Analysis of Public Transport Usage with respect to Population Growth in New York and Los Angeles

Introduction

The US has strong political and public support for public transport based on its goals to reduce congestion, aesthetics, economic development, and sustainability. There are numerous ways that people can transit and move around. There are public and private transit methods where public transportation includes the transport means availed to the public that would normally require fare and run on a schedule. Any transport system is crucial because it ensures reliability when people want to reach different destinations like workplaces, access healthcare amenities, schools, and healthy food markets. Particularly for those individuals who cannot drive (children, disabled, without personal cars, elderly). According to the US Census Bureau (2021), 86% of all Americans get to work using personal cars, and 76% are in these vehicles alone.

Additionally, only 14% of rural and 69% of urban households had access to public transportation (McKenzie, 2015). The CDC (2018) reports that although public transit has remained the safest means of moving around, many people prefer using personal cars. Moreover, motor vehicle crashes are among the leading causes of death among young people in the US. Los Angeles is one of the world's megacities, with more than 4.5 million people living in a 4751 square miles area. As of today, the population of LA is 12.5 million people, a

0.23 percent increase from 2021, a 0.1 percent increase from 2020, and a 0.01 percent increase from 2019 (US Census Bureau, 2022). These people drive, walk, rideshare, bike, or use public transport to get to work and move around to run their errands. With the numerous options people have, one can assume a random distribution of people using these means to move around.

However, US data reports that 73% of the people in Los Angeles drive alone in their cars to work and run errands, and only about 6.8% of them are open to public transport (Lopez, 2017). Chakrabarti (2017) shows that from 2013 to date, the number of people using public transport has reduced by 19%. Another report states that Los Angeles has one of the best public transport networks like light rail, subways, shuttles, and buses in the country used to move around to the remotest areas in the Greater Los Angeles region (Davidson et al., 2011). Conversely, most of the population prefers to use public transit in the New York metropolitan region. Reilly and Landis (2003) reported that an increase in the population density would increase the probability of a New Yorker taking public transit. Therefore, this study aims to assess the envisaged public transport usage and location compared to the population growth in the region and expansion in the cities of Los Angeles and New York.

Literature Review

Today, the world's population clocks 8 billion people, and more than half reside in urban centers and cities (Goetz, 2019). In 2010 51.6% of the world's population lived in urban centers. In the last 2020 census, the number of people residing in urban areas had risen to 56.2%. The numbers are higher in first-world countries because 79.2 of their populace reside in urban areas, while only 51.6% of those in the developing nations live in cities (Blachier, 2021). The authors project that by 2013, 60% of the populace will live in cities. World Bank (2019) reports that cities are increasing in number, size, and population. In 2018, the world had 548 cities with 1 million residents; by 2030, this number is projected to rise to 706cities.

The same report projects that in the same timeframe, the number of cities with 500,000-1million residents is expected to rise from 597 to 710. The average annual population growth in cities has remained at 6% since 2000 in the cities with populations of 500,000 and above (United Nations, 2018). While the population in these areas is increasing, the land area for the city proper has remained the same over the years. The land areas in metropolitan areas and urban agglomerations have increased considerably (Goetz, 2019). This means that the larger cities have more people residing in them.

As globalization is taking a new turn and more people are moving into cities and urban centers to generate better income, the increasing population in the cities is causing a strain on the urban transportation systems. The increasing number of people working and living in the major cities globally face challenges in increased congestion levels, total travel time, delays, accidents, costs, loss of life, early time of departure from home, and costs. Wen et al. (2019) affirm that traffic congestion is one major issue facing the populations in urban areas and cities globally. Colak et al. (2016) follow up by stating that the increased demand for travel and a growing economic potential results in increased population densities that eventually burden the road infrastructure in these areas. More people in urban areas who wish to use private means of transit result in an increased number of vehicles exceeding the road expansion causing high congestion levels on road lines. This causes an effect through time lost in traffic, sound and air pollution, and fuel inefficiency (Abdulla, 2008).

