

FINAL PROJECT

Motown Mo' Buses!

Effects of Historic Redlining on Transit Access and Employment in Motown

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Introduction

This project examines how 20th-century redlining and racially discriminatory urban policy continues to shape economic opportunity and transit access in Detroit. In particular, it focuses on how disinvestment in public transit systems has left residents in the urban core—now more than 80% black—cut off from jobs that have shifted to suburban areas.

As of 2024, Detroit remains the largest U.S. metro area without a functional regional transit system. The implications are far-reaching: transportation insecurity is linked to poor physical and mental health outcomes, while limited access to employment reinforces economic disadvantage. These inequalities are reflected in measurable disparities in income, commute burden, and overall health.

Historical Context: The Redlined Motor City

Nicknamed “The Motor City,” Detroit has a long history of car manufacturing and was once a pioneer in public transportation, becoming the first major city to operate its own transit system. Today, riders face unreliable service and disconnected routes. By the summer of 2024, nearly one-third of Detroit’s buses were out of service due to repair needs. So, how did a once thriving transportation city unravel?

Growing automotive manufacturing plants capitalized on car-centered momentum residual after WWII, and by the 1950s, Chrysler, General Motors, and Ford were the three largest corporations in the country, all with major plants in Detroit. The city became a center of upward mobility, but this golden age came to a crash in 1956 with the decline of the “Big 3” automotive companies. New plants were built in the suburbs where land was cheaper, and jobs shifted with this trend. Those who could afford to follow the work did. Those who couldn’t—primarily black residents locked into disinvested neighborhoods by the HOLC’s redlining practices in the 1930s—were left behind.

Segregated by design and increasingly cut off from economic opportunity, black residents faced police brutality, job discrimination, and shrinking public services. In 1967, Detroit’s transportation network was split between two agencies: DDOT and SMART.



However, hopes for a connected regional system were undermined by a law passed a few years earlier in 1963. Michigan Public Act 55 allowed suburban municipalities to opt out of funding or participating in Detroit's transit system.¹ Now, over 50 municipalities have opted out despite being major hubs for employment, leaving urban Detroiters without reliable access to places where jobs, resources, and opportunity now live.

The following plots illustrate the enduring impact of historical redlining on Detroit's racial geography. Figure 1 displays HOLC redlining indicators: a score of 4 corresponds to a "D" rating, an area deemed riskiest for investment. A score of 1 reflects an "A" ranking, considered safe. Noted in the choropleth, the urban core of Detroit received the most severe redlining designations compared to its surrounding areas.

