Transit Impacts on Jobs, People and Real Estate

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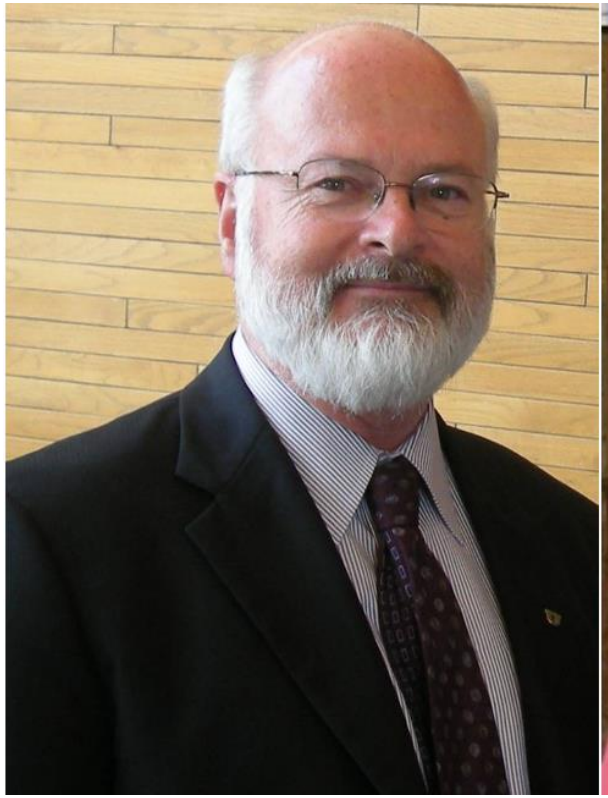

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Research Results of More than 50 Transit Systems …

Light Rail Transit	Year	Bus Rapid Transit	Year	Street Car Transit	Year	Commuter Rail Transit	Year
Buffalo	1984	Cleveland	2008	Atlanta	2014	Albuquerque-Santa Fe	2006
Charlotte	2007	Eugene-Springfield	2007	Dallas	2015	Austin	2010
Cleveland	1980	Kansas City	2005	Little Rock	2004	Dallas-Fort Worth	1996
Dallas	1996	Las Vegas	2004	Portland	2001	Miami Tri-Rail	1989
Denver	1994	Nashville	2009	Salt Lake City	2013	Minneapolis	1997
Houston	2004	Phoenix	2009	Seattle	2007	Nashville	2006
Minneapolis-St. Paul	2004	Pittsburgh	1977	Tacoma	2003	Orlando-Daytona	2014
Norfolk	2011	Reno	2010	Tampa	2002	Portland	2009
Phoenix	2008	Salt Lake City	2008	Tucson	2014	Salt Lake City	2008
Pittsburgh	1984	San Antonio	2012			San Diego	1995
Portland	1986	San Diego	2014			San Jose-Bay Area	1988
Sacramento	1987	Seattle	2010			San Jose-Stockton	1998
Salt Lake City	1999	Stockton	2007			Seattle-Tacoma	2000
San Diego	1981	Washington DC	2014			Washington, DC	1980s-90s
San Jose	1987						
Seattle	2003						
St. Louis	1993						

… in More than 30 Metropolitan Areas

Six Elements

- How transit should affect the location of jobs and people, and how real estate rents should respond → **Chris Nelson**
- Typology of different landscapes served by transit stations →

  Robert Hibberd
- How transit stations influence shifts in the regional share of jobs, people and housing → **Robert Hibberd**
- How transit station proximity influences household transportation budgets → **Chris Nelson**
- The effect of transit station proximity on real estate rents, and the extent to which outcomes are consistent with theory → **Chris Nelson**
- Implications for transit and land use planning.

How transit should affect the location of jobs and people, and how real estate rents should respond

Unless transit stations serve other purposes, their **effectiveness** can be measured by:

- Numbers of kinds of **jobs** attracted to them;
- Number of and kinds of **people and households** attracted to them but our research will explode a few myths; and
- How **real estate rents** perform with respect to transit station distance.

Research leads to insights based on **theoretical expectations** with implications for transit and land use planning.

Place Typologies

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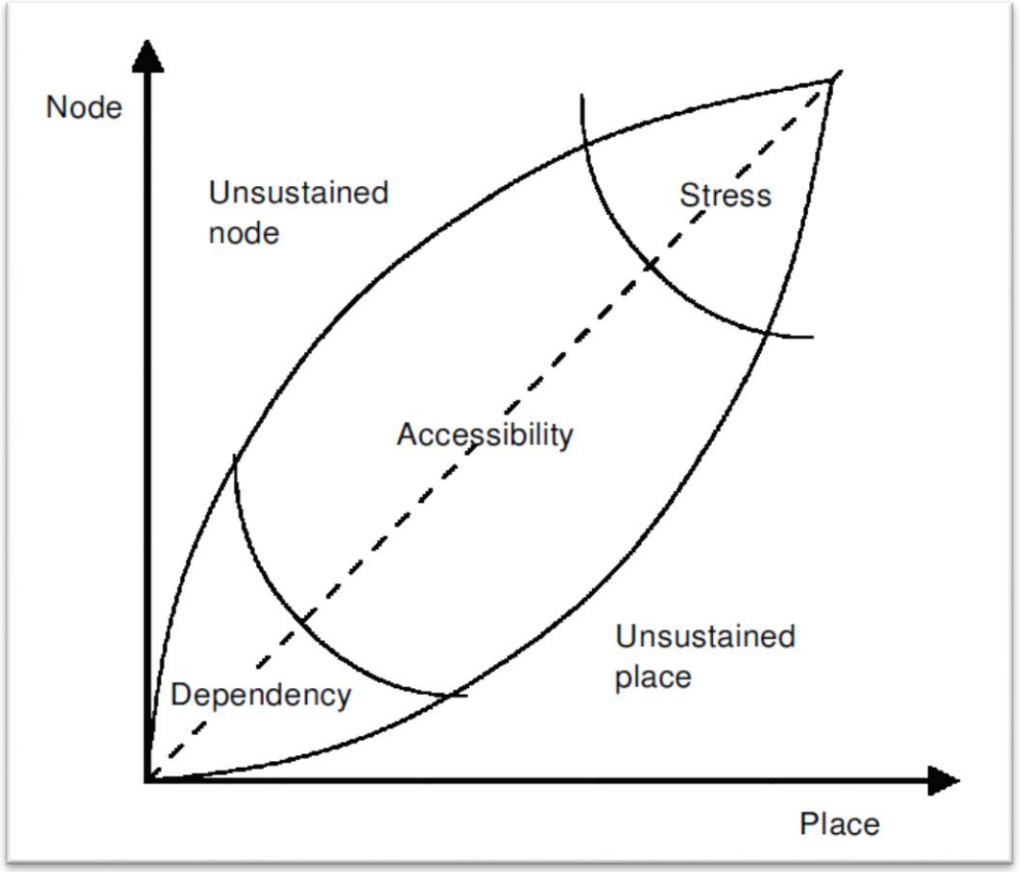
Developing TOD Place Typologies

- Review of white and academic literatures
- Framed Around: Bertolini's (1999) node-place model
  - **Transit** or Node: transportation, transit quality (FRT systems)
  - **Oriented**: distance in between, scale
  - **Development** or Place: built environment measures



From Bertolini, L. 1999. "Spatial Development Patterns and Public Transport: The Application of an Analytical Model in the Netherlands." Planning Practice and Research 14 (2): 199–210. https://doi.org/10.1080/02697459915724.

Guiding Principles

1. Typologies must **capture existing variation in the built environments** using similar dimensions of development, as studied in academia and applied in practice.
   - Identify common measures and proxies of the built environment
2. Categories must be **mutually exclusive and collectively exhaustive** so that potential systems outside of our study might be able to classify their contexts within our framework.
   - Consider the practical application of comparing real world contexts with results
3. Typologies must **enable comparison of similar built environment patterns** across metropolitan areas.
   - Explore the role of place type in market response *across* regions

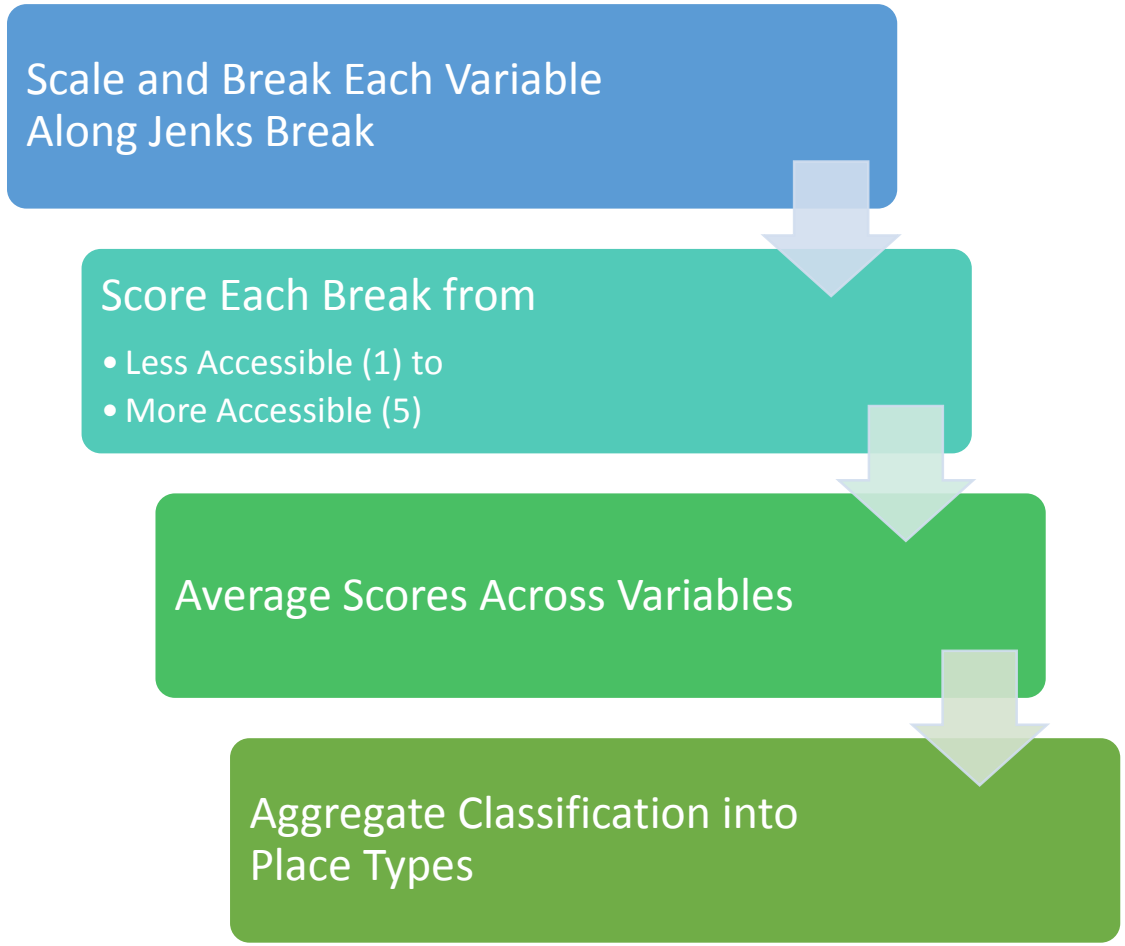
Methods Considered & Evaluated

Method	Complexity	Support Known Measures of Place	Easy to Classify in Practice	Compare Environments Across Regions
Manual Classification	Not Possibly on National Scale	Yes	Yes/ Difficult for larger areas	Possible
Thresholds/ Qualifying Criteria	Low	Limited	Yes	Limited
Scaling and Weighting*	Moderate	Yes	Yes	Yes
Factor and/or Cluster Analysis	Moderate/ Difficult	Yes	Difficult	Possible/ Challenging

* Based on an approach by Gehrke & Clifton (2016) conducted in California

Clifton, Kelly J., and Steven Gehrke. Memo. 2016. "Technical Memorandum: Place Typology Data Sources and Development Procedure," August 23, 2016.

