Who Bears the Cost of Congestion: Evidence from 2017 NHTS

--A Distributional Analysis of Congestion Cost in the U.S.

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Abstract

Congestion pricing policies have long been problematic after decades of research. Charging for public resource that used to be free is never popular among citizens, and the possible regressive nature of congestion charging makes it also undesirable among policy makers. This research develops a theoretical model for calculating the households time loss from congestion and then, provides a series of distributional analyses based on different household characteristics, like household location, income groups and racial groups.

Under the urban-to-urban trips, it's shown that there are certain groups of households, like households living in areas with higher population density, low-income households, and white households, suffering from more congestion time loss than others. Later, with all trips taken into consideration, I find that most of the congestion time loss comes from urban-to-urban trips, and the groups of households that suffer from more congestion time loss won't change.

These findings suggest that it is not fair to charge for driving personal vehicles on congested roads. To deal with the regressive nature of congestion pricing, finding the right way, like reimburse the low-income group through commute allowance or make improvement for public transportation, to make up for disadvantaged groups is highly in need.

Key Words: congestion, time loss, distributional analysis, households, income, racial, regional

Content

Chapter 1 Introduction and Literature Review

Part 1. Introduction

Metropolitan cities have been suffering from heavy congestion issue for over half a century, costing huge amount of money for both society and individuals. According to INRIX, the average American driver lost 36 hours due to congestion in 2021, wasting $564 (2021 INRIX Global Traffic Scoreboard). The congestion situation before the pandemic was even more severe. In 2019, Americans lost 99 hours, which is about $1,377 on average, due to congestion (2019 INRIX Global Traffic Scoreboard). Economists have long understood that traffic congestion is a market failure and therefore, a social problem. Traffic congestion incorporates both non-excludability and externality. As a common resource available for the entire population, public roads act as a complement to cars. Individual drivers benefit highly from using the roads with a low cost. But when congestion occurs, all drivers on congested roads experience a decrease of usefulness of the roads (Krugman and Wells, 2006). On other words, all drivers driving on the road during congested hours has a negative effect by causing more time loss, which is not addressed, on other drivers. This fact makes congestion a negative externality. Since the problem is getting worse even with all the effort on widening the roads and other public service policies, it is important to understand who is bearing most of the congestion cost and suffering from the bad traffic conditions.

It has also long been recognized that charging travelers a premium for using the most popular roads in rush hours can deal with congestion simply and efficiently (Small, 1993). With several cities, such as Singapore and Paris (Small, 1993), actually having a congestion pricing system on some roads, charging for congestion can still be very hard and problematic. Especially in the present context of increasing levels of inequality, it is of particular importance who will be influenced more by the charging policy, and whether congestion is one of the transport-related

social exclusion--where some of the social groups are suffering significantly more from it due to lack of other transportation options--and can be correctly addressed by a certain policy.

In this research, I intend to find out whether certain social groups, such as the low-income group households and African American households, are bearing more congestion time loss than other groups and discuss how the findings will impact policy makers' preference on different types of policies. From the analyses of urban-to-urban trips, I find that households living in areas with higher population density, like Middle Atlantic, South Atlantic and Pacific regions, suffer from more traffic time loss in their personal vehicle, as do low-income households. The racial distributional analysis of congestion time loss shows that white households bear the least time loss among all households. Comparing with the distributional analyses including all trips, I find that most of the congestion time loss comes from urban-to-urban trips, and the results of the analyses are not significantly influenced by adding in other trips.

Part 2. Literature Review

Empirical research on congestion and congestion cost has been carried out around the world since William Vickrey proposed adding a distance- or time-based fare system for the New York City Subway in 1952 (Trimel, 1996). The Texas A&M Transportation Institution starts publishing urban mobility report since 1987. With INRIX founded in 2004, its yearly traffic scoreboard provides statistics on city level congestion time loss, last miles speed and other traffic condition related characteristics.

Congestion pricing has always been of interest to economists since Vickery (1963) drew attention to road traffic pricing using the welfare economic principle of Pigou (1932). The model used in this research to calculate the congestion cost for each trip is modified from the 2021 Urban

Mobility Report. The report provides a clear and simple way to calculate the nationwide congestion cost. It divides the congestion cost into two parts, money loss due to time loss and money loss due to fuel loss. Furthermore, the travel time value evaluation for working purpose trips in this research is also formed following the idea in the mobility report, where the hourly wage for each worker on the trip can be used as the value of travel time.

Apart from the model above, there are still many different models for calculating congestion cost. Arnott and Small (1994) developed a widely used congestion cost model using traffic flow data and formed a clear model to calculate free-flow speed for each road as well. Unfortunately, when used in evaluating congestion situation in very large range, such as city, state or country, this calculation has strong limitation due to the accessibility of the data. Therefore, this research intends to find a different way to obtain the free-flow speed for different types of trips that can be used when the road data is inaccessible.

Much of the congestion cost research conducted before include converting the time loss in transportation into money loss. The most important part in this is the value of travel time (VTT). Most theories of value of time are elaborations of the time allocation framework of Becker (1965). The basic idea is that people choose how much labor to supply, given a constraint that total time available is divided among work, leisure, and travel. The problematic part is the free reallocation of time, which is usually not the case based on the results from the empirical analysis, such as Small and Verhoef (2007: Chapter 2). Small (2012) discusses more development on this research topic. It introduces behavioral science into the calculation of VTT, which helps forming the VTT evaluation part in this research. DeSerpa (1971) and many later literatures provide empirical finding that the value of time (VOT) is less than the wage rate, and then, interpret this as evidence that people may dislike work more than traveling. Jara-Dı́az et al. (2008) provide more direct

evidence for this interpretation by developing a method to separately estimate the value of travel time and the value of leisure. VOT varies when people have different wage levels and when the trips have different length. Daly and Carrasco (2009) find that longer trips tend to have higher VOT and provide two explanations. The first one is that due to the limitation of time endowment for each person, longer trips would make the time constraint bind more tightly. The second one is that trips become more tiresome the longer they are. Johnson (1966) posits that people with higher wages also tend to have more enjoyable jobs, perhaps causing the value of time to vary more than proportionally with the wage rate. The reason that I didn't include the economic value of travel time in this research is because most VTT theories above is related to income level. It is also the case that with the accessible data, income might be the only indicator available in this research for VTT. With the research purpose of finding the distribution of congestion cost among income groups, including household income in building the congestion cost will cause collinearity problem and bias the regression results. Therefore, in the following chapter, I will build a congestion cost model simply regarding congestion time loss.