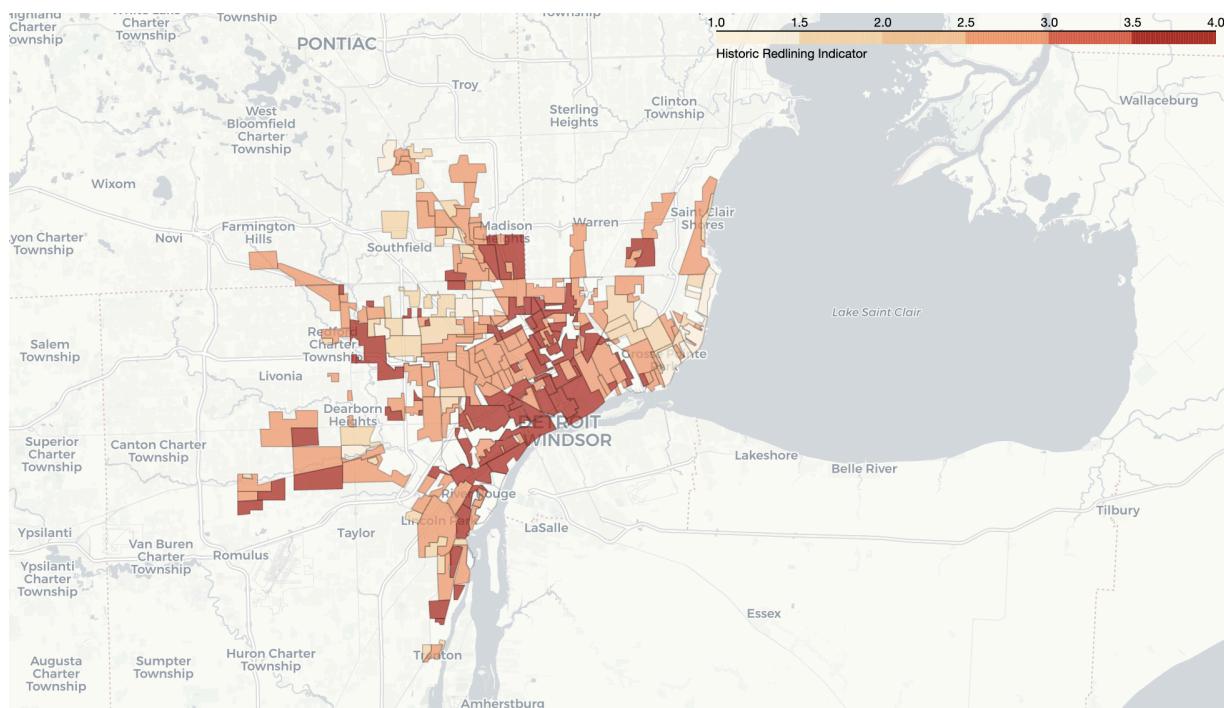


Figure 1: HOLC Redlining Indicator in Detroit (Izzy Prager)

Redlining policies in the 1930s disproportionately targeted black neighborhoods, assigning them low ratings that discouraged development and triggered cyclical disinvestment. The legacy from these policies carries over to modern-day segregation. Figure 2 highlights this stark racial demographic divide—Detroit's urban core is over 80% black in almost all areas, while surrounding suburbs are predominately white.



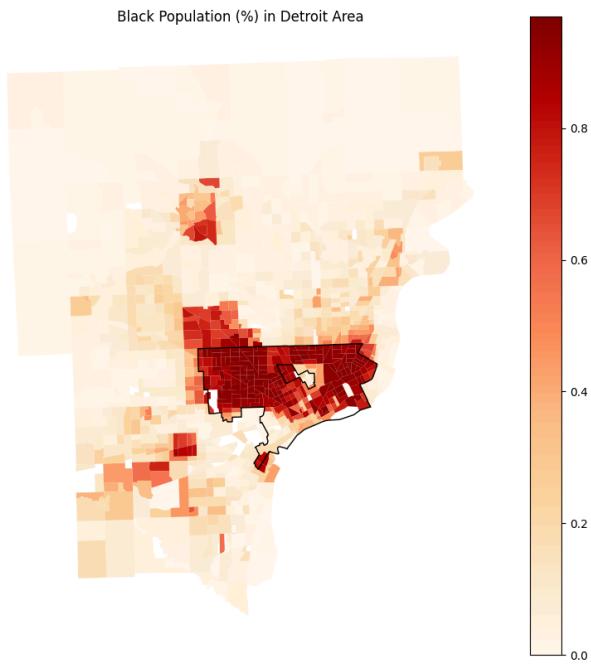


Figure 2: Percent Black Population in Detroit's City Center and Surrounding Suburbs (Extra, Izzy Prager)

Related Works

We situate our research amongst existing surveys and analyses of transportation and racial inequalities in Detroit.

University of Michigan's 2017 DMACS survey reveals that one third of people in Detroit do not have access to a car.² The survey highlights car access correlation with race—40% of black Detroiters do not own a car compared to 21% of white Detroiters.³ DMACS suggests that a lack of car makes transportation unreliable, creating an environment that limits opportunities. A later study examines 2023 DMACS data, finding that those in poverty are more likely to experience Transportation Insecurity (TI) and Detroit's TI rate is higher than the national average.⁴ Furthermore, black people Detroiters are more likely to experience high TI, showing that transportation access affects Detroiters unevenly and reflects historical inequalities.

Transit inequalities are further illustrated in Green (2023), which displays lack of consistent amenities at bus stops, especially evident when comparing with private routes (e.g., the Q-Line which runs through economic and entertainment attractions only).⁵ Thus, bus routes used by the local Detroit population are significantly underfunded and serviced compared to privately-funded lines which serve outside commuters from the suburbs. Beyond car ownership disparities, there are further divides that create obstacles to transportation in Detroit based on socioeconomic status and race.