Built Environment Characteristics



Variables	Calculated from Source
Jobs per acre	Longitudinal Employer-Household Dynamics
Proportion of jobs that are retail and entertainment	Longitudinal Employer-Household Dynamics
Total population per acre	American Community Survey
Total households per acre	American Community Survey
Percent of households with no kids	American Community Survey
Percent of owner occupied housing	American Community Survey
Intersections per square mile	Smart Location Database, 2014, Variable: D3b
Proportion of intersections with four approaching streets	Smart Location Database, 2014, Variable: D3bmm4, and D3bmm3
Notes: **All data are measured at the block-group level.**	

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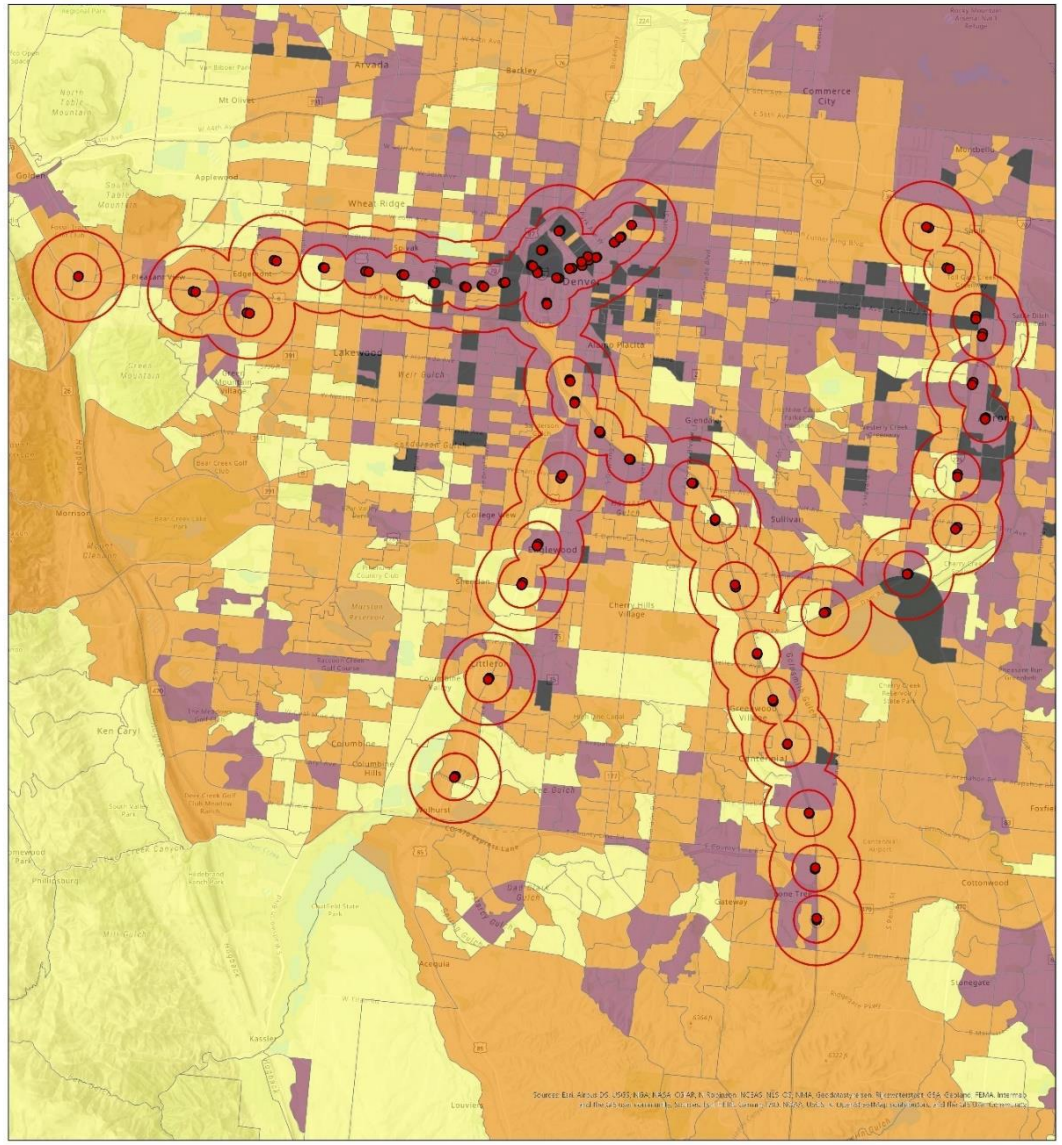
Place Types – High/Mod/Low/Poor Mix/Accessible Areas

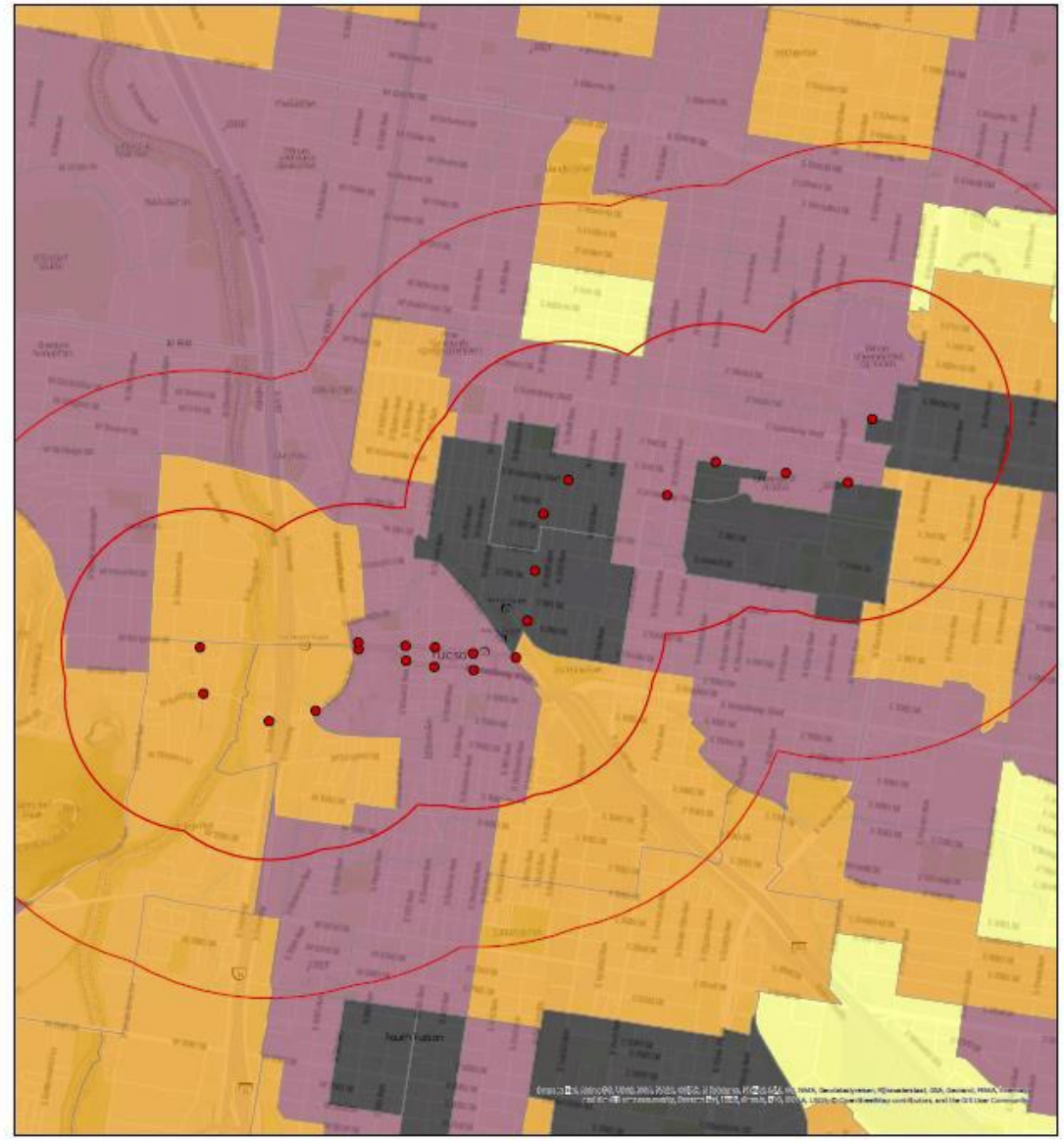
	Place Types			
Mix/Accessible:	**Poor**	**Low**	**Moderate**	**High**
Label:	**(Poor MA)**	**(Low MA)**	**(Mod MA)**	**(High MA)**
Jenks/Scaling Scores:	0-1.5	1.5-2	2-2.5	Greater than 2.5
Built Environment Variables	**Average Values by Place Types**			
Jobs per acre	0.42	1.38	3.26	8.11
Proportion of jobs that are retail and arts	0.06	0.17	0.25	0.27
Total population per acre	4.45	10.97	28.33	72.85
Total households per acre	1.71	4.19	11.04	26.96
Percent of households with no kids	0.71	0.66	0.63	0.51
Percent of owner occupied housing	0.83	0.63	0.40	0.22
Intersections per square mile	45.78	78.98	112.58	149.81
Proportion of intersections with 3 to 4 vertices	0.10	0.26	0.45	0.70



Station Typology for Light Rail Transit:
Denver-Aurora-Lakewood, CO

Buffers: Half & 1 Mile
LRT Buffers
Station Types
High MA
Mod MA
Low MA
Poor MA

0 0.75 1.5 3 4.5 6 Miles



Station Typology for Streetcar Transit:
Tucson, AZ

Buffers: Half & 1 Mile
SCT Buffers
Station Types
High MA
Mod MA
Low MA
Poor MA

0 0.13 0.25 0.5 0.75 1 Miles

Jobs and People

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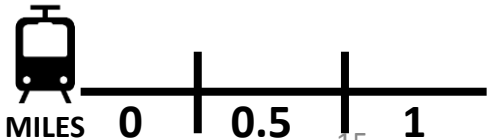
Shift in Share of Jobs – Economic & Wage Groups

Question:

Is there a link between transit station proximity and change in workers by economic sector and wage groups across a hierarchy of station area land use mix and accessibility types from 2010 to 2016?



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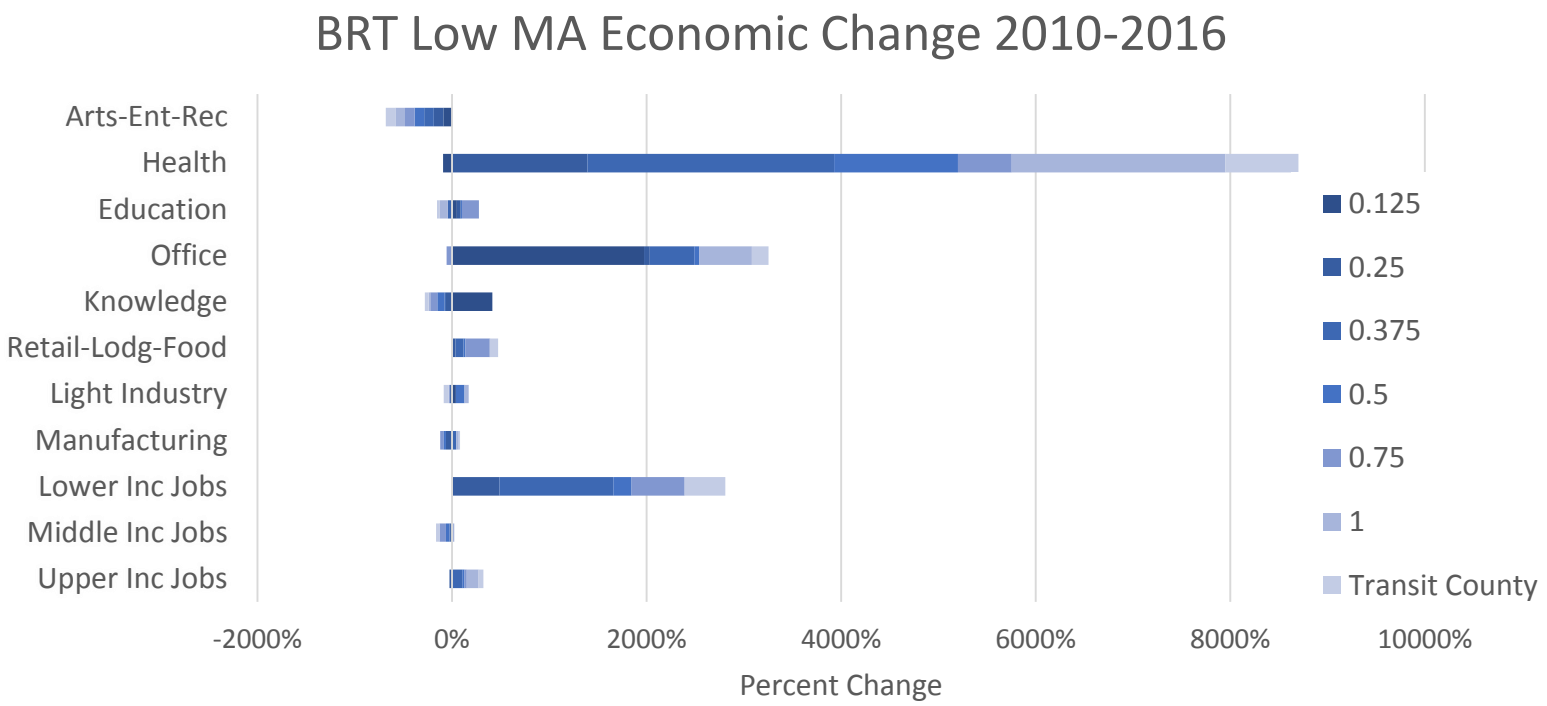
Shift in Share of Jobs – Economic & Wage Groups