Chapter 2 Empirical Analysis

Part 1. Data and Variable Used

The major data source for the analyses in this paper is the 2017 National Household Travel Survey (USDOT, 2017) conducted by Federal Highway Administration. The survey is conducted between March 2016 and May 2017, providing data for 923,572 trips made by 264,234 persons aged 5 or over from 129,696 US households. The data are divided into four files—the household file, the person file, the vehicle file and the trip file, reporting travel-related characteristics of

households and household members in the United States. The trip file contains information on trip duration, trip distance, trip origin region, trip destination as well as some characteristics of the household that conducted the trip. I combined the trip file and household file to obtain add more information on households' income, race, count of members and address location.

Supplementary data have been obtained from US Census Reports and the Urban Mobility Report from the Texas Transportation Institute.

1.1 Variables used in building the dependent variable

The variables used in constructing the congestion time loss which indicates the congestion cost born by the household, include the trip distance, the trip duration, the start time of the trip and the end time of the trips. The start time and end time of the trips are reported in the minute level in the assigned household travel day. The trip duration is reported in minutes and converted into hours in this research. In the data cleaning process, I deleted 16 questionable trip data where the start time and end time of the trip do not match the reported trip duration. The trip distance is reported in miles.

1.2 Household characteristics potentially related to total congestion time loss

The variables used for conducting the distribution analysis of congestion cost are the respondent's home address (under 2010 Census division classification, Figure 31), the annual household income, the count of household members, the race of household respondent, and the household lifecycle.

Nine dummy variables are created for the respondent's home address according to 2010 Census division classification. The annual household income is referring to the combined household

income before tax from the previous year. Eighteen dummy variables reflecting household income level are created since the income is report in ranges (from less than $10,000 to more than $200,000). The count of household members is converted to twelve dummy variables with base category of one so that I could control for the household size. I combined the Hispanic status of the household respondent and race of household respondent reported in the data file to create eight dummy variables for household respondent's race, including Hispanic, White, African American, Asian, Native American, Pacific Islander, Multi-races and other. Household lifecycle is an indicator of the household structure in terms of the number of adults and the number of children. Based on the categories in the NHTS' household file, ten dummy variables are created to reflect inter-household structure differences. The variables include single households without children; two-adult households without children; single-parent households with a child or children aged below 5, 16 and 21, respectively; two-parent households with a child or children aged below 5, 16 and 21, respectively; single-retiree households with no children; and two-retiree households with no children.

Part 2. Theoretical Model

The congestion cost model in this research is based on the nationwide congestion cost model from 2021 Urban Mobility Report (2021). I modified the nationwide model to fit the survey data so that the household and personal level congestion cost distribution analysis results can be delivered, and I also change the congestion cost from money loss to time loss for the main empirical analysis of this research.

To calculate the congestion cost, I first define the free-flow speed as the average trip speed under no congestion. Due to the traffic condition difference, like speed limit, among different types of regions, the free-flow speed for trips in each region should be different. Therefore, I divide the trips into 25 groups (Table 1) based on the types of their destinations and origins, including second city, rural, suburban, small town and urban. The free-flow speed is calculated based on trips that happen in the free-flow time zone defined as between 12am and 5am, since there is hardly any congestion during this time period in any of the regions. Then, the free-flow trip speed would be the average speed of trips that start after 12am and end before 5 am, and other trips would be considered taken place in non-free-flow time zone and would be compared with the free-flow speed for building the congested time loss.

For the household level congestion cost, the model is following:

$$\bar{s}_j = \frac{\sum_{n=1}^{N_j} \frac{TM_{n,j}}{TT_{n,j}}}{N_j} \quad (j = 1, \dots 25), \qquad (1)$$

$$Tloss_i = \sum_{j=1}^{J} \sum_{m=1}^{M_j} \max\left[0, \left(TT_{m,j} - \frac{TM_{m,j}}{\bar{s}_j}\right) * p_{m,j}\right], \qquad (2)$$

where j denotes the destination and origin group of the trips, $\bar{s}_j$ is the free-flow speed, N_j is the number of free-flow trips which start after 12am and end before 5 am, $TM_{m,j}$ is the trip distance in miles, $TT_{m,j}$ is the trip duration in minutes, $Tloss_i$ is the congestion cost in time loss for household i, M_j is the number of trips that household i took in the non-free-flow time zone, and $p_{m,j}$ is number of household members on the trip. The group number notation of trip destination and origin is in Table 1.

The construction of free-flow speed in equation (1) is adopted from the 2021 Urban Mobility Report, where the free-flow travel speed is defined as the average speed of trips that happen at low

volume conditions. The low volume traffic condition in this research can only be roughly constructed due to the availability of the data.

Since the free-flow trips speed is the average speed of trips happen in the free-flow time zone, there are also trips under no congestion situation with speed slower than the free-flow speed in this time zone. In Figure 1, we could see that many trips in free-flow time zone have speed a little slower than the average speed. Therefore, I only include trips that happen in the non-free-flow time zone for congestion cost calculation to minimize the influence of slow trips that are not due to congestion. The free-flow time zone is chosen because the number of trips that starts between 12am to 1am in the data set decreases significantly from the number of trips that starts between 11pm and 12am, and the average hourly trip speed starts decreasing from 4am to 5am.

The congestion cost in time loss for each household in equation (2) is the summation of the actual trip duration net of the predicted trip duration if the trip happens at the free-flow speed. The predicted trip duration at free-flow speed is the criterion of whether the trip is generating congestion cost. If the actual trip duration is longer than the predicted trip duration at free-flow speed, then, there will be a time loss from congestion.