The Spatial Mismatch Hypothesis, introduced by John Kain in 1968, argues that black workers in inner cities experience disproportionately low employment and earnings due to three key factors: housing discrimination, decentralization of jobs to suburban areas, and inadequate transit options.⁶ Kain's idea, tying factors of redlining to transit access, is key to the design of our study. We examine the current transportation situation in Detroit, a city with a long history of redlining, and explore its relationship to income levels and employment opportunities in Detroit's top industries. Joe Grengs expands this to include car ownership as a key piece of transportation accessibility.⁷ Additionally, a 2016 article by the Michigan Catholic Conference highlights that only 22% of jobs in the Detroit region are reachable by transit within 90 minutes, demonstrating the significant difference in experience that owning a car creates for Detroiters.⁸

The Spatial Mismatch Theory is further highlighted in the RTA's Gap Analysis Report (2022) which claims that low income Detroiters do not have the work experience or educational attainment required by Detroit's major employers, driving them to commute outside of the city. Transportation access makes this a larger problem as finding a transit service with reach to suburban destinations is difficult.⁹

McBride (2018) provides a case study on health implications of transportation in Detroit, but additionally delves into the urban and suburban divide of transit. The paper finds that active transport and long commutes, exacerbated by lack of car ownership, is associated with higher stress and exhaustion, highlighting the broader risks associated with transportation inequalities in Detroit beyond employment opportunities.¹ Another study illustrated the relationship between self-reported commute time to work with health factors such as sleep problems, alcohol use, and smoking.¹⁰ Kistler presents the Conservation of Resources Theory which states that humans have limited energy and emotional reserves, and exerting effort in longer commutes is associated with greater mental strain and burnout.¹¹ These studies contextualize our research to explain how Detroit's transportation network, deeply scarred by historic redlining, contributes to limited employment opportunities and poor health outcomes..

Transit Routes

The 2017 DMACS survey revealed that only 44% of Detroit residents without a car reported being satisfied with city transit, while 61% of residents with a car reported the same.² In addition to variability in getting from one place to another, relying on public transportation in Detroit presents equity concerns in terms of the value of services. Only 4.3% of Detroit bus stops have shelters, displaying a massive service deficiency for Detroit residents that need to rely on public transportation.⁵ Compared to stops like the Q-Line, many public stops that service residents in their daily lives, bringing them to work or appointments, are significantly underfunded and in need of amenities while lines with private funding, out of the reach of many Detroit residents, are the most well-equipped.



Car Ownership

Detroit's infrastructure was designed for cars, yet only 43% of households in the inner city own a vehicle, compared to 96% in surrounding suburbs. In some Detroit tracts, transit access is only 22% as effective as car access, and commutes by transit can take up to four times longer than the same trip by car.⁷ While long-term equity depends on improving transit systems, increasing car access for low income residents may be the most effective short-term strategy for addressing poor employment opportunities in the urban core. Figure 3 is a bivariate choropleth illustrating the overlap between the regional distribution of job opportunities accessible by car and areas of the city with the most limited access to auto-based transport, as measured by the EPA accessibility index. The greatest overlap is concentrated within the inner city; residents living in this area of Detroit are less likely to own a car, yet more likely to depend on car-based transportation for socioeconomic mobility. This systemic barrier, the product of historical redlining and a remnant of discriminatory housing policies, remains deleterious for today's inner city residents.

Spatial Mismatch:
Disparities in Car Ownership
Enforce Inequitable Job Access

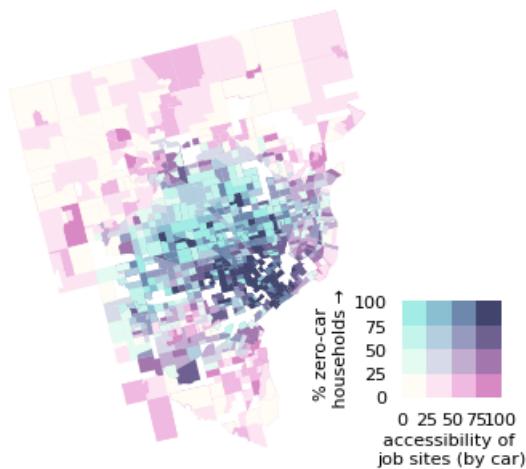


Figure 3: Spatial Mismatch
mapping (Dominic Martinelli)