TomTom is a leading GPS company. In 2013, they reported that people living in major cities like Istanbul, Moscow, Beijing, Mexico City, and Rio de Janeiro spend an average of more than 75 percent extra time on the road because of traffic (Tomtom, 2018). INRIX (2018) assessed the congestion and mobility in 975 congested cities globally and observed that in more than half of the cities, the drivers in these cities lost at least 100hours in congestion yearly. Holmes (2017) conducted a survey to determine the average commuting time for

workers. The author found that in 41 out of 52 nations under observation, residents spent an average of 1-hour commuting. INRIX (2018) further reports that the United States loses close to $87 billion due to congestion, an average of $1348 per driver. In the United Kingdom, the government loses 7.9 billion pounds, an average of 1317 pounds per driver yearly. Road accidents, the majority in urban centers, claim the lives of approximately a 1.35million people yearly. This translates to 3700 people being killed every day globally in car crashes and other accidents by motorcyclists, cyclists, and pedestrians (World Health Organization, 2018).

Urban travel also contributes significantly to climate change. To combat the issue of climate, there was a Paris Agreement whose goal was to reduce carbon emissions in nations by 50% by 2030 and the net zero by 2050 to meet the goal of 1.5^0C (Agreement, 2015). however, the Trump administration withdrew the United States from this Agreement, which made achieving the Agreement's goals more difficult. In the US, transportation is one of the major contributors to global greenhouse gas emissions accounting for 14.5% of the total pollution (Sakadevan & Nguyen, 2017). Cities' populations continue to grow, and most find themselves on the frontline in making efforts to minimize climate change. In line with these efforts, CDP (2019) reports that most cities (including Hong Kong, Cape Town, Barcelona, Paris, and London) have taken the initiative to implement the climate action plan (CAP) to minimize GHG emissions. Significant progress has been noted in most initiatives like introducing renewable energy in producing electricity and lighting industries and buildings. However, transportation in cities remains a problem even with the efforts to remove fossil fuels and educate the masses on the importance of walking, cycling, and public transit.

Le and Trinh (2016) state that using a public transport system contributes to efforts to address the traffic problem. Borck (2019) conducted a study on public transport and urban pollution and found that the provision of public transit reduces air pollution/ emission of greenhouse gas. Therefore, major cities have been investing in public transit for all their residents. Public

transit is characterized as purposefully controlled movements of different means of transport on pre-determined transport routes in a defined zone (Vavrek & Bečica, 2020).

New York is a populous city in the United States with complex infrastructural public transit systems. The New York public transportation is coordinated by the Metropolitan Authority/ Metropolitan Authority New York City Transit. The MTA (2019) reported that they operate the most extensive public transit system in North America and is among the largest globally. According to them, in 2019, the subway had a daily ridership of an estimated 5.5million people and 1.698 billion commuters yearly. Their system comprises 6600 subway cars covering about 365 million miles, 665 miles of train tracks, 472 subway stations, 234 local bus routes with 20 select bus routes and 73 express routes, and 5927 vehicles forming their bus fleet, all accessible to persons with disabilities (Metropolitan Authority, 2019). The US Census Bureau (2013) affirmed that 56% of New Yorkers use public transit in commuting, and almost 60% of those using public transit are individuals commuting to and from their workplaces (American Public Transportation Association, 2013).

Los Angeles is one of the biggest and most recognized cities globally. It is the home of Hollywood, among other attractive features. Because of this, LA attracts many people, both residents, and tourists. This implies that LA has a high population density. One of the important factors to consider in transportation is population density because it not only gives the city its shape but also determines how effective each transport system is. According to Chakrabarti (2017), Los Angeles is home to the best public transit networks encompassing light rail, shuttles, and light rail. People in LA also walk, cycle, or use motorcycles in commuting within their cities. However, there are private means of transport that many people find more convenient and preferable for moving around. A key misconception the LA government has refuted is that its cities do not have a public transit system, and everyone needs a private means of transport. The county has the LA Metro system that serves as a

transport coordinator and planner, builder, designer, and operator for this populous county (Higgins, 2021). According to the LA Metro, more than 9.6 million people work, play, and live within the 1433 square miles of the service area of the county (Higgins, 2021). This body was formed by state law to be overseers n coordination and funding of all public transit services within the county (Higgins, 2021).

