Land Use Impacts of BRT

Commuter Choice Workshop
BRT Session Part II
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Research Objective

- Can bus rapid transit (BRT) impact surrounding land uses and property values in a similar way as light rail transit (LRT)?
- Issue of permanence of services & facilities
Previous Work

• Before 2009, no recent quantitative modeling studies on property value impacts of BRT in the U.S.
• Previous studies address impacts of rail modes on property values
  – Isolate effect of distance from transit (either right-of-way, stations, or both)
  – Typical results find positive impacts on property values from nearby rail transit, but magnitudes are relatively small
Hypothesis & Method

• We hoped to find statistically significant, positive impacts on surrounding property values from BRT, with magnitudes approaching those found for rail transit modes.

• Estimate the impacts of BRT on surrounding property values using hedonic regression models
  – Estimate the variation in property values due to proximity to BRT stations
  – Isolate the effect of distance to nearest BRT station from all other (measurable) factors that determine property values
First Application

• Pittsburgh East Busway
  – Operating since 1983
  – Serves Downtown Pittsburgh, eastern communities of Pittsburgh, and eastern suburbs of Allegheny County
  – Average weekday ridership: 25,000
  – Annual ridership: 7 million
  – 9.1 miles in length
  – 9 stations
Pittsburgh Fixed Guideways

LEGEND
- LRT
- Busways
- North Shore Connector
- Inclines
- Other Roads
Data

- Parcel data from Allegheny County Property Assessor’s Office, 2007
- 2000 U.S. Census data, Allegheny County
- Crime data from the Pennsylvania Uniform Crime Reporting System
- Data set constructed using GIS
- Used only parcels located in between the Allegheny and Monongahela Rivers, and within one half-mile of East Busway corridor
Variables

- Dependent variable: property value (assessed value)
- Key independent variable: distance of parcel to nearest BRT station
- Other variables
  - Property characteristics
  - Neighborhood characteristics
Property Characteristics

- Lot size (sq. ft.)
- Living area (sq. ft.)
- Number of bedrooms (including interaction term with living area)
- Number of full bathrooms, number of half-baths
- Condition of property
- Age of property
- Distance to nearest BRT station (including squared term to test for nonlinearity)
- Distance to nearest LRT station
- Distance to nearest freeway entrance & distance to CBD (highly collinear with distance to LRT station; removed from model)
- Distance to freeway & BRT right-of-way
Neighborhood Characteristics

- Population density
- Median income
- Crime per capita (dropped due to data problems)
- Municipality fixed-effects (dummy variables)
Pittsburgh Results

- Hedonic regression model, statistically significant results, using data within ½-mile of BRT stations
- Moving from 101 to 100 feet from a station increases market value of single-family home by $19.00
- Moving from 1,001 to 1,000 feet from a station increases market value of a single-family home by $2.73
- Example: a property 1,000 feet away from a station is valued approximately $9,745 less than a property 100 feet away, all else constant
Second Application: Boston Silver Line Washington Street Corridor

- Analyzed changes in land uses along the corridor
- Analyzed sale prices on multi-family units
  - Using hedonic regression modeling and GIS
Boston Rapid Transit
Boston Silver Line

- Branded as part of MBTA’s rapid transit system
- Low-floor 60 ft. CNG vehicles
- Exclusive bus lanes
- 10-minute peak frequency
- 15-minute off-peak frequency
- Real-time passenger information
- Transit signal priority
- Phase I Washington Street opened July 2002
- Phase II Waterfront opened December 2004
- Proposed Phase III to connect the two
Boston Silver Line

LEGEND
- Free interchange with other lines
- Accessible Station

Park St
Boylston
Downtown Crossing
Chinatown
NE Medical Center
Herald St
E. Berkeley St
Union Park St
Newton St
Worcester Square
Massachusetts Ave
Lenox St
Melnea Cass Blvd
Dudley Sq

Airport
Logan International Airport
Airport Terminals
World Trade Ctr.
Silver Line Way
Courthouse
Boston Marine Industrial Park
City Point