LQ Trend 2010-2016 (LQ 2016 / LQ 2010)

Income Groups	0.125	0.25	0.375	0.5	0.625	0.75	0.875	1
Upper Income Jobs	**1.85**	**1.01**	**0.61**	**1.36**	0.57	0.74	0.88	1.92
Middle Income Jobs	**1.04**	**1.24**	**1.11**	**1.04**	1.13	0.77	1.21	1.19
Lower Income Jobs	0.77	**1.19**	**1.17**	0.88	1.34	1.70	0.95	0.43

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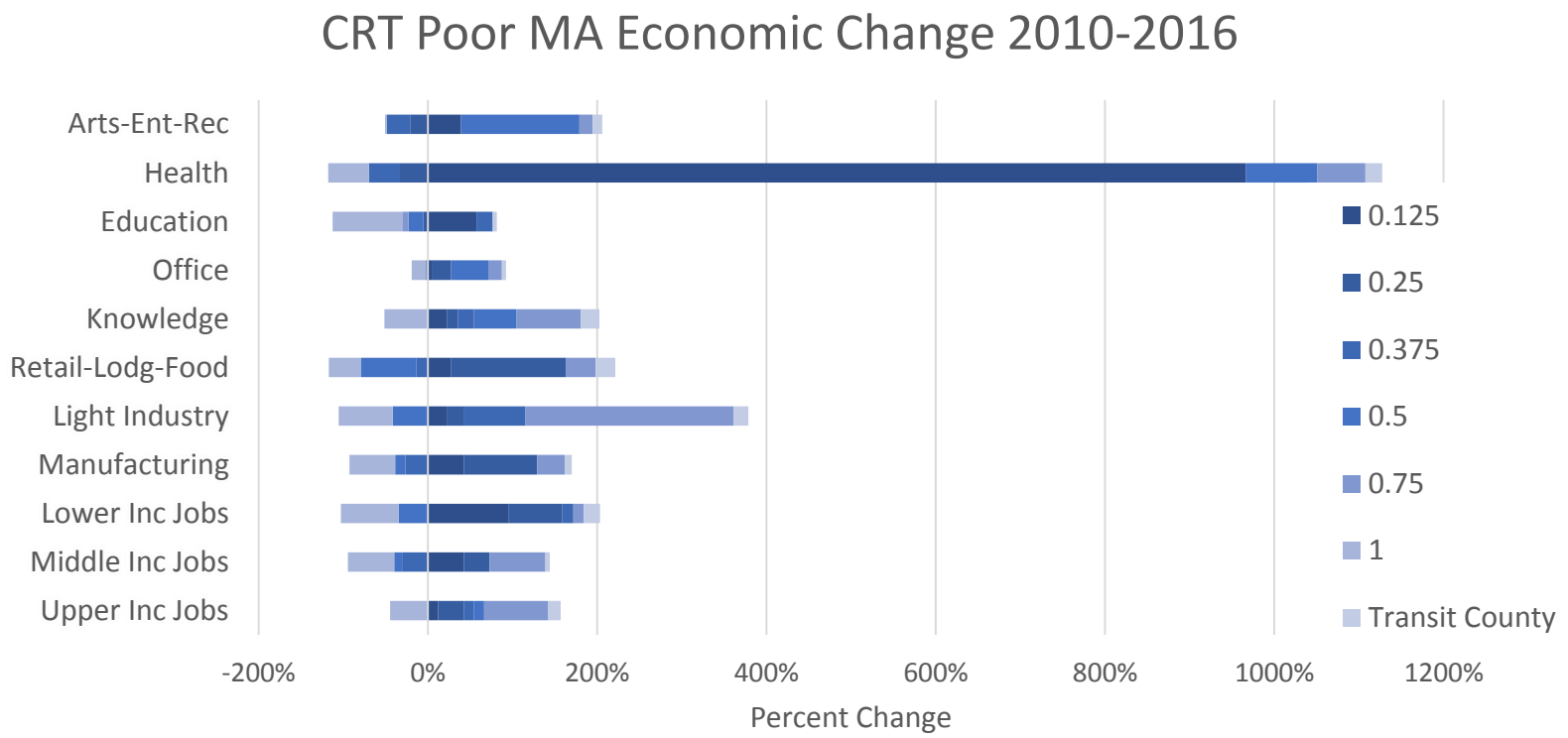
Bus Rapid Transit - Low MA

Shift in Share of Jobs – Economic & Wage Groups



LQ Trend 2010-2016 (LQ 2016 / LQ 2010)

Income Groups	*0.125*	*0.25*	*0.375*	*0.5*	*0.625*	*0.75*	*0.875*	*1*
Upper Income Jobs	0.93	0.93	**1.04**	**1.23**	1.01	1.19	1.05	1.43
Middle Income Jobs	**1.35**	**1.01**	0.72	**1.08**	1.17	1.23	0.93	1.26
Lower Income Jobs	0.94	**1.12**	**1.02**	0.69	0.85	0.74	0.82	0.79

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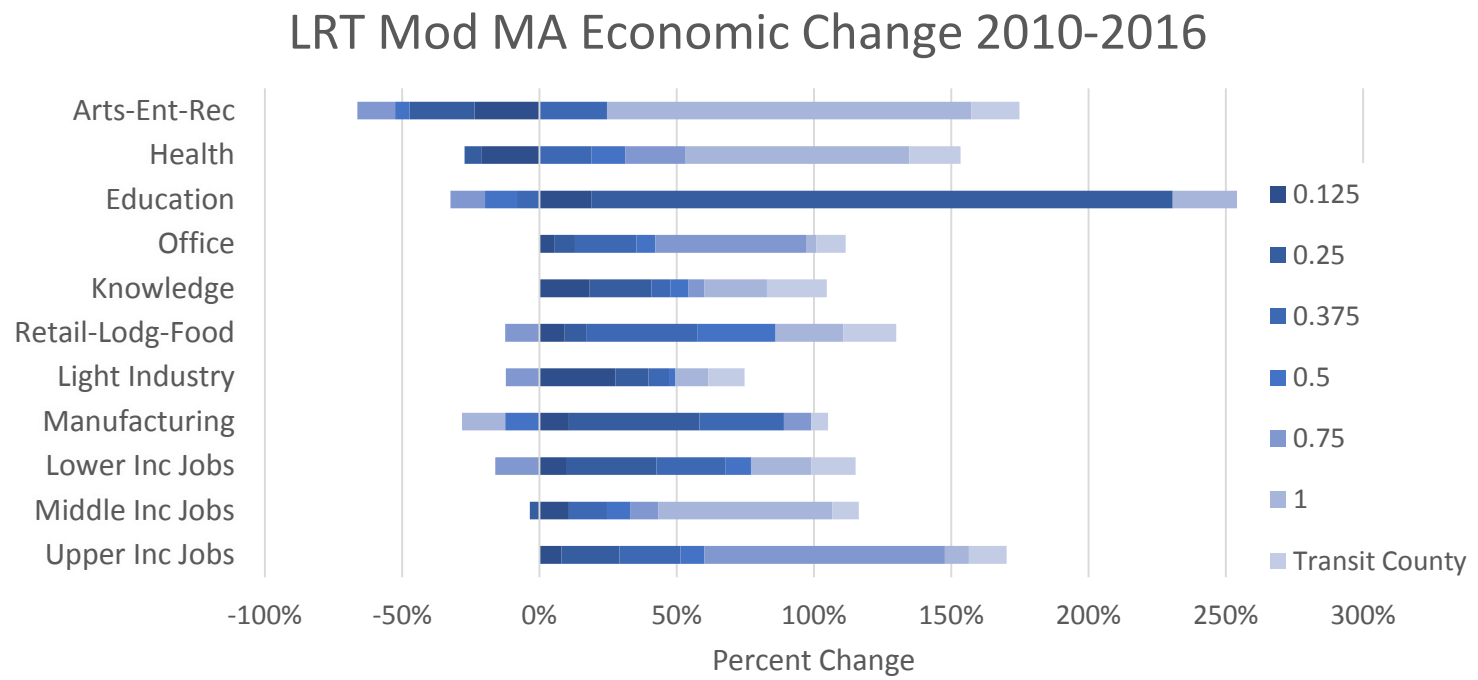
Commuter Rail Transit - Poor MA

Shift in Share of Jobs – Economic & Wage Groups



LQ Trend 2010-2016 (LQ 2016 / LQ 2010)

Income Groups	0.125	0.25	0.375	0.5	0.625	0.75	0.875	1
Upper Income Jobs	**1.00**	**1.02**	**1.01**	**1.00**	0.96	1.69	0.84	0.87
Middle Income Jobs	0.91	0.85	0.98	**1.04**	1.17	1.03	1.23	1.36
Lower Income Jobs	**1.09**	**1.10**	**1.02**	0.98	0.94	0.74	1.01	0.96

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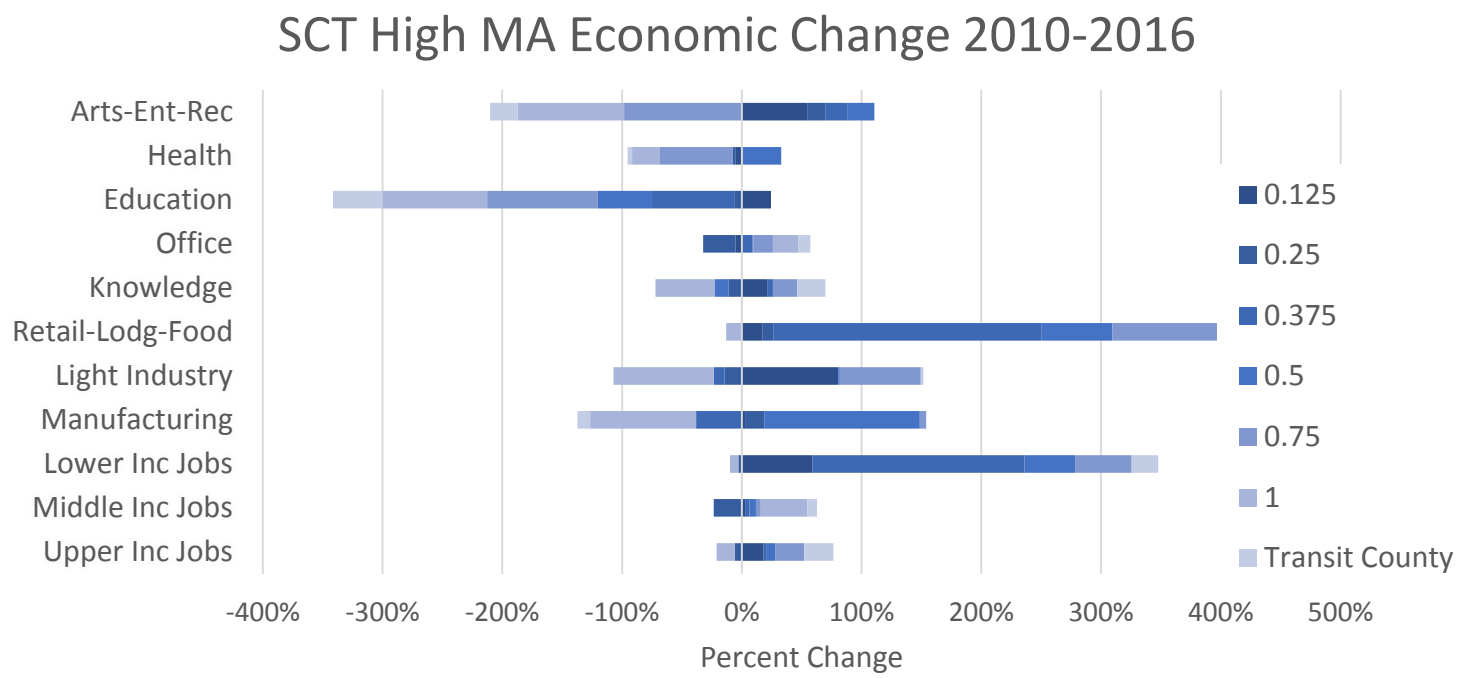
Light Rail Transit - Mod MA

Shift in Share of Jobs – Economic & Wage Groups



LQ Trend 2010-2016 (LQ 2016 / LQ 2010)

