0.000
T Y2008*Calle 80*DS4*	-0.097	***	0.012	50.09	0.000	-0.200	***	0.021	52.91	0.000
T Y2009*Calle 80*DS4*	-0.154	***	0.013	88.44	0.000	-0.285	***	0.021	45.05	0.000
T Y2010*Calle 80*DS4*	-0.097	***	0.011	52.92	0.000	-0.197	***	0.019	44.69	0.000
T Y2011*Calle 80*DS4*	-0.121	***	0.016	43.94	0.000	-0.222	***	0.024	47.21	0.000
T Y2012*Calle 80*DS4*	-0.063	***	0.017	21.99	0.000	-0.161	***	0.024	36.78	0.000
T Y2013*Calle 80*DS4*	-0.080	***	0.018	25.06	0.000	-0.180	***	0.024	32.22	0.000
T Y2000*Calle 80*DS5*	-0.077	**	0.026	ref		-0.381		0.220	ref	
T Y2001*Calle 80*DS5*	-0.077	**	0.026	9.02	0.000	-0.379		0.221	71.65	0.000

T Y2002*Calle 80*DS5*	-0.265		0.139	6.34	0.002	-0.323	*	0.151	54.93	0.000
T Y2003*Calle 80*DS5*	-0.334	*	0.140	7.40	0.001	-0.412	**	0.152	60.61	0.000
T Y2004*Calle 80*DS5*	0.005		0.038	4.33	0.013	-0.073	*	0.036	78.93	0.000
T Y2005*Calle 80*DS5*	0.004		0.037	4.33	0.013	-0.074	*	0.035	77.83	0.000
T Y2006*Calle 80*DS5*	-0.006		0.037	4.34	0.013	-0.114	**	0.035	81.26	0.000
T Y2007*Calle 80*DS5*	-0.006		0.037	4.34	0.013	-0.112	**	0.035	82.05	0.000
T Y2008*Calle 80*DS5*	-0.014		0.036	4.40	0.012	-0.124	***	0.034	94.65	0.000
T Y2009*Calle 80*DS5*	-0.062		0.038	5.68	0.003	-0.202	***	0.036	80.29	0.000
T Y2010*Calle 80*DS5*	-0.020		0.020	4.84	0.008	-0.130	***	0.024	102.98	0.000
T Y2011*Calle 80*DS5*	-0.055	*	0.026	6.64	0.001	-0.164	***	0.029	93.33	0.000
T Y2012*Calle 80*DS5*	0.013		0.027	4.44	0.012	-0.098	***	0.029	61.47	0.000
T Y2013*Calle 80*DS5*	0.005		0.028	4.34	0.013	-0.106	***	0.029	55.33	0.000
T Y2000*Calle 80*DS6*	0.013		0.017	ref		-0.146	**	0.048	ref	
T Y2001*Calle 80*DS6*	0.025		0.016	1.46	0.233	-0.101	***	0.024	64.78	0.000
T Y2002*Calle 80*DS6*	0.015		0.017	0.75	0.472	-0.163	***	0.024	45.77	0.000
T Y2003*Calle 80*DS6*	-0.055	**	0.016	6.38	0.002	-0.251	***	0.023	47.60	0.000
T Y2004*Calle 80*DS6*	0.054	**	0.016	6.20	0.002	-0.124	***	0.023	47.24	0.000
T Y2005*Calle 80*DS6*	0.059	***	0.016	7.23	0.001	-0.122	***	0.023	47.49	0.000
T Y2006*Calle 80*DS6*	0.047	*	0.016	4.77	0.009	-0.155	***	0.024	55.38	0.000
T Y2007*Calle 80*DS6*	0.054	***	0.016	6.36	0.002	-0.153	***	0.022	56.47	0.000
T Y2008*Calle 80*DS6*	0.046	**	0.016	4.64	0.010	-0.163	***	0.022	67.49	0.000
T Y2009*Calle 80*DS6*	0.015		0.016	0.75	0.472	-0.229	***	0.023	64.32	0.000
T Y2010*Calle 80*DS6*	0.095	***	0.017	15.89	0.000	-0.126	***	0.025	58.85	0.000
T Y2011*Calle 80*DS6*	0.053	**	0.016	5.68	0.003	-0.174	***	0.024	63.08	0.000
T Y2012*Calle 80*DS6*	0.144	***	0.016	39.21	0.000	-0.078	**	0.024	52.52	0.000
T Y2013*Calle 80*DS6*	0.100	***	0.016	20.47	0.000	-0.121	***	0.023	48.03	0.000
Constant term	3.335	***	0.081			5.473	***	0.124		
N	1,374,463					1,374,463				
F (288,1374175)	6,169.29					5027.5				
Prob > F	0.0000					0.0000				
R-squared	0.7354					0.7931				
Root MSE	0.4869					0.9832				