Available literature has presented that the lack of people in LA using public transit networks is not because of the inexistence of these networks but because of other reasons, including preference, number of individuals in the household, the time they are leaving their homes to go to work and the duration it takes them to commute. Los Angeles County, California, has three components that make up the county's public transportation system. The county has a well-established underground metro system, buses, and light rail that are rapidly expanding and have the highest quality of parts used in making them (Chakrabarti, 2017). The Metro System is commonly used in LA to refer to the underground railway networks. The city has six fast, environmentally friendly, and easy-to-use rail lines spanning the city, covering over 100miles. The surrounding cities are covered by the Metrolink rail service (Elkind, 2014). The second public means of transportation in LA is the bus. Bus lines connect all the important areas in and between the cities in the county. However, most buses in LA are infrequent as they often run twice or thrice every hour but are effective in taking people over short distances. Still, the county has express buses that take people from one point to the next, allowing them to cover long distances in a short time. In the last few years, technology has also come to impact the public transit system in LA with the introduction of new ways of commuting. The use of Lyft and Uber, where people get to share rides in the taxis, has made a considerable difference in the public transit system. These options allowed the LA people to get a cheaper and more convenient way of moving around if they did not like being in crowded places (Leard & Xing, 2020).

The US data reports that LA is low in ranks on the use of public transportation compared to other major counties in the United States. The report adds that people majorly use public transit in La because they do not own vehicles. Research has shown that people from low-income households are less likely to access vehicles than those from higher-income homes (Blumenberg, 2017). Moreover, an estimated 200,000 households in LA county do not have access to a vehicle, most of whom are people of color. Blumenberg (2017) surveyed the Metro and observed that over 80% of the riders were Blacks or Latinx, and 72% lived in low-income households (poor people making less than $25,000). Another reason why most people in LA prefer to use private transportation methods is the lack of direct routes to their destinations. Mejía (2020) states that most students live a 20minute drive away from their institutions, but using a public transit system, they would have to spend at least 1.5 hours to get there. Additionally, 58% of all work opportunities, 56% of the low-income households, and 44% of the population in LA are within 0.31miles of a walk or a 10-minute cycle to the city. This implies that residents of the county have non-car options available to them, but only 15% of the population in LA walk, use public transit, or cycle to their destinations.

Methodology

Population

The population considered in the data collection and analysis was workers aged 16 and above in Los Angeles and New York. The study will include data collected by the US Census Bureau and the American Community Survey (ACS). The research was focused on the data collected from the ACS on the use of public transit to commute. Based on this information, the number of participants using various means of transport was compared against the population in the region using data obtained from the US Census Bureau. Finally, the report utilizes the findings of the report from the ACS to check for the behavior in choosing a

particular mode of transit. In other words, the paper presents why participants rely on a specific way of transit. The survey introduces extra independent variables to the study.

Variables

The research considered the likely factors influencing an individual's decision to use public transit or private means of transport. Therefore, the predictor variables used in the study included the mode of transit, the departure time, and the time one leaves home to go to work or run errands. These are all factors that have been deemed significant in the decision. A person who works the night shift will likely use private means of transport as opposed to someone who leaves the house when the bus, rail, or subway is scheduled to leave or arrive at a particular destination. Therefore, the study hypothesized that individuals who leave their homes in the wee hours of the night or morning would be more likely to avoid public transport in LA and NY.

The dependent variable used in the study is the mode of transport. The study categorized the mode of choice of commuting as carpooling, auto trips (truck/van/car/motorcycle), driving alone, public transportation (with the exclusion of taxis), bus, streetcar, subway, railroad, and slow traffic encompassing biking and walking. An individual who loves biking will likely prefer to cycle or walk while running errands, while those used to auto trips will prefer private means. Therefore, the available mode of commute is crucial in determining whether a person uses public or private means of transport. Thus, the study hypothesizes that fewer individuals use public transportation than auto trips in LA and NY.

The second predictor variable was the population size in the two regions. According to Frank and Pivo (1994), the population density significantly impacts the choice of mode of transit. Balcombe et al. (2004) add that an increase in the population of a place causes a decline in the average access distance to the public transportation network, which results in

fewer people using it as the number of trips made also reduces. This means that if the population of the two regions continues to increase, there will be a further decline in the number of persons using public transportation. Hence, the study hypothesizes that population increase results in decreased use of public transportation.

Finally, the third predictor variable was the time a person spends in transit. Depending on the destination, traffic, and errands to run, one might spend between a few minutes to more than an hour in transit. Therefore, if one is taking a journey that would typically take half an hour to get to the final destination, they are likely to depend on the transport mode that gets them there in the shortest time possible. If using a bus increases the time spent on the road compared to cycling or walking, the person will go for the latter. Moreover, the person will choose the subway if the subway is faster than a bus. Therefore, the study hypothesizes that the shorter the commute time, the higher the chances the person will use public transportation.

