The Price of Transit:

How Does Transit Affect or Gentrify the Communities that We Live in

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Abstract

The impacts that three different forms of permanent transit infrastructure have on the gentrification of neighboring communities were measured in terms of the change in the racial-ethnic composition, median income, and property values within the neighborhood. Stations along the Green Line LRT line in Saint Paul, the A-Line BRT line, and the KC Streetcar and the areas within an eighth of a mile surrounding them were compared to areas around control points nearby. Race was seen to have a minimal change in all cases and did not function as an indicator of gentrification within the study. Both BRT and LRT increased median household income and median property value at a greater rate than in the areas near the control points in Saint Paul. The area around KC Streetcar Line had a lower rate of increase in both median household income and median property value than around the control points in KC. The study found that in less developed areas transit induced gentrification was not dependent on mode, and that in downtown areas transit indeed gentrification may be mitigated near the stations due to property values and incomes already being higher for residents nearby. However, this gentrification may affect communities in less developed nearby neighborhoods within the downtown center.

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Introduction

Public transport infrastructure projects have seen a massive surge in popularity over the most recent decades, in the form of Light Rail Transit (LRT), and more recently in the form of Bus Rapid Transit (BRT) and Modern Streetcar lines. These projects are used mainly as a form of economic redevelopment within certain areas as well as a way of providing low-income and middle-class workers with an additional method of transportation. Stations of these lines are thought to create localized jobs around them, promote development in those areas which may have previously been dying, and reduce traffic from commuters along the route. Economic development may be a double-edged sword, however, as rising costs and rents may force current residents out in a process called gentrification, and many people have raised concerns about how transit may impact the surrounding neighborhoods.

This paper examines the impacts that the implementation of three different forms of permanent transit infrastructure has on the gentrification of neighboring communities in terms of the change in the racial-ethnic composition, median income, and property values within the neighborhood. This study is focused specifically primarily on the Minneapolis-Saint Paul Metro Area (MSP) to allow for the macroeconomic strength of the region to not have as large of an effect on the results, as is seen within nationwide studies. If existing data is not available for MSP, similar cities were looked at such as Milwaukee, Kansas City, and Denver

Literature Review

Historical Context

Historically, the streetcar served as a major form of transportation within urban areas from the late nineteenth to the early twentieth centuries. This initial form of multi-person transportation helped to create dedicated commercial and residential zones (Tehrani 4). Streetcar companies sought to build these streetcars initially as a way to improve property rates and density in areas that their other businesses served, creating more demand for utilities instead of attempting to profit off of the fares for the streetcars (King and Fischer 383). Modern streetcars, although publicly-owned, function under a similar purpose as they do not serve to recoup costs through their ticket fares, but through the resulting increase in property value along their lines.

Even though now public transport is used by urban planners to foster the creation of dense self-sufficient areas, prior to WWII the streetcar systems fostered the creation of suburbs. These "Streetcar Suburbs," a term coined by Sam Bass Warner in his book of that title, were the first movement towards the urban sprawl that is seen around many central business districts. The suburbs were one of the first instances of the usage of transit to collaborate with real estate development, creating a two-part city: "a city of work separated from a city of homes"(Warner 4).

As streetcars began to lose favor during WWII, many of the existing private companies declared bankruptcy as they faced rising competition from widespread automobile use and lost favor with many local governments, alongside dealing with the aftermaths of the Great

Depression. After the 1960s, nearly all of the streetcar lines were torn up and replaced with roads, indicating the cultural shift to the usage of the automobile. (Dittmar and Ohland 45).

In the 1980s, many metropolitan areas were dealing with skyrocketing traffic along primary roads and began to reinvest in public transportation, beginning with the systems in New York, DC, and Boston. As time went on many of the other urban areas began to put money and propositions forward for new rail, bus, and streetcar lines that would go alongside commonly used corridors. This infrastructure was made for a secondary reason as well. The local governments believed that by implementing different forms of semi-permanent public transportation, they would be able to see a boost in property values, demand, and inevitably tax revenue around these stations, similar to what was seen along with the privately-owned streetcar lines around the turn of the century.