DS1= Distance BRT station ≤100 m

DS2= Distance BRT station >100m ≤200 m

DS3= Distance BRT station >200m ≤300 m

DS4= Distance BRT station >300m ≤400 m

DS5= Distance BRT station >400 m ≤500 m

DS6= Distance BRT station >500 m

†F statistic: (2,245580)

††F statistic: (2,245580)

* p<0.05, ** p<0.01, *** p<0.001

Figure 11: Maps Treatment Corridors: Change in Appraisal Value, 2000–2013

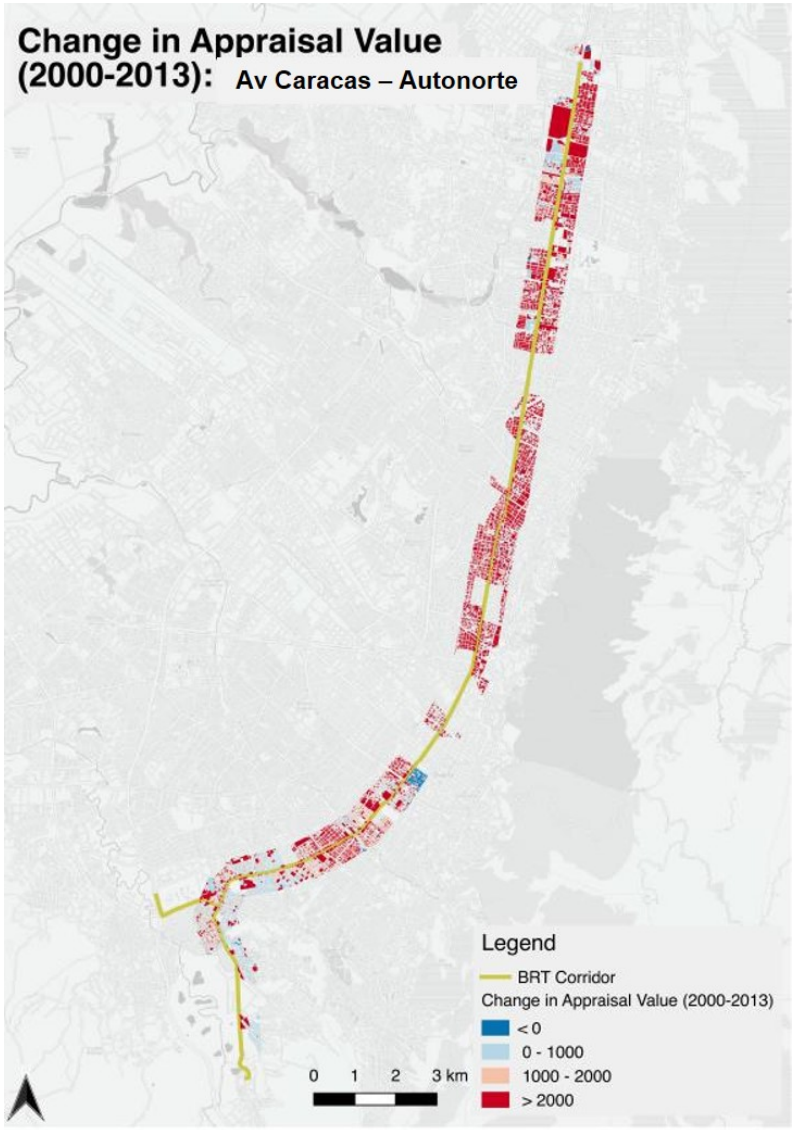


Figure 12: Maps Control Corridors: Change in Appraisal Value, 2000–2013

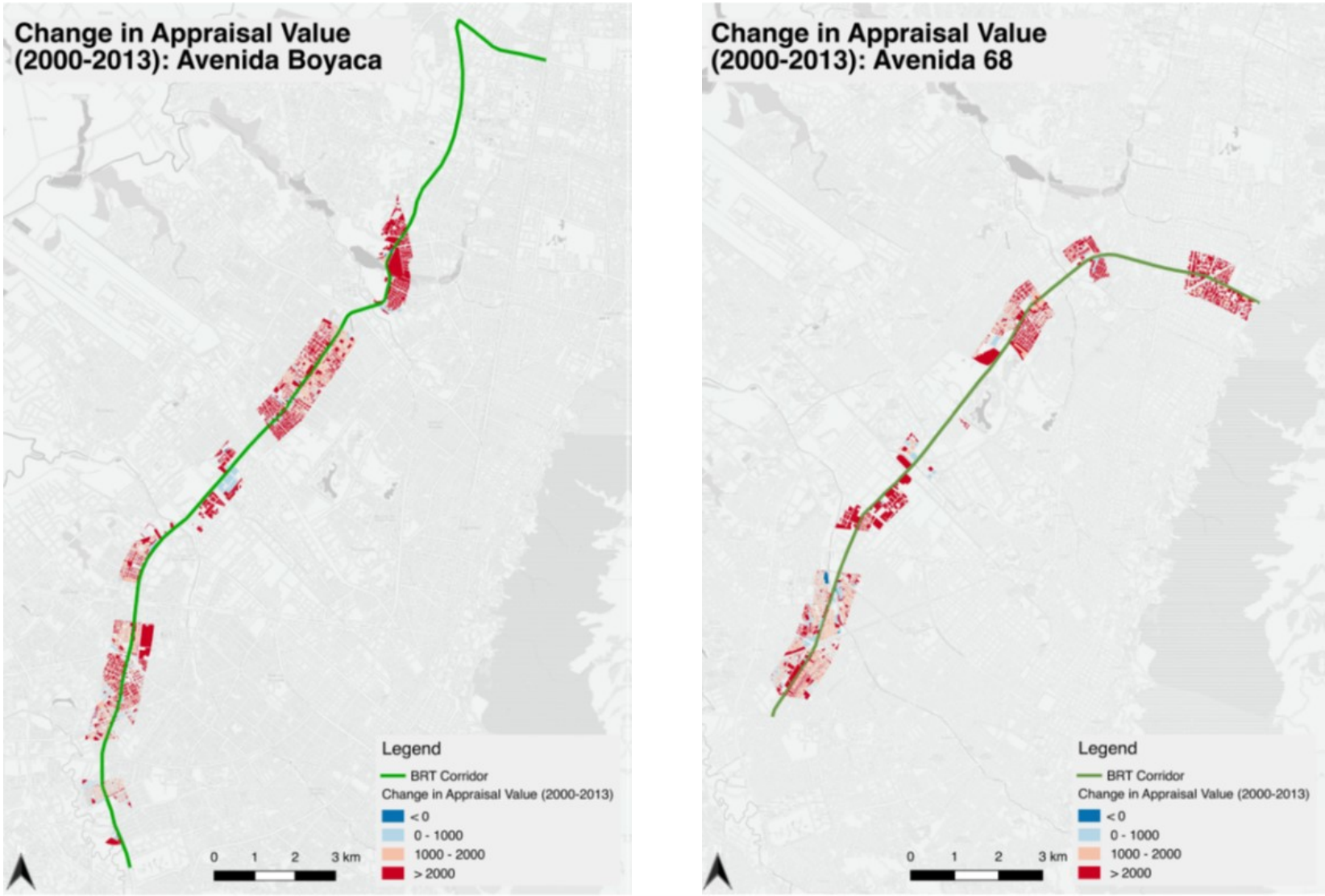


Figure 13: Maps Treatment Corridors: Land Uses Av Caracas and Autonorte, 2000–2013

