PBOT
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Steve Novick Commissioner **Leah Treat** Director

February 5, 2016

To: Karla Moore-Love, Council Clerk

From: Commissioner Steve Novick

Subject: **Report to Council – Portland Streetcar 2nd Annual Report**

Thank you for scheduling the 10:15am time certain Portland Streetcar Annual Report for February 24, 2016.

The purpose of this report is to provide Council members with an update on Portland Streetcar operations, performance, and budget and its impact on land-use and development.

Attached for Council consideration in advance of the presentation are the results of the 2015 Streetcar Ridership survey as well as a link to the 2015 Portland Streetcar Development Impact Study (http://www.portlandstreetcar.org/pdf/DevelopmentStudy.pdf).

Presenters will include Jim Mark, Portland Streetcar, Inc. (PSI) board Chair, Dan Bower, Executive Director of PSI, and Kathryn Levine, Portland Transportation Streetcar Manager.

Connecting the Entire Community

From home to work to class to shopping

4K Riders

Daily streetcar ridership has increased from **4,000** users per day in 2001 to **15,000** users per day in 2015.

15K Riders

66% **of streetcar trips** begin at home

The top destinations
for Portland Streetcar riders:

- **Work 32%**
- **Shopping/Dining 26%**
- **College Class 17%**

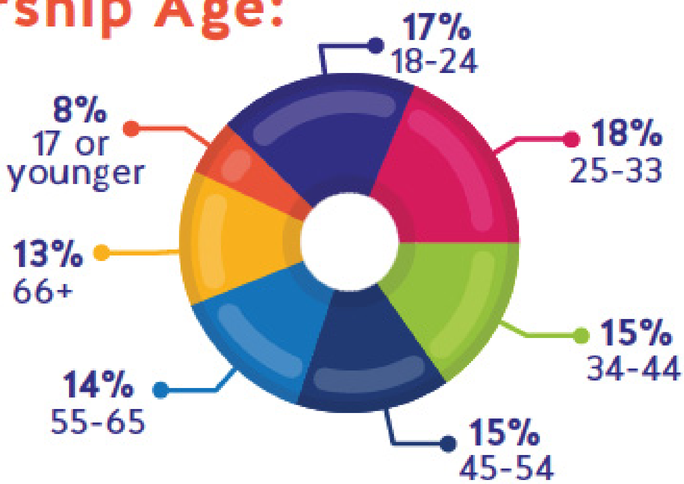
SOURCES:
ECONorthwest Data Analysis, July 2015
Portland Streetcar Ridership Survey, 2015
Portland Streetcar Monthly Ridership Data, 2015

PORTLAND STREETCAR

Connecting the Entire Community

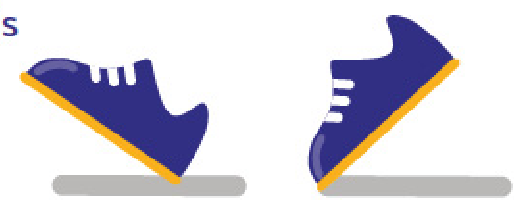
A system that serves everyone

Ridership Age:



LESS THAN 5%
of riders are tourists

38%
of streetcar riders come from households **without a car**



25% of streetcar riders earn less than **$20,000** per year

23% of streetcar riders do not have a **driver's license**

SOURCES:
ECONorthwest Data Analysis, July 2015
Portland Streetcar Ridership Survey, 2015
Portland Streetcar Monthly Ridership Data, 2015

PORTLAND STREETCAR

Connecting the Entire Community

Making it easy to get around the city

Mobile App

Monthly Pass

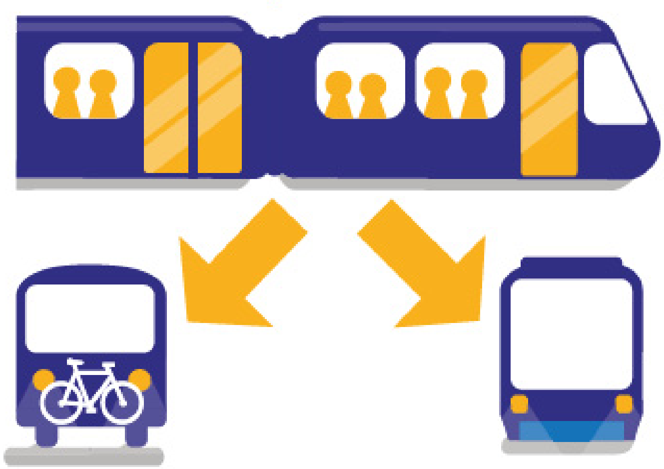
OVER 90%

of riders board with a pre-purchased fare

Employer Pass

TriMet Ticket

Riders that transfer from the system take a:



15% TriMet bus

7% MAX Light Rail

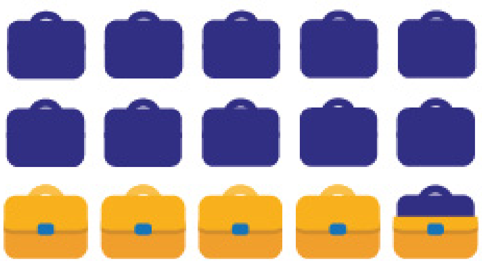
Streetcar drivers use the **mobility ramp** **35+ times** times per hour to assist passengers with disabilities

SOURCES:
ECONorthwest Data Analysis, July 2015
Portland Streetcar Ridership Survey, 2015
Portland Streetcar Monthly Ridership Data, 2015

PORTLAND STREETCAR

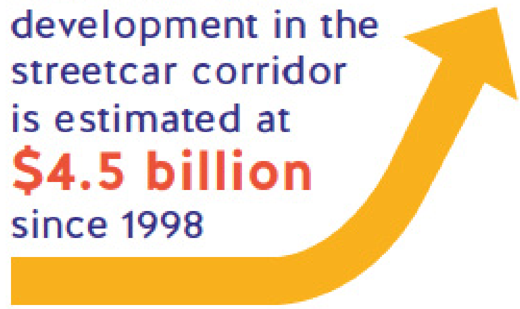
Connecting the Entire Community

Supporting investment in Portland's Central City



32% of **Portland's jobs** are along the streetcar route

The market value of new property development in the streetcar corridor is estimated at **$4.5 billion** since 1998



The streetcar has prompted the construction of **2.7 million square feet** **of commercial real estate**

The streetcar has prompted the construction of **7,400** residential units

2,911

affordable housing units have been built in the streetcar corridor

SOURCES:
ECONorthwest Data Analysis, July 2015
Portland Streetcar Ridership Survey, 2015
Portland Streetcar Monthly Ridership Data, 2015

PORTLAND STREETCAR

DATE: 8/4/15
TO: Dan Bower, Executive Director, Portland Streetcar, Inc.
FROM: ECONorthwest
SUBJECT: TECHNICAL MEMO ---PORTLAND STREETCAR DEVELOPMENT IMPACT STUDY

Introduction

Investments in transit systems and services provide direct benefits to transit patrons in the form of improved mobility and access to locations and amenities. Improving access to property can result in increases in land values; which in turn influence the land development market. Understanding this complex relationship is important to policy-makers, land developers and transit system designers. The potential for a feedback cycle (transit benefits → land value changes →development events →generation of new transit patrons) means that quality empirical estimates of land development effects, and their timing, can change expectations about the merits of alternative transit programs.

TriMet and Portland Streetcar Inc. (PSI) retained ECONorthwest (ECO) and its partners at Fregonese Associates (FA) to evaluate real estate development impacts along the Portland streetcar corridor. This technical memorandum provides summary findings as well as information about research design, methods, assumptions, limitations, and other information necessary to support and interpret the findings. The findings themselves are also described in an infographic and a detailed PowerPoint presentation.

This memorandum begins by describing the research questions, the study design, and limitations of the study. It then summaries key results. An appendix to the memorandum describes methods, assumptions, and more findings from each of the major components of the evaluation. A second appendix is a review of relevant literature.

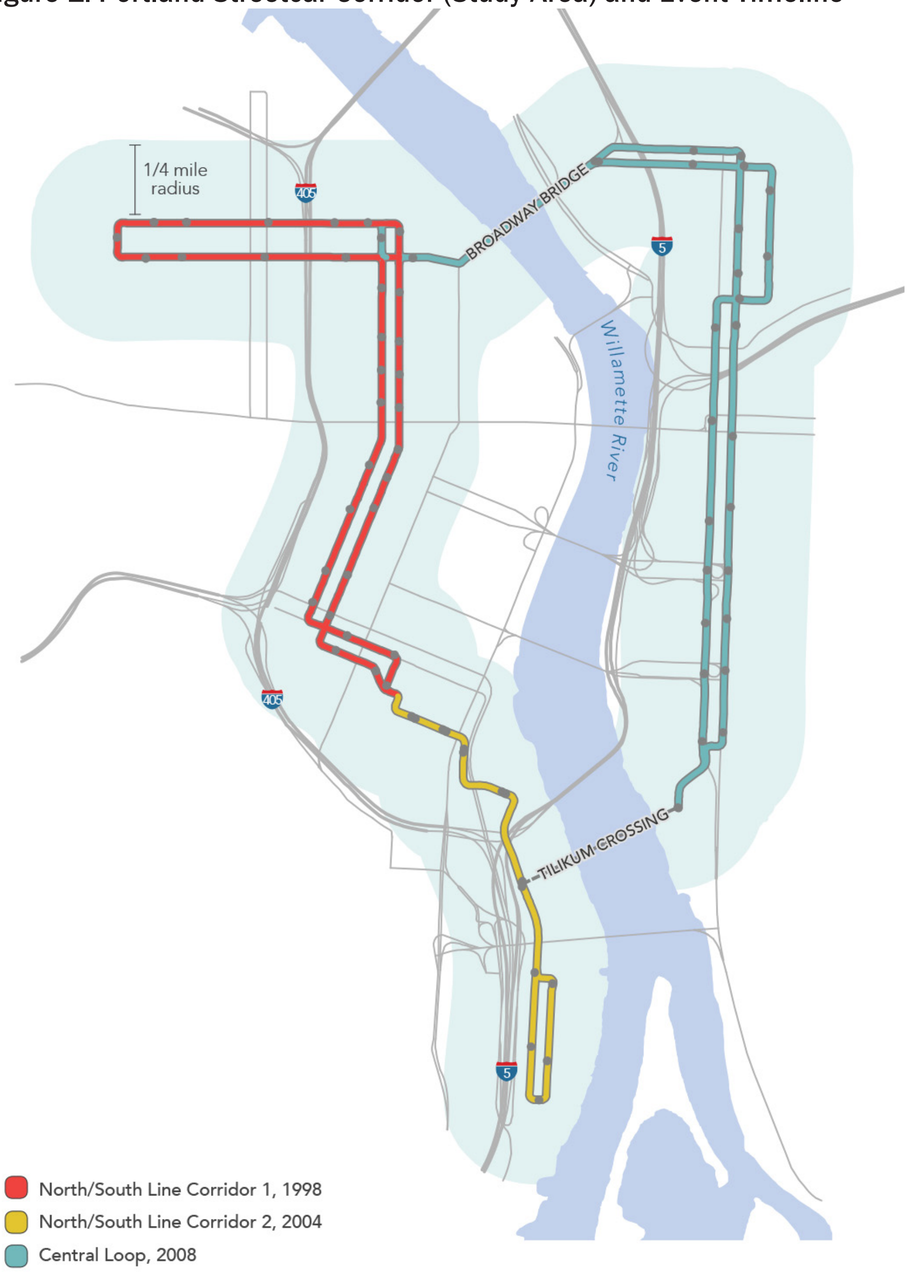
Purpose and approach

Portland's streetcar lines were implemented as one component of an intentional package of public incentives and investments designed to simultaneously increase density and ridership in the corridor (see Figure 1). That package included development incentives, zoning changes, streetscape improvements, and other investments, all of which were implemented concurrently with the streetcar lines themselves. Now that several decades have passed since the construction of the initial segment of the streetcar loop, PSI is interested in evaluating the impact of that package of investments. More specifically, PSI asked the following key research questions:

(1) From the time Portland's streetcar lines were announced, how much new residential, commercial, and other development has occurred in the corridor?

(2) How much of that new construction is related to proximity to streetcar and the package of amenities that accompanied streetcar?

Figure 1. Portland Streetcar Corridor (Study Area) and Event Timeline



To answer these questions, the ECO team designed a methodology with three major components, each of which is described in detail in later sections of this memorandum and its appendices:

(1) *Gather, organize, and evaluate time-series data describing new construction in the corridor.* While data describing the current built environment are generally available, time-series data spanning back to 1998 (when the alignment was announced) are spotty and inconsistent. ECO's task in this component of the evaluation was to normalize into a spatial-temporal dataset a range of built environment data to allow an evaluation of the

amount of new development, by type, that occurred over this time period in the corridor.

(2) *Using a hedonic methodology, evaluate the price effects of proximity to streetcar, considering how those price effects have changed over time.* The hedonic methodology builds on the dataset described above to isolate the pricing impact of the package of investments in the streetcar corridor. Previous studies in Portland employed coefficients from a literature review in order to estimate their results. This was the first time Portland specific data was used to calculate the price impacts related to the streetcar corridor proximity.

(3) *Create a counterfactual scenario: If streetcar and associated amenities had not been implemented, how much development might have occurred in the corridor?* To answer this question, ECO worked with Fregonese Associates and the Envision Tomorrow software to create a counterfactual scenario, which was then compared to the development outcomes that factually occurred in the corridor. Using pro forma feasibility tools tailored to a range of development types, the team backed out the price impacts associated with the streetcar (defined through component 2 above), and populated the corridor with development types that would have been feasible without streetcar.

The result of this approach are findings that define how prices in the corridor changed over time as the streetcar lines were implemented, and an estimate of the amount and type of development that would have occurred had the streetcar investment package and the price effects not been in place.

Study design and limitations

In national academic and policy circles, there is significant interest in quantifying causal links between transit investments and development outcomes. While well-established hedonic and user-benefit methods create a theoretical foundation for these analyses, to date, a limited number of rigorous, peer-reviewed studies have successfully assigned a quantifiable statistically significant value to investments in transit. In most regions, data availability severely limits the possibility to rigorously model and predict the relationship between transit investment and development outcomes.

The Portland region has maintained some of the best spatial development data in the country, which this analysis supplements with a robust, parcel-specific, time series real estate dataset. Even in this data rich environment, data insufficiencies and the complexities of real-world development cycles and policy changes create limitations in the application of hedonic theory.

To overcome these limitations, the modeling work in this analysis necessarily required a set of assumptions and model design decisions that have implications for interpretation of the analysis. The matrix below describes those assumptions and study design decisions, and the implications of those decisions and assumptions for interpretation of results.