Employment

Only 61,945 people living within Detroit remain there for work while 173,711 enter Detroit for work. There are additional inequalities based on race within this mismatch as 78% of Detroit is black while only 37% of workers in Detroit are black, illustrating difficulties in opportunity based on demographics.⁵

To access opportunity, the average Detroit resident is dependent on transit opportunities and are vulnerable to unreliable bus stops. Thus, these residents must consider not only if they are qualified for a job, but additionally if they can reliably access



that job based on their transportation needs, further limiting the job pool.⁹ This vulnerability may drive job-seeking Detroiters to accept positions with lower pay than they are qualified for due to this lack of access, crafting systematic inequalities based on transportation.

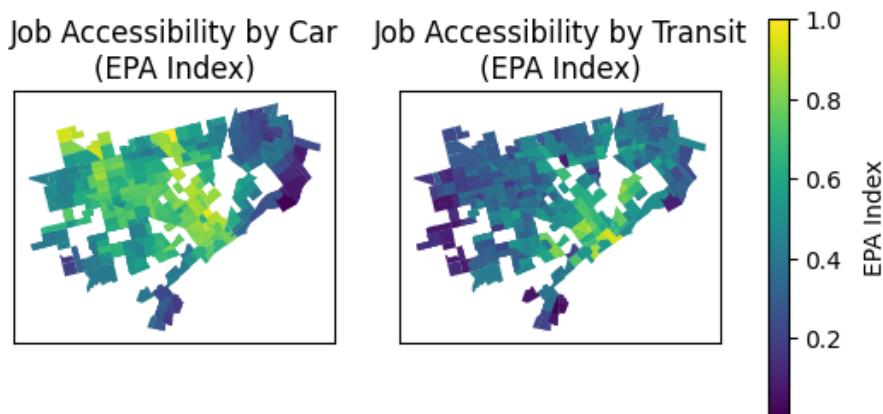


Figure 4: EPA index choropleths (Extra, Dominic Martinelli)

The US EPA developed an “accessibility index” to quantify the ease with which one can access employment opportunities in an area. Detroit’s transportation infrastructure affords broader regional accessibility to car owners, empowering them to pursue employment both at the heart of the city and in the outskirts, just a short drive from the surrounding suburbs. One of the “Detroit 3” automotive corporations, Stellantis, houses its North America Headquarters in this suburban region, offering unique employment opportunities to nearby residents. The other two major corporate entities, Ford and General Motors, have established their headquarters at the core of the city, which is also highly accessible by car. As a consequence, car owners benefit from opportunities across a diversity of sectors and industries, augmenting their economic resiliency.

On the contrary, Detroit residents without access to a personal vehicle are limited to only those opportunities offered within the confines of the inner city. This area is especially affected by the structural injustices of historic redlining that plague the region’s most vulnerable populations. Employers take advantage of the high population density and asymmetry in access to alternative job opportunities to hire a large workforce willing to work for lower wages. The difference in diversity and breadth of job and education opportunities is illustrated in Figure 4; the geospatial limitations of transit-based transportation translate to systematically-reinforced socioeconomic limitations.



Mapping Auto Industry Jobs in Detroit

To better understand the spatial relationship between employment and transportation access, Figure 5 was created to visualize the locations of major automobile companies in Detroit. Given the central role that Ford, GM, and FCA continue to play in the city's economy, business-level data was filtered to display only sites belonging to these "Detroit Three" manufacturers. Each site was plotted using circle markers, where the size of each marker corresponds to the number of employees. This visualization offers a clear picture of how concentrated and unevenly distributed these employment centers are. While many sites are within Detroit's boundaries, a number are located closer to the suburban edges or in areas with limited public transit coverage.