SL1
SL2
SL3
Boston Silver Line
Washington Street Corridor

- As the first phase of the Silver Line, this corridor was selected for research
- Replaced MBTA Route 49
- Two routes operate along the corridor: SL4 & SL5
  - Provide two options into Downtown Boston
- 14 stations
- Approximately 15,500 daily boardings
Data

- Parcel data from City of Boston Assessing Department, 2003-2009
- Sales transactions of condominium units from the City of Boston, 2000-2009
- U.S. Census data
- Data set constructed using GIS
- Used only parcels located within one quarter-mile of the Washington Street corridor
- Data set contains approximately 5100 sales transactions from 2000 to 2009
Variables

• Dependent variable: sale price per square foot
• Key independent variable: network distance of parcel to nearest BRT station
• Other variables
  – Property characteristics
  – Neighborhood characteristics
  – Local housing price index
Property & Neighborhood Characteristics

- Number of bedrooms
- Number of full bathrooms, number of half-baths
- Age of property
- Number of parking spaces assigned to the unit
- Distance to nearest BRT station (including squared term to test for nonlinearity)
- Median income
- City ward fixed-effects (dummy variables)
- Local housing price index
# Boston Results

## Changes in Sale Price per Square Foot and the Housing Price Index: 2000 – 2009

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale Price per Square Foot*</td>
<td>$344.59</td>
<td>$590.55</td>
<td>$522.83</td>
<td>71.4%</td>
<td>-11.5%</td>
<td>51.7%</td>
</tr>
<tr>
<td>Boston Housing Price Index**</td>
<td>100.56</td>
<td>175.04</td>
<td>148.44</td>
<td>74.1%</td>
<td>-15.2%</td>
<td>47.6%</td>
</tr>
</tbody>
</table>

*Represents the average sale price per square foot of condo units located within 0.25 mile of the Washington Street corridor in the first quarter of the year listed.

**Represents the Case-Shiller housing price index for the City of Boston in the first quarter of the year listed.
Hedonic regression models using sales from years 2000, 2001, and 2002 indicate that prices per square foot were higher for condos further away from the corridor, but this relationship was not statistically significant.

Beginning in 2003, after the opening of the Silver Line Washington Street, similar models begin to show a statistically significant inverse relationship between distance to a BRT station and sale price per square foot.
• Using sales data from 2007 and 2009, the results are statistically significant
• Moving from 101 to 100 feet from a station increases sale price by $0.08 per square foot
• Moving from 1,001 to 1,000 feet from a station increases sale price by $0.04 per square foot
• Example: a condo 1,000 feet away from a station would sell for $53 per square foot less than a condo 100 feet away, all else constant (mean sale price in the data is about $600 per square foot)
With recent research on BRT in Pittsburgh and the Boston Silver Line, we are beginning to show that proximity to BRT stations can have a positive effect on residential property values and sale prices.

These effects are very similar to those shown in the literature for LRT.
Policies and Potential Impacts on BRT and Development

- Understanding the relationship between land use & BRT
- Question of incentives offered in cities where BRT and LRT operate
- Report on land use policies that may impact development around BRT and/or other transit modes
Cleveland – Euclid Corridor

• Over $4B in investment
• Retail, residential, office
Ottawa

- $700M in development around stations
- Retail, office, residential
Boston – Washington Street

- Over $650M
- Retail, residential, office, health
Boston Seaport

- Fan Pier, Courthouse, World Trade Center
- Retail, residential, office, health
Pittsburgh

• Over $500M
• Commercial, residential, office, medical, recreational
## MLK, Jr. East Busway (Pittsburgh)