Income Groups	0.125	0.25	0.375	0.5	0.625	0.75	0.875	1
Upper Income Jobs	**1.10**	**1.06**	0.49	0.89	0.68	0.92	1.13	0.77
Middle Income Jobs	**1.04**	0.94	0.54	0.96	1.50	0.84	0.53	0.88
Lower Income Jobs	0.88	**1.06**	**1.26**	**1.15**	0.94	1.08	1.33	1.06

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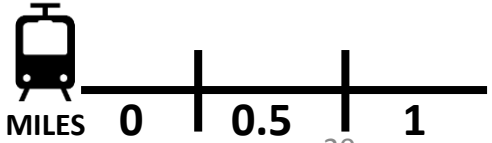
Streetcar Transit - High MA

Shift in Share of People by Demographics

Research Question:

- ***Relative to the counties within which transit systems operate ("transit counties"), are there shifts in the regional share of people over time with respect to FRT station proximity, particularly with respect to change in people by demographics.***



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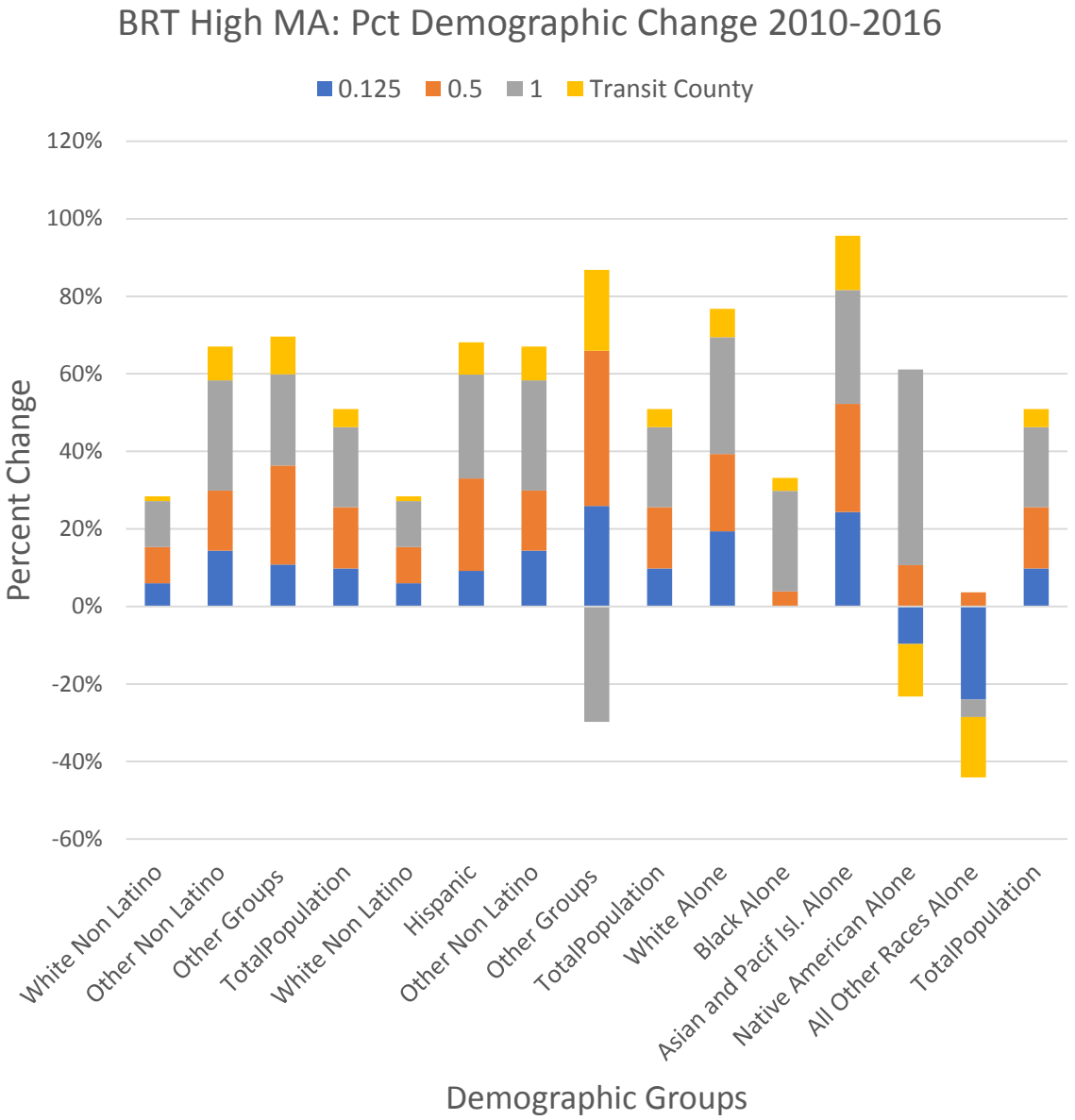

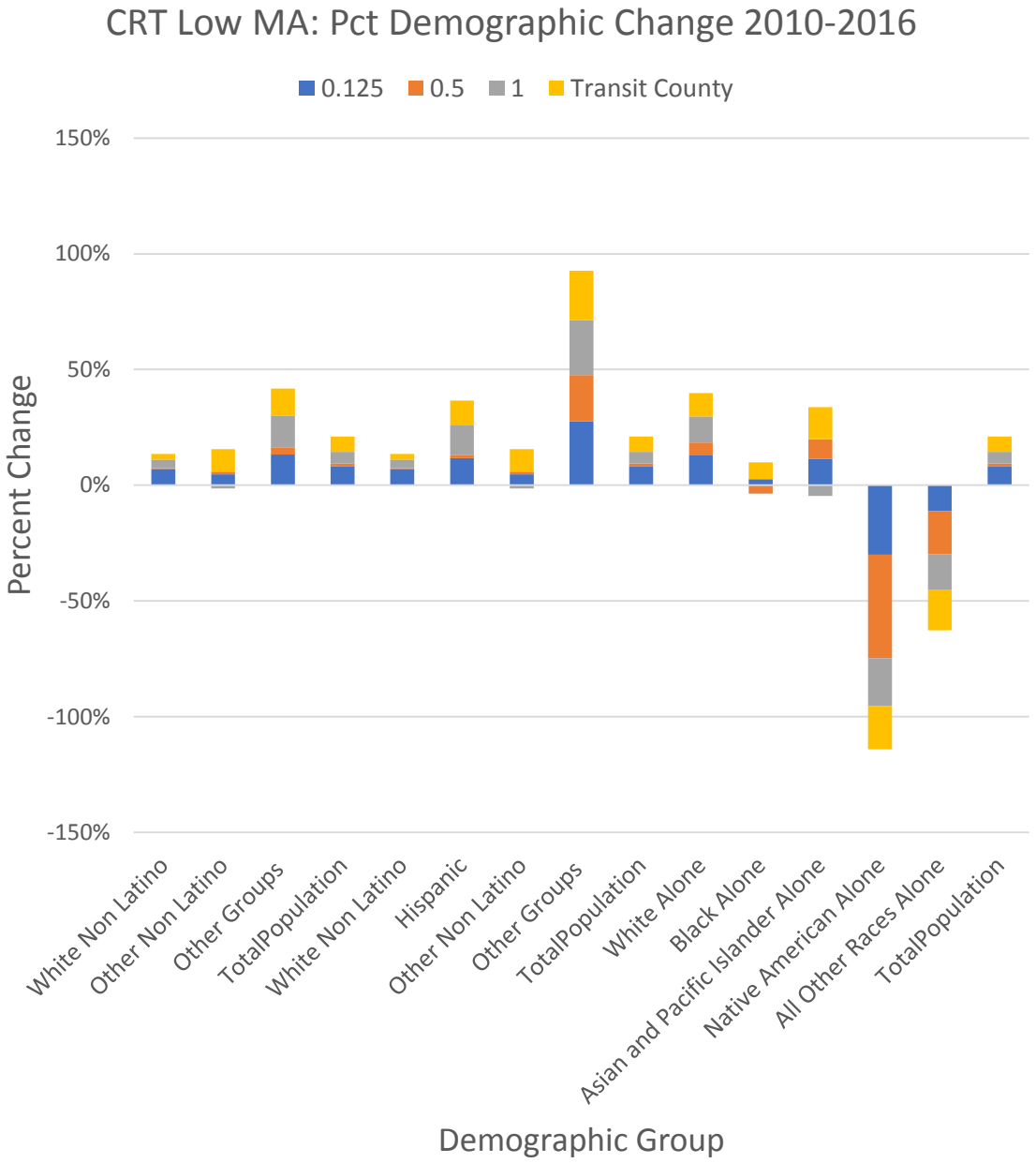

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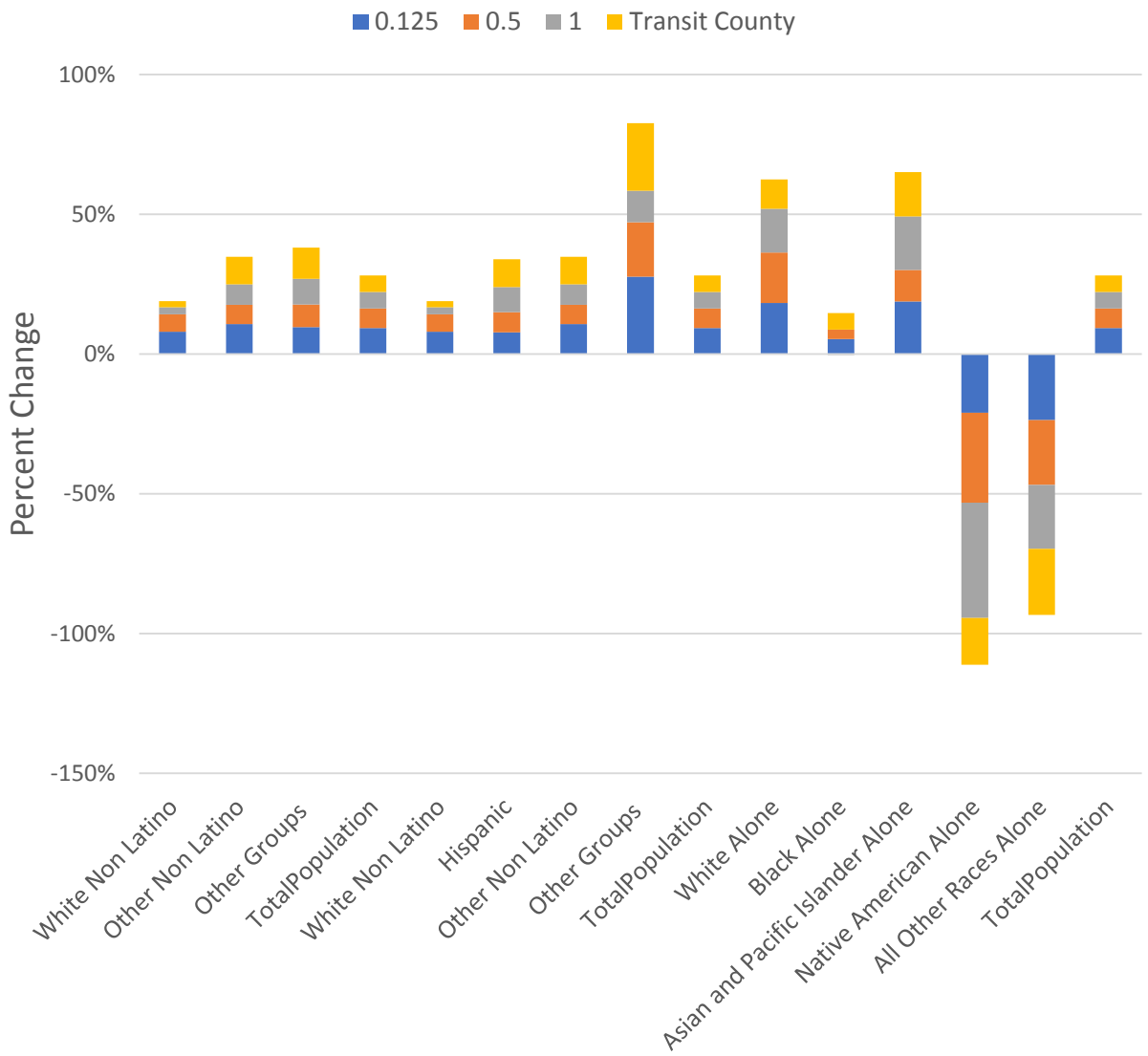
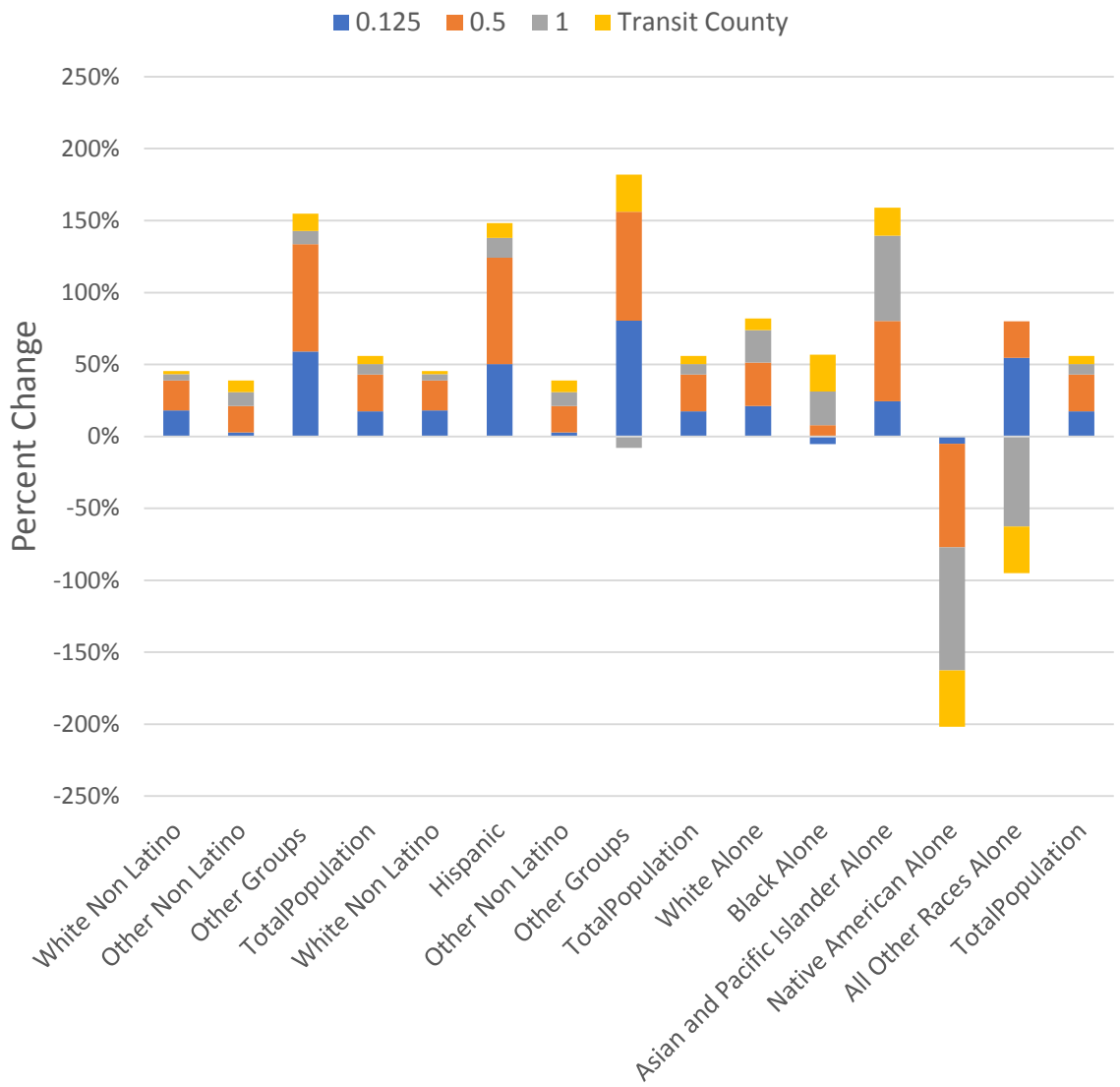
LRT Mod MA: Pct Demographic Change 2010-2016