Transit Types

Modern-day urban mass transit investments can be commonly separated into the three categories of Light Rail Transit, Bus Rapid Transit, and the Modern Streetcar.[1] Generally, LRT spans longer distances, has its own right of way, and operates on rails. BRT lines will often switch on and off of a dedicated right of way, requires minimal infrastructure to be set up, and range over a variety of distances, providing the services that a bus would but more often. The

[1] These three options were recently considered for the Riverview Corridor transit project in Minneapolis-Saint Paul, where the Metropolitan Council decide that a modern streetcar would be the best option due to it using the same right of way as other motor vehicles, and thus not requiring an expansion of the existing

modern streetcar typically is found within the central business district and commercial areas and spans short distances.[2]

Light Rail Transit, otherwise known as LRT[3], came into the public eye under that name around 1978. In this year the Transportation Research Board defined it as "a metropolitan electric railway system characterized by its ability to operate single cars or short trains along exclusive rights-of-way at ground level, on aerial structures, in subways or, occasionally, in streets, and to board and discharge passengers at the track or car-floor level" (?). This definition allows the term Light Rail Transit to cover a wide range of trams, trains, and metro systems while being extremely vague as to the exact definition. However, this vague definition also helps to present the way in which LRT works as a form of multi-use transportation(Der Bijl)

Bus Rapid Transit, or BRT[4], has recently become more popular within the United States due to its success within many areas of South America. Touted as a rail-like service on rubber tires, BRT attempts to take the place of LRT in areas where it would commonly be used, due to its ability to be much cheaper and use more of the existing infrastructure than both LRT and the modern streetcar. However, there has been very little research on whether BRT has the same effects on the surrounding communities as LRT and on its overall effectiveness at gaining funding and transportation of people.

The modern streetcar has come into favor more recently and serves a slightly different purpose than both BRT and LRT. These streetcar systems are shorter than either of the others, as

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[2] Streetcar systems have been implemented in a number of cities, including Milwaukee, Kansas City, Seattle, Atlanta, and Portland.
[3] LRT systems have been implemented in Minneapolis-Saint Paul, Seattle, Philadelphia, Houston, Denver, and Dallas, and in a number of other metropolitan areas.
[4] BRT systems have been implemented in a number of cities, including Minneapolis-Saint Paul, Kansas City, Reno, and Boston.

they are around 10 km in length, and exist primarily in the downtown area of the central business district, making frequent stops. Additionally, many times streetcars will lack a dedicated right of way, slowing them down to the pace of traffic on the road that it sits on. These are sometimes themed to appeal to the historical nature of their predecessors and other times follow a more modern style, looking like a one-car light rail system (King and Fischer 383). Due to their small size, short range, and low speeds, King and Fischer argue that "Streetcars, as currently practiced in the United States, act as desirable amenities more than meaningful transit improvements"(King and Fischer 389). This suggests that Streetcars work similarly to their earlier counterparts, increasing rents and demand for services around them

TOD vs. TAD

Areas around transit stations can be classified in three ways: either as a Transit Oriented Development (TOD), a Transit Adjacent Development (TAD), or a hybrid of the two. These different classifications allow for specific differences in demographics to be highlighted due to each attracting different sorts of renters.

TODs focus on creating a full community that surrounds the station that allows residents to be primarily reliant on transportation. This involves creating a mix of retail, residential, office, commercial, and public use into a livable, walkable environment. These areas require a higher density of both businesses and residential developments and typically follow a pedestrian-friendly grid pattern, making it convenient for residents to walk, bike, or use public transit (Ewing and Renne 4). Currently, only portions of the MSP LRT lines closer to the downtown area of Minneapolis have developments that function as effective TODs.

The term TAD is commonly used as a comparison to a TOD. Where a TOD promotes transit usage due to density, TADs designate an area where there is access to transit nearby; however, the area is not dense, pedestrian-friendly, or mixed-use. This type of area instead promotes transit as much more of an amenity than an everyday service, as cars are almost necessary to get goods and to provide transportation to work (Ewing and Renne 4).

There have been many attempts to provide a quantitative analysis of the ratio of TADs to TODs using different definitions. In their article, Ewing and Renne suggest a three-point system utilizes the following traits: greater than thirty jobs or residents per gross acre, not having 100% of land uses as either residential or commercial, average block size less than 6.5 acres, each equal one point Under this classification method only 37.3 % of transit development areas classified as a TOD and 30% were classified as a Hybrid Development (Ewing and Renne 7). This lack of effective land use around transit stations is shown on another occasion as two-thirds of fixed-route transportation fails to meet a density of at least eight units per acre (Renne et al 331).