Part 3 Empirical Analysis

In this part, I will present the empirical results of the congestion cost distributional analysis. The level of distribution included is households' level. The trips in consideration will first be limited to certain groups among the 25 different groups of trips, and then, I will include all trips in the construction of congestion cost. The definition of congestion in this part is all trips with speed under the average free-flow speed for a certain group of trips. This definition might be

controversial since trips with different length and taking place on different roads tend to have different free-flow speed. Unfortunately, the data used in this research doesn't provide detailed information of whether the trip is in a low-speed limit neighborhood or mostly on the highway. Therefore, in part 4 of this section, I will do several robustness tests with different definitions of congestion, for example adding trip length limit while building the free-flow speed or directly using travel duration as an indicator for congestion, to compare with the results I present in this part.

3.1 Household level congestion cost distributional analysis in Urban-to-Urban trips

In the first part of the empirical analysis in this research, I focus on the household level distribution of congestion cost among all the trips conducted inside the urban area (i.e., trips with Origin Block Group=Urban, and Destination Block Group=Urban in NHTS 2017 Report). According to INRIX 2019 Global Traffic Scorecard (2019), the most congested cities in the US are mostly Metropolitan cities, such as Boston, Chicago and New York. It is obvious that urban areas suffer from the worst traffic condition, so, this analysis of urban-to-urban trips is focusing on the most severe and important part of congestion. After restricted to urban-to-urban congested trips with personal vehicles, there are 43,779 trips and 11,576 households left in the data.

The empirical methods used in this section are straight forward. I first regress the household congestion time loss on a set of indicators for each of the groups in the household characteristic. Then, I add categorial variables, which are other household characteristics, into the regression to control for the differences among regions, income groups and races etc. To make the regression results comparable, I use different notation for the household characteristic that is of interest and other possibly influential household characteristics in the equation listed below. The coefficient estimates for each of the indicators' group will be the average daily congestion time loss by hours

for households in this group. The difference among these coefficient estimates indicates the distribution of congestion cost along a certain household characteristic.

The basic specifications are:

$$Tloss_i = \boldsymbol{X_i}\boldsymbol{\beta} + \mu_i \quad (3),$$

$$Tloss_i = \boldsymbol{X_i}\boldsymbol{\rho} + \boldsymbol{Y_i}\boldsymbol{\alpha} + \upsilon_i \quad (4),$$

where $Tloss_i$ is household i's congestion time loss in hours, $\boldsymbol{X_i}$ is a vector of dummy variables indicating household i's characteristic for distributional analysis (all groups included), $\boldsymbol{Y_i}$ is a vector of household i's characteristic as categorical variables. The goal of estimating (3) is to build a general distribution of congestion cost along a certain household characteristic. The additional estimating of (4) is to eliminate the possible influence from other household characteristics. The region categorical variable absorbs variations across country and the household size categorical variable will eliminate the possible congestion time loss increase due to more travelling time requirement. In order to avoid the dummy variable trap caused by including all household groups in $\boldsymbol{X_i}$, I did not include constant term in the regressions.

I start with the regional distribution of congestion cost because the INRIX 2019 Global Traffic Scorecard (2019) shows that most of the top-rated congested cities are along the east coast of US, such as Boston, New York and Philadelphia. Figure 2 presents the result of regional congestion cost distribution without any categorical variables, Figure 3 presents the results of regional congestion cost distribution with income categorical variable, household size categorical variable and household respondent's race categorical variable, while Table 2 presents the results of estimation with and without categorical variables (the relation between Tables and Figures is labelled under each Figure). From the results, it can be easily found that households in Middle Atlantic, South Atlantic and Pacific regions are experiencing the most severe congestion with or

without controlling for other household characteristics, which aligns with the reported data from INRIX. The fact that households in all regions are suffering from quite significantly more congestion time loss inside a certain income group suggests that household income can be another household characteristic that is highly correlated to household congestion time loss.

For estimating congestion time loss distribution among income groups, Figure 4 presents the result without any categorical variables, Figure 4 presents the result with region categorical variable, household size categorical variable and household respondent's race categorical variable, while Table 3 presents the results of estimation with and without categorical variables. The lowest two income groups are suffering from the most severe congestion time loss in all estimation results, almost reaching 0.6 hours (36 minutes) per day, and in Figure 5, we can see that for households with annual income lower than $100K, the average congestion time loss decreases when the annual income increases. These findings show similarity with the findings in Income Inequality, Social Inclusion and Mobility Roundtable Report (2017), which suggests low-income groups might suffer more from worse traffic conditions due to more restricted choices of transportation. This indicates that alleviating congestion issue might benefit the low-income groups most. Further policy indications will be discussed in Chapter 3 Part 1.

Next, I estimate the racial congestion time loss distribution. Figure 6 presents the result without any categorical variables, Figure 7 presents the result with region categorical variable, household size categorical variable and income categorical variable, while the results of estimation with and without categorical variables can be found in Table 4. The estimation results show that households with white respondent or Pacific islander respondent suffer from the least congestion time loss, and the congestion cost difference among other racial groups is not very significant. The Pacific islander's case might be because of the small sample size. There are only 12 Pacific islander

households in the data. But the fact that white households experience least congestion time loss does have a policy implication on solving the congestion situation.

The last estimate is the congestion time loss distribution among household lifecycle groups. In Figure 8 and column (1) of Table 5, we can see that the households with one child or children aged 5-16 are bearing the most congestion time loss without controlling for region, income, and race. This might partly because households in this lifecycle group have more demand for personal vehicle trips. It is also obvious that holding the children condition same, single adult households experience less congestion. Controlling for household income would narrow difference of average congestion time loss among lifecycle groups (Figure 9).

In summary, the congestion time loss among urban-to-urban trips shows distributional results as expected. In the next section, I will redo the first three distributional analyses for rural-to-rural trips with total travel time consumption as an indicator of congestion cost instead of congestion time loss.

3.2 Household level total travel time distributional analysis in Rural-to-Rural trips

In the rural area, traffic condition is different. According to U.S. Census Bureau and Federal Highway Administration's 2019 Highway Statistics (2019), roughly 19 percent of people in the U.S. live in rural areas and 30 percent of the vehicle miles traveled occurs in the rural areas. With less congestion happening, I use the total household travel time in the distributional analysis for rural-to-rural trips to find out who spend more time on the non-congested trips. Since for the personal vehicle users, the cost of congestion is mostly from the value of time, it would be also an interesting subject to see whether households that suffer from less congestion time loss are spending more time on non-congested trips which also could be loss of utility.