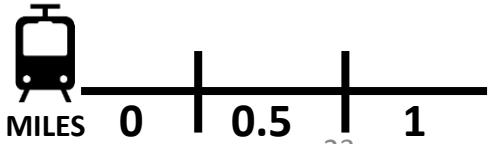
SCT High MA: Pct Demographic Change 2010-2016



Shift in Share by Households

Research Question:

- ***Relative to the counties within which transit systems operate ("transit counties"), are there shifts in the regional share of housing over time with respect to FRT station proximity, particularly with respect to change in households.***



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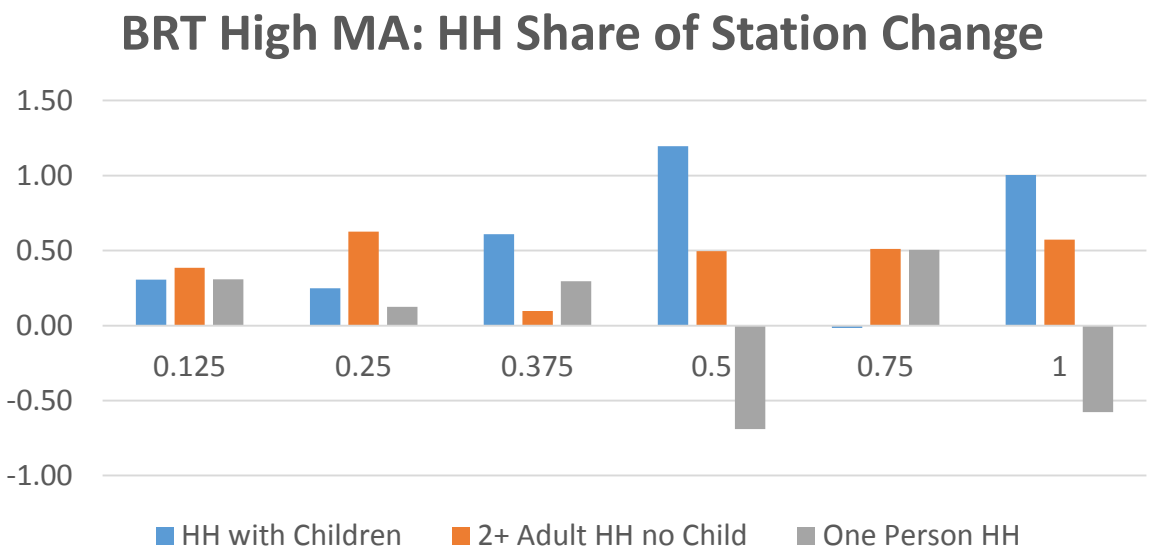
Shift in Share by Households - BRT

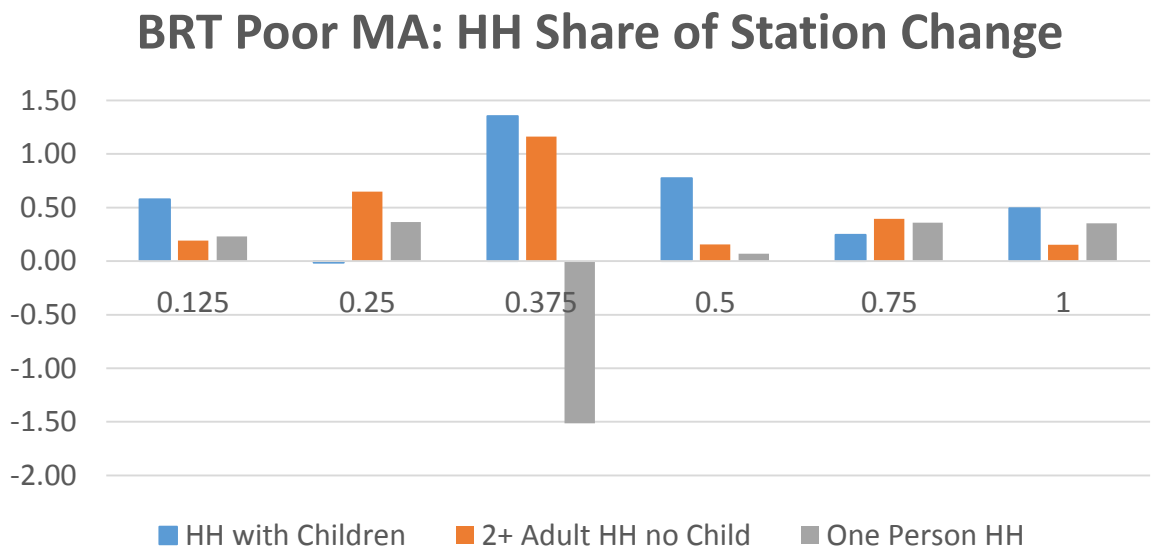
Poor MA Total HH loss of 9,000.

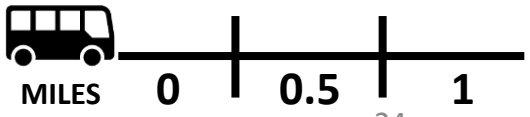
- HH with Kids **-82%** at the half-mile DB but gained at the station.
- HH age 25 to 44 : **-63%** cum. @ 0.5-mile DB.

High MA gained 13,000 households.

- HH with Kids gained 5,450 households, **6.8%** of the regional growth, which was **40.6%** of half-mile DB growth.







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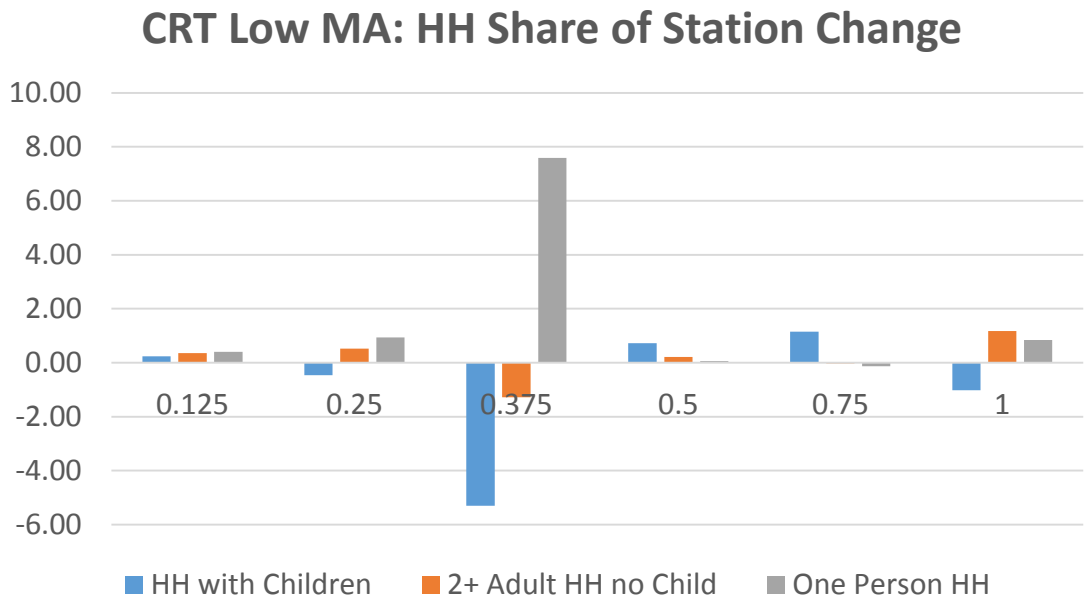
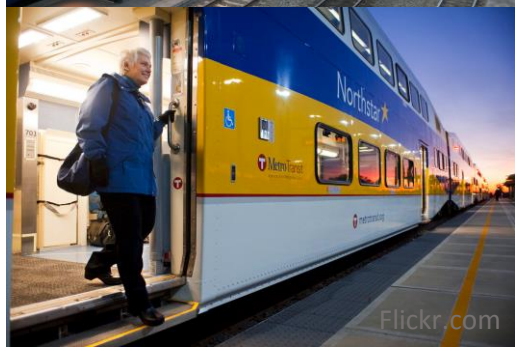
Shift in Share by Households - CRT



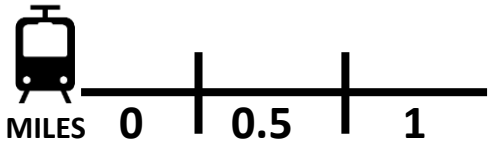


Low MA added nearly 8,000 households.