TODs also showcase a significant difference from TADs in the terms of the demographics of their renters and property owners. On average, residents had half the level of vehicle ownership, made $17,000 less per year, and were much more likely to be renters. The lower-income is counterbalanced by the lower cost of transportation around TODs, resulting in a similar amount of money being spent on housing and rent within both types of development((Ewing and Renne ix). Additionally, people living within TODs tend to have views that align

with the promotion of transit ridership, New Urbanism[5], and smart growth movements (Dittmar and Ohland 6).

Even with a large number of Transit Oriented Developments, many of them fall short of moving permanently towards a public transit based future. Many projects will include details that would be unnecessary if a partial switch to public transit were expected, such as parking lots that adhere to standard parking ratios. The developments also tend to lack all the different necessary forms of retail, instead focusing on what is demanded by the market at the time, a fact which is reflected in the target age and income demographics that the developments are marketed to.(Dittmar and Ohland 7)

Gentrification Definition

The word "gentrification" has proved to be a challenge for many researchers to define both as a concept and as a qualitative measuring tool. The first usage of the term gentrification was by a British sociologist named Ruth Glass in 1964 within her book *London: Aspects of Change*, describing how "one by one, many of the working class quarters of London have been invaded by the middle classes-upper and lower'' and the way in which the working class was then displaced from those neighbourhoods.

Other papers present a more holistic approach as they define the multiple facets of it. Shadi Tehrani and her colleagues present gentrification under four defining factors: "(1) capital reinvestment; (2) social upgrading of locale by incoming high-income groups; (3) landscape

[5] New Urbanism is a planning and development approach based on the principles of how cities and towns had been built for the last several centuries: walkable blocks and streets, housing and shopping in close proximity, and accessible public spaces. In other words: New Urbanism focuses on human-scaled urban design (Summers).

change; and (4) direct or indirect (exclusionary) displacement of low-income groups" (Tehrani (6). Although this definition focuses mainly on the wealth and capital changes within a neighborhood, other papers focus on the education, age, and career choices of the contributors. Marcuse defines gentrification similar to the latter papers, describing gentrification as a process when younger professional white workers with higher education displace low-income older minority residents (Marcuse 1985, 198–99).

Although gentrification can be difficult to quantify, many studies have attempted to do so. Some studies have used changes in the income, property values, rate of new construction, and educational levels of the neighborhoods around a transit station. In some cases, research focused on the change in the racial composition and poverty levels before and after a permanent transit stop was implemented nearby (Tehrani 7). Other studies have focused on the occupational change within the neighborhoods as an indicator of gentrification, as new residents will likely have a more well paying or professional job that existing residents in neighborhoods that gentrification is taking place

For the purposes of this paper, gentrification is defined as a process of neighborhood change that is tied to a shift in the racial and economic compositions of a neighborhood coupled with residential displacement.

Gentrification Additional Impacts

A study of gentrification is important primarily due to the effects that the process will have on existing residents and the surrounding community. Gentrification is seen to cause a greater extent of social mixing and an increase in social capital, leading to an increase in public

investment and diversity as well as increasing land value for existing residents. This benefit, however, does not have a positive effect on residents if the existing ones do not own their property, as increasing property values and rents can cause evictions of the existing residents (Tehrani 7).

The same concept of gentrification being beneficial to some residents is seen within their health. Tehrani posits the idea that "while gentrification does have a marginal effect improving self-rated health for neighborhood residents overall, it leads to worse health outcomes for African Americans"(9). These issues stem from the increased stress caused by both cultural and residential displacement, resulting in psychological distress. Displaced residents may also lose access to food, shelter, and medical care, leading to decreased health and feelings of disenfranchisement (Tehrani 10). In Minneapolis-Saint Paul, where a ⅛ of the population is african american, it is important to prevent gentrification due to the large percentage of the population that may have their health affected negatively affected by it.