The empirical method is same as in the former section:

$$TTime_i = \boldsymbol{X_i}\,\boldsymbol{\beta} + \mu_i \quad (5),$$

$$TTime_i = \boldsymbol{X_i}\,\boldsymbol{\rho} + \boldsymbol{Y_i}\boldsymbol{\alpha} + \upsilon_i \quad (6),$$

where $TTime_i$ is household i's total travel time in hours, and all other variables same as in equation (3) and (4). After restricted to rural-to-rural trips with personal vehicles, there are 79,343 trips and 18,898 households left in the data.

In the estimation of regional total household travel time distribution, we can see that in Figure 10 and Table 6, households in New England and East South Central have the longest total travel time on average with or without controlling for other household characteristics. This finding can be explained by the 2010 U.S. census data (2010). The top two states with the largest proportion of their population living in rural areas are Maine (61.34%) and Vermont (61.1%), and Mississippi (50.65%), Kentucky (41.62%) and Alabama (40.96%) are in the top ten states with the largest proportion of their population living in rural areas. Due to this fact, it can be expected that more rural-to-rural trips are required in these two regions.

The estimation results of total travel time distribution among income groups show difference when adding the household size control to the regression. In Figure 11 and column (1), (2), (4) of Table 6, we can see that for households with annual income higher than $25K, total travel time increases with the increase of household annual income, and the lowest three income groups have much less total travel time. However, in Figure 12 and column (3), (5) of Table 7, the average total travel time among income groups doesn't vary much after controlling for household size. Due to this finding, examining the correlation between income and household size is needed. The regression result of household annual income on the count of household members in Table 8 shows that household annual income has a significant positive correlation with household size (the t-

statistics is 31.34). Therefore, controlling for household size has a strong influence on the coefficient estimates of total travel time distribution among income groups.

Figure 13 and Table 9 show the estimation results of racial total household travel time distribution, where the Asian, Native American and Pacific Islander has the longest total travel time on average. In Table 10, the number the households that conducted rural-to-rural trips in the NHTS highly aligns with the U.S. Department of Agriculture's 2017 data (2017), according to which, the Asian, Native American and Pacific Islander account for the fewest percent of rural population. This finding together with the estimation results suggests that the longer total travel time of these groups' might be because of the small volume of data.

The different indicator of congestion cost in this section has its strength when the congestion situation doesn't necessarily occur. However, taking vehicle miles traveled into consideration, households might not suffer from any efficiency loss even when they have the longest total travel time. Therefore, in the next section, I will resume using the congestion time loss as the indicator of congestion cost for analyzing the congestion cost distribution with all trips included.

3.3 Household level Congestion Cost Distributional Analysis with All Trips

For all 795,163 trips conducted by households using personal vehicles in the NHTS trip file, 74.88 percentage of them have time loss based on the definition of free-flow speed. 94.15 percentage of the 110,446 households traveling by personal vehicles are involved in these congested trips. These numbers are consistent with the findings from 2019 Urban Mobility Report (2019), which suggests that about 75% of the trips are experiencing some level of congestion. The average congestion time loss per person is 0.188 hour, which is larger than the estimated 0.145

hour in the report. I will adjust the definition of free-flow speed to meet this reported number in the robustness test part.

The regional congestion time loss distribution without controlling for other household's characteristics is shown in Figure 14 and column (1) of Table 11. It seems that households in the west north central region experience the least congestion while the households in the Pacific region experience the most congestion. This finding is consistent with the 2010 U.S. Census data (2010), reporting that the west north central region is the most sparsely populated region and Pacific the most densely populated. In Figure 15 and column (5) of Table 11, the average congestion time loss for New England households is higher among all groups adding the control variables, which is more consistent with the population density reported in the census data.

For the estimation of the congestion time loss distribution among income groups without controlling for other household's characteristics, the lowest income households bear significantly larger average congestion time loss than other households, and the medium income households bear the least average congestion time loss (refer to Figure 16 and column (1) of Table 12). After controlling for other household's characteristics in Figure 17 and column (5) of Table 12, the household congestion time loss decreases when the household income increases when the household income is under $100K.

The racial congestion time loss distribution estimation in Figure 18 shows that white households bear the least average congestion time loss, and the difference is significant. The estimation results in Table 13 indicate that adding categorical variables to the regression won't change this finding.

The distributional analysis of congestion time loss for all trips lead to very similar results as the distributional analysis of congestion time loss for urban-to-urban trips. This similarity shows

that the findings from using urban-to-urban trips and using all trips have some robustness and can be used for policy implications. Adding controls to the estimation won't change most of the distribution results. In the next part, I will further examine the robustness of the distribution results by altering the construction of free-flow speed.

Part 4. Robustness Tests

The robustness tests are conducted to check the sensitivity of the results of this thesis to the specifications in the theoretical model. In this part, I will examine the results obtained in part 3.3 Household level Congestion Cost Distributional Analysis with All Trips by using different definitions of congestion cost. The first robustness test is to replace the construction of congestion cost in Part 3.3 with the total household travel time (same as the definition of congestion cost in Part 3.2). The second robustness test involves three different bars of the free-flow speed, including median, the upper and lower quartiles of the speed of the trips that happen in the free-flow time zone.

Considering that congestion cost in this research is highly affected by the free-flow speed, I first test the results of distributional analyses without the effect of free-flow speed. I keep the focus on trips happened between 5 am and 1 am the next day since there is only a very small percentage of trips happing between 1am and 5am (2,877 out of 793,971) and there's not likely to be any congestion on the road. Without the free-flow speed, the results show the distributional analyses of total household travel time. Figure 19 is the distribution of total household travel time among income groups. Comparing it to Figure 16 shows that although households with higher income spend more time on traveling in personal vehicles, they generally suffer from less congestion than

lower income groups, especially households with annual income lower than $15,000. Table 14 shows that controlling for region, household size and household race doesn't significantly affect the distribution of total household travel time among income groups. The regional distribution of total household travel time is shown in Figure 20. The difference between Figure 20 and Figure 14 implies that households in east south central area have much longer average total travel time, but the average congestion cost is lower than most areas, suggesting better traffic condition over all. Households in pacific area, however, experience the opposite situation. The racial distribution of total household travel time is shown in Figure 21. Comparing Figure 21 and Figure 18 shows that African American households have low average total travel time but high congestion time loss.