Assumption / Study Design Decisions	Rationale	Implications
Analysis covers time period 1998 - 2015	1998 is when the original streetcar line was announced. Ideally, the analysis would begin prior to announcement, but quality data are simply not available at an earlier date.	Data and modeling do not capture any price or development impacts of the announcement or construction of the first streetcar construction: N-S Line Part 1. Baseline comparisons for the corridor begin roughly contemporaneous with construction of the line.
All findings are based on spatial proximity to streetcar, rather than on a causal link directly to the streetcar.	It was not possible to model the impact of the streetcar separate from all of the other investments and changes that occurred in the corridor contemporaneous with construction of streetcar lines. These changes included significant zoning changes that allowed greater density, incentives for and subsidy of higher density development types, and improvements to streetscape design.	All results should be interpreted as being related to geographic proximity to streetcar line, inclusive of all other investments and amenities that are spatially proximate to streetcar.
Findings are only attributable to corridor	The analysis focuses on the corridor adjacent to the streetcar lines. The analysis does not control for net distributional impacts throughout the region.	Any impacts should not be considered net new for the region. For example, additional development that occurred in the corridor near streetcar may still have occurred in other parts of the region without the catalytic investments in and around the streetcar corridor.
Analysis focuses on completed units (rather than permitted)	The lag between a building permit being issued and construction completion varies greatly. Changes in the business cycle and parcel specific issues influence the length of the lag. Further, permit data do not always accurately reflect the amount of development that actually occurs. Focusing on completed development is a more accurate measure of the associated impacts.	For the eastside loop, there has been limited completed new development to date. Future studies will be better able to measure the impacts based on completed construction.
Pricing (hedonic) analysis used condo sales in the corridor adjacent to N-S Line Part 1 as a marker of pricing in the market, rather than residential and commercial rents, and applies those measures to development in other corridors and development types.	Data for condo sales are more readily available and have more observations in and outside the corridor than other real estate types. Condo data also have detailed amenity data to include as control variables that allow for better isolation of the spatial impacts of the streetcar corridor.	Literature commonly finds transit has greater impacts on commercial / retail pricing than on residential; using the residential pricing as a proxy for commercial / retail means that applying residential estimates to calculate commercial impacts is a conservative approach.
Analysis measures new construction (rather than net new contribution)	The available data sources do not accurately describe the proportion of use by type for mixed-use development. Data sources are insufficiently specified to allow an understanding of the square footage by use type of buildings that have been demolished in the area, making it prohibitively difficult to estimate net new development by square footage by use type.	Measures of development cannot account for previous uses, and therefore should be described as new development, rather than net new. The pre-streetcar conditions in the Pearl and South Waterfront did not have significant active high density uses, therefore we believe that new construction is a close proxy for net new development in these locations.
Excludes adaptive reuse and other improvements in existing buildings	Adaptive reuse does not change the building footprints or the urban form, leading to net new square footage (a key metric in our analysis.) As above, available data sources provide insufficient detail to evaluate the amount of new investment to adaptively re-use or otherwise improve existing buildings.	These investments are not included in the analysis or findings.
For counterfactual: all variables grouped into three distinct time periods: 1998-2006, 2007-2011, and 2012-2014	The estimations provided in the counterfactual required a set of year-by-year assumptions regarding construction costs and cost appreciation, real estate values (rents, sales prices, cap rates), and other variables. Wherever possible, the analysis uses real-world data for those assumptions. However, to simplify the methods, the analysis grouped the analysis into three increments.	This method allowed for the evaluation of changes over time without creating the appearance of artificial precision year by year.

Using the methodological approach and assumptions listed above allowed for the creation of a robust model that explained 89% of the variance in condo prices from 1998 to 2014. In additional to explaining a very high portion of the variance, all of the relevant variables were statistically significant. What follows is a summary of study results regarding the price effects from the package of investments that include the Portland Streetcar.

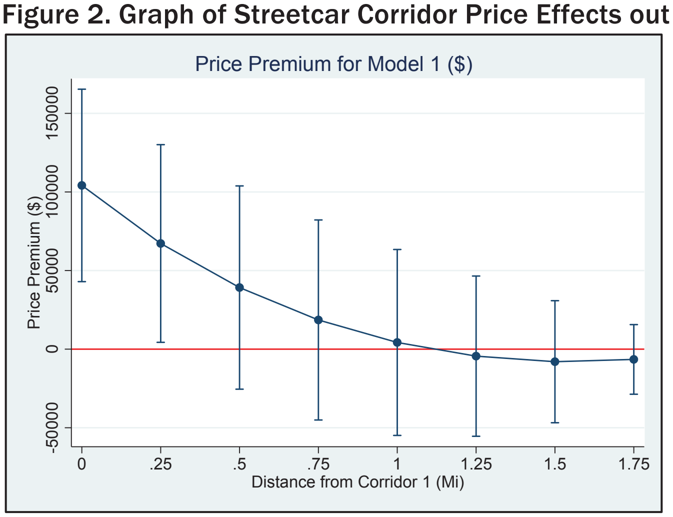
This memorandum also contains two appendices. Appendix 1 includes the sources used for the descriptive data, the methodology and sources for the model data, a description of the model specification and findings, and finally details about the creation and results of a counterfactual scenario measuring the development impacts absent the regulatory and public investments in the corridor. Appendix 2 is a review of the literature related to the development effects of transit.

Key study results

The first major component of the analysis involved describing and quantifying development trends in the streetcar corridor. The next step was to estimate the real estate development impacts in the streetcar corridor using the hedonic price method. ECONorthwest used its internal housing information data warehouse to provide a customized dataset designed specifically for this purpose.

We find a substantial premium for condo prices based upon proximity to the streetcar (see Figure 2) **Controlling for other factors, a condo located adjacent to the streetcar corridor receives an increase in value of approximately 32.8% ($104,000) relative to a condo located 2 miles away.** For a condo located 0.25 miles from the streetcar, the premium is equivalent to 21.2% ($67,000). The premium diminishes with distance from the streetcar and completely dissipates by approximately 0.75 miles. Overall, these findings suggest that the proximity to streetcar and all of the associated improvements in infrastructure, incentives, and changes in zoning, resulted in a substantial premium for condo prices near corridor 1 in Portland. These price impacts were estimated for the entire time period, when we estimated the impacts over time, we also see the price impact decreasing.

Figure 2. Graph of Streetcar Corridor Price Effects out to 2 Miles, 1998 to 2014 (Model 1)



The price impacts decrease over time and appear to stabilize at 9% for properties located ¼ mile from the corridor. The largest premium in condo prices occurs in early periods and steadily decreases over time. For condos adjacent to streetcar (i.e. within 0.25 miles) price premiums associated with proximity to the corridor stabilize between 10% to 20% of condo value by 2014 (see Figure 3). These results suggest that streetcar corridor 1 created a substantial catalyst for growth in condo prices, particularly after the streetcar was announced and ultimately constructed. As time went on, the premiums steadily diminished. The telling result is that there is a stabilized and statistically significant impact on condo prices located proximate to the streetcar corridor modeled in the this study.

Figure 3. Price Impacts by proximity to corridor group by time period. (**Model 1**)

Model 1 (W Spatial Fixed Effects & W Temporal Fixed Effects)								
	1998 - 2002		2003 - 2006		2007 - 2010		2011 - 2014	
Distance (MI)	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
0	37.77***	13.58	42.35***	9.19	22.84**	10.52	20.43*	10.96
0.25	37.79**	15.61	27.06***	8.67	12.11	10.07	9.39	11.9
0.5	36.23**	17.55	15.68*	8.54	4.25	9.7	1.45	12.43
0.75	33.16*	18.33	7.44	8.28	-1.22	9.16	-3.93	12.32
1	28.67	17.6	1.79	7.68	-4.63	8.3	-7.11	11.5
1.25	22.91	15.29	-1.64	6.62	-6.17	7.04	-8.29	9.95
1.5	16.07	11.47	-3.04	5.04	-5.94	5.29	-7.55	7.59
1.75	8.35	6.3	-2.5	2.86	-3.92	2.98	-4.85	4.32

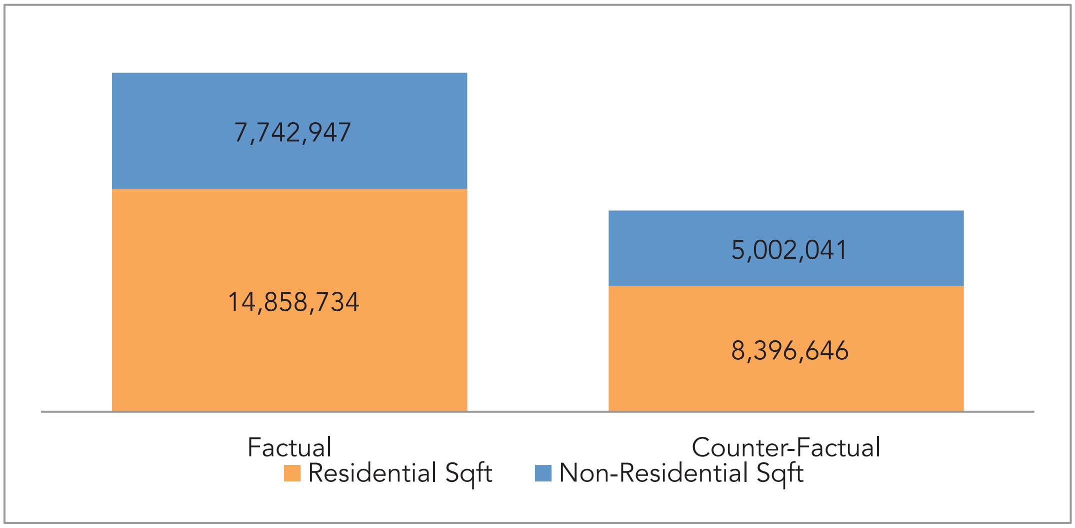
The estimates of the real estate price effects associated with proximity to the streetcar over time were then used in an analysis of corridor-level real estate development. Fregonese Associates (FA) developed two land use scenarios: a "factual" reality-based scenario representing development that occurred within ¼ mile of the alignment between 1998 and 2014 and a "counterfactual" scenario that assumed lower land values and rents in the absence of the package of public investments that include the Portland Streetcar.

ECO's hedonic modeling produced estimated price premiums attributable to the package of public investments located proximate to the streetcar corridor. These results imply reduced achievable rents and lease rates for the "counterfactual" scenario. Fregonese Associates applied these lower rents when creating a "counterfactual" land use scenario to estimate how much development would have occurred without the presence of the bundle of transit supportive public investments in the corridor.

The "counterfactual" scenario produced 35% less commercial development (measured in square feet) and 42% less residential development (measured in the number of units) than the "factual" scenario from 1998 to 2014. Figure 4 below summarizes the difference between observed development square-footage and counter-factual square-footage by type.

The analysis finds that with $4.5 billion in new development the corridor has increased in total market value by $11.63 billion since 1998. The corridor comprised 11% of citywide market value in 1998. Post- streetcar, it increased to 17% of total market value in the city by 2015.

Figure 4: New building square-footage by type within 1/4 mile of Streetcar (1998 - 2014)



Appendix 1: Data Development and Analysis Methods

Methodology for descriptive data

The first major component of the analysis involved describing and quantifying development trends in the streetcar corridor. The following is a summary of the data sources and methods. To reflect the construction process, the North/South line was divided into two sections: Corridor 1 which runs from Portland State University to Northwest 23rd Street and was constructed in 1998, and Corridor 2,which runs from PSU to the South Waterfront and was constructed in 2004. The Central Loop is referred to as part Corridor 3.

New development

Data source

Data for new construction between 1998 and 2015 came from the Metro RLIS tax lot shapefile, and included the year structures on the property were built as well as the total square feet of said buildings.

Data for the number of new multifamily units built between 1998 and 2015 came from the following sources:

- **Apartments, hotels, institutional, and condos:** Fregonese Associates provided ECOwith a file based on the building footprints shapefile provided by Portland Maps and other data from the City of Portland. To supplement this file, ECO used REIS and Costar data and included any buildings that were previously omitted. If buildings classified as multifamily were missing the number of units in the building, ECO used Portland Maps or CoStar to find that information.
- **Affordable housing:** ECO was provided an affordable housing shapefile from 2011 by the City of Portland. ECO first verified that these buildings had not been included in the multifamily shapefile provided by Fregonese Associates and removed any duplicates. To find affordable housing units that had been built since 2011, ECO added data from CoStar and the City's "Central City Development and Redevelopment Projects" report released in May 2015.

Methods

Square feet of New Development

Using first quarter 2015 data from Metro RLIS, ECO did the following:

1. Selected all parcels that intersected a quarter-mile buffer around North/South Line and Central Loop
2. Classified parcels by the nearest streetcar line—Corridor 1, Corridor 2, or Corridor 3—that were in operation at the time of the new development.
3. Classified parcels as commercial, residential, or other based on their RLIS property class.

4. From those parcels, selected parcels which had been built between 1998 and 2015
5. Summarized commercial, residential, and total development by closest line and year built to find the square feet of new construction by development type for each year in the period.

Units of New Development

Using the building footprint shapefile created by Fregonese Associates and ECO, based on data provided by the City of Portland and Metro, ECO:

1. Selected all buildings within a quarter-mile buffer of the North/South Line and the Central Loop that were built between 1998 and 2015.
2. Exported the data to excel in order to calculate the number of buildings and units by type, built between 1998 and 2015 within a quarter mile of the streetcar corridors (1, 2, or 3).

Proposed or under construction development

Data source

Data for proposed or under construction commercial and residential development came from the real estate databases CoStar and Construction monitor. Some but not all of the provided data contained building area for commercial development or number of units for residential development.

Methods

Residential development

In February 2015, ECO created an inventory of proposed and under construction residential development using geocoded CoStar and Construction Monitor data. Records more than a quarter mile from the streetcar lines were removed. At that time, ECO verified that no duplicate records existed by examining building addresses and names in addition to manually checking records which overlapped or were within five hundred feet of another record. For this analysis, ECO again geocoded data from CoStar and Construction Monitor which had been proposed after February 2015. Buildings more than a quarter mile from the streetcar lines as well as duplicate records were removed from the dataset.

Commercial development

CoStar classifies commercial development into three broad categories: office, retail, and industrial. Construction Monitor's commercial designation on the other hand includes over a dozen development types and over 2,000 proposed developments. Records from both sources were geocoded and developments more than a quarter mile from the streetcar lines were removed. To avoid classification errors, ECO chose not to distinguish between commercial development types. ECO did not verify if duplicates in the data exist because of the number of records. As a result, the data should be viewed in aggregate as a broad picture of future commercial development.

Floor area ratio utilization

Floor Area Ratio (FAR) is calculated by dividing the parcel size in square feet by the total building square feet. For example, if a building is 20,000 square feet and its lot is 10,000 square feet, the property would have a FAR of 2:1. FAR utilization is the ratio of the existing FAR to the FAR allowed on a given property. So if that same property is in a zone that had a FAR limit of 4:1, its FAR utilization would be fifty percent.

Data source

Data for floor area ratio limits came from the City of Portland Bureau of Planning and Sustainability. The shapefile contained FAR limits for the Central City where zoned FAR limits do not apply; all areas outside of the given FAR polygons were limited based on their base zone. To assign a FAR limit to parcels within the quarter mile boundary but outside given FAR limit geographies, ECO first joined Metro RLIS zoning data to Metro RLIS tax lots in order to determine each parcel's zone. Next, ECO used the City of Portland Zoning Code's summary of base zone development standards, (available at https://www.portlandoregon.gov/bds/article/411748) to assign a FAR limit to each tax lot.