Transit-Induced Gentrification

The impact that public transportation and specifically LRT has on the gentrification of surrounding communities is inconsistent when looking at the national scale. Although certain studies view the gentrification of communities due to transit as a commonly known fact, others view the overall concept much more skeptically. According to a study done by Baker and Lee: "An analysis of UA-specific[6] impacts gives a complicated story of possible (counter-) gentrification and TOD related changes, implying that the impacts of LRT stations can vary depending on local and regional contexts and planning efforts"(46).

[6] An urbanized area (UA) consists of densely settled territory that contains 50,000 or more people.

A study done within LA county on BRT found that adjacent areas had an increase in educational attainment, home values, and median rents. However, the racial composition of the neighborhood stayed relatively static. This suggests that in some cases, gentrification may be racially and ethnically independent, meaning that a white neighborhood of the same socio-economic status will gentrify at the same rate (Brown 1).

An explanation for the inconsistency of transit induced gentrification is provided by Brown as well. Brown suggests that "while not all rail-adjacent areas gentrify, they may be "particularly susceptible to gentrification" because of the improved access and mobility that rail provides" (2). Additionally, according to Chapple, neighborhoods experiencing gentrification are "nearly twice as likely to be located within one-half mile of transit than any other kind of neighborhood" (1). This means that the Metropolitan Council may be fostering gentrification within its transit plans for MSP in its Thrive MSP 2040 plan.[7] To mitigate this the Metropolitan Council hopes to support more affordable housing along the lines, but this may not be enough to offset the gentrification caused.

In the cases where gentrification takes place around TODs, it can be attributed to a "back-to-the-city" wave of high income households that is caused by the increased accessibility from public transportation (Tehrani 6). As these waves happen, the failures of the market to provide new housing will lead to a rapid increase in prices. As demand increases, the amount of affordable housing decreases, causing the subsequent gentrification (831).

As the income of residents increases, the rate of car ownership will also increase, decreasing the necessity of the transit fixtures. As an urban area gentrifies and the existing

[7]https://metrocouncil.org/Planning/Publications-And-Resources/Thrive-MSP-2040-Plan-(1)/ThriveMSP2040.aspx

residents are pushed out of transit-rich neighborhoods into the suburbs, many of them lose access to the transportation that they were using prior (Wang and Woo 2).

Gap

Although research has been done on the impacts of Light Rail Transit on surrounding neighborhoods, very little research has been done on the effects of bus rapid transit over time and even less research is present on the modern effects of the streetcar. Much of the research also hinges on nationwide data which may skew towards a lack of support for the presence of gentrification due to overall socioeconomic climate varying from city to city. By focusing my research on the Minneapolis-Saint Paul metropolitan area (MSP) and similar metro areas, I am hoping to examine an area that has a strong current economic growth rate as well as a slowly growing interest in permanent public transit features.

My gap in research is a comparison of the three notated types of permanent public transit installations, looking into the effect that it has on the local racial composition, median household incomes, and property values of surrounding neighborhoods specifically within MSP and Kansas City.

Method

An examination of the percent change in racial composition, median household income, and property values is used to determine whether gentrification is taking place. Racial composition and median income will assist in determining whether there is a change in the

residents of neighborhoods due to residents leaving. An increase in property values is assessed to determine if the increase may have been a factor in provoking the withdrawal of existing residents from the neighborhood.

This study utilizes publically available geospatial data for the accumulation of numbers for property value, racial composition, and median income over time. Property value data is commonly included within property tax records which are publically available and have been acquired through local governments. The racial composition has been acquired through a combination of census data and the American Community Survey and examining the relative proportion of population during census years for both and using that proportion with the American Community Survey for later years.

Property value data and census data is then inputted into QGIS, a geospatial software program, and is examined in an eighth of a mile diameter around each stop as well as a series of similar circles placed nearby to the stop as a control. If data was not available for MSP, Kansas City was examined due to the quality of its geospatial data along with its similar economic climate and more established transit network.

Three stations were selected at random for analysis along the Green Line LRT route in Saint Paul, the A Line BRT route in Saint. Paul, and the KC Streetcar line in Kansas City. Control parcels were selected to be half of a mile from the selected station, so as to mitigate the effects that different neighborhoods could have on the housing market.