<table>
<thead>
<tr>
<th>Community</th>
<th>Type of Development</th>
<th>Type of use</th>
<th>New Construction or Redevelopment</th>
<th>Value of Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilkinsburg</td>
<td>Apartments*</td>
<td>Residential</td>
<td>New</td>
<td>$1,340,000</td>
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<tr>
<td></td>
<td>Bank*</td>
<td>Bank</td>
<td>New</td>
<td>$76,000</td>
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<tr>
<td></td>
<td>Convenience Store*</td>
<td>Retail</td>
<td>New</td>
<td>$210,000</td>
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<tr>
<td></td>
<td>Drug Store*</td>
<td>Retail</td>
<td>New</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fast food restaurants (4)*</td>
<td>Retail</td>
<td>New</td>
<td>$832,000</td>
</tr>
<tr>
<td></td>
<td>Hospital*</td>
<td>Medical</td>
<td>New</td>
<td>$5,526,000</td>
</tr>
<tr>
<td>Homewood</td>
<td>Community College*</td>
<td>Institutional</td>
<td>New</td>
<td>$275,000</td>
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<tr>
<td></td>
<td>Farmers Market*</td>
<td>Retail</td>
<td>New</td>
<td>$900,000</td>
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<tr>
<td></td>
<td>Single family residence*</td>
<td>Residential</td>
<td>New</td>
<td>$1,871,000</td>
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<tr>
<td></td>
<td>Single family residences*</td>
<td>Residential</td>
<td>New</td>
<td>$1,484,000</td>
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<tr>
<td>Point Breeze</td>
<td>Research and Engineering offices</td>
<td>Office</td>
<td>New</td>
<td>$32,800,000</td>
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<tr>
<td></td>
<td>University offices</td>
<td>Office</td>
<td>Redevelopment</td>
<td>$1,350,000</td>
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<tr>
<td>East Liberty</td>
<td>Fast Food restaurant</td>
<td>Retail</td>
<td>New</td>
<td>$213,000</td>
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<tr>
<td></td>
<td>Shopping center</td>
<td>Shopping center</td>
<td>New</td>
<td>$4,300,000</td>
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<tr>
<td></td>
<td>Association offices*</td>
<td>Office</td>
<td>Redevelopment</td>
<td>$524,000</td>
</tr>
<tr>
<td></td>
<td>Bank*</td>
<td>Bank</td>
<td>New</td>
<td>$53,000</td>
</tr>
<tr>
<td></td>
<td>Condominiums*</td>
<td>Residential</td>
<td>New</td>
<td>$548,000</td>
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<td></td>
<td>Health Club*</td>
<td>Recreation</td>
<td>New</td>
<td>N/A</td>
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<tr>
<td></td>
<td>Medical offices*</td>
<td>Medical</td>
<td>Redevelopment</td>
<td>$397,000</td>
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<tr>
<td></td>
<td>Medical offices*</td>
<td>Medical</td>
<td>New</td>
<td>$58,000</td>
</tr>
<tr>
<td></td>
<td>Organization Headquarters*</td>
<td>Office</td>
<td>Redevelopment</td>
<td>$14,000,000</td>
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<tr>
<td></td>
<td>Painters Store*</td>
<td>Retail</td>
<td>New</td>
<td>$310,000</td>
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<tr>
<td></td>
<td>Restaurant*</td>
<td>Retail</td>
<td>Redevelopment</td>
<td>$960,000</td>
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<tr>
<td></td>
<td>Shopping center (8 tenants)*</td>
<td>Retail</td>
<td>New</td>
<td>$2,816,000</td>
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<tr>
<td></td>
<td>Theatre and shops*</td>
<td>Theatre/retail</td>
<td>Redevelopment</td>
<td>$1,360,000</td>
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<tr>
<td></td>
<td>Townhouses*</td>
<td>Residential</td>
<td>New</td>
<td>$25,000,000</td>
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<tr>
<td>Shadyside</td>
<td>Apartments</td>
<td>Residential</td>
<td>Redevelopment</td>
<td>$20,000,000</td>
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<tr>
<td></td>
<td>Apartments</td>
<td>Residential</td>
<td>New</td>
<td>$2,600,000</td>
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<tr>
<td></td>
<td>Hospital, Medical offices, parking garage</td>
<td>Medical/parking</td>
<td>New</td>
<td>$43,798,000</td>
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<tr>
<td></td>
<td>Offices</td>
<td>Office</td>
<td>Redevelopment</td>
<td>$4,500,000</td>
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<tr>
<td></td>
<td>Offices</td>
<td>Office</td>
<td>Redevelopment</td>
<td>$200,000</td>
</tr>
</tbody>
</table>