Methods

Using first quarter 2015 data from Metro RLIS, ECO did the following:

1. Selected all parcels that intersected a quarter-mile buffer around the N-S and C-L streetcar lines and were not designated as having no FAR limit or as open space.
2. Calculated the existing FAR of each parcel
    a. FAR = building size (sqft) ÷ lot size (sqft)
3. Calculated FAR utilization for each parcel
    a. FAR utilization = Existing FAR ÷ Allowed FAR

Number of jobs

Data source

ECO uses the Quarterly Census of Employment and Wages (QCEW), provided the City of Portland, to evaluate jobs in the corridor from 2000 to 2013. The City of Portland provided the data to ECO in shapefile format.

Methods

Using the 2000 to 2013 QCEW data from the City of Portland, ECO:

1. Selected all places of employment within a quarter-mile buffer around corridors 1 through 3.
2. Classified parcels by the nearest streetcar line: corridor 1, corridor 2, or corridor 3
3. Exported the data to excel in order to calculate the following:

a. The number of jobs, total pay, and average annual pay from 2000 to 2013 within a quarter mile of corridor 1, corridor 2, or corridor 3, as well as the City of Portland.

b. The number of employees, total pay, and jobs per block by NAICS sector in 2000 and 2013 within a quarter mile of the streetcar

    i. To model blocks, ECONorthwest created a vector grid where each block measured 200 feet by 200 feet, the average block size in downtown Portland. Next ECONorthwest summarized the number of jobs in each block in 2000 and 2013 and took the average.

Demographic data

Data source

Demographic data came from the 2000 Decennial Census and the 2013 American Community Survey 5-year estimates. Shapefiles of the census tract geographies for 2000 and 2010 (used for ACS estimates until the next decennial census in 2020) came from the Census's TIGER/Line database.

Methods

Using the 2000 and 2010 TIGER/Line census tract shapefiles for Oregon, ECO calculated the proportion of census tracts in the central city that were within the quarter-mile buffer of the streetcar lines. Using those proportions, ECO estimated a host of demographic variables for the streetcar corridor compared to the entire City of Portland. The streetcar corridor was measured based on the current configuration of the lines for both the 2000 and 2013 estimates. The following steps were performed by ECO to calculate proportions for the 2000 and 2010 census tract shapefiles:

1. Calculate the area of Oregon census tracts in acres
2. Intersected the quarter mile buffer with the Oregon census tracts
3. Calculated the area in acres of the census tracts which intersected the quarter mile buffer
4. For the census tracts that fell within the quarter mile buffer, ECO calculated the proportion of each census tract's area which fell within the quarter mile buffer (Area within quarter mile buffer ÷ Total Area)

Methodology for real estate data

ECO used its internal housing information data warehouse to provide a customized dataset, designed to estimate the real estate development impacts in the streetcar corridor. The following is a description of the construction of the dataset used in the formal modeling process, with the intention of providing an overview of the manipulations and transformation that were applied to reach the end result.

ECO maintains a spatially enabled housing dataset that draws from multiple publicly-available and subscription-based services. The main source used for modeling price impacts in this analysis was Regional Multiple Listing Service (RMLS) data; its composition of housing and condo sales data with in-unit specifications, organized in a temporal and spatial manner, provided the foundation for the hedonic analysis. The dataset contains over 9,000 observations. The Regional Land Information System (RLIS) taxlot and assessors data was also a key dataset, providing the Floor Area Ratio (FAR) of each unit based on lot membership. The FAR data was joined in using the spatial contains operation.

Starting with the data as described above, ECO undertook a series of spatial calculations to develop spatial relationships between each observation, the streetcar lines, and other key physical amenities: straight-line distance from each observation to the nearest point on each of the 3 streetcar corridors, minimum distance to the bank of the Willamette River, and total park area within a half-mile of each observation. ECO also coded the relationship to other geographic variables to add explanatory power to the model. Census tracts and Census block groups were joined to the dataset using the spatial 'contains' join operation. Finally, a set of 'randomly' generated/placed consistent area hexagon shapes were generated using a GIS.

ECO uploaded the calculated spatial relationships into the housing data warehouse and joined to the final streetcar hedonic dataset using spatial contains logic between the hexagon polygons and the Streetcar hedonic point layer. These 'hex bins' provided an area normalized unit for use in fixed effect modeling, downstream in the hedonic component of the project. Hexagon layers/bins were created with the following areas: 1/16th, 1/8th, 1/4th, ½, 1, and 2 square miles.

Methodology for hedonic price model

Although most people think of a home as a single good, each home comprises a bundle of attributes that the homeowner values. These attributes may reflect the physical characteristics of the home, such as the square footage, number of bedrooms, and age of the home. They also may reflect the amenities of the neighborhood, such as school quality or proximity to transportation infrastructure. However, when a buyer purchases a home, the buyer pays a single price that reflects his or her willingness to pay for the bundle of attributes the home contains. Although we cannot directly observe the value that the buyer places on each attribute of the home, we can implicitly determine the value through the theory of ***hedonic pricing***.

The hedonic pricing model dates back to at least 1929[1] and is used to study markets, such as home sales, with an abundance of differentiated products and unique product attributes. Rosen (1974) documented and codified much of the hedonic theory. Under the law of one price, given a competitive market for goods and services, two products with identical attributes must, necessarily, sell for same price. Therefore, disparities in the price of two differentiated products (such as two distinct homes) must be attributable to the value of the differences in the underlying characteristics of the goods in question. Following this line of reasoning, economists

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[1] Waugh (1929) studied the determinates of vegetable price based upon quality characteristics

represent the transaction level price paid for a good, such as a home, as a function of the combined unique attributes of the product (Figure A-1.).

Figure A-1.

$$Price = f(Physical\ Attributes, Neighborhood, Interest\ Rate, Employment, etc)$$

Given a sufficient quantity of market transactions and a reasonable depiction of the relevant product attributes valued by homeowners, we can construct a statistical representation of the determinants of home sales price, represented in Figure A-2.

Figure A-2.

$$P = \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon$$

Here, P represents the final sale price of a given home with n different home characteristics represented by the parameter x and an error term ε. The parameter β_i represents the marginal effect of home attribute x_i on the equilibrium sales price. For a small change in the value of x_i, β_i provides the value of the resultant change in home sales price. As an example, if x_i represents home square footage, β_i represents the value of the increase in home price due to an increase in the size of the home by one square foot. In this way, we may statistically decompose final sales price of a home into the contributions from all the relevant home attributes.

Model: impact of streetcar corridor on Portland condo prices

ECO developed a hedonic model to evaluate the price effects related to the proximity to streetcar corridor 1. The model used data describing price and key home attributes for all condo sales located within 2 miles of streetcar corridor 1 in the City of Portland between the years 1998 and 2014 (Corridor 1 construction was announced in 1998 and completed in 2001)[2]. This sample contains 7,989 condo sales. The analysis concentrates on condo sales (as opposed to rental rates or land values) because condo development and prices are highly sensitive to improvements in the transportation infrastructure and other improvements and changes associated with the streetcar construction. The maximum distance threshold of two miles limits the sample to properties geographically "near" the streetcar rail infrastructure while still allowing observation of the pattern of spatial decay (impacts decreasing with distance from streetcar in predictable patterns). The hedonic price equation used to predict condo sales price for each condo i in year t is specified in Figure A-3.

Figure A-3

$$lnP_{it} = f(D_{it}) + X_{it}\beta + M_{it}\theta_1 + Y_{it}\theta_2 + S_{it}\gamma + \varepsilon_{it}$$

[2] Corridor 1 was used as the study area based on 2 main selection criteria (1) it comprised the largest section of alignment (2) it had the longest history and largest number of observations. Corridor 3 did not have enough sales transactions to model, for Corridor 2 the largest number of sales transactions occurred during the peak and bust of the housing boom, so exogenous shocks were difficult to properly account for in the model.

The dependent variable in this model is the natural log of condo sales price, lnP_{it}. We use the natural log of sales price to be consistent with the literature and reflect the non-linearity[3] in the demand for housing-related attributes. The variables $D_{it}, X_{it}, M_{it}, Y_{it}$ and S_{it} represent the spatially and temporally varying characteristics of the condos, and the parameters $\beta, \theta_1, \theta_2$ and γ are coefficients to be estimated. The parameter ε_{it} is the error term, or the difference between the predicted versus actual condo sales price. The lower the estimated error term, the more accurately we can predict condo sales prices. The model clusters errors at the census block group level. This corrects for spatial and temporal correlation in condo sales within census block groups by adjusting the standard errors, which measures significance of the coefficients, to account for this within cluster correlation.

The vector X_{it} represents the physical attributes of the condo. In our model, this includes the natural log of the square footage of the condo, the number of bedrooms, the number of bathrooms, the age of the condo, the age squared, the floor number that the condo is on, the total number of floors of the condo building, and the linear distance (in miles) from the condo to the Willamette River. We also include and control for several indicator variables, including whether the condo has a garage, a fireplace, or air conditioning, and if it is a penthouse or is located on the waterfront. The variables M_{it} and Y_{it} are vectors of time fixed effects for the month and year of condo sales transaction, respectively.

In some of the model specifications, we dropped the temporal fixed effects in favor of variations with controls for macroeconomic variables, including the yearly permits for single family home, duplexes, small multifamily buildings (between 3-4 units), and large multifamily buildings (5 or more units), as well as the total Portland MSA employment. The permitting data are used as leading indicators of future construction activity, and the employment variable is a macroeconomic indicator of Portland area economic activity. S_{it} is a vector of spatial fixed effects used to capture unobserved spatial heterogeneity (e.g. proximity to downtown Portland). In our primary model, we include spatial fixed effects for the quadrant that the condo is located in (i.e. SW, NW, SE, NE, and N), but we also estimate models without these controls.

The primary variable of interest, D_{it} is the distance, in miles, from the condo to the corridor 1 streetcar. $f(D_{it})$ is a flexible polynomial specification of distance, used to capture the potential non-linear spatial decay of the effect of proximity to the streetcar on condo prices. In our primary specification, we use a quadratic polynomial, such that $f(D_{it}) = \alpha_1 D_{it} + \alpha_2 D_{it} * D_{it}$. Summary statistics, including the mean, standard deviation, minimum, and maximum, are provided for the variables in our model in Figure A-4.

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[3] For instance, an increase in the condo square footage from 500 sqft to 600 sqft is likely to have a larger effect on prices than an increase from 2,000 sqft to 2,100 sqft.

Figure A-4 Summary Statistics for Condo Sales within 2 Miles of Corridor 1 (1998-2014)

Variable	Mean	Standard Deviation	Min	Max
Distance	0.4	0.46	0.0	2.0
ln(Square Footage)	6.9	0.43	5.6	8.2
Bedrooms	1.4	0.68	0	4
Bathrooms	1.4	0.53	0.1	4
Age	25.7	33.29	0	111
Garage	0.8	0.37	0	1
Fireplace	0.9	0.31	0	1
AC	0.7	0.44	0	1
Total Floors	12.1	13.76	1	82
Condo Floor	5.7	4.87	1	82
Top Floor	0.2	0.42	0	1
Waterfront	0.1	0.32	0	1
River Distance	0.6	0.35	0.0	2.0
Permit 1	7261.6	3307.82	3011	12789
Permit 2	183.9	122.89	28	552
Permit 3 & 4	191.8	150.52	51	541
Permit 5	3753.4	1632.84	925	6681
Employment	1009.5	37.69	941.7	1073.9
Sample Size	7989			

Model results

Price premium over proximity

Figure A-5 displays the results for four alternative models of the impact of proximity to corridor 1 Portland streetcar on condo sales price between the years 1998 – 2014. Model 1 includes the independent variables listed in Figure A-5, along with temporal fixed effects for the month and year of sales transaction, along with spatial fixed effects for the quadrant of Portland. Model 2 is identical to model 1, but we drop the quadrant based fixed effects from the estimation. In model 3, we exclude the temporal fixed effects and instead include macroeconomic indicators for permits for single family homes, duplexes, small multifamily buildings (between 3-4 units), large multifamily buildings (5 or more units), total Portland area employment, along with the quadrant based spatial fixed effects. Finally, in model 4, we include the macroeconomic variables from model 3 but drop the quadrant based fixed effects.

In each model, we display the estimated coefficients and standard errors, as well as the total sample size and R squared value. The R-squared value can be interpreted as a measure of "goodness of fit" for the data, indicating the total amount of variation in the dependent variable can be explained by parameters of the model. Based upon these results, the predictive power of our models is strong—the variables used in our models can be used to explain and predict between 87% and 89% of the total variation in condo sales price.

Figure A-5. Model Results for the Impact of Streetcar on Condo Home Values (1998-2014)

	Model 1 (W Spatial Fixed Effects & W Temporal Fixed Effects)		Model 2 (W/O Spatial Fixed Effects & W Temporal Fixed Effects)		Model 3 (W Spatial Fixed Effects & W Temporal Fixed Effects)		Model 4 (W/O Spatial Fixed Effects & W Temporal Fixed Effects)	
Variable	**Coefficeint**	**Std. Error**	**Coefficeint**	**Std. Error**	**Coefficeint**	**Std. Error**	**Coefficeint**	**Std. Error**
Distance	-0.39876***	0.115	-0.41344**	0.116	-0.42363***	0.11944	-0.4381***	0.120
Distance^2	0.12847**	0.064	0.12445**	0.061	0.13813**	0.06776	0.13669**	0.065
ln(Square Footage))	0.98962***	0.032	0.99157***	0.032	0.9749***	0.03213	0.97575***	0.032
Bedrooms	-0.01981	0.019	-0.01999	0.019	-0.02518	0.01951	-0.02538	0.020
Bathrooms	0.03574**	0.017	0.0377**	0.019	0.04445**	0.01848	0.04657**	0.021
Age	-0.01261***	0.003	-0.01239**	0.003	-0.01433***	0.00288	-0.01407**	0.003
Age^2	0.00012***	0.000	0.00012***	0.000	0.00013***	0.00003	0.00013***	0.000
Garage	0.0648**	0.029	0.07204**	0.028	0.05545**	0.02808	0.06008**	0.028
Fireplace	0.00787	0.015	0.0075	0.015	0.04187**	0.01732	0.04176**	0.017
AC	-0.02187	0.014	-0.02909**	0.013	-0.02719*	0.01627	-0.03371**	0.015
Total Floors	-0.00232***	0.000	-0.00226**	0.000	-0.00232***	0.00036	-0.00224**	0.000
Condo Floor	0.01225***	0.002	0.0121***	0.002	0.01297***	0.00185	0.01293***	0.002
Top Floor	-0.0026	0.010	-0.0054	0.010	-0.02458*	0.01492	-0.02798*	0.015
Waterfront	0.1072**	0.042	0.11877***	0.044	0.12997***	0.04374	0.13801***	0.044
River Distance	0.0501	0.059	0.05096	0.053	0.07009	0.05957	0.06332	0.055
Permit 1	--	--	--	--	0.00004***	0.00001	0.00004***	0.000
Permit 2	--	--	--	--	-0.00047***	0.00012	-0.00047**	0.000
Permit 3 & 4	--	--	--	--	-0.00042***	0.00016	-0.00044**	0.000
Permit 5	--	--	--	--	-0.00003***	0.00001	-0.00003**	0.000
Employment	--	--	--	--	0.00425***	0.00025	0.00427***	0.000
Fixed Effects								
Quadrant	Yes		No		Yes		No	
Month	Yes		Yes		No		No	
Year	Yes		Yes		No		No	
R^2	**0.89**		**0.888**		**0.868**		**0.866**	
Observations	7989		7989		7989		7989	