Findings

Demographic Information in and around Transit Adjacent Neighborhoods

Figure 1 showcases the changes in racial composition within an 1/8th of a mile of either stations or control points in Ramsey County, more specifically Saint Paul, Minnesota. Overall there was not a significant shift in the racial composition within the block groups that were analyzed, except for a small decrease in the Black or African American population, and a similar increase in the Asian American population amongst all of the tested areas.

	Racial Composition by Percent Ramsey County					
	2016			2020		
Race	LRT	BRT	Control	LRT	BRT	Control
White alone	57.37%	82.10%	62.51%	59.54%	84.13%	62.03%
Black or African American alone	19.65%	5.79%	25.51%	16.82%	4.58%	21.26%
American Indian and Alaska Native alone	0.73%	0.12%	1.15%	1.05%	0.65%	0.75%
Asian alone	13.67%	5.17%	8.41%	14.85%	6.40%	10.53%
Some other race alone	2.03%	1.99%	0.50%	1.01%	0.79%	2.49%
Two or more races:	6.55%	4.83%	1.92%	6.66%	3.42%	2.94%
Two races including Some other race	0.91%	0.04%	0.00%	0.07%	0.18%	0.28%
Three or more races	5.64%	4.78%	1.92%	6.59%	3.23%	2.66%

Figure 1: The racial composition of American Communities Survey block groups in Ramsey County, MN that were used as property value samples within the study. Source: 2016-2020 5-Year American Communities Survey.

	Racial Composition By Percent Jackson County, MO			
	2016		2020	
Race	Streetcar	Control	Streetcar	Control
White alone	80.80%	54.71%	82.79%	50.05%
Black or African American alone	10.61%	34.01%	10.93%	38.17%
American Indian and Alaska Native alone	0.69%	0.22%	0.30%	1.12%
Asian alone	2.68%	4.69%	2.42%	7.36%
Some other race alone	0.72%	2.89%	0.32%	0.46%
Two or more races:	3.92%	2.47%	3.24%	2.38%
Two races including Some other race	0.87%	0.00%	0.15%	0.00%
Three or more races	3.04%	2.47%	3.09%	2.38%

Figure 2: The racial composition of American Communities Survey block groups in Jackson County, MO that were used as property value samples within the study. Source: 2016-2020 5-Year American Communities Survey.

The area around the Kansas City Streetcar showcases something slightly more interesting as is shown within Figure 2. The area surrounding the Streetcar in 2016 appeared to have a majority of white residents, while nearly half a mile away from the line there was a much more diverse population. In 2020, the area surrounding the streetcar appeared to get slightly less diverse, especially when compared to the control data which presents an increase in the Black, American Indian, and Asian Communities, suggesting that may have been a shift in the location of inner city residents over the short period of time.

	Median Household Income By Year				
	Ramsey County, MN			Jackson County, MO	
Year	LRT	BRT	Control	Streetcar	Control
2016	$47,019	$67,068	$74,341	$65,752.67	$47,635.50
2020	$57,759	$81,981	$85,372	$67,203.00	$54,493.50
Percent Change	22.84%	22.24%	14.84%	2.21%	14.40%

Figure 3: The median household income of residents within American Communities Survey block groups that were sampled within the study. Source: 2016-2020 5-Year American Communities Survey.

Although changes in the racial background were fairly insignificant, there was a significant change in the median household income as is shown within Figure 3. In Ramsey County, residents in areas neighboring to either LRT stations or BRT stations saw around a 22% increase in the median household income while people living in the block groups surrounding the control points had approximately a 15% increase in the median household income between 2016 and 2020. In Jackson County, the streetcar was seen to have a very different effect on incomes. From 2016 to 2020, the median household income increased by 14% in the control block groups, and by only 2% around the streetcar, showing a significant difference in income change. This information is especially important when viewed with the racial demographic information for the sampled areas in Jackson County. The area surrounding the streetcar that was heavily perceived to be white, saw a stagnation in median household income, suggesting that there was no drive for higher income earners to move in. In the more diverse control area, there was an increase in median income, meaning that there was either a drive for new people to move in at the current rent and property values, or the current residents in 2016 gained more income through promotions or other means.