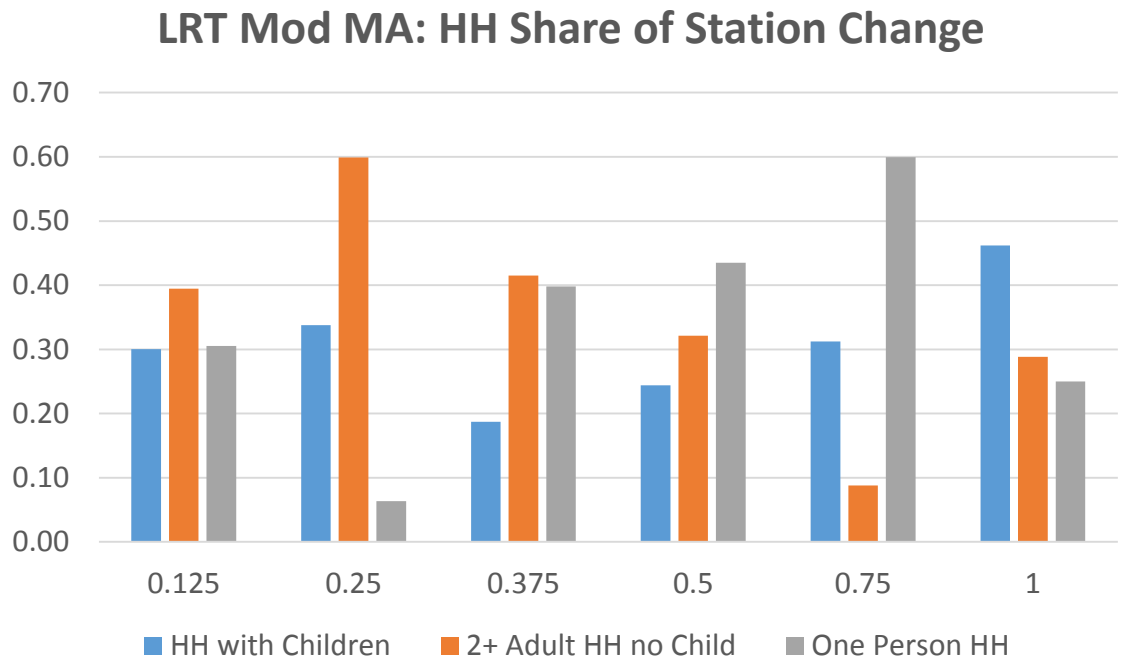
- HH with Kids grew at the half-mile radius.
- They gained 4,000 householders under 25.
- One-person HH and HH age 65 or above gained to half-mile DB.

High MA Modest gain in some HH types.

- HH age 25-44 gained at the highest rate.



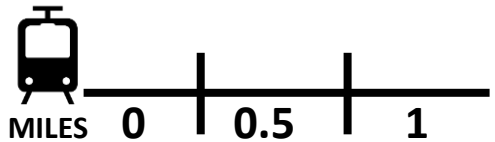
Shift in Share by Households - LRT



Poor MA - HH age 65 or above gained 3.8%.

Low MA - HH age 65 and over gained at 17%, growing at 43% that of total HH.

Mod MA place types gained total households at 5% rate, capturing 41,400 of the region's 841,000-strong household increase.



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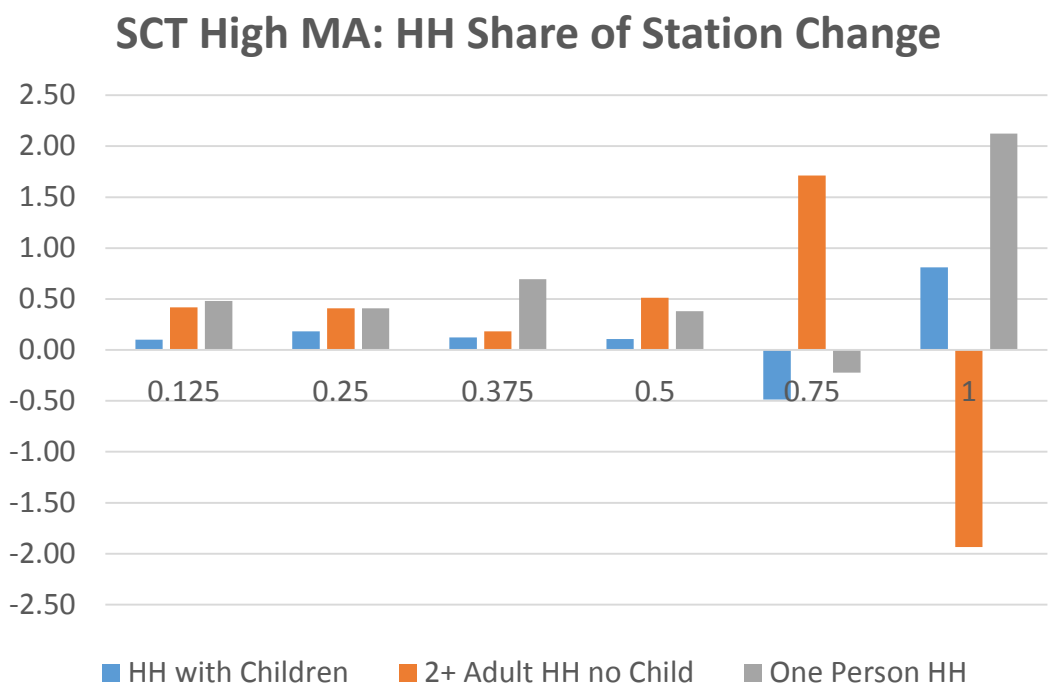
Shift in Share by Households - SCT

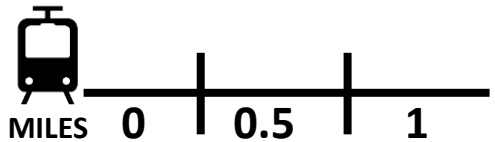


Mod MA gained **2.2%** rate growth for the total population.

- Two-plus adult HH with no children captured **5%** of the regional share in growth while growing at a rate of **77%.**

High MA grew 11,000 households, **5%** of 225,000 at the regional level.

- Householders 25 to 44 declined significantly at the cumulative half-mile DB. all other household types gained **3 to 6%** of regional share.



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Household Budgets & Real Estate Markets

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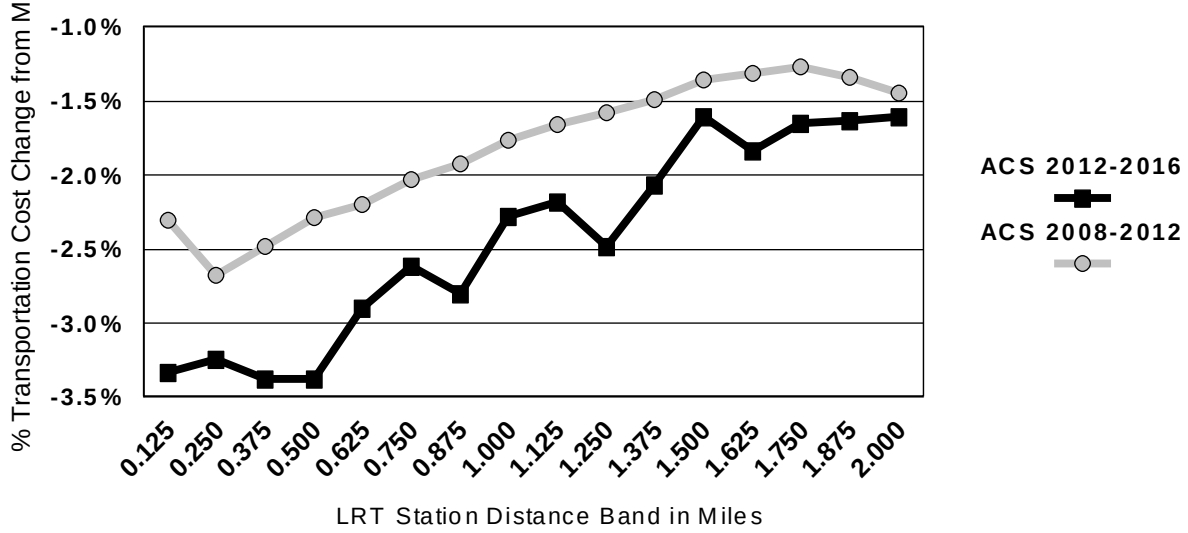
How transit station proximity influences household transportation budgets

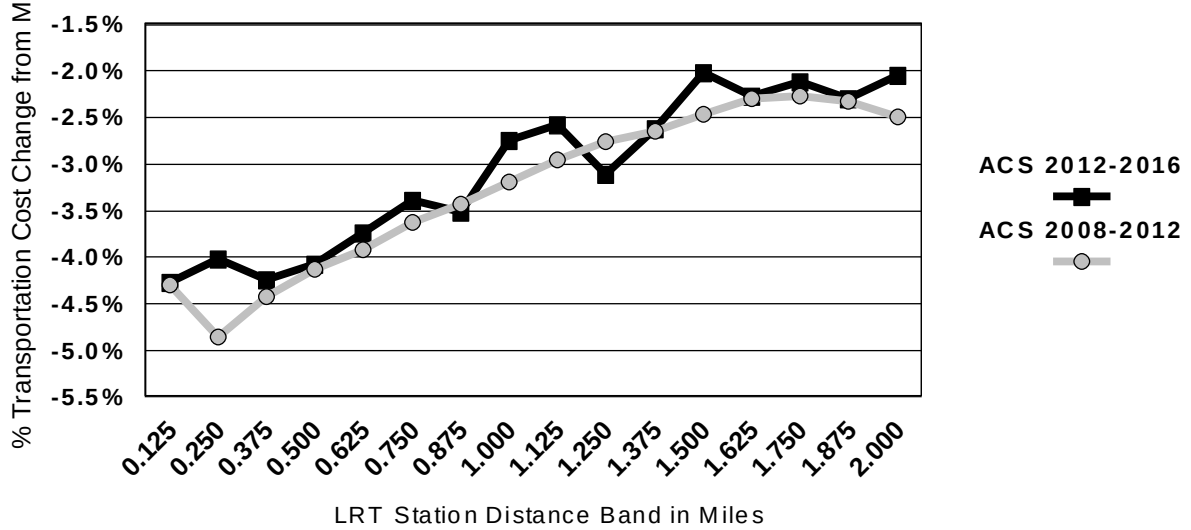
Research Question

Do transportation costs as a share of median household decline generally and over time with respect to light rail transit station proximity controlling for other factors?

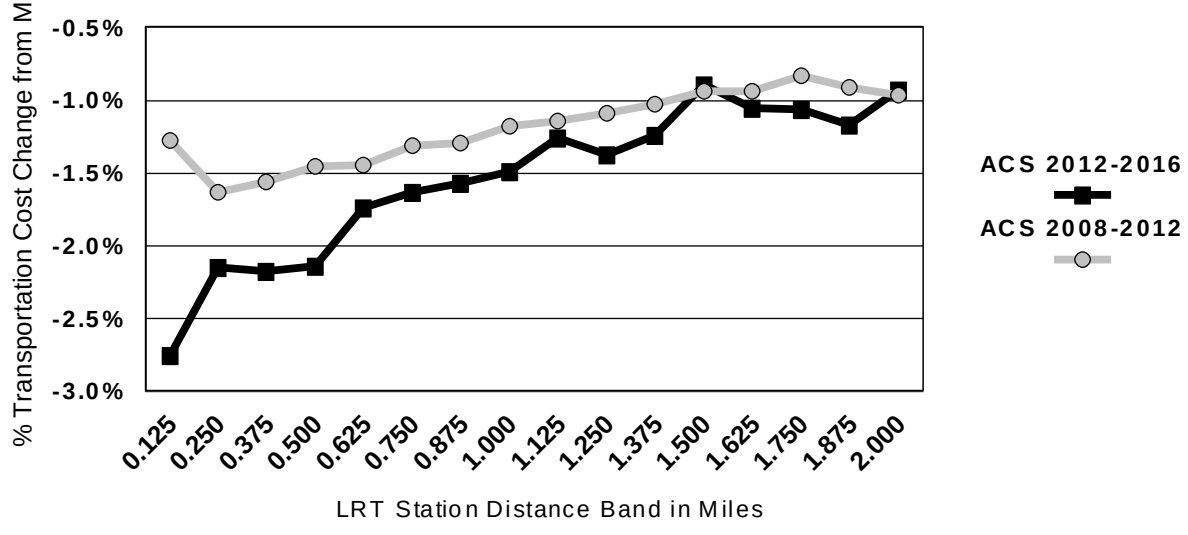
Median-Income Family



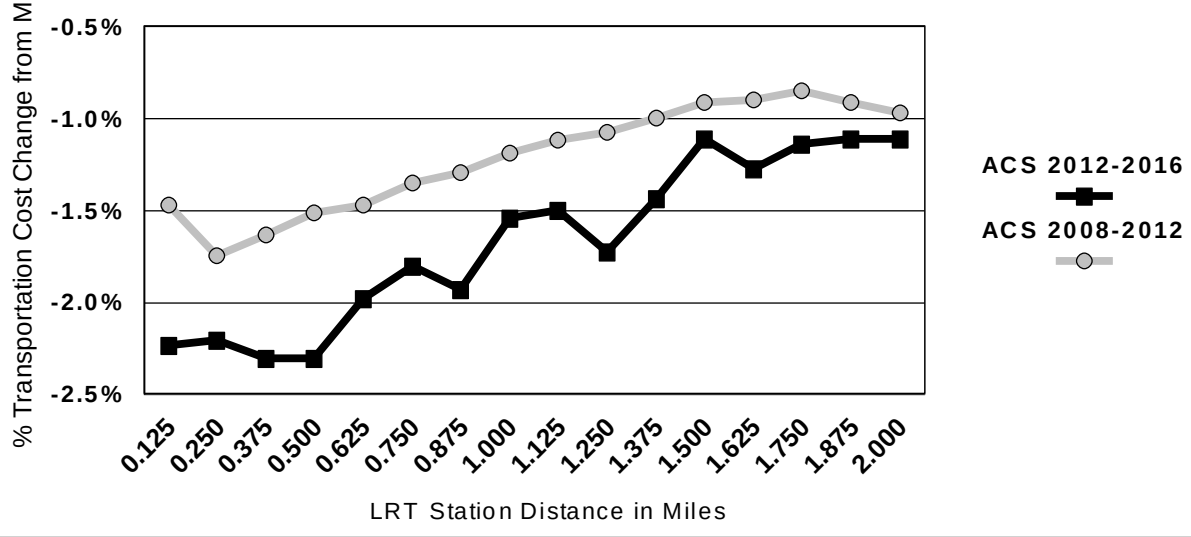
Single Parent Family @ 50% MHHI



Single Professional @ 135% MHHI



Dual-Professional Family @ 150% MHHI



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Implications for Transit and Land Use Planning

- All HH types realize **transportation cost savings** with respect to LRT station proximity.
- As will be seen next, transportation cost savings can be capitalized into **higher rents** with respect to transit station proximity.
- Lower/middle income HHs can be **squeezed out of locations** near transit stations.
- One solution is to **increase the supply of housing** for all HH types near transit stations.