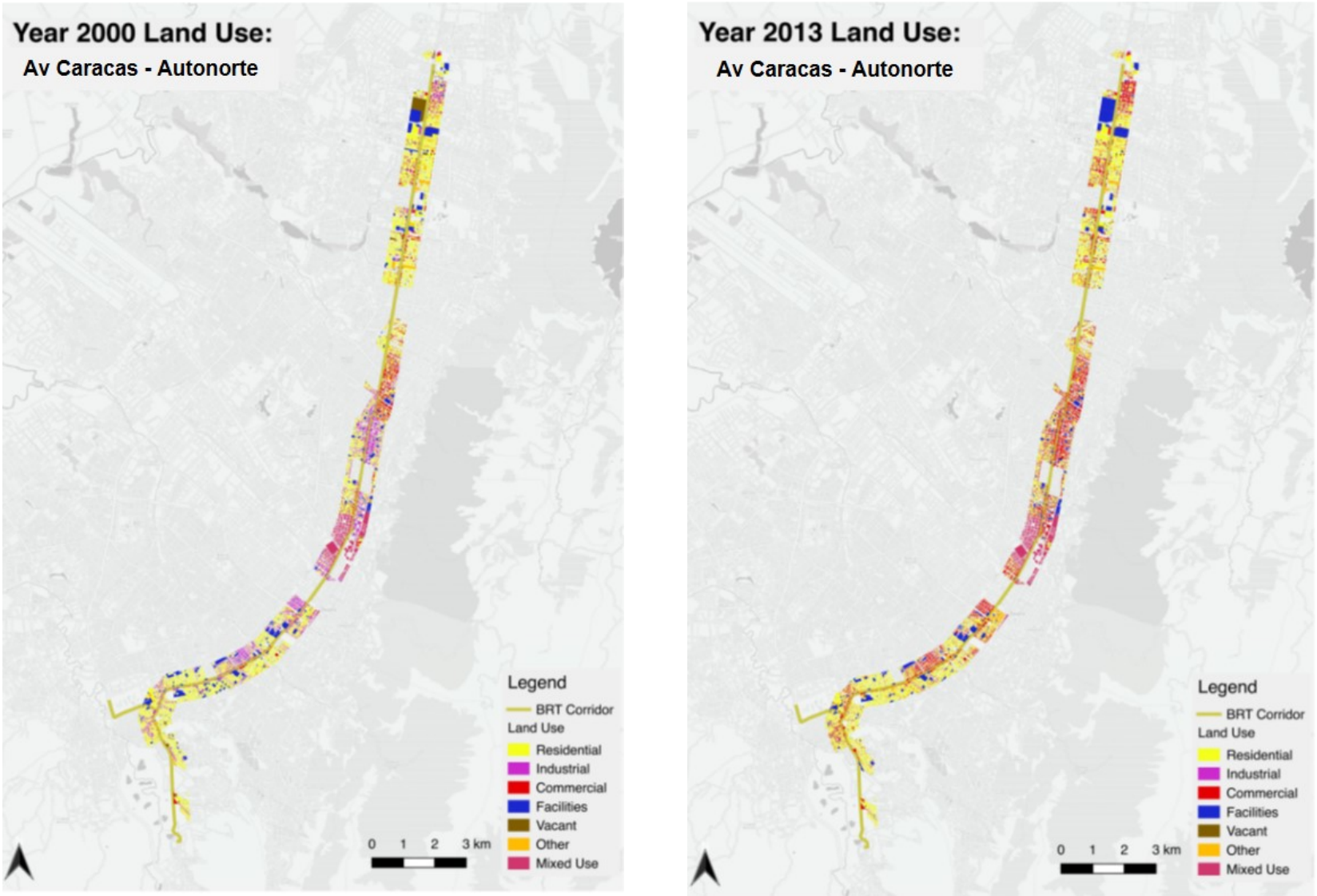
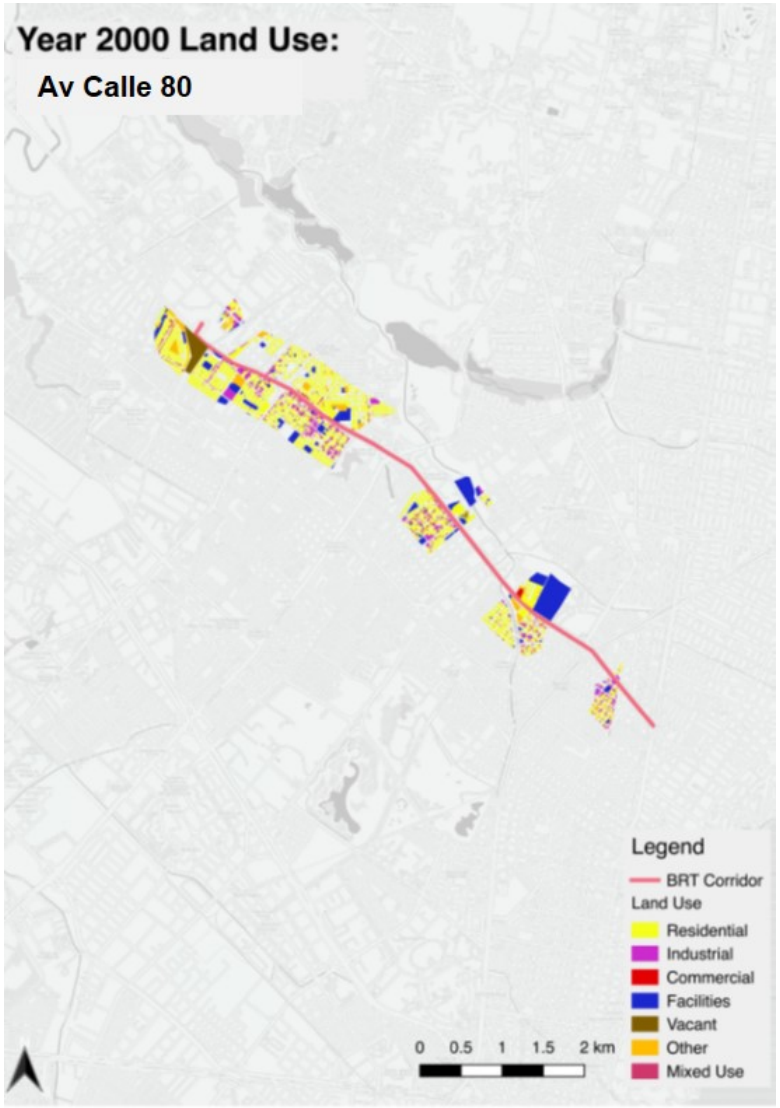