Changes in Property Values

	Median Property Value By Year				
	Ramsey County, MN			Jackson County, MO	
Year	LRT	BRT	Control	Streetcar	Control
2016	$147,700	$304,850	$162,500	$304,115	$342,100
2020	$191,100	$397,450	$204,600	$464,210	$571,950
Percent Change	29.38%	30.38%	25.91%	52.64%	67.19%

Figure 4: The median household property value of tax parcels that were sampled within the study. Sources: Ramsey County Property Tax and Value Lookup, and Jackson County Parcel Viewer 2020

As is represented within figure 4, LRT and BRT saw a slightly greater increase in median property value along the lines than was present in the control groups. One thing that must be noted is that the median valuation of the BRT properties is nearly twice as much as the median property value for both LRT and the Control set, and thus may have seen a larger increase than would have been predicted for the selection otherwise.

In Jackson County, the streetcar and the control parcels seem to follow a similar pattern to what was seen in the median income, where the area around the streetcar has a smaller median increase in value or income than is seen in the control area.

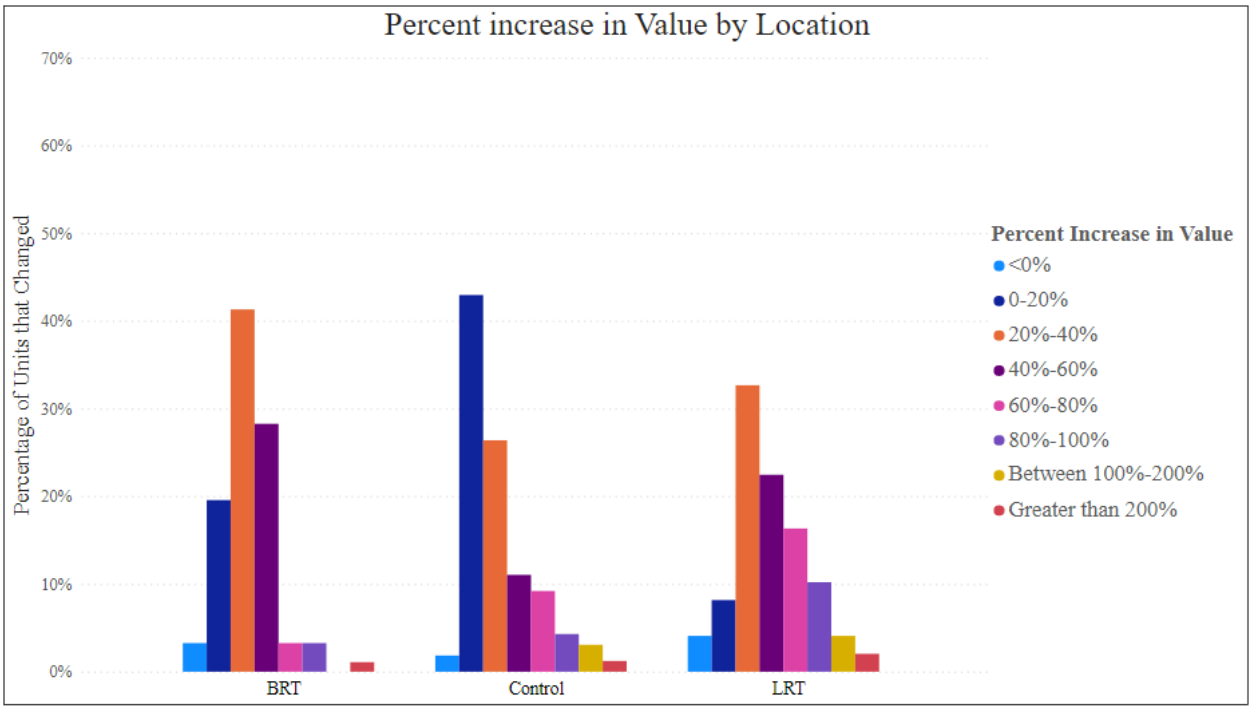


Figure 5: The percent increase in value of parcels in Ramsey County, Minnesota, separated into brackets and shown as a percentage of units that changed at that rate. Sources: Ramsey County Property Tax and Value Lookup,