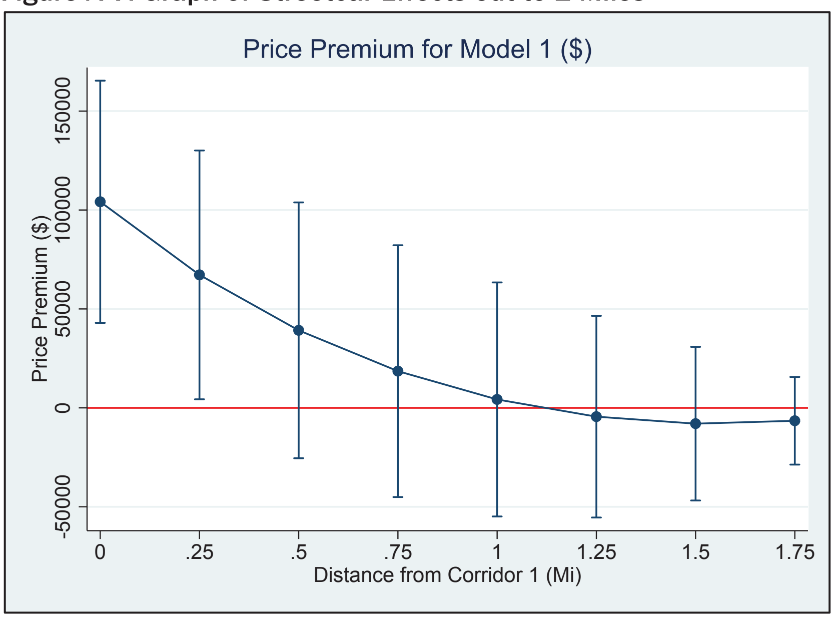
The coefficients between models are generally consistent in both sign and significance, and conform to expectation where significant. For example, condos with greater square footage, with more bathrooms, with a garage, and on the waterfront generally sell for a higher price than smaller unites without those amenities. In addition, the coefficient for age is negative, whereas the coefficient for age squared is positive. For relatively new condos, increases in the age of the condo decrease the sales price. For older, more historic condos, increases in the age increase the price. Condos located on higher floors tend to have a higher value, but condos with more total floors are less valuable. For models without temporal based fixed effects, more permits for single-family homes tend to increase condo price, whereas more permits for duplexes and multifamily buildings tend to decrease price. These results likely reflect the relative scarcity of condos compared to single-family homes. When more single-family homes are constructed, condos become relatively scarcer, and the value for condos increases. On the other hand, when duplexes and multifamily units are built, condos become more common, and the price decreases. As expected, area wide employment has a positive effect on condo prices.

In all of our models, the effect of distance from the streetcar is negative, whereas the effect of distance squared is positive. Both of these coefficients are significant at well below the one-percent level. These results suggest that increases in the distance from the streetcar decrease condo sale price, but do so at a decreasing rate. We further explore the impact of proximity to streetcar in Figure A-6 and in Figure A-7. Here, we base our calculations on the results of model 1 and estimate the expected sales price for condos located within 0.25 mi distance bands (0 mi, 0.25 mi, 0.5 mi, etc.), out to 2 miles from corridor 1. For each distance band, we compare these estimates to properties located 2 miles away. A positive value would indicate a statistical increase in sales price, relative to condos 2 miles away, whereas a negative value would indicate a decrease in sales price. In Figure A-6, we report these results in dollar values as well as in percentage terms. In Figure A-7, the graph is presented in dollar value terms and the 95% statistical confidence intervals are represents with vertical bars.

Figure A-6. Impact of Proximity to Street Car Relative to Condos 2 miles Away (from Model 1)

Model 1 (W Spatial Fixed Effects & W Temporal Fixed Effects)				
Distance (MI)	Dollar Premium	Std. Error	Percent Premium	Std. Error
0	104089***	31265	32.79***	11.02
0.25	67172**	32108	21.16*	10.89
0.5	39170	33001	12.34	10.81
0.75	18558	32478	5.85	10.41
1	4263	30186	1.34	9.55
1.25	-4439	26014	-1.4	8.15
1.5	-7975	19817	-2.51	6.13
1.75	-6519	11306	-2.05	3.45

Figure A-7. Graph of Streetcar Effects out to 2 Miles



Based upon these results, we find a substantial premium for condo prices based upon proximity to the streetcar. Controlling for other factors, a condo located adjacent to the streetcar (i.e. 0 mi) would receive an increase in value equivalent to approximately $104,000 (32.8%) relative to a condo located 2 miles away, a result significant at below the one-percent level. For a condo located 0.25 miles from the streetcar, the premium is equivalent to $67,000 (21.2%). Based upon the shape of the graph in Figure A-7, the premium diminishes with distance from the streetcar and completely dissipates by approximately 0.75 miles. Overall, these findings suggest that the proximity to streetcar and all of the associated improvements in infrastructure, incentives, and changes in zoning, resulted in a substantial premium for condo prices near corridor 1 in Portland.

Our results are robust to a variety of alternative and unreported model specifications. We have experimented with alternative spatial fixed effects, such as census tracts and using a hexagonal grid of 0.5 square mile cells to define neighborhood. In other models we used higher order polynomials such as cubic and quartic. Finally, we have also experimented with dropping observations from years prior to the completion of construction. Results of these alternative models conform to those reported here and are available upon request.

Price premium over time

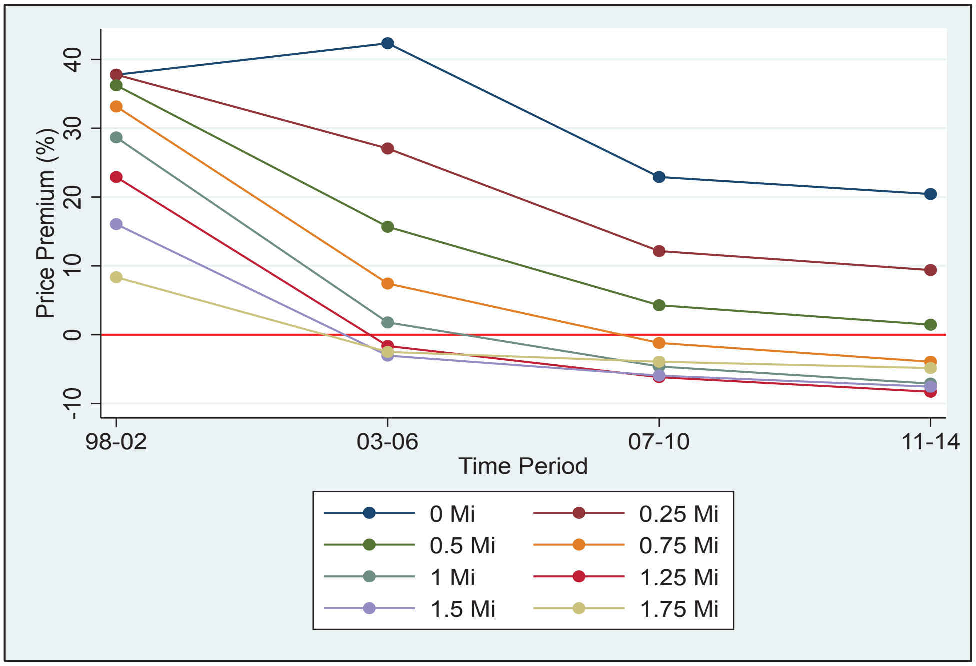
We examine the impact of the streetcar over time by studying the results in four separate 4 – 5 year time intervals: 1998 – 2002, 2003 – 2006, 2007 – 2010, and 2011 – 2014. We then run models, specified identically to those in model 1, separately for observations in each period. Using these predictions, we determine the percentage premium, by 0.25 mi distance band, relative to parcels located 2 miles away. Figure A-8 displays results of the percentage premium in condo prices due to the streetcar proximity over time.

Figure A-8. Percentage Premium In Condo Sale Price, Relative to Condos 2 mi Away, by Time Period

Model 1 (W Spatial Fixed Effects & W Temporal Fixed Effects)								
	1998 - 2002		2003 - 2006		2007 - 2010		2011 - 2014	
Distance (MI)	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
0	37.77***	13.58	42.35***	9.19	22.84**	10.52	20.43*	10.96
0.25	37.79**	15.61	27.06***	8.67	12.11	10.07	9.39	11.9
0.5	36.23**	17.55	15.68*	8.54	4.25	9.7	1.45	12.43
0.75	33.16*	18.33	7.44	8.28	-1.22	9.16	-3.93	12.32
1	28.67	17.6	1.79	7.68	-4.63	8.3	-7.11	11.5
1.25	22.91	15.29	-1.64	6.62	-6.17	7.04	-8.29	9.95
1.5	16.07	11.47	-3.04	5.04	-5.94	5.29	-7.55	7.59
1.75	8.35	6.3	-2.5	2.86	-3.92	2.98	-4.85	4.32

As demonstrated in Figure A-8, the largest premiums in condo prices occur in years just after the corridor 1 announcement (1998) and completion of construction (2001). Condos located adjacent to the street car (0 mi) are 37.8% and 42.3% more valuable than condos located 2 miles away during 1998 – 2002 and 2003 – 2006, respectively. These effects are similarly large for properties located 0.25 mi away; here the premiums are 37.8% and 27.1%, respectively. For later time periods, the premium in condo price steadily decreases for all distances. In the period 2007 – 2010, properties located adjacent to corridor 1 report a 22.9% and in 2011 – 2014, the premium is only 20.4%. Figure A-9 displays a graph of the price premium over time for each distance band (0 mi – 1.75 mi with 0.25 mi intervals).

Figure A-9. Percentage Premium Over Time by Distance Band (0 mi – 1.75 mi)



Across all distance bands, the largest premium in condo prices occurs in early periods and steadily decreases over time. For condos very close (i.e. within 0.25 miles) price premiums stabilize between 10% to 20% of condo value by 2014. For condos further away, the price premiums approach zero by the end of the sample time horizon. These results suggest that the corridor 1 streetcar offered a substantial catalyst for growth in condo prices, especially soon after the streetcar was announced and ultimately constructed. As time went on, the premiums steadily diminished. This is likely due to changes in zoning and other public infrastructure improvements whose impacts decreased over time as other pubic investments were made elsewhere in the city (for example, the South Waterfront). The telling result is that there is appears to be a stabilized and statistically significant impact on condo prices located proximate to the streetcar corridor modeled in the this study. The permanence of the streetcar investment appears to generate persistent positive externalities that decrease as you move away from the streetcar corridor.

Methodology for the counterfactual scenario

Development scenarios

ECO led the hedonic modeling effort related to the price impacts on development proximate to the Portland Streetcar between 1998 -2014. As a sub-consultant to ECO, Fregonese Associates (FA) quantified the amount of development within ¼ mile corridor of the Portland Streetcar alignment attributable to investment in high-capacity transit (Streetcar), regulatory adjustments (zone changes), and an associated package of public amenities (streetscape improvements).

FA developed two land use scenarios: a "factual" reality-based scenario representing development that occurred within ¼ mile of the alignment between 1998 and 2014 and a "counterfactual" scenario that assumed lower price premiums in the absence of the package of public investments that include the Portland Streetcar.

In order to create land use scenarios from the outputs of ECO's hedonic modeling, the consultant team employed Envision Tomorrow (ET), an open-source scenario planning framework developed by FA. ET consists of a suite of urban and regional planning tools that can be used to model development feasibility on a site-by-site basis as well as create and evaluate multiple land use scenarios, test and refine transportation plans, produce small-area concept plans, and model complex regional issues.

Scenario creation process

Scenario creation with ET consists of four primary components: building types, development types, scenario development, and evaluation. For this project, the ET Prototype Builder was used to develop a library of building types based on recent development in the Central City. Fregonese blended these building prototypes to create place types that reflect recent development within each zone in the study area, and then calibrated and used to create a "counterfactual" land use scenario using alternative market inputs from ECO's hedonic model. To control for variations in market dynamics over time, the scenario horizon was deconstructed into three periods corresponding to major shifts in construction costs and market rents: 1998-2006, 2007-2011, and 2012-2014. As separate set of building assumptions were used during each period, the results of which were then aggregated to create the "factual" and "counterfactual" scenarios. These scenarios were then evaluated in terms of metrics such as total market value, population, housing units, and employment.

Building prototype library

Understanding and accounting for local real estate dynamics was critical to deriving a realistic assessment of development potential under the "factual" and "counterfactual" scenarios. ET is able to answer this question through the use of pro formas to develop scenario building blocks and calibrate those buildings to assumed market conditions.

FA created a diverse library of building types that were calibrated to the Central City real estate market. From the Portland Bureau of Planning and Sustainability (BPS), the consultant team obtained a database of major real estate projects that have been built in the Central City since 1998. This database included information related to a range of physical characteristics including height, dwelling unit density, and parking configuration. Using this database, Fregonese Associates created a library of 16 prototypes calibrated using actual projects from the BPS database. These prototypes are summarized in below.

Figure A-10 below.