Figure 14: Maps Treatment Corridors: Land Uses Av Calle 80, 2000–2013


Year 2000 Land Use:
Av Calle 80
Legend
BRT Corridor
Land Use
Residential
Industrial
Commercial
Facilities
Vacant
Other
Mixed Use
0 0.5 1 1.5 2 km

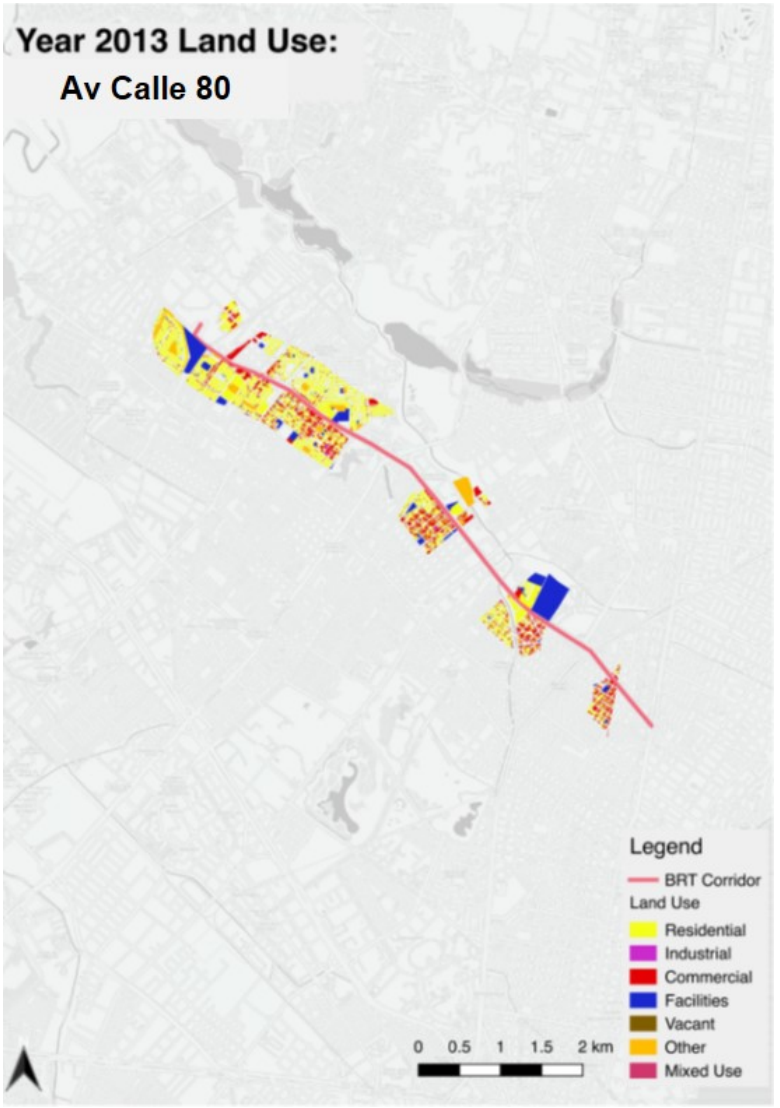

Year 2013 Land Use:
Av Calle 80
Legend
BRT Corridor
Land Use
Residential
Industrial
Commercial
Facilities
Vacant
Other
Mixed Use
0 0.5 1 1.5 2 km