Figure 22, Figure 23 and Figure 24 as well as Table 17, Table 18 and Table 19 are the regional distributions of household congestion cost using median, upper quartile and lower quartile of free-flow time zone trip speed as free-flow speed. The results show that the regional distribution doesn't change when different free-flow speeds are chosen. The racial distribution of congestion cost doesn't show many changes as the free-flow speed changes. The results for distributions of household congestion cost among income groups show slightly different results. Generally, the congestion costs are higher for lower income groups with the exception of households with income between $25,000 and $30,000.

With all the empirical analysis above, I find that households living in areas with higher population density, like Middle Atlantic, South Atlantic and Pacific regions, suffer from more traffic time loss in their personal vehicle, as do low-income households. The racial distributional analysis of congestion time loss shows that white households bear the least time loss among all households. Comparing with the distributional analyses including all trips, I find that most of the

congestion time loss comes from urban-to-urban trips, and the results of the distributional analyses are not significantly influenced by adding in other trips.

Chapter 3 Policy Implications and Conclusions

Part 1. Policy Implications

In the former few decades, the only wide-applied taxation that could address congestion externality caused by driving at a certain level, is gasoline tax. However, even the gasoline tax is deviating further and further from being the correct Pigovian tax for congestion externality, since with more and more EV and PHEV on the road, the gasoline consumption is not going to be proportional to the driving distance. Also, the regressive nature of the gasoline tax makes it very unpopular among policy makers and individuals, therefore, hard to set at a higher level (Parry and Small, 2004).

With the finding that lower income household group suffers more from congestion, directly charging drivers for congestion would also cause regressive effect, especially when considering that time savings are less valuable to low-income than to high-income. One of the solutions proposed by Small (1993) is to use the revenues on improving inner cities traffic services, which would mostly benefit the low-income. Another solution that he proposed is to use the revenue as a reimbursement to travelers through commuting allowance to workers. Charging for congestion can also be used as an alternative for gasoline tax, which may reduce a regressive tax.

Part 2. Conclusions

With the modeling of congestion cost in this research, I find that households locating in densely populated areas, with lower annual income or belong to ethnic minorities bear more time loss from congested trips and suffer more from bad traffic conditions, even though they don't have the longest total travel time.

Comparing the results of congestion cost distribution inside urban areas and among all trips, it can be seen that most of the congestion cost that households are bearing comes from urban-to-urban trips.

While the robustness test suggests that the results obtained are encouraging, there are still a few caveats that should be recognized. Since I don't have information on the speed limit of the roads where the trips are taking place, the construction of the free-flow speed is flawed (in the extreme case where the trip happens entirely inside a low-speed-limit neighborhood, the trip could be considered totally congested all time even if there's no traffic on the road). The second caveat stems from the methodology that NHTS 2017 measures the trip length. NHTS 2017 uses the length of the best route from Google Map as the estimated trip length. However, the longer the trips are, the more likely that the trips are to deviate from the best route and to involve other activities such as refuel the gasoline. Another problem with the construction of the congestion cost for each trip is that the trip speed is the average speed of the entire trip, which ignores the congestion that could happen in part of the trip but was omitted since the rest of the trip has a high speed. This is clearly an area worth further investigation, especially if the road data is accessible.