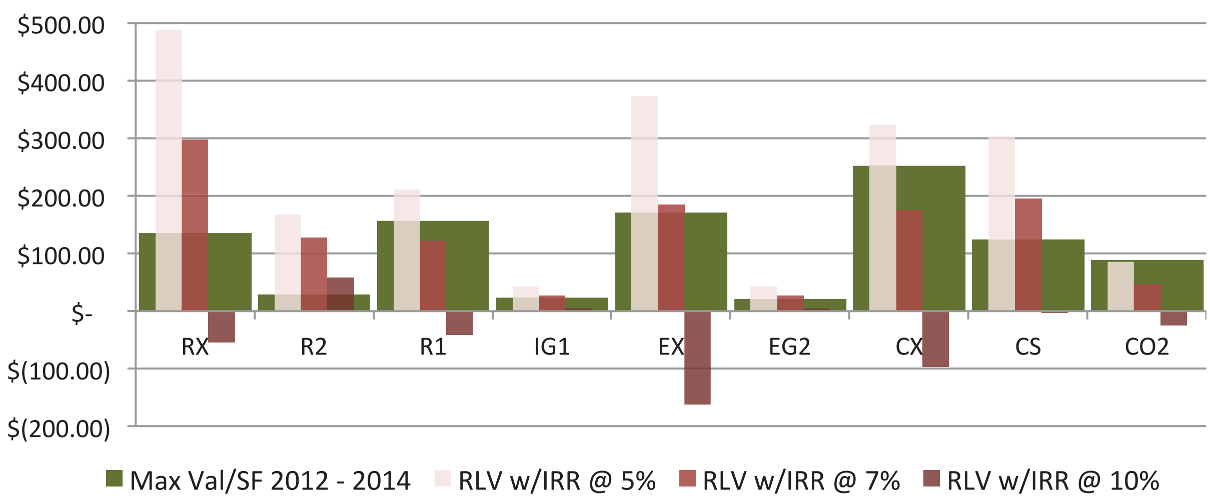
Figure A-10. Building Prototype Assumptions

Prototype	Stories	FAR	Residential	Commercial	DU / Acre
Compact Single-Family	2	0.50	100%	0%	9
Skinny Lot Single-Family	2	0.65	100%	0%	18
Townhomes	3	1.12	95%	5%	25
Mid Rise Condos	5	2.88	80%	20%	100
Condo Tower	15	8.84	92%	8%	270
Low Rise Apartment	3	1.97	88%	13%	67
Garden Apartments	4	2.10	100%	0%	125
Mid Rise Apartments	6	4.80	100%	0%	209
Mid Rise Mixed Use	6	3.61	82%	18%	142
Mod Rise Mixed Use	7	4.75	88%	12%	274
Tower Mixed Use	18	9.06	80%	20%	314
Flex Office	1	0.81	0%	100%	0
Low Rise Commercial	2	1.99	0%	100%	0
Low Rise Office	2	0.62	0%	100%	0
Mid Rise Office	6	3.85	0%	100%	0
Office Tower	20	12.84	0%	100%	0

Calibration

The 16 prototypes listed above were calibrated both in terms of their physical form (using the BPS database) and their financial characteristics. Using historical market data provided by ECO, FA assigned separate rental/lease rates, construction costs, and cap rates to each building for each of the three scenario periods.

Figure A-11. IRR Sensitivity Test



In order to validate the financial performance of prototype buildings, a series of sensitivity tests using residual land value were done to ensure that they were financially feasible in the "factual" scenario. Residual land value is the remaining capacity, after construction costs and developer return are factored in, for a building to acquire land. In theory, buildings built on each transacted parcel over the study horizon had a residual land value equal to or greater than the land price at the time of acquisition. Thus valid prototypes should also satisfy this requirement. To ensure this was the case, internal rate of return (IRR) targets were adjusted for each prototype to a point where residual land values for each building were at or above land values of transacted parcels in each scenario period. Figure A-11 shows the results of one of these sensitivity tests for the last of the three scenario periods: 2012-2014.

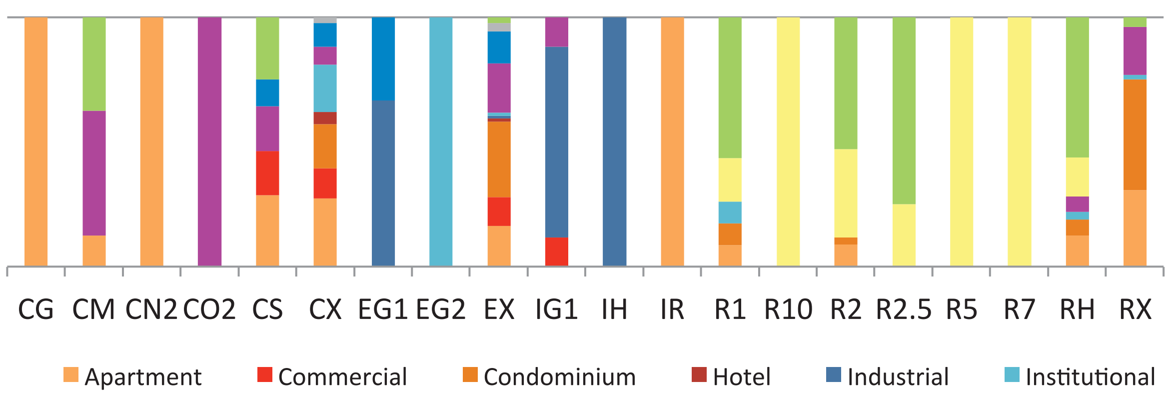
Development types

Using the library of calibrated building prototypes, FA developed a set of development types that are representative of recent construction within each zone in the study area. By tailoring development types to recent growth within zones, the consultant team created a "factual" build-out of recent development within ET and adjust the mix of buildings within each zone so that they closely reflected actual development that occurred between 1998 and 2014.

Calibration

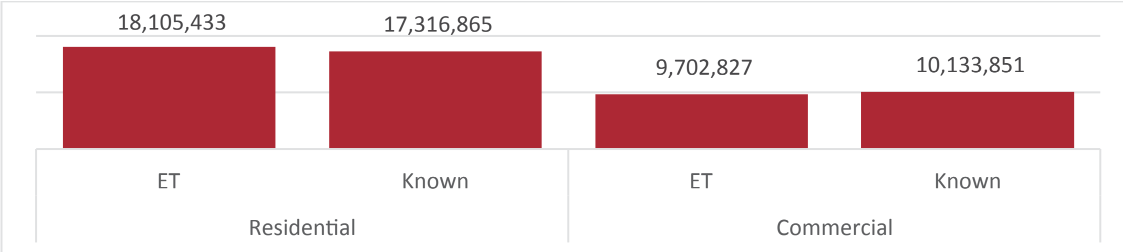
In order to calibrate the zoning-based development types, FA used historical RLIS parcel data to observe the composition and intensity of development within each zone. The BPS Major Projects Database was used in combination with RLIS parcel data to provide more detailed building attributes and help construct a more complete picture of recent activity along the Streetcar alignment. Figure A-12 below shows a summary of the building types constructed within each zone – one of the major determinants of the development types.

Figure A-12. Building Mix by Zone



In addition the calibrating the mix of buildings within each zone, FA also analyzed the total development square-footage produced in the "factual" build out scenario. Using building square-footage data from RLIS for buildings constructed between 1998 and 2014, FA adjusted the mix and intensity of buildings to match observed values. The results of this calibration are summarized in Figure A-13 below.

Figure A-13. Gross Square-Footage Comparison - 1/2 Mile Radius of Streetcar Corridor



Lower intensity development

In addition to a set of development types representing development as it occurred within each zone, a separate lower-intensity set of zone-based development types were created. This lower-intensity set of development types was intended to test the idea that if rents/lease rates in the "counterfactual" scenario could not have supported higher-intensity development, perhaps a lower intensity form may have been feasible.

Using the same set of 16 prototypes but in different proportions, FA created development types that could existing within the regulatory parameters of each zone, but take advantage of much lower FARs than are allowed by right in each zone. In addition, these development types were comprised of building prototypes with less expensive construction formats such as surface parking and single-use buildings.

Counterfactual scenario

ECO's hedonic modeling produced estimated price premiums attributable to the package of public investments located proximate to the streetcar corridor. These results translate into reduced achievable rents and lease rates in the "counterfactual" scenario. FA applied these lower rents to each of the 16 building prototypes and then created a "counterfactual" land use scenario to estimate how much development would have occurred without the presence of the bundle of public investments proximate to the corridor.

For each of the three time periods, RLIS assessor data and local zoning data were used from each period's base year. For instance, for the 2007-2011 period, RLIS and zoning data for 2007 was used. Furthermore, land values in each period were reduced from their actual values by a factor equal to the price premium attributable to the Streetcar. Total values of transacted parcels were converted to a square foot basis and only those parcels that transacted in the "factual" scenario were assumed to have redevelopment potential for development in the "counterfactual" scenario.

Scenario creation followed a series of queries by zone. Within each zone, only those parcels with a total value per square foot equal to or less than the residual land value of the associated development type (low or high intensity version) were deemed developable. All remaining parcels were deemed too expensive to have redeveloped given the market conditions in the "counterfactual" scenario. For the "counterfactual" scenario, maximum parcel values for redevelopment within each zone are summarized in Figure A-14 below.

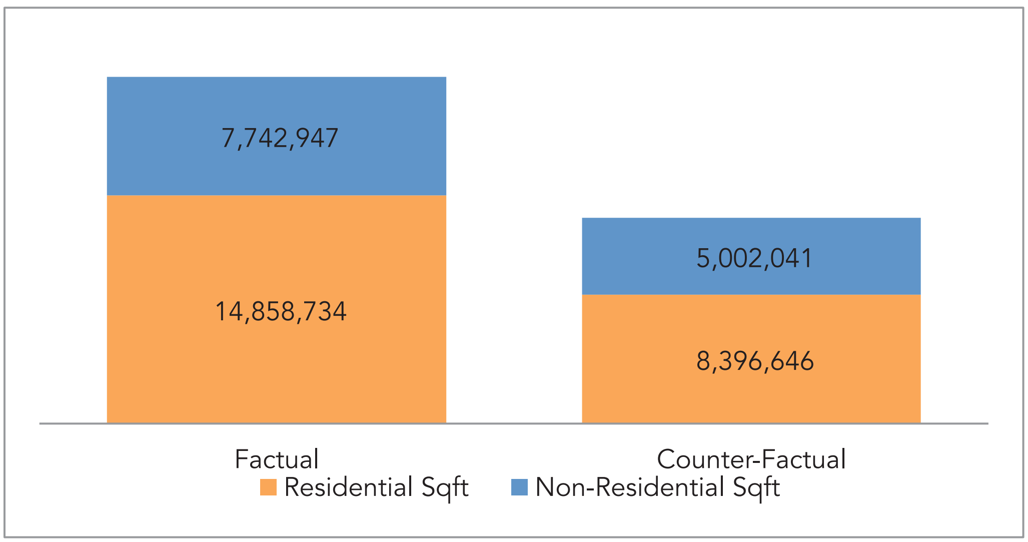
Figure A-14. Counterfactual maximum parcel values

Period	R2	R1	RH	RX	IR	CN1	CN2	CO1	CO2	CM	CS	CG	CX	EG1	EG2	EX	IG1	IG2	IH
1998-2006	$21	$24	$29	$0	$0	$14	$12	$37	$36	$49	$28	$41	$0	$45	$45	$0	$45	$45	$45
2007-2011	$65	$74	$78	$128	$195	$92	$89	$87	$46	$185	$132	$58	$118	$155	$44	$165	$44	$44	$44
2012-2014	$135	$168	$181	$338	$468	$302	$277	$104	$54	$193	$215	$244	$311	$200	$36	$225	$36	$36	$36

Results

By stepping through each zone using the query values in table 4 above, the "counterfactual" scenario produced 35% less commercial (measured in square feet) and 42% less residential (measured in the number of units) development than the "factual" scenario and observed values from RLIS for the scenario horizon. Of the 122 acres of land that transacted and developed between 1998 and 2014, 81 acres or 66% was estimated to have developed in absence of the package of public investments that included the Portland Streetcar. Furthermore, a number of parcels were estimated to have developed at a much lower intensity, replacing building types such as 5 story mixed use buildings and office towers with more modest 3 story garden apartments and low-rise office buildings. Figure A-15 below summarizes the difference between observed development square-footage and counter-factual square-footage by type.

Figure A-15. New building square-footage by type within 1/4 mile of Streetcar (1998 - 2014)



Appendix 2: Literature Review—Effects of Transit on Economic Activity and Land Development

Background

ECONorthwest accessed 60 relevant studies, reports, and articles, and included 31 in the literature review below. This document contains a list of documents reviewed followed by a short summary of relevant findings for this project.

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Literature Review

City of Portland. 2013. “”Streetcar Corridor Evaluation Methods: Economic Impact analysis Tool, Final Project Report.” Johnson Reid LLC & Angelo Planning Group. Prepared for City of Portland Office of Transportation.

This study describes the underlying model used to project economic development impacts (defined as real estate development activity) of a proposed streetcar corridor. This analysis measured the potential number of housing units, commercial space, and real market value. The results from this model predict the magnitude of new development that could expected from the investment into a new streetcar corridor relative to existing conditions.

Methodology

- The model is an Excel-based tool, which uses a pro forma based predictive model to generate the most likely development profiles for the study corridors.
- Baseline scenario looks at local pricing, amenities, and inventories (e.g. vacancy sites)
- Streetcar Impacts include the bundles of physical and environmental improvements (e.g. streetscape improvements or reduced auto dependence)
- Calculations about the predominant future use of the parcels are based on the implied residual property value under a range of options, in order to define the “highest and best use” of property (using market dynamics and zoning).

General Results

- Streetcar improvements generally have a positive impact on corridor, but depend on types of improvements proposed
- Generally, these improvements can encourage further development by increasing transit and pedestrian access, and supporting local amenities
- Streetcar improvements have the greatest marginal impact where they represent a significant improvement over existing conditions
- There were few instances of streetcar developments actually changing the likely development path of the study corridor
- Corridors with medium and high density neighborhoods have the greatest potential for meaningful redevelopment into TOD
- Note that results are in magnitudes, rather than defined units of development
- Authors recommend a further analysis using hedonic methods for more accurate estimates of marginal effects

Hovee, Eric, and Tess Jordan. 2005. "Portland Streetcar Development Impacts." E.D. Hovee & Company, LLC. Prepared for Portland Streetcar, Inc.

This report provides an initial assessment of Portland's streetcar corridor by quantifying the development trends in west Portland before and after the project's completion. The authors also outline an approach for conducting a more "statistically rigorous" analysis in future reports.

Background

In 2000, the City of Portland constructed its first streetcar track in 80 years, extending to several neighborhoods in west Portland. Since the projects completion, notable levels of new development have clustered around the corridor. In 2005, the City of Portland asked E.D. Hovee to provide an initial assessment of the trends and benefits associated with the new development.

Methodology

This analysis compares the existing Floor Area Ratios (FARs) around the streetcar corridor pre and post-construction of the streetcar corridor.

The results of the westside analysis are then applied to a projection of future corridors in east Portland to predict future changes in housing and commercial development.

Hedonic model: $y = \beta_0 + \beta_1 X_1 +, \ldots, +\beta_n + \varepsilon$

x_1 = Net Development Rehab Space
x_2 = Steetcar Proximity
x_3 = FAR Headroom
x_4 = Other Transit Proximity
x_5 = Public-Private Partnership
x_6 = Year Developed

Results

This research estimates that the eastside streetcar investment will produce 3,020 additional housing units by 2025. This is an increase of 300 percent over the study period, resulting in 4.4 million square feet of new residential development.

Hovee, Eric, and Tess Jordan. 2008. "Streetcar-Development Linkage: The Portland Streetcar Loop." E.D. Hovee & Company. Prepared for City of Portland Office of Transportation.

This study analyzes the effects of the construction/implementation of the Portland Streetcar, which was shown to increase density proximate to the corridor.

Portland Streetcar

- Constructed in 2001, extended 3 times by 2006

- Post streetcar development "clustered near the alignment and achieved higher densities as proximity to the alignment increased" (5)
  - In 2005, after secured streetcar investment, 55% of all new development within neighborhoods (through which the streetcar passed) were located in lots within one-block of streetcar
  - Higher density development closer to streetcar
- Strong developer confidence "may be the first and foremost indicator of successful development oriented transit investment"
  - Developers saw streetcar as public-private sector investment confidence, willing to bring higher-end products to market
- Strong property owner confidence that streetcar investment will increase land value
  - Contributed $15 million of streetcar cost

Public Benefits of High Density Development

- Reduced auto dependence
- Reduced infrastructure costs, important considering the Portland metro region's expected growth
- Reduced suburban sprawl
- Reduced carbon footprint
- Increased economic development

Atkinson-Palombo, Carol. 2010. "Comparing the Capitalization Benefits of Light-Rail Transit and Overlay Zoning for Single-Family Houses and Condos by Neighborhood Type in Metropolitan Phoenix, Arizona." *Urban Studies* 47(11): 2409-2426.