Multinomial Logit Model

The research implemented the multinomial logit model, a discrete analysis method to determine the propensity of choice of mode to transit in New York and Los Angeles. The data used in the model was obtained from the American Community Survey. From this data, the researchers categorized the mode of choice of commuting as carpooling, auto trips (truck/van/car/motorcycle), driving alone, public transportation (with the exclusion of taxis), bus, streetcar, subway, railroad, and slow traffic encompassing biking and walking.

Equations for the model

A multinomial logit model usually nominates one response category as the baseline or reference cell. In the current analysis, the automobile trips were used as the reference cell; the baseline was then used to compute the log odds of the categories relative to the reference cell.

The obtained log odds become the line function of the predictor. The formula for the multinomial logit model appears as:

Where is the constant and is a vector of the regression coefficients for j=1,2,…, J-1. The formula was written with the constant explicitly to allow the assumption that the model matrix X excludes a column of ones to hold. In the multinomial logit model, the response is multinomially distributed and not binomial, and there are J-1 equations as opposed to having a single one. The J-1 multinomial logit equations are different for each category 1, 2, and J-1 with category J. The single logistic regression equation contrasts successes and failures. Suppose, for example, J=2; then the multinomial logit model is reduced to the usual logistic regression model with the binomial distribution.

The multinomial logit method gives the coefficients of the variables, the asymptotic standard errors, and their respective t-statistics. The statistics test the null hypothesis that a particular coefficient equals zero. Additionally, testing the null hypothesis that all the parameters are zero, the researchers performed a likelihood ratio test. Other parameters obtained from the model typically included the which is analogous to the R^2 measure commonly obtained in a linear regression model.

Data

The data used in the analysis were obtained from the US Census Bureau's American Community Survey (ACS), 1-year estimated tables B8301, B08302, and B08303. The travel data was collected from around 2,000 households across the cities in the metropolitan New York and Los Angeles County. These provided the key travel statistics for the regions that would help set a path to improving the use of public transit and consideration in expanding the global lines. Moreover, the data contained information about the population in these

regions for comparison and inferences to be made with respect to this variable. In the New York region, 1,000 households were used to collect data. This results in about 13 925 linked trips divided across the households, 4,558 respondents, and a sub-sample of 130 families whose members provided their travel data using the car GPS (global positioning system). In LA, the study will use a total of 1,000 households to collect data. This resulted in approximately 10 305 linked trips divided across the households, 6,000 respondents, and a sub-sample of 90 families whose members provided their travel data using the car GPS (global positioning system).

Analysis

The researchers conducted descriptive statistics to get general information about the data. Inverted column charts were used to represent the count of persons using each mode of transport, the departure time in relation to the population, and the time one leaves the house in relation to the population. The charts provided an image of the number of persons in each category and how this was useful to the study. A multinomial logit model was conducted on the data using the categorized mode of choice of commuting (carpooling, auto trips (truck/van/car/motorcycle), driving alone, public transportation (with the exclusion of taxis), bus, streetcar, subway, railroad, and slow traffic encompassing biking and walking). The model predicted the definite placement of the mode of transit in or the probability of category membership on a dependent variable (mode of transit) based on several predictor variables (population, departure time, and commute time).

Limitation

The US Census Bureau stopped collecting commuting information directly from decennial census respondents after 2000 and relied on statistical surveys. Unlike the census data, which collects the exact count of persons and households every decade, the American Community Survey (ACS) data are estimated based on the represented survey sample. The one-year

estimated period used in this report is thus, limited in that it provides a limited geographical granularity and a more granular period.

Results

Descriptive statistics

The current study was constrained in data sources and technical skills. Therefore, to check for the relationship between population growth and the likelihood of using public transport, the researchers used the commonly used measure of the population as obtained from the 2010 and 2020 censuses. Frank and Pivo (1994) stated that there was a significant relationship between population density and choice of mode of transit. Based on this finding, the current study hypothesized that the higher the population, the lesser the likelihood of using public transit.

The commute time was used to determine the value of time placed for the independent variables.

Another factor that would affect the choice of the mode of travel is the number of persons in the car and the preference to carpool. A group of more than four people would generally exceed the number of people in a private car, forcing them to use public transportation. Currently, environmentalists have quoted an increase in the number of persons willing to travel alone in their cars as the single most contribution to congestion and traffic on the road. Therefore, driving alone has been termed as the least efficient way of travel and the highest contributor to carbon emission and global warming in the long run. Therefore, the researchers considered the people who drive alone to work, those who carpool, drive alone, and two-person, three-person, and four-person or more carpools.