* Development clustered at the stations
Plans, Policies, and Institutions

- Any of these may provide incentive or disincentive for new developments or concentration of ongoing development along transit corridors:
  - Local land use plans, policies, zoning, and capital improvement programs
  - Financial and non-financial incentives (e.g., density bonuses, tax incentives, streamlined development application process, loan support, etc.)
  - Structure of tax revenues for local jurisdictions
  - Experience of the transit agency and other local institutions
Policies

- Ottawa, ON
- Boston, MA
- Los Angeles, CA
- Baltimore, MD
- New York, NY
- Pittsburgh, PA
Ottawa Policies

- **Greenbelt**
  - Development occurring within certain areas
- **Restrictions on future developments**
  - Regional Official Plan
  - Parking limits
Boston Policies

• Boston (Boston Redevelopment Authority)
  – Site acquisition, low-interest loans, joint development opportunities, multi-agency coordination, neighborhood visioning, grants, and streetscape improvements
  – Encourages developers to make projects pedestrian-friendly, mixed-use, with minimal parking
  – Does not require these or other design standards to be met in order to receive the assistance that it offers

• Boston agreements with EPA
  – Allowed to freeze its parking requirements at the 1973 level plus 10%, which includes all general parking in Boston proper
Los Angeles, CA

- Metro Rail, Metro Orange Line, Metro Rapid
  - Specifically focused on Orange Line
- Local jurisdictions and Metro helped create supportive land use policies, joint development agreements
  - City of Los Angeles (incentives), County of Los Angeles (combine incentives with development standards)
- 1993 City of Los Angeles Land Use and Transportation Policy was adopted
  - Created series of incentives to projects within ¼ mile of transit stations
Los Angeles, CA

- City also asks for local contribution toward construction cost of any fixed guideway transit
  - Target is 3% of total cost
- Metro provided supplementary zoning regulations for transit stations along the Blue Line LRT
- 1992 Pacific Court Project – Redevelopment Agency program to reintroduce housing to Long Beach
  - Unintentional effort by Metro and City to encourage TOD
  - Financing incentives (wrote down cost of land and tax-exempting financing)
Pittsburgh, PA

- LRT, BRT
- Port Authority of Allegheny County (PAT) has not established any local, county, regional policies for TOD
  - Development occurring on informal basis based on interest and public involvement
Pittsburgh, PA

• 2004 Pennsylvania Legislature
  – Allow local governments to create Transit Revitalization Investment Districts (TRID)
  – Lay the groundwork for TODs
  – No difference between rail and BRT
Baltimore, MD

- Light rail, Metro subway, commuter bus, and MARC train
- Had proposed 10.5 mile BRT route
- MDOT aggressively promotes TOD
  - Promote efficient and sustainable growth
- Maryland Base Realignment Zones (BRAC)
  - Local governments to provide state financing support for public infrastructure to these zones – for rail
New York, NY

- Extensive transit system
  - Five designated BRT corridors
- Incentives for development not specific toward mode
  - Limited ROW
- Blue Ribbon Commission on Sustainability of MTA ("green" focus)
  - Controlling growth by utilizing TODs: two-thirds of new development within $\frac{1}{4}$ to $\frac{1}{2}$ mile of bus and subway stops
- Parking limits
- Ongoing efforts to update zoning by considering travel behaviors/patterns within areas
Upcoming Work

- A report on this research will be available in early spring
- Additional work has begun on analyzing data from Cleveland (Healthline BRT system)
- Work underway this year to update information on local, regional, and state policies and plans related to transit and development
- For more information please visit [www.nbri.org](http://www.nbri.org)