This study uses hedonic models to estimate effects of light rail transit and overlay zoning near transit on property values. They find that walk and ride stations result in more benefits to the surrounding area than park and ride stations.

Background

- 20.3 mile system, 27 stations
- Zoning implemented before construction (overlay zoning right around station
- 9 percent of single-family homes within walking distance of LRT subject to overlay zoning

Key Findings

- Mixed-use neighborhoods with Walk and Ride stations
  - Single family houses: 6 percent premium before overlay, 6 percent after

- Condos: 28 percent before overlay, 16 percent after

- Residential neighborhoods
  - Park and Ride produces no capitalization benefit (houses subject to overlay zoning sod at 12 percent price discount)
- Walkable neighborhoods and mixed-use result in the most benefits from LRT implementation
- Overlay zoning can enhance capitalization effects

Bartholomew, Keith, and Reid Ewing. 2011. "Hedonic Price Effects of Pedestrian- and Transit-Oriented Development." *Journal of Planning Literature,* 26: 18.

Barthomew and Ewing (2011) review and summarize the literature that utilizes hedonic price models to test whether pedestrian- and transit-oriented development is associated with higher real estate prices. They find that the majority of empirical studies examining the introduction of transit service on land values support that its introduction is associated with higher land values.

Price Premiums

- Duncan (2002): Price premiums vary with respect to the amount of regional access provided by the proximate transit station. San Jose, CA area, downtown properties within a quarter-mile of a station that is served by regional commuter rail have a premium of $25 per sq. ft. where as downtown properties within a quarter mile of a station served by the city-wide light rail and not the regional commuter rail have a premium of only $4 per sq. ft.
- Duncan (2008): Premium for proximity to a light rail station in San Diego varies substantially by housing type. Multifamily housing has a premium of 16.6 percent where as single-family housing has a premium of only 5.7 percent.
- Bowes and Ihlanfeldt (2001) Proximity to heavy rail stations can have a negative effect on housing prices. Properties (Atlanta) within a quarter mile of a MARTA station are discounted by 16 percent relative to properties that are at least three miles away from the station. Properties within one and three miles of the station have a price premium.
- Kahn (2007): finds that there is a higher premium for proximity to walk and ride stations relative to park and ride stations. He studies 14 metropolitan areas over a 10 year period and finds that the prices of homes in the areas around a park and ride station decrease by 1.9 percent whereas those around a walk and ride station increase by 5.4 percent. He finds that over a 20 year period, the value of homes around a walk in ride station increase by 10.8 percent.

Density/Development

- A number of studies have also examined whether areas proximate to transit stations have higher density and higher value developments.

- City of Portland (2008): Pearl District; considers the density of buildings (measured by floor-area ratio) before the construction of the streetcar line in 1997 to the density after construction. Prior to the line's construction, developments were constructed in the Pearl District at less than half the density allowed by the district's zoning code. After 1997 developments were constructed at between 60 and 90 percent of the allowed density. The highest density developments are directly adjacent to the streetcar line.

Belzer, Dena, et al. 2011. "Transit and Regional Economic Development." Center for Transit Oriented Development.

Belzer looks at the effects of public transit on employment patterns by industry sector and employment densities, while discussing the overall benefits of public transit.

Transit Facilitates Development

- Transit often is a "powerful force for facilitating" density and economic agglomeration, where independently acting firms choose to locate in "close physical proximity to each other" (8-9)
    - Typically concentrated within walking distance of transit (0.25-0.5 miles from station), so natural clusters around stations
    - Expanded access to workforce/knowledge pool (higher quality worker attraction and retention): transit-dependent as well as choice riders; more young people are choosing alternative modes of transportation (share of vehicle miles traveled by people ages 21-30 has decreased from 20.8 to 13.7% in 2009)
    - Firms drawn to transit-oriented locations, even if they do not specifically receive strong benefits from it
    - Influences distributional effect on regional economic activity, rather than the generation of new economic activity in a region
- Worker benefits of transit: greater accessibility to employment opportunities
- Transit-Oriented Industry Sectors: Government employment and knowledge based industries most attracted to transit; Production, Distribution, and Repair (PDR) industries, including manufacturing and wholesale trade, are least attracted to transit and often operate during non-traditional work hours

Recent Transit Development Trends

- 2002-2008: 5% decline in capture rates in transit zones, but 1% employment growth (most sectors had more positive growth, but land-intensive manufacturing employment fell by 22%, affecting the overall total- A&E, Recreation, Food, and Accommodation each grew 14%; Health Care/ Social Assistance (10%), Professional, Scientific, and Technical (9%)
- Larger transit systems had less job sprawl to non transit areas
- Knowledge-based industries typically situate in densely employed areas

Cao, Xinyu, and Jill A. Hough. 2007. "Hedonic Value of Transit Accessibility: An Empirical Analysis in a Small Urban Area." Small Urban & Rural Transit Center. Funded by the Federal Transit Administration.

Cao and Hough use a hedonic price model to determine the effects of proximity to bus routes on apartment rent in Fargo, North Dakota.

Background/Rental Properties

- Transit infrastructure has the potential to affect lease rates more than home values because apartment dwellers are typically "transportation-disadvantaged" people
- Apartment dwellers value the importance of transportation access more than home owners

Methods

- Variables that influence property value identified in three categories: Location, Structure, and Neighborhood
- Self-administered telephone surveys and interviews developed from previous research project questionnaires- 43.2% response rate

Notable Results

- Apartments located with 1/8 of bus routes are $18.41 less expensive than other apartments (living within 1/4 or 1/2 mile shows no significance in the model)
- Nuisance effect: noise, crime, negative image
- However, bus routes were specifically located in low-income areas, so neighborhoods in general could cause low lease rates of apartments

Cervero, Robert. 2008. "TCRP Report 128: Effects of TOD on Housing, Parking, and Travel." Transit Cooperative Research Program.

Cervero compares TOD (transit oriented development) residential areas to conventional residential areas through a review recent literature on TODs and research on 17 TODs in four metropolitan areas (Portland, San Francisco, Washington DC, Philadelphia/Northern New Jersey). While TOD's are typically considered generate the same amount of traffic conventional residential areas, TOD housing actually generates much less traffic, as residents of TODs are less likely to own a car and more likely to use public transit. Due to this misconception, TOD projects face higher fees and overestimate parking demand, and are therefore fewer in number and less affordable.

TOD Resident/Tenant Characteristics

- Majority along new transit systems: childless singles or couples; younger working professionals, older "empty-nesters"; TOD developers can thus target/predict their market (varying incomes)

- TOD households twice as likely not to own a car; half as many cars owned than in comparable household (11); TOD households more likely to forego an extra car (44).
- High value on neighborhood design, home prices, perceived value, transit proximity, employment access
- TOD commuters use transit 2-5 times more than other commuters (2-5 times higher for non-work trips also)
- TOD commuters with no previous transit access increased transit use by 50%

Transit Ridership Factors

- Transit quality; fast, frequent, and comfortable transit service; station proximity; parking policies; high parking charges and/or limited parking availability at destination; implementation of a TOD transit pass program; transit vs. auto relative travel time (most important)
- "Employment densities at trip ends have more influence on ridership population densities at trip origins" (6).
- "As the transit network links to more job centers, educational opportunities, and cultural facilities, transit use increase" (5).
- "Access to high quality transit is becoming increasingly important to firms trying to attract 'creative class' workers in the knowledge economy."

Four Metropolitan Area Study

- "24 hour weekday trip rates were considerably below the ITE weighted average rate for similar uses" (69).
- Decreasing parking spaces/unit (2.2 to 1.1 spaces/unit) allows space for additional unites and thus increases population density (20-%-33%) in a given TOD. Correspondingly, annual transit ridership and fares also increase, which also increases capital cost savings (112).
- New understanding regarding TOD traffic generation could allow for more compact development, easier development approval, lower development fees, more affordable housing, and less road construction.

Committee for the Study on the Relationships Among Development Patterns, Vehicle Miles Traveled, and Energy Consumption; Transportation Research Board; Board on Energy and Environmental Systems. 2009. *Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO_2 Emissions*

This study looks at the relationship between built environments (land development patterns) and motor vehicle travel, measured in vehicle miles traveled (VMT). As global warming and greenhouse gas emissions are of great importance, by extension so is petroleum use and vehicle use. Conclusions state that more compact development, along with employment concentration increases, public transportation improvements, and mixed use development, will likely lead to a reduction in VMT and reduce greenhouse gas emissions directly and indirectly.

Background

- Quality and cost of housing and neighborhood quality among top reasons for moving to a TOD (1/3 of residents reported access to transit as a top three reason)
  - "Those who cited access to transit as one of their top three reasons for choosing to live in a TOD were nearly 20 times more likely to travel by rail than those who did not cite this factor" (78).
- Applicability of past studies may be low in the future due to the aging population, growth of immigrant populations, higher energy prices, and new vehicle technologies
- Socioeconomic characteristics significantly impact travel behavior

VMT Reduction Techniques

- Compact development lowers VMT because trip origins and destinations typically become closer, shortening trip lengths
- Accessibility and quality of transit contributes to decrease in VMT
- "Higher densities make it easier to support public transit" (3)
  - "Higher transit usage and walking found in high-density employment centers" (66)
  - "Households in higher-density neighborhoods tend to own fewer vehicles, use transit more (where available), and generate less VMT" (67)
- "Reducing supply and increasing the cost of parking can complement efforts to reduce VMT" (4)
- "The biggest opportunities for more compact, mixed-use development are likely to lie in new housing construction and replacement units in areas already experiencing density increases, such as the inner suburbs and developments near transit stops and along major highway corridors or interchanges. Coordinated public infrastructure investments and development incentives can be used to encourage more compact development in these locations, and zoning regulations can be relaxed to steer this development to areas that can support transit and non-motorized travel modes." (9).

Currie, Graham. 2006. "Bus Transit Oriented Development- Strengths and Challenges Relative to Rail." *Journal of Public Transportation* 9(4).

Currie focuses on strengths and weaknesses of Bus Rapid Transit (BRT) systems as compared to rail in relation to Transit Oriented Development (TOD). The article also includes a Literature Review of Bus Transit Oriented Development (BTOD). Currie cites developmental risks a major challenge to BTOD, but flexibility as an advantage.

Challenges

- Development Risk: Many developers see bus transit as less permanent than rail, and thus feel more secure developing along rail (high significance)
  - Development scale and magnitude significantly lower for bus
- Different Markets: Rail and bus riders demographically different, rail attracts "choice riders" with higher incomes—"rail can target a more affluent market for TOD investments…will be better suited to TOD." (5)
- Park and Ride (P&R): limits successful TOD; Low P&R benefits BTOD over some RTOD- more "prime development space…quality uninterrupted walk access;" Design of BRT needs "to exclude or manage P&R where BTOD is to be implemented
- Urban Density: Bus systems typically operate in lower density areas, which correspondingly causes less successful at reducing private auto travel
- Scale Dilution: There are typically more bus stops than railway stops, harder to concentrate development activity around stops. However, with BRT, this may not be the case.
- Noise/Pollution: Buses are louder than rail due to closer proximity to pedestrians, etc. However, when diesel is not used (as in the case of Spokane), this is less relevant.

Strengths

- Complementarity/Ubiquitousness- opposite of dilution
- Flexibility (Choice): BRT can operate as a way to build ridership to make rail more feasible; BTOD has locational implementation flexibility and can thus easier "mimic the many-to-many nature of suburban trip patterns than rail."
- Flexibility (Adaptivity): BRT can more easily respond to "changing geographical activity patterns"
- Cost Effectiveness- BRT more cost effective to build and operate than light rail (high significance)
- Transfers: Typically, BRT riders do not need to transfer busses to access downtown; For a typical rider, a bus-rail transfer penalty is 19 minutes.

BRT vs. Local Bus

- BRT has less significant weaknesses than local bus, BRT has more strengths than local bus
- BRT "users tend to have characteristics more like rail markets than bus markets. This could suggest that the potential yield from BRT systems in terms of TOD development may be similar to rail"

ECONorthwest. 2009. "Development of Light Rail Cost Indices for Sound Transit: Technical Memorandum #1." Prepared for Central Puget Sound Regional Transit Authority (Sound Transit). Seattle, WA.

Background

This analysis uses hedonic methods to develop forecasting tools for cost indices related to light rail development. Specifically, these tools are used to measure right of way (ROW) and construction cost index (CCI) costs to be used by Sound Transit.

Methodology

- Equation 1 (ROWI model): estimates lat.log of the site value per square foot using a first-differences model and a one-year lag of the dependent variable
    - Includes quarterly transactions data, controlled for parcel size.
    - Also includes macro trend indicators (employment, inflation, etc.)

- Equation 2 (CCI model): estimates nat.log of the CCI using a first differences model for all variables using a one-year lag of the dependent variable
    - Uses two types of data: input share used for construction (proportion of concrete, steel, labor, etc.), and unit input cost indices.
    - Applies a simplified emulation method, which pairs historical input prices with publically available driver variables
    - Includes

Results

- ROWI: models display good explanatory power in capturing the variation in historical price data.
- "The ROWI models confirm that the intensity of development of a corridor's parcels elevates parcel values significantly."
- CCI: model predictions using the compact emulation model fits the historical CCI data fairly well. Issues with forecasting using input price indices given uncertainty about input shares in future projects.

Ewing, Reid, and Robert Cervero. 2010. "Travel and the Built Environment." *Journal of the American Planning Association:* 76(3).

Ewing and Cervero examine the associations between the built environment and travel through a meta-analysis of the available literature as of 2009.

Background

- Five (seven) D's as influences of travel demand in a built environment: Density, Diversity (different land uses in a given land area), Design (street network characteristics), Destination accessibility (ease of access to trip attractions), Distance to transit (shortest street routes from residence/workplace to nearest station/stop), and unofficially demand management (parking supply/cost) and demographics.

- Travel outcomes based on 7 D's: 2001 study shows trip frequency based primarily on socioeconomic characteristics and secondarily on the built environment, trip length is based primarily on the built environment and secondarily on socioeconomic characteristics, mode of choice depends on both, vehicle miles and hours traveled depends on both

Meta-analysis: "the relationships between travel variables and built environmental variables are inelastic" (11)

- Weighted average elasticity with greatest absolute magnitude is 0.39, while most are smaller; combined effect of several built environmental variables could be large
- Elasticity of VMT with respect to job accessibility by auto: -0.20; VMT with respect to distance downtown: -0.20; small elasticity of VMT with respect to population, job densities;
- "Mode share and likelihood of walk trips are most strongly associated with the design and diversity dimensions of built environments" (11)
- Mode share, likelihood of transit trips strongly associated with transit access
- "Density has the weakest association with travel choices…suggesting that density is an intermediate variable that is often expressed by the other Ds" (12)

Garrett, Thomas A. 2004. "Light Rail Transit in America: Policy Issues and Prospects for Economic Development." Federal Reserve Bank of St. Louis.