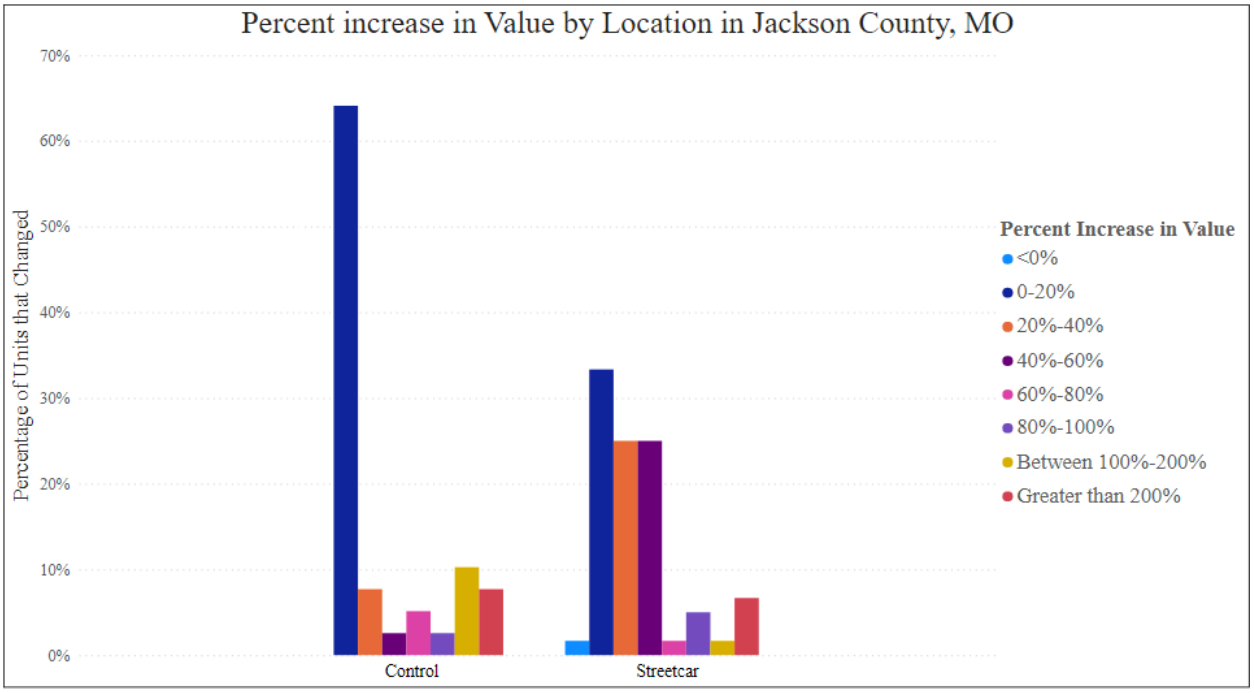


Figure 6: The percent increase in value of parcels in Jackson County, Missouri, separated into brackets and shown as a percentage of units that changed at that rate. Sources: Jackson County Parcel Viewer 2020

Figures 5 and 6 help to represent the individual parcel changes with much less summarization than is shown in Figure 4. Figure 5 may be used to represent how the control group in Ramsey County saw only a 0-20% increase in the majority of the parcels while the majority of parcels around either BRT or LRT stations saw an increase of 20-40%. Additionally, LRT stations have many more properties around them that increase by 60% or higher than can be seen around either BRT station or the control points, potentially implying that new developments are taking place near the stations as that is when larger increases in property values are seen.

Figure 6 shows how the changes in property value varied quite a bit between the two samples. Although the properties surrounding the control point saw a higher median income increase in general, the area primarily increased in value by 0-20%, with the next largest brackets being 100%-200% and greater than 200%. The area along the streetcar saw a much more normal distribution of property value increases. Similar to what was seen around the LRT stations but to a greater extent, the control area appears to be experiencing a multitude of new developments.

Discussion of Results

The changes that can be seen over time in both Ramsey County, MN and Jackson County, MO, suggest that gentrification depends much more heavily on the neighborhood that the lines are present in. Additionally, it appears that there is very little change in the overall racial composition amongst all the block groups that were surveyed, which provides evidence for the fact gentrifying neighborhoods may not change in their racial composition in all cases, as was also found in *Rubber Tires for Residents* by Anne Brown (9). This factor may mean that a change in other socioeconomic factors within a neighborhood, such as the median household income, educational attainment, and property values will be more effective at showcasing whether a neighborhood is currently experiencing gentrification.