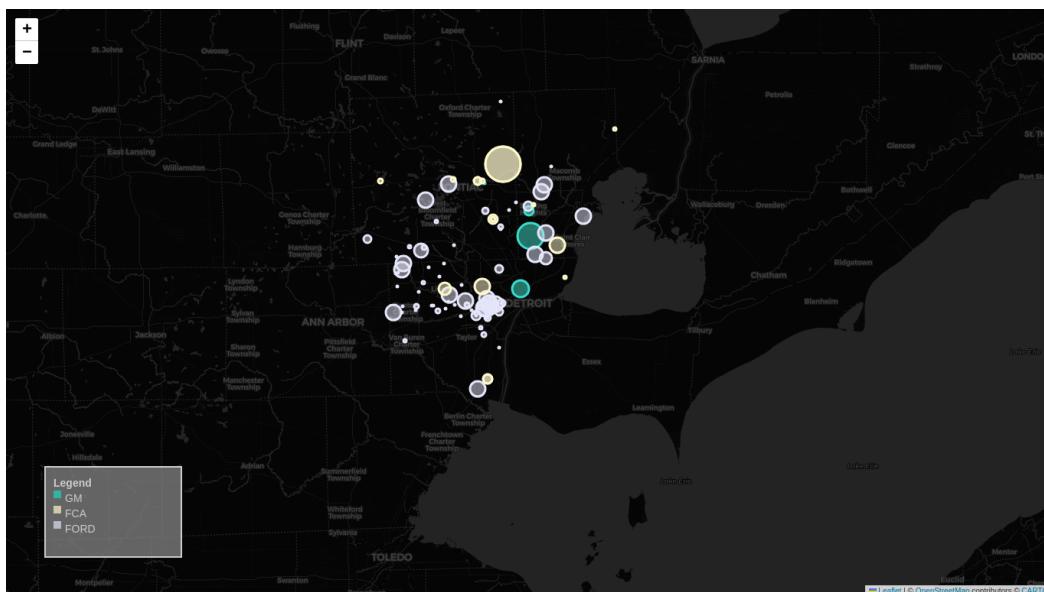


Figure 5: Major Employers in Detroit (Abduljellil Hamid & Dominic Martinelli)

Despite the presence of major employers, structural barriers such as unreliable transit and historic segregation continue to limit access to opportunity. Without significant changes in transportation infrastructure or policies aimed at bridging these divides, Detroiters who rely on public transit will remain disconnected from key sources of employment even in industries that define the city's identity.