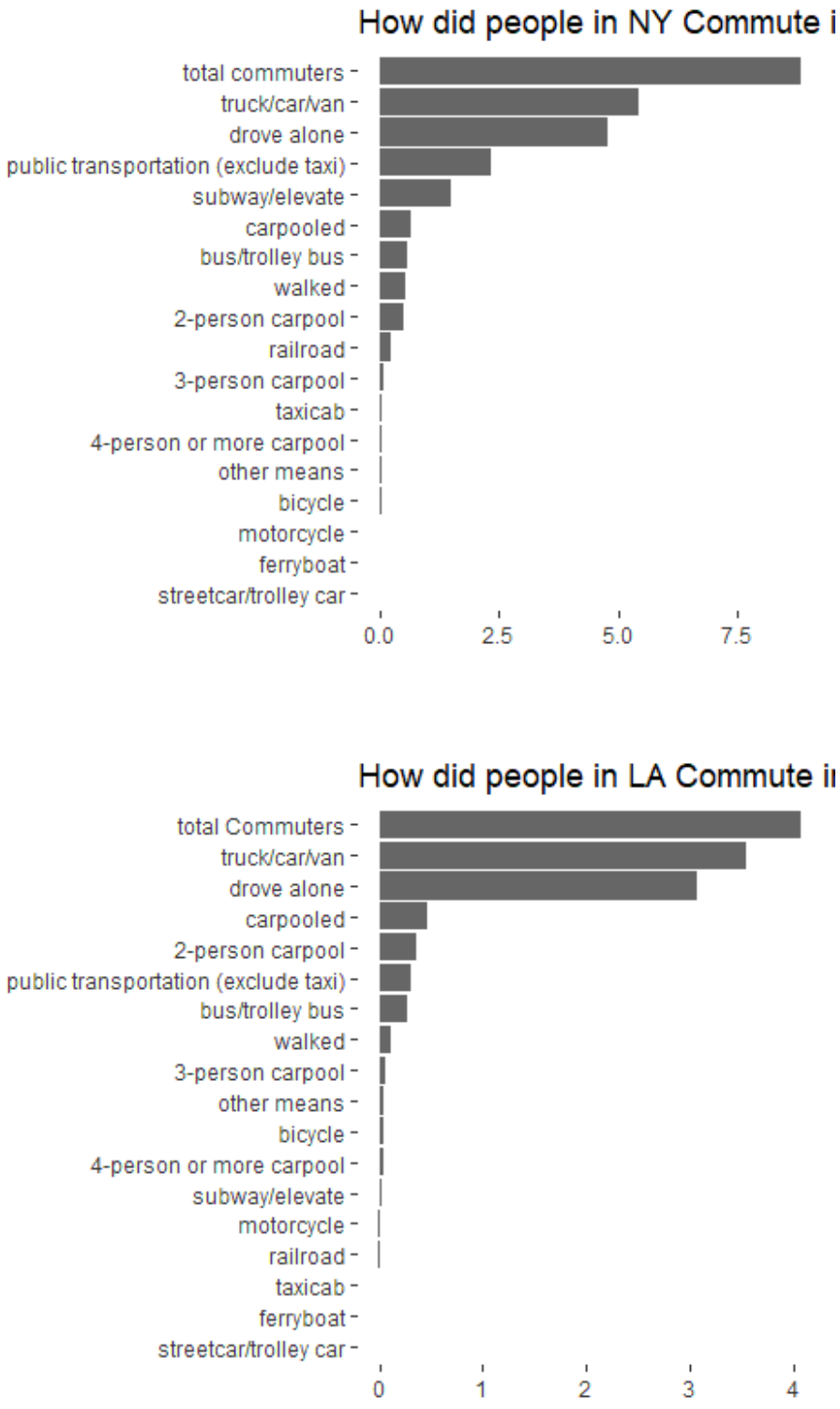


Figure 1: Mode of transit in LA and NY in 2010.