General Information

- Two types of light rail: streetcar and multicar trains separated from roadway
- Light Rail systems are cheaper to build and can more easily maneuver sharp curves and steeper grades than commuter or heavy rail

Economic Development and Property Values

- "Impact of light rail on property values cannot be generalized" (15)
- "Nuisance and accessibility effects have opposing influence on proper values" (16)
- TOD involves public-sector and private-sector partnerships
- Developers may contribute to capital construction costs in return for a portion of the fare revenue or a tax reduction
- TOD can positively influence residential and commercial property values

St. Louis MetroLink

- Single family homes in St. Louis county sold 1998-2001 located within 1 mile of MetroLink Station.
- Effects on house prices
  - 2,300-2,800 feet price increase with increased distance from MetroLink track

- Beyond 2,800 feet, property values decrease as distance from track increases
- Accessibility effect for homes within 1,460 feet of a station: Homes 100 feet from the station have a home price on average 31.25-32.72 percent higher than a homes 1,460 away
- Weak nuisance effect, large accessibility effect

Goetz, Edward G., et al. 2010. "The Hiawatha Line: Impacts on Land Use and Residential Housing Value." Humphrey Institute of Public Affairs.

This report analyzes the impacts on property values and land use from the Hiawatha Light Rail Line, opened in 2004 in Minneapolis. After the line's introduction, property values increased and significant development has occurred along the line.

Background

- Hiawatha Light Rail Line: 12 miles between downtown and the Mall of America, first investment in a "comprehensive network of transitways "which will include light rail, heavy rail, and BRT, 17 stations
- Diverse set of land use/neighborhoods on line ranging from residential to commercial and airport stations
- Honor system ticketing, random checks
- Initially undecided between light rail and BRT (dependent on funding), but received significant funding from Legislature
- Total cost: $675 million ($334 million received from FTA New Starts)
- City of Minneapolis received federal funds to assist with TOD development within 1500 feet of stations

Key Findings

- Exceeded ridership forecasts by 58% the first year and continued to grow
- 40% of riders had previously not used transit
- Market effects began to manifest between 1998 and 2000 due to publicity for project
- Within half mile of station: pre-2004 homes valued 16.4% lower than surrounding area, after 2004 homes valued 4.2% more
- Accessibility effect outweighs nuisance effect close to tracks
- Line contributed significantly to residential development in some areas, no effect in other areas: 87% increase in sales price compared to 61% increase in larger area; new cluster of construction around line
- Little change in land use since 2004

Guerra and Cervero Cost of a Ride: The Effects of Densities on Fixed-Guideway Transit Ridership and Capital Costs

Guerra and Cervero established "minimum thresholds for population and employment densities" in fixed-guideway transit systems by reviewing previous literature and analyzing 59 capital transit investment projects in 19 United States metropolitan areas: 33 light rail investments, 23 heavy rail, 4 bus rapid transit investments (Boston, Cleveland, Eugene, and Los Angeles).

Relevant/Notable Information

- Number of stations, density, and parking have positive influence on ridership (14).
- As urban population density increases, capital costs and ridership also increase for fixed-guideway transit (14).
- Higher population density improves cost effectiveness of transit (15).
- Number of parking spots and train frequency increases are correlated with lower costs/rider.
- Jobs and population per acre and percentile of jobs and housing density both negatively correlated with capital costs per annual rider.
- "An average light rail system in an average city requires approximately 56 jobs and persons per gross acre in order to achieve a strong cost-per-rider performance with an average capital cost of $50 million/mile" (19).

Hodel, Peter, and Megan Ickler. "The Value of Bus Rapid Transit: Hedonic Price Analysis of the EmX in Eugene, Oregon." University of Oregon Department of Economics.

This study analyzes the impact of the introduction of the EmX BRT on residential property values in Eugene, Oregon.

Background/Methodology

- Cross sectional and time series analysis of area 2002-2012
- Homes within a 60-minute walk (3 miles) of station
- Variables: Distance to transit, housing characteristics, time variables in years

Results

- Every walking minute that separates a property from an EmX station, there is a premium of 0.18-0.11 percent

Kahn, Matthew E. 2007. "Gentrification Trends in New Transit Oriented Communities: Evidence from Fourteen Cities that Expanded and Built Rail Transit Systems." Tufts University and University of California, Los Angeles.

This study analyzes new rail transit construction in fourteen cities across the United States. They find that walk and ride stations show more gentrification than park and ride stations.

Key Findings

- Park and Ride reduced the share of college graduate adults by 1.9 percent (10 year increase of 1.1 percent)
- Park and Ride station areas 10 year reduction in housing prices of 1.9 percent
- Increased poverty rates
- Walk and Ride in an area above MSA median income and population density increases the share of graduates by 5.1 percent (10 year increase of 4.2 percent)
- Walk and Ride station areas 10 year increase in housing prices of 5.4 percent

Kim, Jinwon, and David Brownstone. 2010. The Impact of Residential Density on Vehicle Usage and Fuel Consumption. University of California, Irvine, Department of Economics.

This study utilizes national level data to analyze the impact of residential density on VMT and fuel consumption, and specifically the impacts of urban sprawl on household travel behavior.

Background

- 2001 National Household Travel Survey; large sample size creates a more accurate model and region comparisons
  - Four levels of data: household, person, vehicle, daily travel
- Model specification: three endogenous variables, residential density (housing units per square mile in the census block group), total annual mileage per year of all household vehicles, and total household annual fuel consumption. Socio-demographic and geographic control variables also included
  - Model accounts for residential self-selection

Results

- "If two households are identical in all aspects measured by the socio-demographics variables and residing in the same category of urban/rural dimension, but one household is located in a residential area that is 1000 housing units per square mile denser…the household in the denser area will drive 1500 (7.8%) miles per year less than the household in the less dense area" (19)
  - Due to vehicle ownership level and trip patterns

- California subsample: decrease of 1107 miles (4.4%)
- 1500 miles=66 gallons of fuel, people in denser residential areas choose more fuel efficient vehicles

- Effect of rail transit on VMT and fuel consumption is not statistically significant
- Rural to Urban simulation: when a household moves from rural to urban area, annual household mileage decreases by 35%; rural to suburban: 22% decrease
- Fuel usage increases linearly with income
- "Residential density ahs a statistically significant by economically modest influence on household travel behavior"

Kolko, Jed. 2011. "Making the Most of Transit: Density, Employment Growth, and Ridership around New Stations." Public Policy Institute of California.

This paper focuses on the success of TOD and residential/employment densities around new transit stations in California from 1996-2006. It concludes that the opening of new transit stations does not significantly boost employment in surrounding area.

Background

- California's (especially Southern California's) residential density is higher than the national average
- California Senate Bill 375 (2008): integration of land use and transportation planning for emission reduction
- 200 new transit stations opening in California from 1992-2006 with plans for future
- Even if transit investments do not reduce VMT, they may be desirable for other reasons.

Transit Ridership

- Share of commuters taking transit increased from 5 percent (1990) to 5.5 percent (2008), but VMT per capita also increased by 3.5 percent (13.7 percent national average increase)
- Proximity to transit influences ridership; people will walk up to 0.25 miles to a station
- Transit ridership decreases as distances from transit stations increase
- The majority of Californians who live or work within 0.5 miles of a transit station drive alone to work.
- Employment densities at trip destinations affect ridership more than residential densities at origins

Land Use Effects on Transportation

- It is possible that people who prefer transit will choose to live in higher-density neighborhoods (and thus it is not the density that changes the behavior of residents)
- People who live closer to jobs/destinations drive less

- "Holding all else constant" understates the effect of land use on transportation because of overall effects
- Integrated policies (land use and transportation) have a greater effect than each alone

California Results

- New transit stations were located in areas with higher residential density and higher employment density than areas more than one-half-mile (need high ridership to support transit investment)
- New transit stations were often located near freeways
- Regression analysis to estimate the change in employment growth associated with the opening of a transit station: results showed that that employment growth is 1% lower after a station opens, relative to comparison areas (but not statistically significant)
  - Individual transit station openings showed varied in employment growth: of 204 stations, 18 statistically significant positive employment change
  - Higher employment growth associated with transit stations surrounded by higher residential density, higher employment density, and farther from an older transit station
- "Existing zoning that allows commercial or industrial use may not, by itself, be sufficient to spur employment growth…more explicit strategies to encourage commercial development are necessary" (31)
- Parking policies are recommended

Leonard, Christopher. 2007. "Measuring the Value of Transit Access for Dallas County: A Hedonic Approach." University of North Texas.

Background/Methodology

- Dallas Area Rapid Transit (DART), Dallas County: 23 station area with 18,164 residential properties, all properties located within 3000 feet from transit station
- Variables: Primary structural characteristics and measured distances to nearest station and rail line
- Majority of residential property is single family

Key Findings

- Multi- family housing appreciated higher premiums closer to transit stations than single family housing (detached housing is more auto-oriented)
- Lower income areas achieved highest appreciation
- Stations increase value, rail lines decrease value, combined infrastructure response generally has a negative economic impact in all corridors
  - For each 1% closer to a rail station, the property appreciates 0.011% of the predicted mean value.

- Distance to rail has a nuisance effect of $33/30 feet

Liu, Chen. 2012. "The Impact of LA's Fixed-Guideway Transit Stations on the Local Real Estate Market." UCLA Urban Planning Department for SCANPH.

Liu analyzes the impact of 11 Los Angeles fixed-guideway transit stations on the surrounding real estate market. The eleven stations were selected to represent the variety of station types in Los Angeles' TOD.

Background/Methodology

- 11 of 32 stations chosen to achieve maximum variation in intensity, land use pattern, and median household income
- Areas surrounding stations previously underutilized and underdeveloped
- Five real estate market indicators: number of transactions, median home value, rate of home value change, median cost per square foot, and median gross rent.

Results

- Median home values in station areas more stable during recession periods
- Long term impacts are stronger than short term (3 year) impacts: the market needed adjustment time for people to realize the benefits of being near the transit station and added accessibility brings in new development
- Housing supply increased after station opening: new developments near stations
- "Housing demand increased in excess of supply in station areas" resulting in home price increases and higher rent and cost per square foot (39)- leads to displacement and gentrification
- High density and land use patterns can lead to high housing values, but density is a more important factor

Perk, Victoria. 2009. "Impacts of Bus Rapid Transit (BRT) on Surrounding Property Values" National Bus Rapid Transit Institute. PowerPoint Presentation for the APTA Bus Rapid Transit Conference.

This brief PowerPoint presentation provides a short explanation of BRT implementation effects in Pittsburgh.

Key Findings

- 9 stations, 9.1 miles, average weekday ridership: 25,000
- Variables: Distance of parcel to nearest BRT station, property characteristics, neighborhood characteristics
- "Every 1,000 feet closer to a station increases market value of single-family home by $836"

Perk, Victoria, et al. 2012. Land Use Impacts of Bus Rapid Transit: Phase II Effects of BRT Station Proximity on Property Values along the Boston Silver Line Washington Street Corridor." National Bus Rapid Transit Institute. Funded by the US Department of Transportation and the Federal Transit Administration.

Perk, et al. analyze the effects of the implementation of BRT service on condominium sale prices in the Boston Silver Line Washington Street Corridor.

Background/Methods

- Boston's Silver line BRT opened 2002, premium transit and dedicated runningway, 11 stops
- Regression model uses condominium sale data along the corridor, regression models run for units sold in 2007 and 2009 (5 and 7 years after the opening of the line)
- Hedonic price model: Sale price per square foot regressed on four vectors: Distance of parcels to transit stations, housing characteristics, locational amenities, and neighborhood characteristics

Results

- Mean price per square foot 2000-2001 was $402.63, 2007-2009 was $601.24
- Condominiums within one quarter mile from station (it is important to realize that this jump in condominium prices occurred throughout the Boston area)
  - 2000 (Before BRT): $344.59 per square foot
  - 2005: $590.55
  - 2009: $522.83
- 2000-2001 Before BRT
  - Moving 101 to 100 feet away from a BRT station *decreases* condominium sale price by $0.12 per square foot
  - Moving 871-870 feet away from a BRT station *decreases* condominium sale price by $0.06 per square foot
  - Moving 1,321-1,320 feet away from a BRT station *decreases* condominium sale price by $0.04 per square foot
- 2007-2009: BRT premium of 7.6 percent for properties near stations
  - Moving 101 to 100 feet away from a BRT station *increases* condominium sale price by $0.06 per square foot
  - Moving 871-870 feet away from a BRT station *increases* condominium sale price by $0.04 per square foot

- Moving 1,321-1,320 feet away from a BRT station *increases* condominium sale price by $0.02 per square foot

Perk, Victoria A. and Martin Catalá. 2009. "Land Use Impacts of Bus Rapid Transit: Effects of BRT Station Proximity on Property Values along the Pittsburgh Martin Luther King, Jr. East Busway." National Bus Rapid Transit Institute. Sponsored by Federal Transit Administration.

Victoria and Catalá discuss the effects of BRT stations on surrounding single-family home values in Pittsburgh. The analysis was completed using a hedonic price regression model.

Relevant/Notable Information

- East Busway: 9.1 miles length

Literature Review

- Chen, et al. (1998), Portland, OR: Hedonic approach reveals increasing distance to a light rail station (MAX) decreases housing price at a decreasing rate; Positive accessibility effect outweighs negative nuisance effect
    - At 100 meter distance from a station, each additional meter further away decreases an average-priced home's value by $32.20
- Hess an Almeida (2007), Buffalo, NY: Linear distance and network distance (route distance) from a property to a transit station
    - "Property located within the half mile radius of a transit station is valued @2.31 higher (using linear distance) and $0.99 higher (using the network distance) for every foot closer to a light rail station." (23)

Methodology

- Hedonic Price Regression, price estimation based on variables believed to influence the price
- Cross Sectional analysis
- Null hypothesis: "as the distance to the transit station increases, there will be no impact on property values" of single family homes (42)

Model Variable categories

- Distance to transit stations: straight-line distance and route distance
- Housing characteristics: square footage of lot, square footage of living area, number of bedrooms and bathrooms (full and half); bedrooms and living area interaction variable, condition of home (Likert scale), year built
- Locational amenities: distance to interstate highway distance to nearest light-rail access (also squared to account for non-linearites), distance to Pittsburgh CBD, dummy variables to indicate whether a property is located within one-tenth of a mile from BRT corridor or interstate highway

- Neighborhood characteristics: median household income, percentage of minority population, population density, dummy variable for each borough, city wards, and neighborhoods, crimes per capita

Results

- "The relationship between the distance to a station and property value is inverse and decreasing as distance from a station increase." (57)
- Holding all else constant, property 1,000 feet away from a BRT station is valued $9,745 less than one that is 100 feet away from the station, adjusted R-squared value: 0.80
- Residences located within one-tenth of a mile of the East Busway runningway, property value drops on average $5,904.79. However, if a residence is located within one-tenth of the nearest interstate right-of-way, property value falls on average by $6,379.77.