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Figure 1

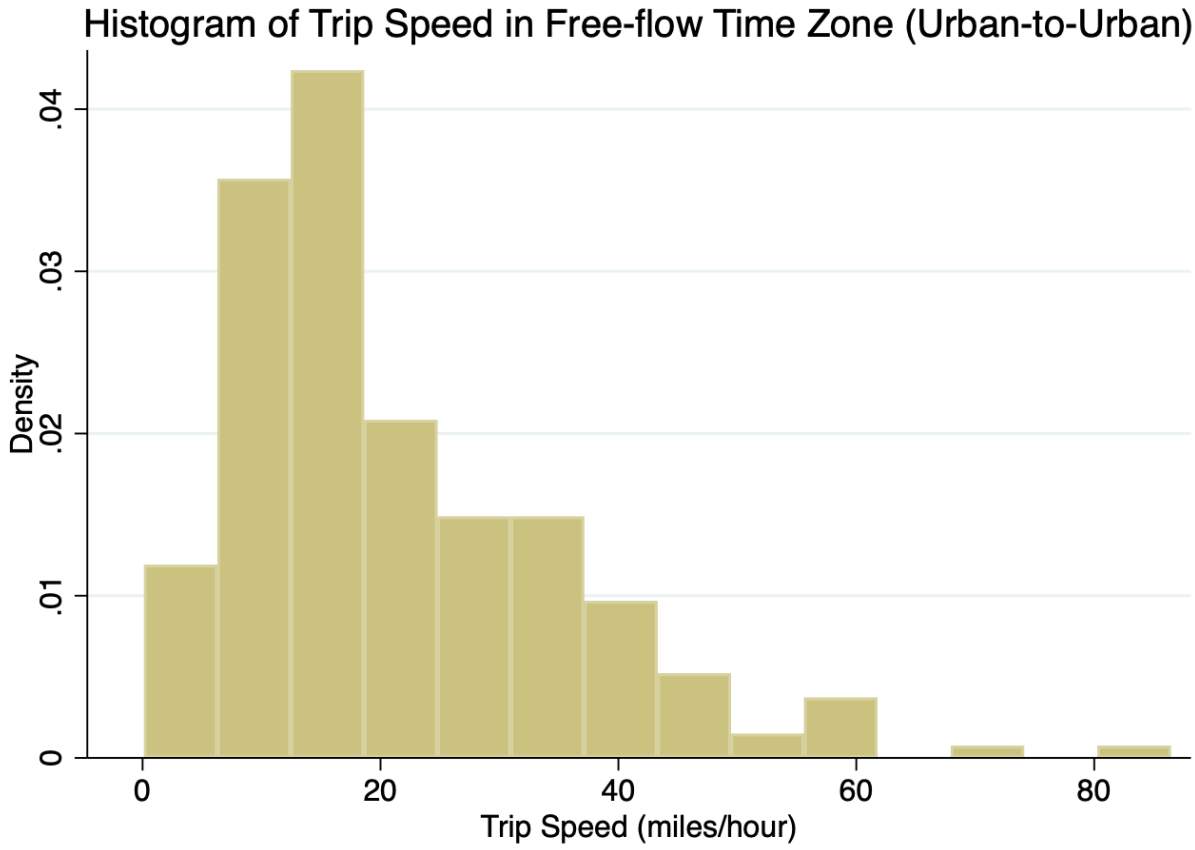
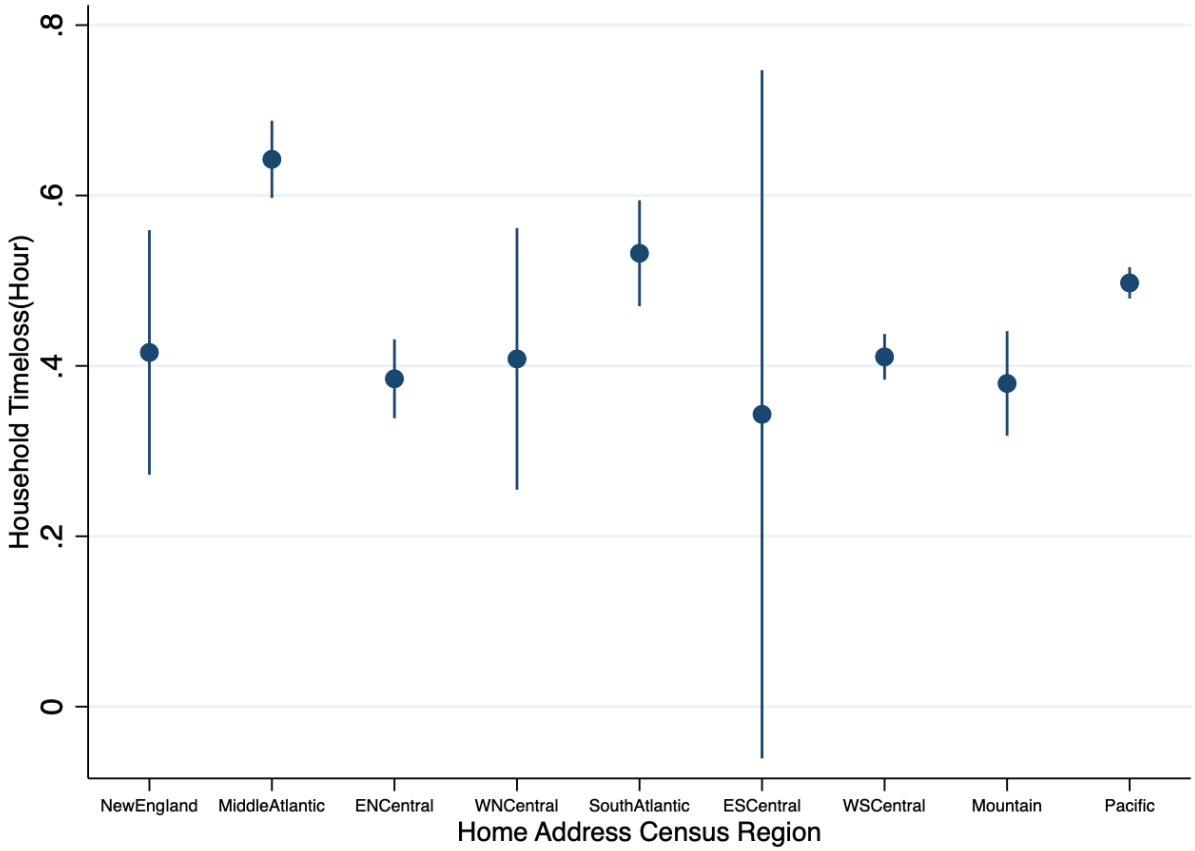
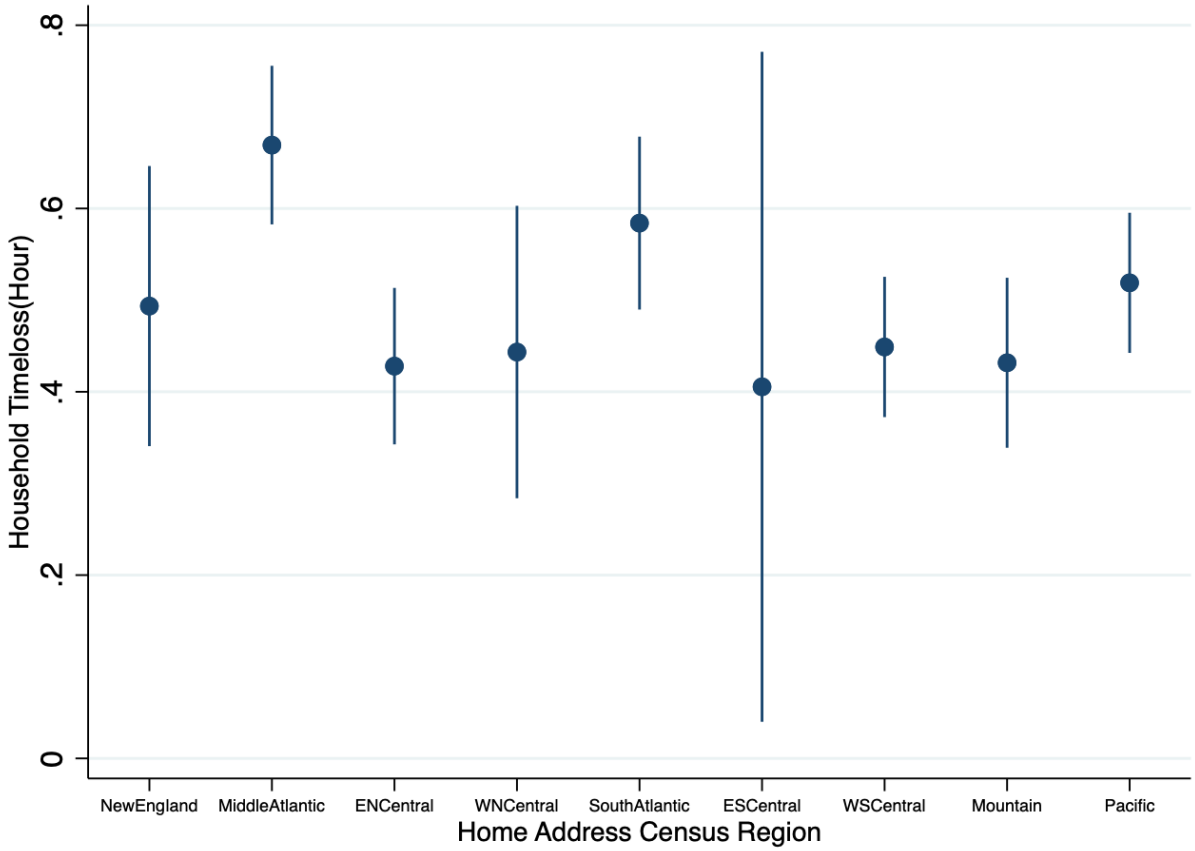