The basic analysis of the choice of the mode of transit revealed some common trends in which method was most preferred by people in Los Angeles and New York. The bar graph shows the distribution of the primary mode of transport in the two regions from 2010 and 2020

surveys and census data. The choice of transport means by New Yorkers has not changed significantly in the ten years. The travel mode remained dominated by auto trips (trucks, cars, motorcycles, and vans) between 2010 and 2020, with a 9% increase in commuters. The numbers were similar in LA because there was a difference of 9% in the ten with auto trips being the most used mode of transit. The individuals that drove alone were second on the list showing a 10.6% increase in commuters for Los Angelenes, and New Yorkers recorded a 1.7% increase in the number of commuters. Those who used auto trips in the decade accounted for 45% of the total commuters, while slow traffic (walking and cycling) accounted for 2% of all the commuters. These statistics imply that most people prefer driving alone and auto trips to public transportation and walking or cycling around in both countries.

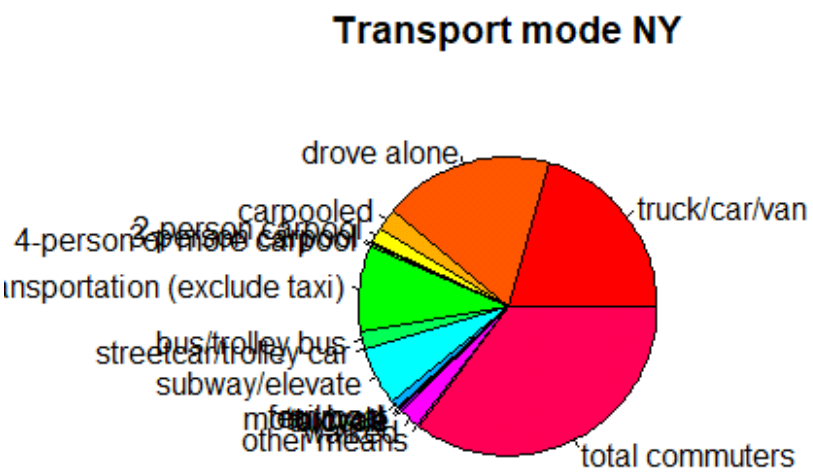
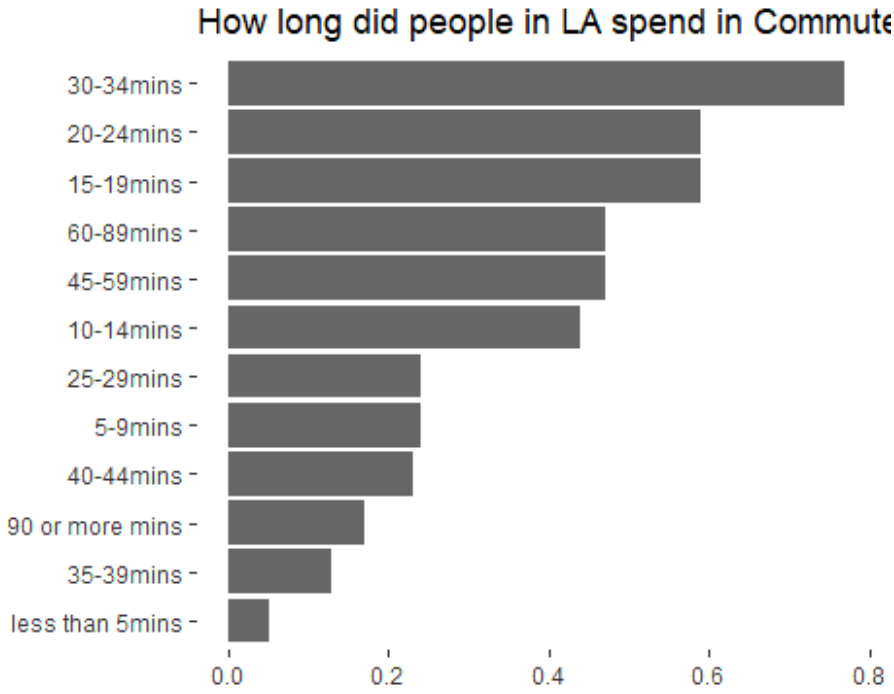


Figure 2: pie chart of the transport mode in NY

The report also provided a chart on the number of commuters, the time they left their houses, and the duration it would take them to get to their destinations. These were also significant factors in determining the mode of transportation a person would choose in relation to the

population differences between the two countries. The analysis showed that the people who spent between half an hour and four minutes past the half-hour mark represented 17% of the total commuters, while those who spent between 20 and 24 minutes and 15 and 19minutes commuting represented 14% (each) of the total commuters. This means that most people in LA spent more than 30 minutes commuting to their destinations. 3% of the commuters spent more than 90 minutes, and 2% represented the number of those who spent less than 5 minutes in commute to their destinations.