Ratner, Keith A., and Goetz, Andrew R. 2013. "The Reshaping of Land Use and Urban Form in Denver Through Transit-Oriented Development." *Cities*: 30: 31-46.

Ratner and Goetz discuss Denver's efforts to reincorporate public transit throughout the automobile dependent city by developing a 157-mile regional rail transit system while encouraging transit-oriented development. The authors address transit and TOD effects on land use and urban form.

Background

- Accessibility: physical access of reaching goods, services, activities, and destinations
- TOD considered a smart growth movement in the US: new urbanism, infill development, affordable housing, historic preservation, urban growth boundaries
  - High-density mixed-use development: increases in biking, walking, transit use
  - Economic, environmental, social costs of low-density suburban sprawl
- 42 metropolitan areas have rail transit (heavy, light, and/or commuter rail), newer systems typically light or commuter rail, 138 fixed-guideway systems in construction or engineering phase (as of 2011)

Denver

- 4 commuter rail corridors, 5 light rail corridors, 1 BRT corridor
- Denver Transit/TOD: Denver Regional Transportation District, City and County of Denver, Denver Regional Council of Governments
  - Blueprint Denver: 2002 land use/transportation plan that changed zoning in transit station areas in order to allow higher-density and mixed use development
  - 2006 Strategic Plan

- TOD becoming a larger part of overall development in Denver (66% of regional residential development, 60% regional office development, 19% regional retail development)
  - Most TOD occurs at downtown stations from 1997-2010: 46% of retail, 76% of hotel rooms, 49% of office, 66% of government, 64% of cultural
  - BRT corridor experienced 44% of total retail TOD
  - 2000-2010: 11% total retail development was TOD
- Land Use and Urban Form
  - 1990-2000: urbanized area density increased from 3309-3979 persons/sq. mi.
  - 2000-2006: density of housing increased from 1379 to 1429 units/sq.mi.

Changes in Attitude/Thinking

- Visitors appreciate and enjoy pleasant atmosphere, cultural opportunities, and accessibility
- "Tying transit development to land use development is causing Denver to think and plan for the future in a way that will best utilize the transit system as an integral part of the existing and future land use pattern" (45).

"TCRP Report 118: Bus Rapid Transit Practitioner's Guide" 2007. Kittelson & Associates. Inc. Sponsored by the Federal Transit Administration for the Transportation Research Board.

The "TCRP Report 118: Bus Rapid Transit Practitioner's Guide" provides information for transit professionals and policy makers on the impacts and effectiveness of BRT implementation. While it acts as a "how to" guide, the report provides information about ridership and economic growth associated with BRT implementation.

Relevant/Notable Information

- BRT systems will likely attract similar ridership levels as those of rail-based systems
  - Rider characteristics similar to that of rail transit riders (attributed to the "premium transit" design of the BRT services)
  - "It is therefore reasonable to expect that BRT could achieve land development effects similar to rail-based TOD where the service structure is similar" and that it is not necessary to distinguish BRT from light rail when assessing land development impacts (6-6).
- Large portion of new BRT ridership is from new transit trips, not diverted from other transit routes.
- For successful TOD around BRT, there must be a market (If there is no demand for development near transit, BRT may not be successful in attracting development).

- Important factors affecting possibility for development include a permanence factor that can create a "positive climate for investment" (6-18), as well as transit-supportive policies and public-private partnerships.

Thole, Cheryl, and Joseph Samus. 2009. "Bus Rapid Transit and Development: Policies and Practices that Affect Development Around Transit." National Bus Rapid Transit Institute. Sponsored by Federal Transit Administration.

This study looks at examples of the introduction of BRT systems in North America, discussing development and using these case studies to evaluate land development policies around BRT and LRT.

Ottawa

- Regional Official Plan developed in 2003 to curb suburbanization effects; encourages development along stations, enforcing a greenbelt
- Construction of roadways considered alternative; transit is considered the priority: transit professionals partake in review of plans for subdivisions "in an effort to ensure that access to transit is provided" (27)
- Parking limits established downtown, "developments that include bus stops or stations are allowed a reduction in parking spaces" (28)

Pittsburgh

- No established policy for development incentives, but development "has been occurring in the rapid transit corridors on an informal basis…from developer interest and public involvement"
- 2004: Pennsylvania Legislature measure that allows local governments to create Transit Revitalization Investment Districts to encourage development at/near transit stations and also to "capture the value of the development to fund local infrastructure and transit improvements" (48)

Portland (LRT)

- Metro promotes TOD development by buying property (Federal transportation funds)/designating land use; then sold to private developers
- CMAQ grant: helps states meet Clean Air Act requirements; used by Metro to acquire land for "construction of transit amenities as part of TODs" (52)
- 10 year property tax exemption for developments

General Conclusions

- No differences in incentives offered for BRT and LRT
- "Development around mass transit corridors seem to be dependent upon public support and developer interest with various factors determining the interest in the corridor development" (60)

United States Government Accountability Office (GAO) "BUS RAPID TRANSIT Projects Improve Transit Service and Can Contribute to Economic Development" 2012

The GAO assessed recent Bus Rapid Transit (BRT) projects by distributing and evaluating questionnaires to sponsors of 20 completed BRT projects in the United States since 2005, incorporating five site visits, and comparing BRT to other light rail projects. The study concluded that although ridership is typically less for BRT than for light rail, BRT typically increases ridership and service at a lower initial capital cost, and has the potential to contribute to economic development in the surrounding area. Factors that have affected economic development were especially transit-supportive local policies and development incentives, physical BRT features that give developers a sense of "permanence," centers along/near the BRT corridor, and the economic climate.

Physical Features

- Dedicated or semi-dedicated running way creates the greatest travel time savings, but only in congested areas. In low congestion areas, the cost of dedicated or semi-dedicated running ways is too high and is not worth the received time saving benefits.
  - 16/20 BRT are in mixed traffic for at least 50% of their route
- Station amenities "help shape the identity of a BRT project by portraying a premium service and enhancing the local environment" (11).
  - 12/20 BRT have at least four station amenities at over half of their stations
- BRT projects vary in fare collection methods; most allow on board validation
  - Off board fare collection infrastructure "may contribute to customers' perception of BRT as a high-quality transit service" (14).
- "The design and features of BRT vehicles can affect the projects' ridership capacity, environmental friendliness, and passengers' comfort and overall impression of BRT" (14)
- Strong BRT branding helps to shape the identity of the system and attract riders
- Intelligent Transportation Systems (ITS) in BRT projects "can help transit agencies increase safety, operational efficiency, and quality of service" (16)
  - 18/20 incorporate at least one ITS feature
- Community needs/input, overall cost, and ability to continue to add features were among the top factors in incorporating specific physical features into the BRT projects

Ridership Effects

- 13/15 projects reported increased ridership from previous transit service
  - Increases of 30% or more: 7
  - Reduction in travel time, headway (time between buses), and wait time, and additional physical features attracted riders

- Increase in choice riders (transit over car)

- BRT projects typically have less daily riders than light rail, but BRT has the capability to generate similar ridership to light rail

Cost

- BRT projects typically have lower capital costs than light rail projects, but with "rail-like" benefits (29)
- Factors affecting cost: type of running way, right-of-way property acquisition, type of vehicles, services, and amenities selected, non-transit related features

Economic Development

- Development has been limited due to economic conditions, mainly the recent recession.
- Physical features perceived as permanent by developers are important to stimulate economic development (include running ways, substantial stations, other fixed assets)
- Major institutions, employment centers, and activity centers along BRT corridors contribute to development
- Increases in land value
- "Transit-supportive policies and development incentives can play a crucial role in helping to attract and spur economic development" (38).
- Lack of land owned around BRT stations can limit development; development around BRT could be more suitable for "small-scale retail and residential developments, affordable housing developments, and medical facilities" (39).
- Community Benefits: quick construction and implementation, operational flexibility, precursor to rail

Vincent, William, and Lisa Callaghan. 2008. "Bus Rapid Transit and Transit Oriented Development: Case Studies on Transit Oriented Development Around Bus Rapid Transit Systems in North America and Australia." Washington D.C.: Breakthrough Technologies Institute.

These six carefully selected and varied case studies serve as a resource for policymakers, public agencies, and developers about Bus Rapid Transit (BRT) and its corresponding transit-oriented development (TOD). The report focuses on economic impacts of BRT, as little literature has been published about BRT's ability to "catalyze" TOD (9).

Relevant/Notable Information

- BRT successfully operates in many different settings under many different circumstances.

Case Studies

- Generally, the introduction of BRT in an area increased ridership and sparked development in the area.

- The cities have experienced varying TOD along BRT corridors, including urban fill-in as well as green field development.
  - Brisbane, Australia: BRT system has mainly served communities that already "exhibited many TOD characteristics but lacked a dedicated transit connection" (14)
  - Boston's (an already high transit ridership city) BRT service has doubled ridership in the corridor.
  - Ottawa, Ontario: Transitway has been successful in concentrating new growth around "already-developed areas served by rapid transit" and has recently included high-density residential and mixed-use projects around Transitway stations (58?).
- Factors positively influencing development: shorter approval processes for projects near the BRT, "walkable streetscapes," attractive amenities, increased cooperation between private and public sectors, and the frequency, convenience, and speed of the BRT.

Surveys to developers and governmental agencies

- Positive attitudes towards development and investment near BRT, highlighting the necessity of a perceived permanence factor of BRT
- Development around BRT was a way to promote growth and catalyze development, as well as increase property value and transit ridership; agencies actively promoted TOD

Problems with BRT

- Pushback from some of the communities surrounding the transit lines, as the th wanted to keep the residential neighborhoods less dense
- Lack of dedicated bus lanes in Boston caused bus bunching and delays, as well as delays from on board fare collection.

Wardrip, Keith. 2011. "Public Transit's Impact on Housing Costs: A Review of the Literature." Center for Housing Policy.

This summary reviews the literature addressing the implementation of public transit's effect on United States housing costs for renters and owners.

Relevant/Notable Information

- Proximity to public transit generally increases home values and rents, but magnitude varies (although generally positive)
  - Cervero, et al (2004): price premium for homes 6-45%
  - Diaz (1999): 3-40%
  - Hess and Almeida (2007): maximum premium of 32%
  - Impact depends on many factors: housing tenure/type, extent/reliability of transit system, strength of housing market, nature of surrounding development, etc.
- Atlanta Beltline redevelopment (freight rail to light rail): single family homes within ¼ mile of planned loop sold at 15-30% premium compared to those 2 miles away

Factors that Influence Impact

- *Accessibility:* proximity matters; includes access to job centers, cultural amenities, commercial hubs, and health services, etc. "Only when transit begins to mimic the network attributes of its chief competitor, the automobile-highway system, will accessibility improvements be significant enough to register through real-estate transactions" (5)
- *Housing Type:* effects on condominium prices larger than single family, multifamily effects largely unknown
- *Type of Transit:* BRT has greater effects than traditional bus service; heavy and commuter rail have greater impacts than light rail, but mainly due to increased frequency, speed, and scope of service
- *Nuisance Effects:* Larger for heavy rail; Portland light rail: proximity to station had negative effect on prices (within 2,000 feet); Minneapolis: building a track along an industrial corridor reduced existing nuisance effect
- *Neighborhood Profile:* some studies suggest that transit impacts on home values are positive in higher-income neighborhood, and negative in lower-income neighborhoods; other studies show the opposite, leading to inconclusive results
- *Orientation and Zoning of the Station Area:* housing cost premiums are greater around stations in walkable-mixed use, and pedestrian-oriented areas
- *Regional Economy:* Weak housing demand in a region leads to less residential development from transit
- *Public Commitment and Policy Framework:* Financial incentives and supportive pro-growth policies will maximize development potential around transit (not a "build it and they will come" policy)

Policy Implications

- *Affordable Housing Preservation:* ensure that affordable housing surrounding transit remains affordable
- *Inclusionary Zoning:* Ensure a share of newly-built and rental units are affordable for low/moderate income
- *Tax-Increment Financing:* In order to help pay for public infrastructure improvements, incremental property taxes
- *Early-Stage Land Acquisition:* Acquire land for affordable housing before property values increase
- *Long-Term Affordability:* shared-equity homeownership and long-term affordability covenants for rental developments to preserve public investments in affordable housing
- *Conditional Transportation Funding:* FTA could consider an area's commitment to affordable housing before funding transportation projects

Weinberger, Rachel. 2001. "Commercial Property Value and Proximity to Light Rail: A Hedonic Price Application." University of California, Berkeley.

This dissertation uses a hedonic price model to determine the effects of proximity to light rail on commercial property values in Santa Clara County, specifically using rental rates as opposed to sale price.

Background/Methodology

- Rental rates more elastic/responsive to market conditions and more abundant than sales transactions
- Santa Clara County: 1,300 square miles, includes Silicon Valley
- Light rail opened stages beginning in 1987
- Study uses 4,632 geocoded lease transactions between 1984 and 2000
- Series of explanatory hedonic models: study variables (locational attributes for distance to LRT and highway) and control variables (space and lease terms, location, transaction year)

Results

- Properties within a half mile of a light rail station have higher lease rates than other properties in the county, holding all else constant.
    - Properties within a quarter mile receive a higher positive impact than those a quarter to a half mile from the station
- Positive eternality for commercial property outweighs any nuisance effect
- Little difference among property values that lie within a quarter mile of the station (unlike residential, where there are typically price penalties for properties adjacent to the light rail station)

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Agenda No.
REPORT NO.
Title

Accept Portland Streetcar 2nd Annual Report (Report)

INTRODUCED BY Commissioner/Auditor: **COMMISSIONER STEVE NOVICK**	CLERK USE: DATE FILED FEB 16 2016
COMMISSIONER APPROVAL	Mary Hull Caballero Auditor of the City of Portland
Mayor—Finance and Administration - Hales	
Position 1/Utilities - Fritz	By: ______________ Deputy
Position 2/Works - Fish	
Position 3/Affairs - Saltzman	
Position 4/Safety - Novick	**ACTION TAKEN:**
BUREAU APPROVAL	FEB 24 2016 ACCEPTED
Bureau: Transportation Development, Permitting & Transit Group Manager: Christine Leon Assistant Director: Maurice Henderson 2/8/16	
Prepared by: Kathryn Levine:sld Date Prepared:2/05/2016	
Impact Statement Completed ☒ Amends Budget ☐	
City Auditor Office Approval: required for Code Ordinances	
City Attorney Approval: required for contract, code, easement, franchise, comp plan, charter	
Council Meeting Date: **February 24, 2016**	

AGENDA

TIME CERTAIN ☒
Start time: 10:15 AM

Total amount of time needed: _____
(for presentation, testimony and discussion)

CONSENT ☐

REGULAR ☐
Total amount of time needed: _____
(for presentation, testimony and discussion)

FOUR-FIFTHS AGENDA	COMMISSIONERS VOTED AS FOLLOWS:	YEAS	NAYS
1. Fritz	1. Fritz	✓	
2. Fish	2. Fish	✓	
3. Saltzman	3. Saltzman	✓	
4. Novick	4. Novick	✓	
Hales	Hales	✓	