Histogram of Trip Speed in Free-flow Time Zone (Urban-to-Urban)
Density
0
.01
.02
.03
.04
0
20
40
60
80
Trip Speed (miles/hour)

Figure 2 Regional Congestion Time Loss Distribution without Categorical Variables (Urban-to-Urban trips)



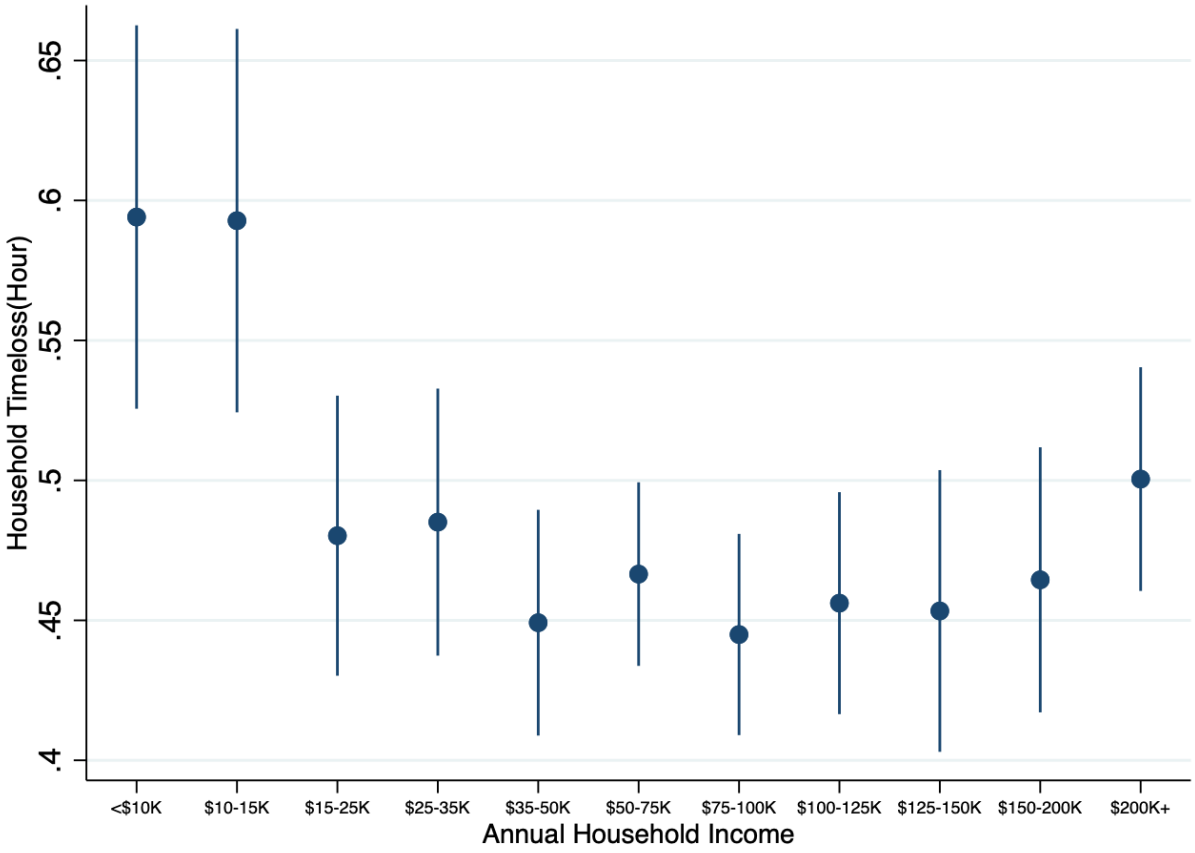
Same regression as Table 2 column (1)

Figure 3 Regional Congestion Time Loss Distribution with Categorical Variables (Urban-to-Urban trips)