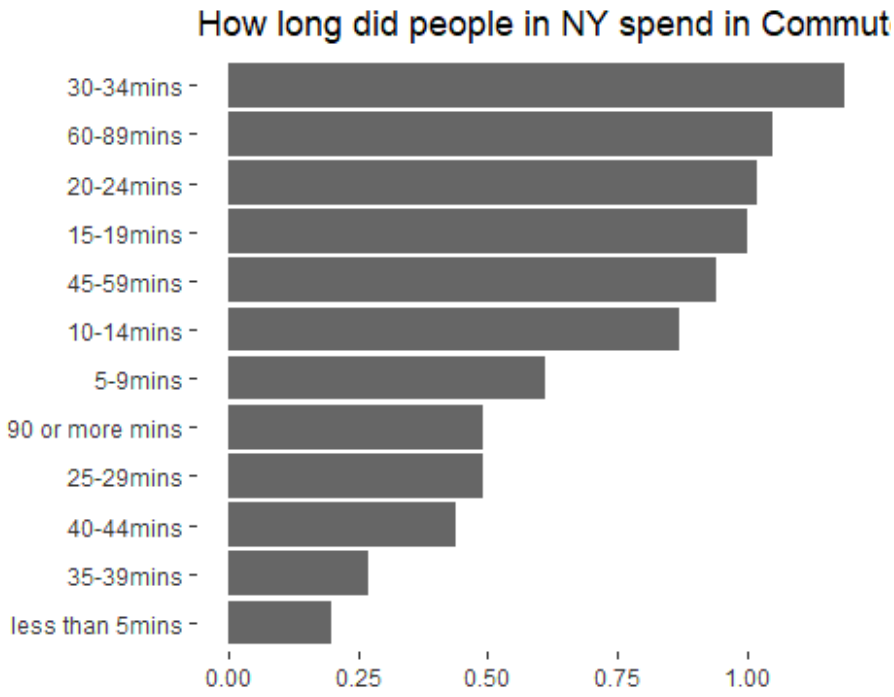


Figure 3: travel times in NY and LA.

Different from LA, people in NY that spent between half an hour and four minutes past the half-hour mark represented 18% of the total commuters, while those who spent between 60 and 89 minutes represented 16%, and 20 to 24 minutes 14% of the total commuters. This means that most people in NY spent more than 30 minutes commuting to their destinations. 5% of the commuters spent more than 90 minutes, and less than 2% represented the number of those who spent less than 5 minutes in commute to their destinations.

The presented charts analyzed the choice of mode of transit in general terms. They obtained the descriptive statistics for the data allowing the researchers to determine the factors that caused the greatest difference in the choice of mode of commute.

Multinomial Logit Model

Based on the report from the descriptive statistics, it was evident that people using public transportation were in competition with those who preferred to drive alone and those who used auto trips. Therefore, the three modes of commute were considered in the analysis as the

dependent variable. The departure times, population, and time spent on commute were the predictors in the multinomial logit model for LA and NY. The model shows the iteration history, including the final negative value of the log-likelihood function being 6 $x10^{-5}$ for LA and 0 for NY. When these values are doubled, the results of the model provide the residual deviance of 1.16e-05 and 0, respectively. The residual variance is used in statistics to determine how well the model with n number of predictors predicts the dependent variables. Therefore, since the residual deviance was significantly small in both models, it was concluded that population, time of departure, and commute time were good predictors of the mode of transportation.

The summary compares each predictor with the choice of mode of transport.

Los Angeles

A unit increase in the departure time is associated with increasing the log odds of an individual driving alone in the car versus using auto trips by 1.26e-05. Secondly, a unit increase in the same variable would increase the log odds of using public transport versus auto trips in the value of 3.76e-05. The log odds of using public transportation versus auto trips increase by 8.8e-05 when comparing commute and departure times. After fitting the model, the researchers computed the p-value to determine the variables that are insignificant in determining the choice of mode of transport in the dataset. Considering a 0.05 level of significance, all the variables used in the study were significant in predicting the choice of mode of transport.

```
## Coefficients:
##                (Intercept) dataset2$population dataset2$commute.time
## drove alone     5.568603e-11       -0.001258746          0.0003287835
## public transport 8.925138e-10       -0.007044115          0.0297589730
##                dataset2$departure.time
```

```
## drove alone                0.01244165
## public transport           0.02440144
```