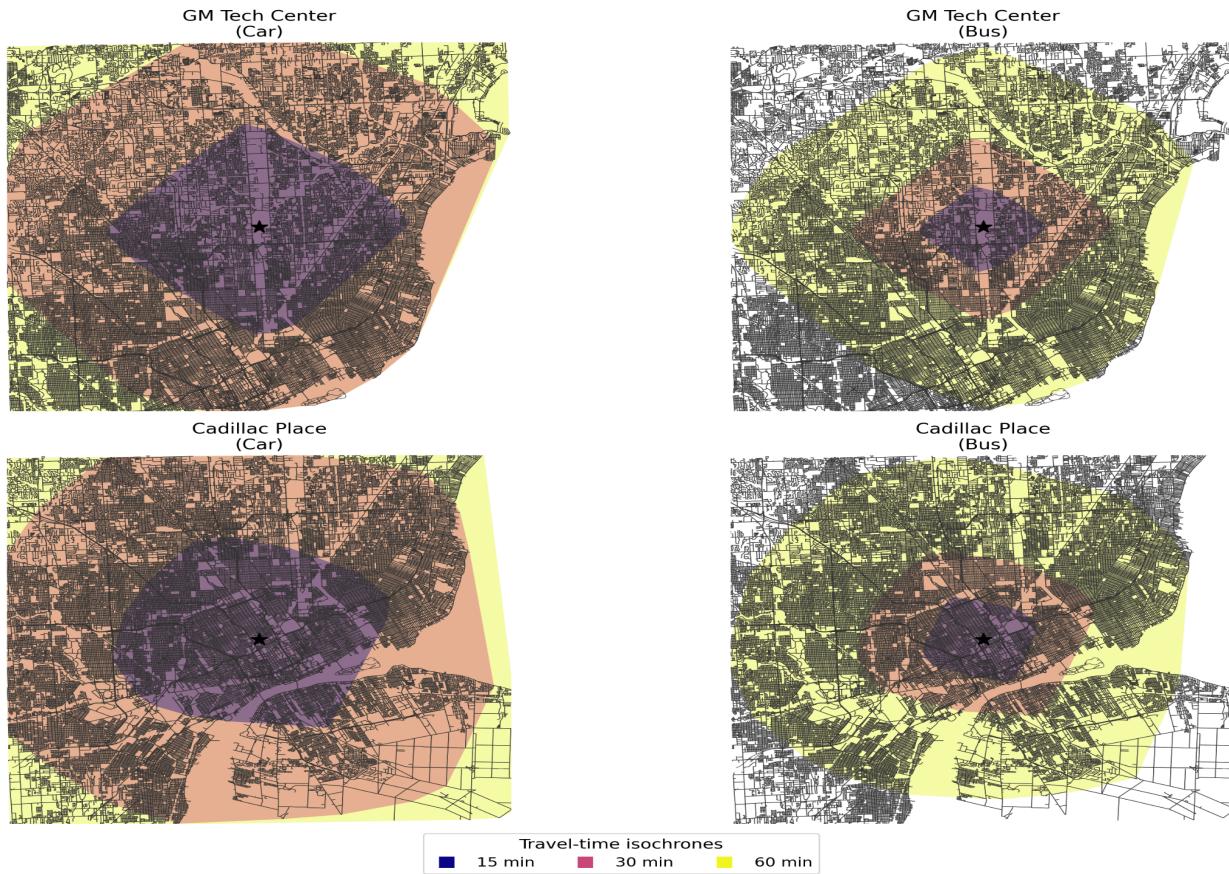


Figure 6: Car vs Bus Travel-time isochrones (Benjamin Perl)

The visualization above juxtaposes travel-time catchment areas around GM's Tech Center (Warren) and Cadillac Place (Detroit) for car and bus travel. Although these employment centers appear geographically accessible, practical transit reach is limited, especially for the suburban Warren site. The bus isochrones assume direct routes and unified service, but in reality, Detroit relies on two separate transit agencies (urban DDOT and suburban SMART), requiring transfers, route detours, and involving uneven headways. This discrepancy between modeled and actual conditions amplifies spatial mismatch and transportation inequity.

Regression Analysis

The top industries in Detroit include automotive manufacturing, tech, healthcare, and finance (*Detroit Data Center / Fastest Growing Industries*, 2022). We used data from the American Community Survey on industry popularity, pulling numbers from manufacturing, healthcare, finance, and technological services employment to represent these top fields.



Multivariable Transportation Analysis

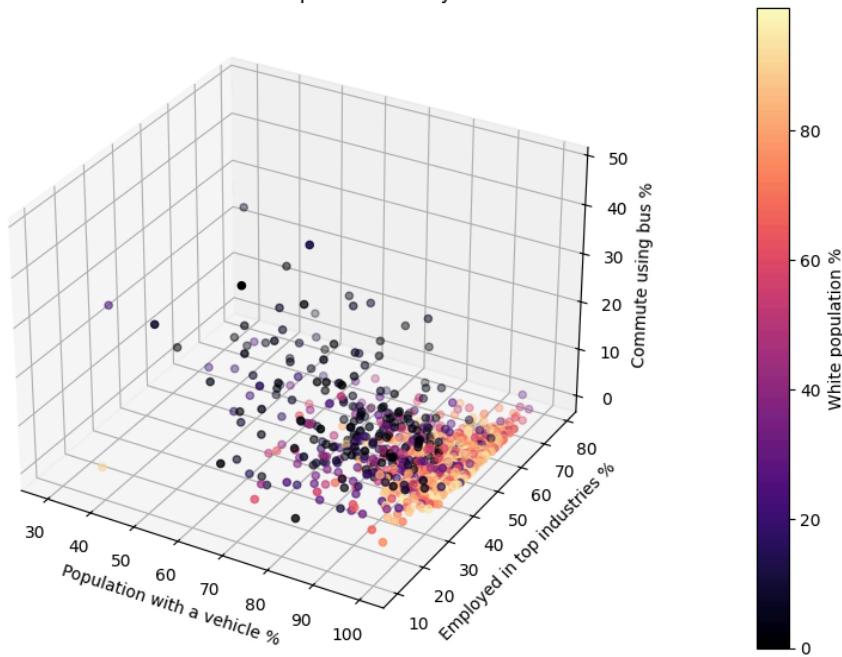


Figure 7: Dimensional Transportation and Employment Scatter Plot (Amelia Garcia)