The effect of transit station proximity on real estate rents

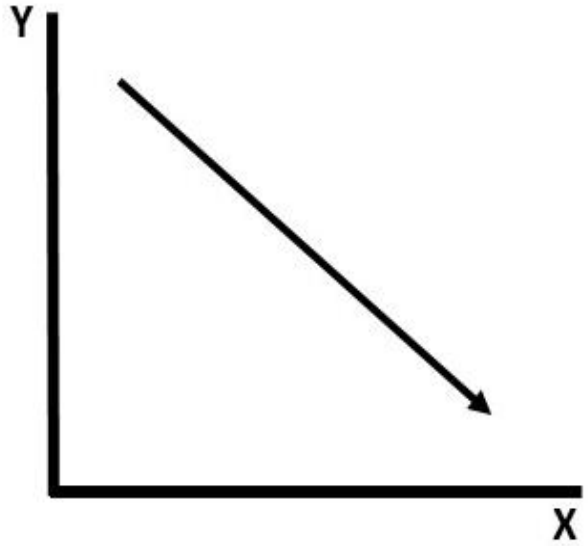
Research Questions

Is there an association between commercial real estate rent (per square foot) and proximity to rail transit stations holding other factors including place typology constant?

If there is an association, is there evidence of negative externality or amenity effects with respect to transit station proximity?

The effect of transit station proximity on real estate rents—*Theory*

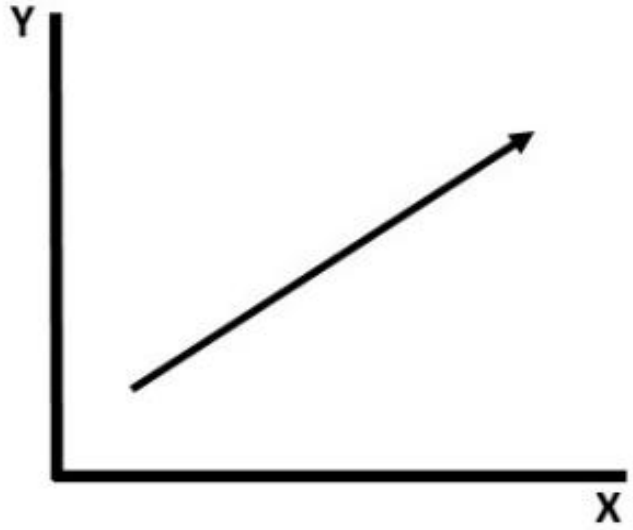
Downward Sloping Rent with respect to transit station proximity



This is **GOOD** because the market values station proximity as an **amenity**.

The effect of transit station proximity on real estate rents—*Theory*

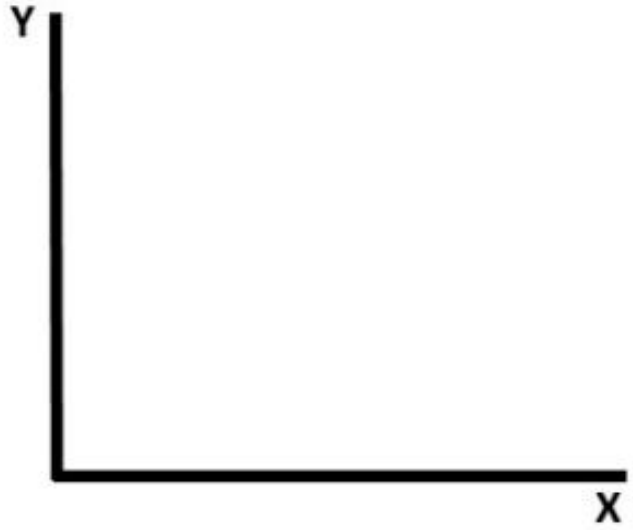
Upward Sloping Rent with respect to transit station proximity



This is **BAD** because the market values station proximity as an **externality**.

The effect of transit station proximity on real estate rents—*Theory*

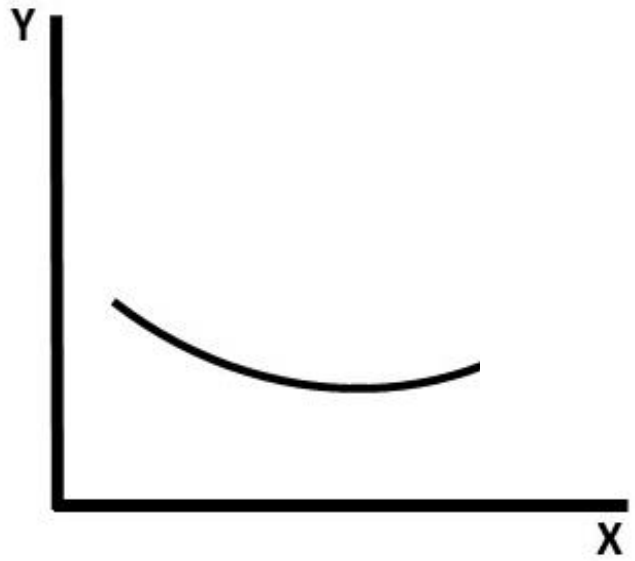
Ambiguous (no) Sloping Rent with respect to transit station proximity



This is also **BAD** because the market does not value station proximity.

The effect of transit station proximity on real estate rents—*Theory*

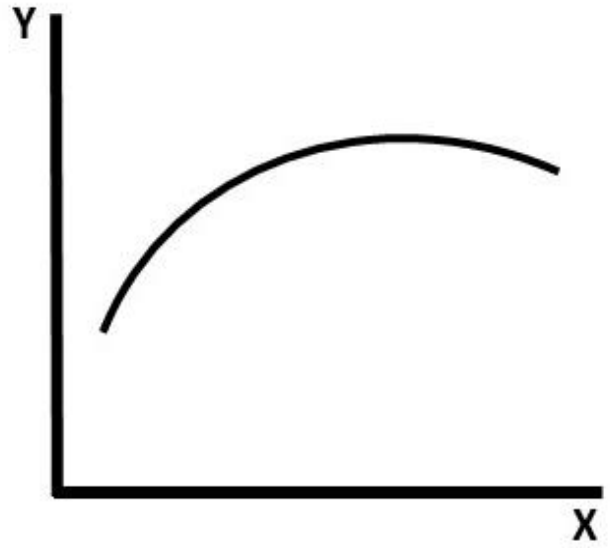
Convex Sloping Rent with respect to transit station proximity



This is **GOOD** because the market values station proximity close to stations as an **amenity** before station externality effects are revealed.

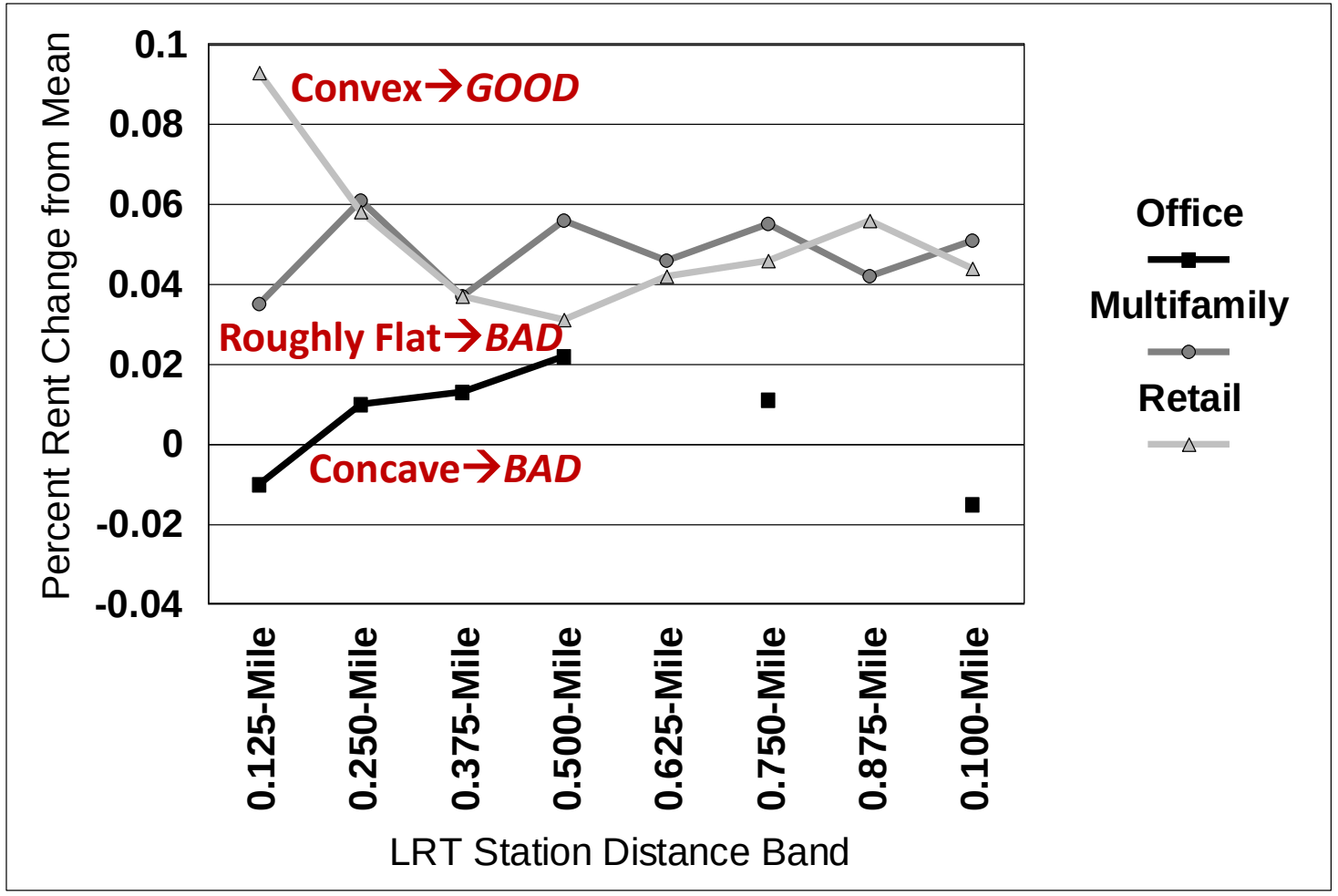
The effect of transit station proximity on real estate rents—*Theory*