Figure 15: Maps Control Corridors: Land Uses Av Boyaca, 2000–2013

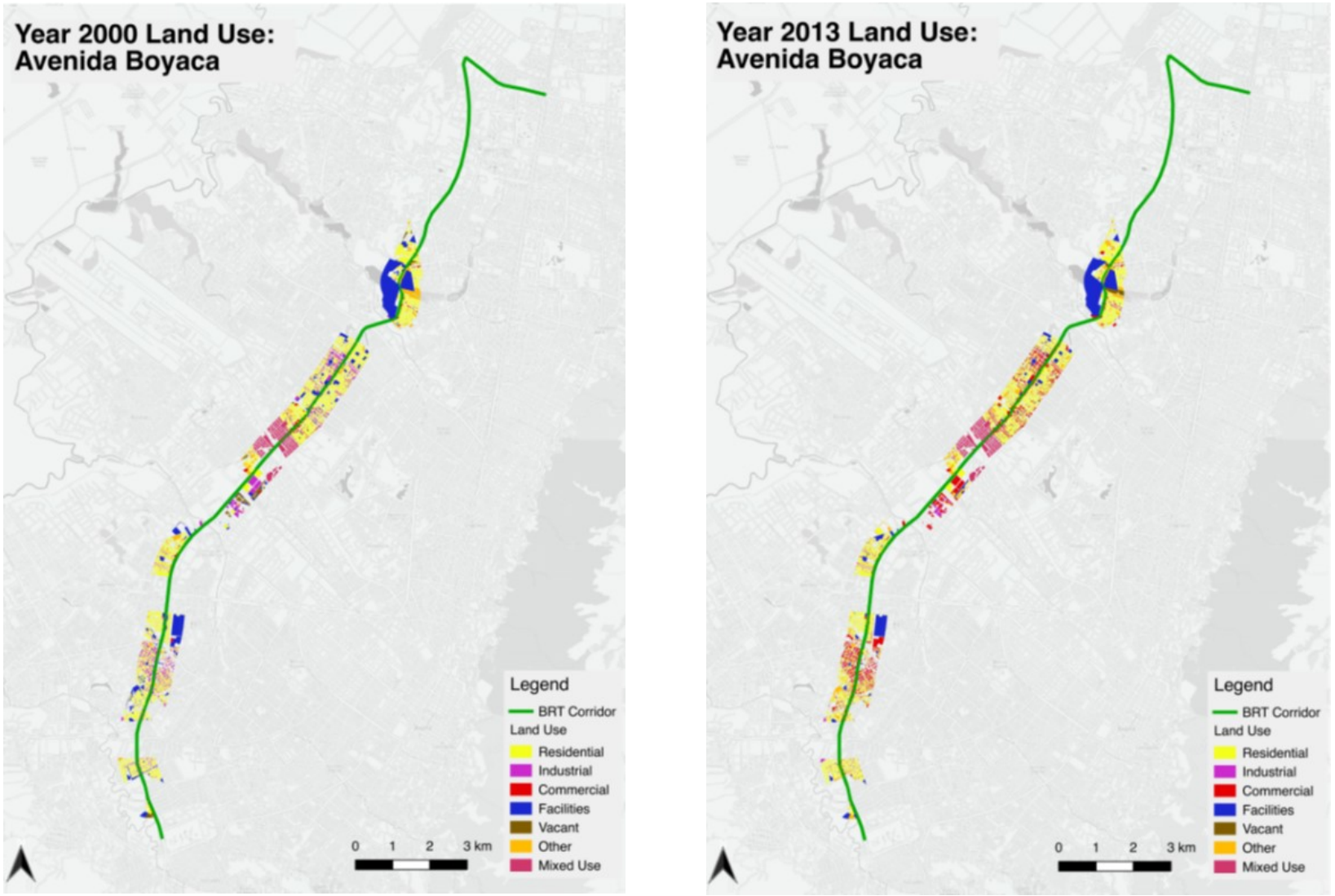


Figure 16: Maps Control Corridors: Land Uses Av 68, 2000–2013