New York

The log odds of an individual driving alone versus using public transportation increase by 0.004 with a unit increase in the departure time. Also, a unit increase in the commute time leads to a decrease in the log odds of using public transportation versus auto trips by 0.003. the log odds of an individual using public transportation versus auto trips decrease by 0.02 when considering the population. The significance level was set at 0.05. since all the p-values were less than the significance level, the variables were significant to the model.

```
Coefficients:
##                   (Intercept) dataset1$population dataset1$commute.time
## drove alone      -1.932016e-09        0.002706676         -0.012328513
## public transport  5.021992e-09       -0.002138062         -0.002968816
##                   dataset1$departure.time
## drove alone                   0.003604175
## public transport              0.024142584
```

Discussion and Conclusion

The findings of the current study were similar to what has been proposed by previous studies that population is a significant determinant of whether a person would use public transportation. Like Tirachini, Hensher, and Rose (2013), the study findings supported the hypothesis that departure time was a significant determinant of whether an individual uses public transport. Travel time was equally significant in influencing the choice of mode of transport in this study (Lunke, Fearnley, & Aarhaug, 2021).

The population was a complex factor in determining the use of public transportation in both regions. According to Boulange et al. (2017), population density in the New York metropolitan region strongly impacts the preference to take public transportation. Similarly,

the results of the current study illustrate that the probability of choosing to use public transportation increases with an increase in the population. Saghapour, Moridpour, and Thompson (2016) added that population density impacts the choice to use public transportation regardless of the destination and origin of the journey. In other words, in their study, they concluded that a higher population greatly impacts the choice to use public transport. However, a different study showed that job density has a similar effect on the choice of mode of transport as population density. In an area like the New York metropolitan region, there is a unique distribution of jobs where more jobs are located in the city center and thin out as one moves to the outer rings. The region has about 2000jobs per acre within the city center, which reduces to about 37jobs per acre in the outer regions of the city. Thus, the authors conclude that the large gap in job availability results in the circumstances where most people find it more convenient to drive alone in their cars in places with a significantly higher job density (Tong, 2015). In contrast, Zhang (2004) reported that population density is a significant factor in determining the probability of choosing to use public transportation only when looking at work-related and not non-work-related trips. Arguably, job density would be an influential factor when considering work trips and population density when looking at recreational activities.

The multinomial logistic regression model evidenced that all the variables selected in the study were significant in determining the probability of choosing to use public transportation. The researchers set auto trips and driving alone as dummy variables in the mode of transit and observed that these factors had almost an equal influence on a person's choice as the population in the area. Most people spend an average duration on the road when running errands. However, research has shown that by reducing variability in the travel time, passengers will be more inclined to use public transportation as opposed to reducing the time spent on the road (Bates et al., 2001). The literature review presented that most public transportation networks function using a schedule that provides consistency. This ensures the

current public transportation users are not frustrated, and new users can be easily incorporated into the system.

Another significant variable in the probability of choosing the mode of transport is the departure time. This refers to the time the passenger leaves their home. The departure time is determined by factors such as the type of work a person holds, their shift, and the crime rates in the areas where they live. Due to this, it was observed that most people in NY and LA left their homes between 7 am, and 9 am. This means that many people are running errands or rushing to work during this period and the public transport systems are congested. Hence, most prefer to drive alone or use auto trips (Yuldoshev & Muminov, 2021).

The researcher recommends further studies to be conducted to assess the influence of socioeconomic factors on the choice of public transportation. This includes factors like social class. In most cities, the type of car a person drives is a sign of a higher social class, while those who take public transportation are regarded as being from poor backgrounds. The societal structure will therefore have a significant influence on whether a person living in the high-income areas and earning a good salary will be influenced not to use public transportation. Other factors such as trip-based issues should be evaluated. That is the reason for taking a trip, whether for school, shopping, visiting the hospital, or driving around. These are factors whose influence on the choice of public transportation needs to be evaluated in future studies.

All the factors assessed and discussed in the current study show some multicollinearity and are significant in determining the probability of using public transportation. However, the study was limited in the sources of data and function of the model, making it impossible to incorporate the public transportation index during analysis. The index would have helped counteract the effect of some variables and allowed for a clearer explanation of the variables

used in the analysis. Still, future analysis should consider including personal qualities such as personalities in evaluating the probability of choosing to use public transportation.

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