Concave Sloping Rent with respect to transit station proximity

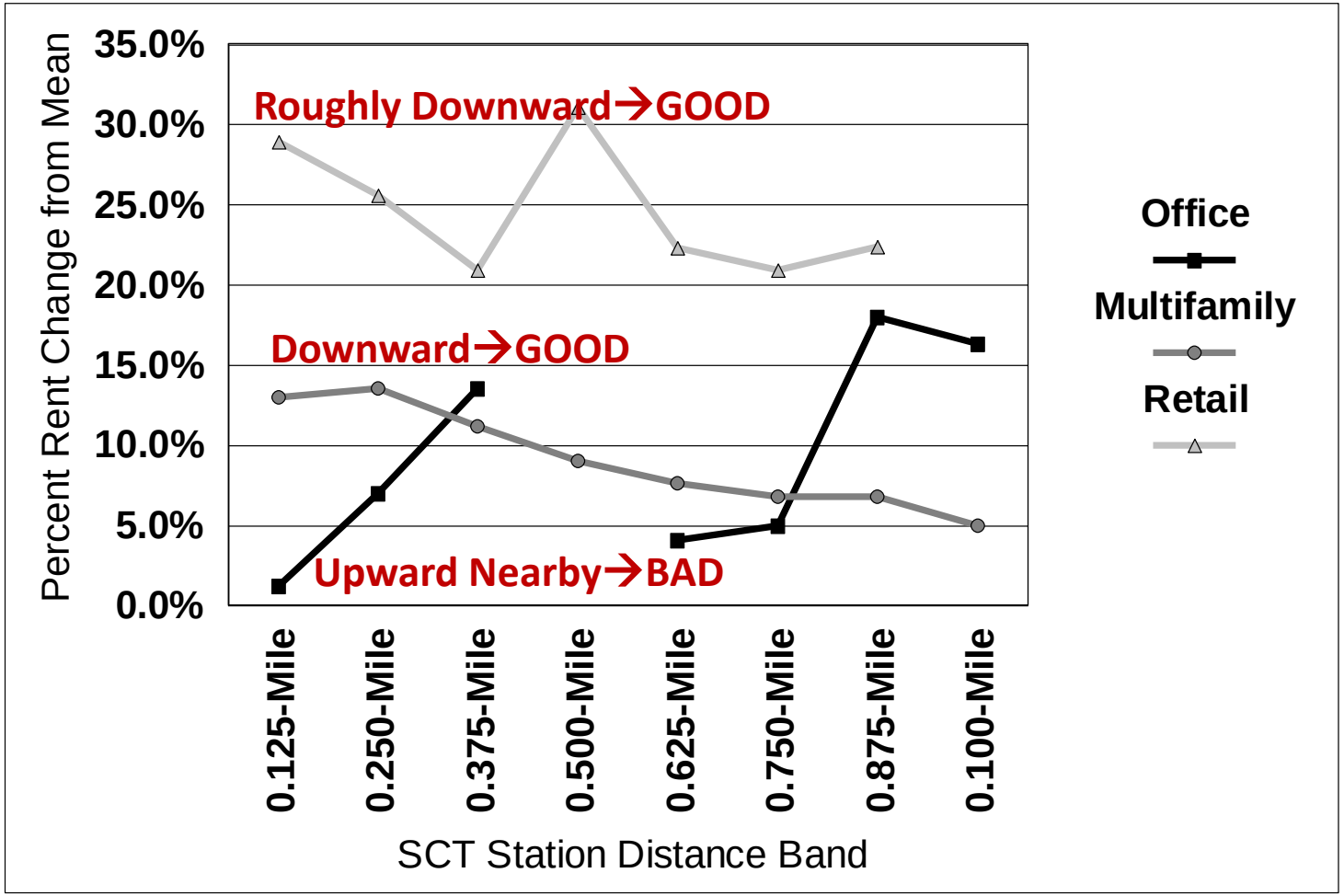


This is **BAD** because the market values station proximity close to stations as an **externality** before station amenity effects are revealed.

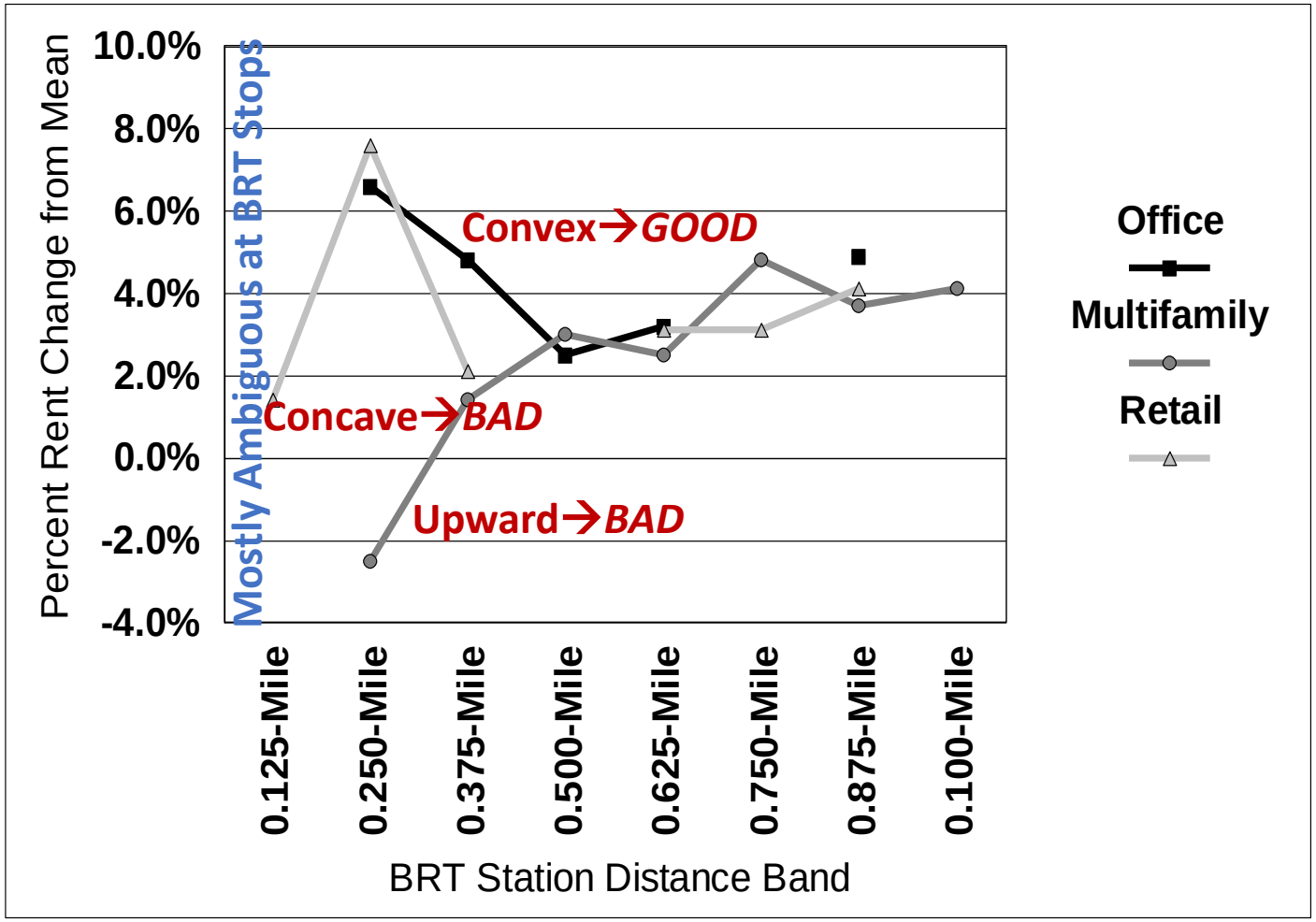
The effect of transit station proximity on real estate rents—*Results for LRT*



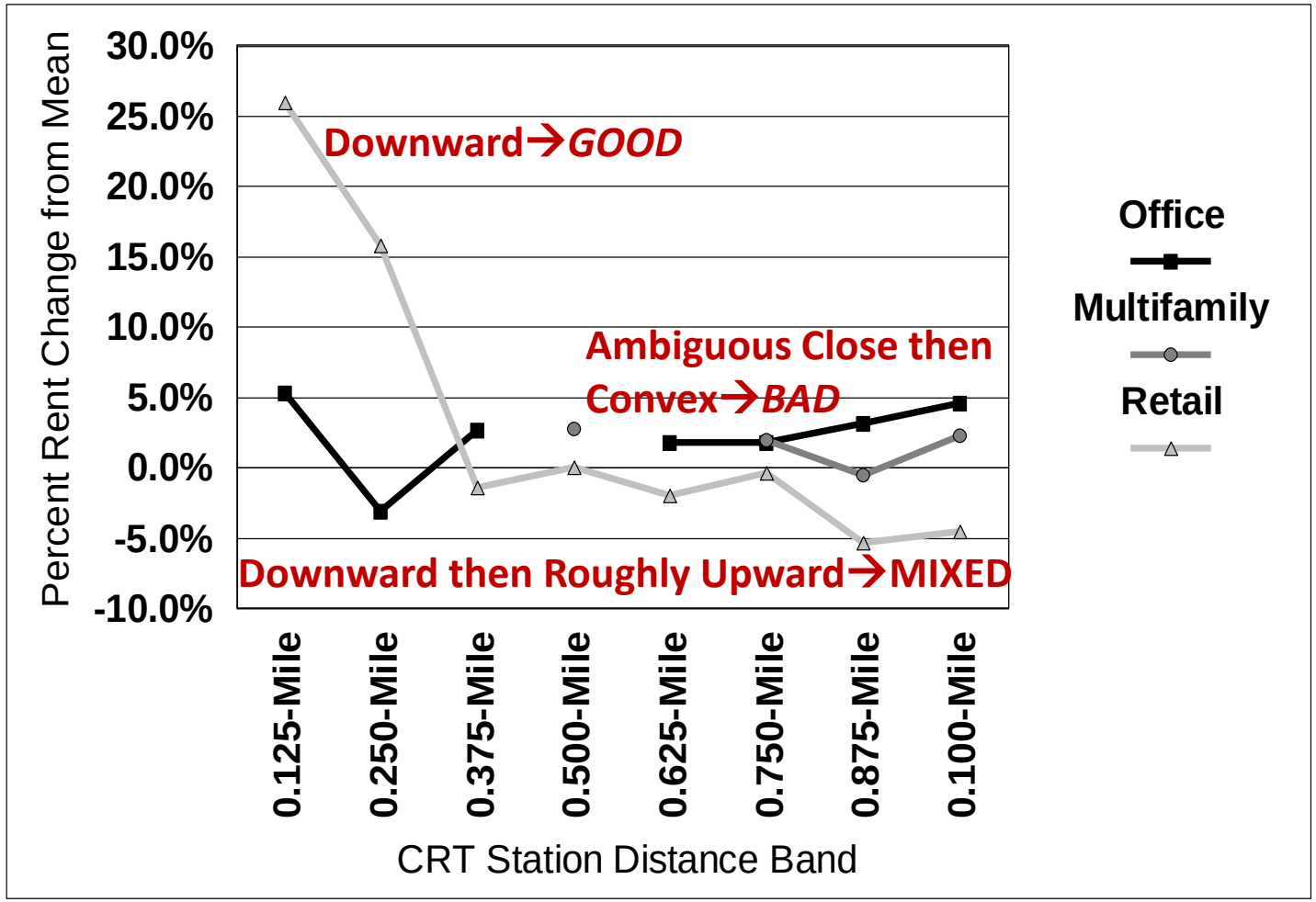
The effect of transit station proximity on real estate rents—*Results for SCT*



The effect of transit station proximity on real estate rents—*Results for BRT*



The effect of transit station proximity on real estate rents—*Results for CRT*



The effect of transit station proximity on real estate rents

Implications for Transit and Land Use Planning

The real estate market is a good indicator of measuring the extent to which transit station planning, location, design and other factors will be **effective** in influencing land use patterns in desirable ways.

Future station planning can use our results to **improve** outcomes.

Existing station performance may be **informed** by our analysis of real estate rent outcomes.

Overall Implications for Transit and Land Use Planning

Place matters →

Land use mix and mobility richness **improves transit outcomes** with respect to attracting jobs and people, and elevating real estate value.

Overall Implications for Transit and Land Use Planning

Economic Group Matters →

Change in jobs by economic groups varies by:

Place Typology

Transit System Type

Research provides insights into knowing which economic groups to target for station areas

Overall Implications for Transit and Land Use Planning

Demographics matters →

Usual suspect HHs attracted to station areas

Singles and HHs without children

Overlooked opportunity to meet the demand for HHs with children

Some metros attract more HHs w/children than other types

Rethink demographic assumptions because many are wrong

Considerable variation by Place Typology and system.

Overall Implications for Transit and Land Use Planning

Real Estate Rent matters →

Evaluating the **relationship between** real estate rents and key factors especially Place Typology and transit station distance can tell us:

How different kinds of real estate are **attracted to or repelled** by transit systems;

The extent to which stations are **amenities** that attract jobs and people; and

The extent to which station-based **externalities** repel markets and by implication jobs and people.

Final Report Available in April at

https://nitc.trec.pdx.edu/research/project/1253

Questions/Comments/Insights?

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