Linear Regression

Feature	Coefficient - Percent in top industries
Percent white population	+0.02
Percent bus usage for commutes	-0.21
Percent car ownership	+0.2

Figure 8: Linear Regression, Employment (Amelia Garcia)

This regression visualized in Figures 7 and 8 demonstrates that access to cars is tied to higher rates of employment at high-demand industries, compared to use of buses. The model additionally finds that for every 1% increase in the percentage of white populations in Detroit area tracts, there is a 0.02% increase in employment at high-demand industries. The model suggests that car ownership is tied to employment opportunities in Detroit,



whereas transit usage correlates to a decrease in employment opportunity. Therefore, transportation disparities may be a key indicator of access to employment in Detroit.

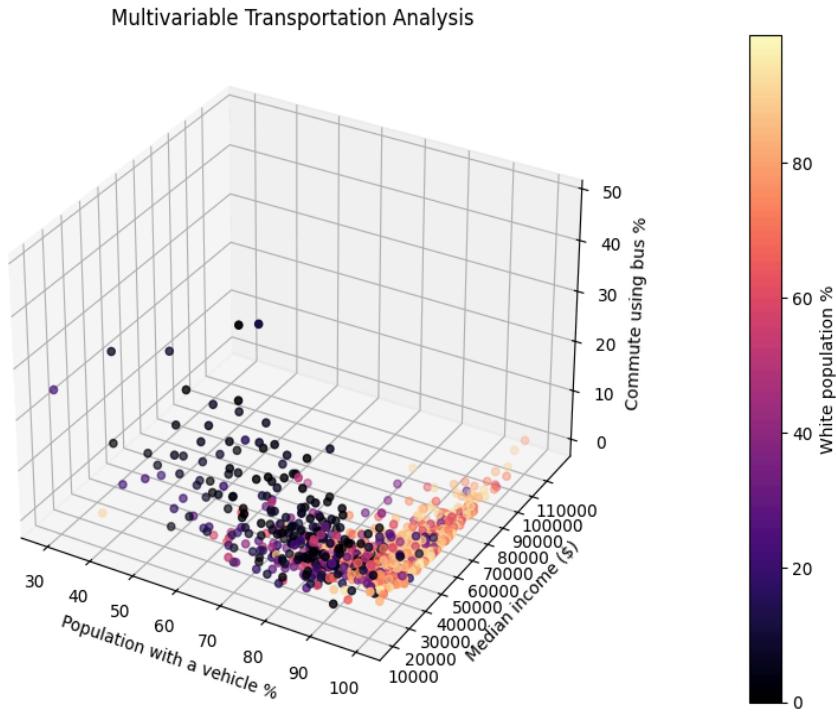


Figure 9: Dimensional Transportation and Income Scatter Plot (Extra, Amelia Garcia)

Linear Regression	
Feature	Coefficient - Median Income (\$)
Percent white population	156
Percent bus usage for commutes	-20.26
Percent car ownership	574.34

Figure 10: Linear Regression, Median Income (Amelia Garcia)

Next, we looked at the relationship between income and transportation, as seen in Figures 9 and 10. When plotted on the same three-dimensional surface with median income, there is a wider array of spread. As seen in Figure 10, linear regression reveals an expected \$574.34 increase in median income for every 1% increase in car ownership. For



every 1% increase in bus ridership, the model expects a \$20.26 decrease. For each 1% increase in white-alone population, the model expects a \$156 increase in median income. Car ownership stands out as having the strongest tie to median income, whereas when looking at employment in top industries, the relationship was more equally invested with bus usage. Tracts in Detroit with greater car ownership exhibit higher median incomes, displaying the advantages of car access in the Motor City. Additionally, white population percentage has a stronger influence on median income than on employment in a high-demand industry, suggesting race could be tied to pay or employment disparities.

Conclusion

Detroit's current transportation landscape is a direct result of historic redlining and segregation. Our analysis reveals that car ownership is strongly correlated with both access to employment in high demand industries and higher median income, while reliance on transit is tied to economic disadvantage. These disparities are not coincidence and are directly correlated with areas containing large black populations that were historically segregated by design. Addressing the societal implications of transportation insecurity is an important step in breaking cycles of disinvestment and building policy that improves infrastructure and ensures opportunity is given to those historically left behind.



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