When examining the data within Ramsey County, a connection can be drawn between the changes in median household income and the changes in median property value. Areas that were near either LRT or BRT line stations saw a larger increase in both sections than the control group, suggesting that neighborhood change is not modally-independent. Additionally, the beginnings of a change in the racial compositions of the studied areas may be perceived;

however a larger sample size over a larger set of years must be used to determine if this is a trend or a coincidence. The results support a conclusion that both BRT and LRT adjacent communities saw a degree of gentrification taking place.

Within Kansas City a similar connection between median income and property value may be seen; in this instance the area near the control points saw a larger percent increase than was found in the transit adjacent neighborhood. This pattern is consistent with what was stated earlier within the results: that the streetcar was placed in an area that had already been fully developed, and thus lacked the ability to see the magnitude of the effect of the streetcar, and thus a larger impact took place on the nearby control points.

Error and Options for Expansion

Within the study, there were many instances where error could have taken place, the largest source of which being the overall economic conditions within the tested areas. Prior to the development of the Green Line LRT, the area around University Avenue, which the line goes down, had much lower property values and had primarily commercial developments directly along the collector road. In contrast, the A Line BRT when it was introduced was in an area with a higher median property value and is composed mainly of residential single family homes. Control points were collected from nearby to both areas and served to encompass the range of economic conditions.

In Kansas City, this error is much more prevalent than in Ramsey County, as the streetcar runs through a downtown neighborhood and thus there are many more properties that are worth multiple millions of dollars. The proximity of the control points does not alleviate the error, as

the position of the streetcar down Main Street means that the area was already much more developed than the surrounding areas. This then focused gentrification into the control area as it was much cheaper to redevelop that land.

Although the usage of individual parcels was effective at retrieving a look at the range of changes that impacted the properties, it also created issues when compared to American Communities Survey Data due to the ACS parcels taking up a larger area than the selected parcels. Thus it may have not accurately represented the true residents of the sampled parcels. This also comes into play as areas around transit tend to involve rented properties, so an analysis of median rents may have yielded a more accurate interpretation of the impact of the transit on residents. Additionally the examined time frame may not showcase the true overall changes in the neighborhood that would result from the transit.

Error within the sources of the data must also be accounted for. The tax evaluations which were used to get the property value of the parcel are only estimates of what the property is worth and are made by county tax assessors. American Communities Survey data is created based on predictions and small survey groups and thus may have some error within it at a larger scale than would be seen in the Decennial Census. A study that incorporated a longer time frame after the market had finished shifting to accommodate the transit may have been able to mitigate this error.

With a larger budget, more time, or more access to data, this study could be expanded to encompass either a nationwide scope, and include factors such as educational attainment and rent values, which were not analyzed in this study. Additionally, if the project is scaled up, a larger range of areas would be analyzed around each station and selected areas would be categorized

based on the distance of the ACS block group from the stations or control points, so as to remove the error that came from using two different sources of data. The error would also be further mitigated by utilizing the American Communities Survey for the acquisition of median property values and this change would also make the expansion of the survey significantly easier.

Conclusion

Gentrification within lower density neighborhoods was seen to take place within an ⅛ of a mile around both LRT and BRT stations without dependency on the mode of transport within Ramsey County as was shown by the changes in median property values and median income. The racial composition of the communities studied did not vary significantly between the tested years, suggesting that racial-ethnic change is a less significant indicator of gentrification. Data concerning Kansas City and the KC streetcar was shown to represent a different sort neighborhood than was tested in Ramsey County, and thus the properties around the streetcar saw a smaller increase in median household income and property values than the control points, suggesting that gentrification was taking place outside of the area directly adjacent to the streetcar.

In potentially gentrifying neighborhoods, it is important for current residents to be protected from the negative effects that increasing housing costs and rents could have on them, as it can have negative effects on the neighborhood and the health of residents. Local governments must work to either provide affordable housing for lower income residents within the neighborhood, or prevent areas of development to preserve existing affordable

neighborhoods, both adjacent to BRT and LRT stations, and within the surrounding larger neighborhoods.

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