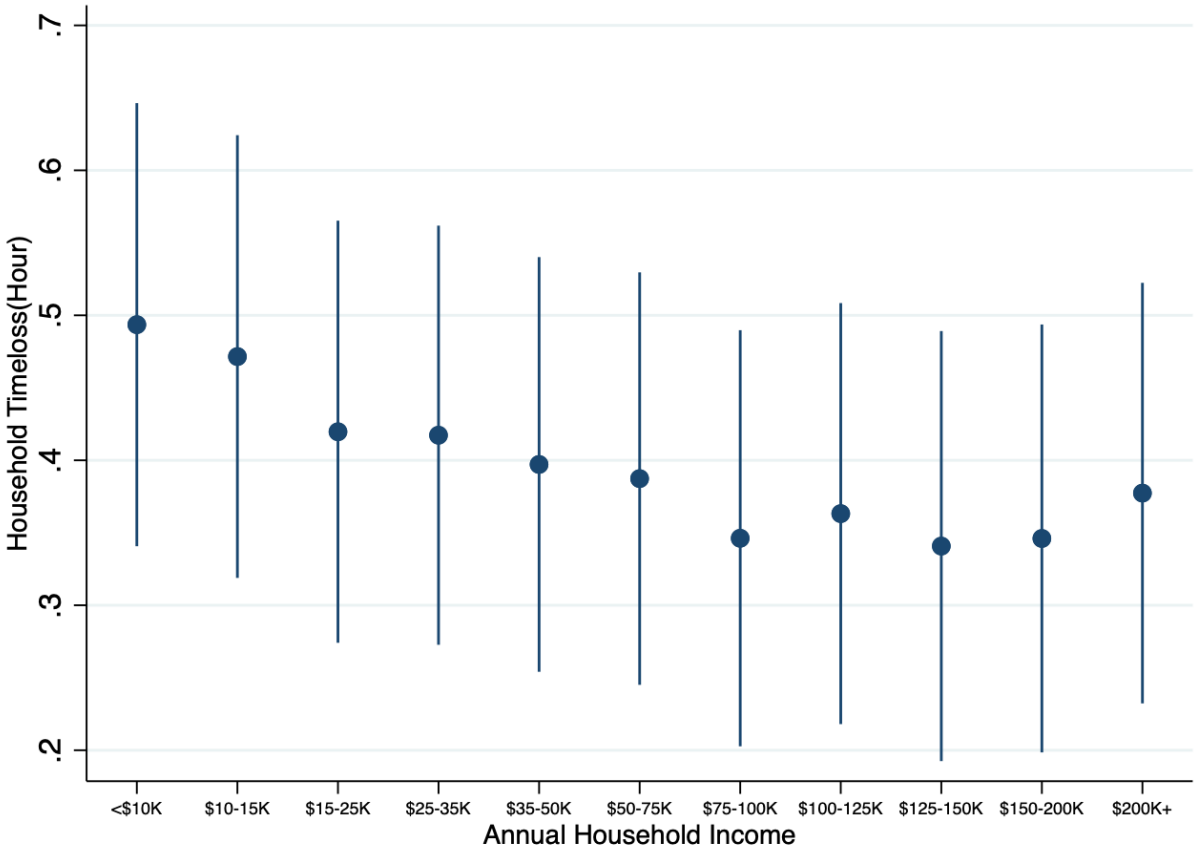
Same regression as Table 2 column (5)

Figure 4 Congestion Time Loss Distribution among Income Groups without Categorical Variables (Urban-to-Urban trips)



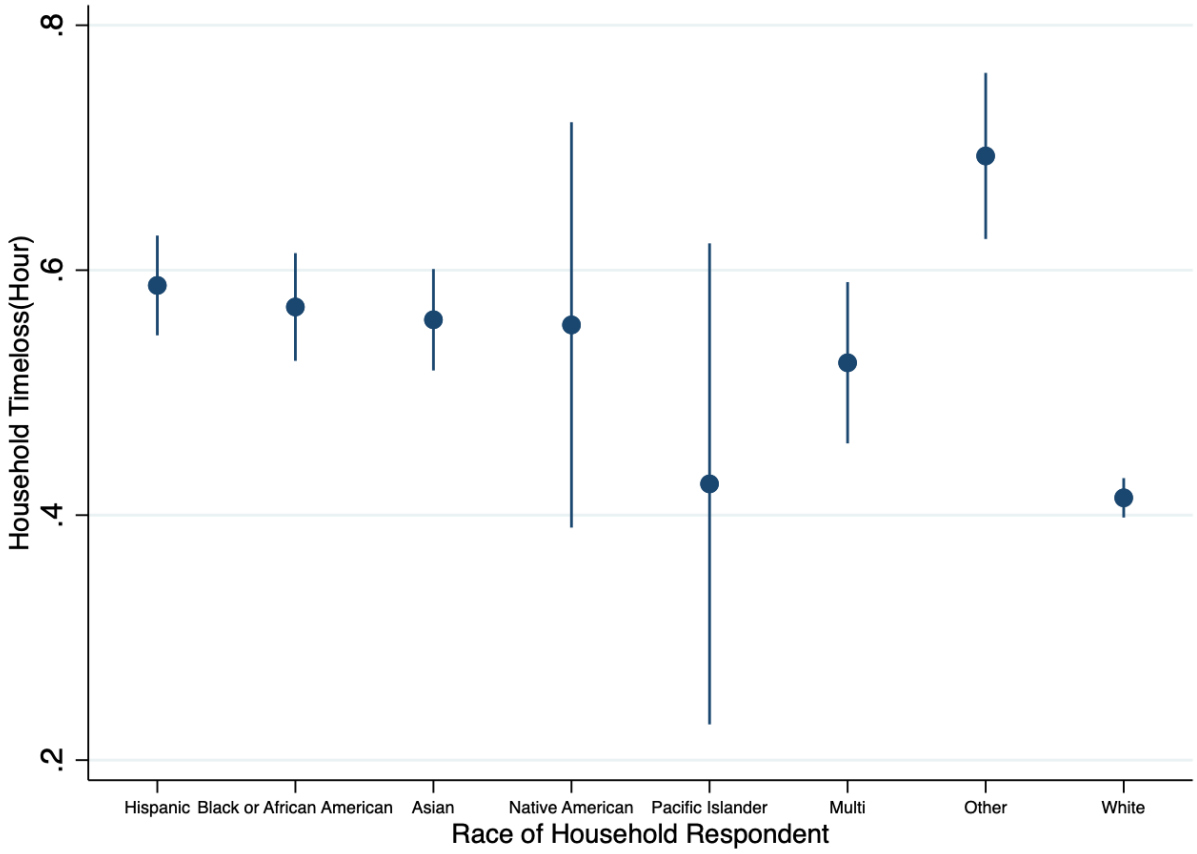
Same regression as Table 3 column (1)

Figure 5 Congestion Time Loss Distribution among Income Groups with Categorical Variables (Urban-to-Urban trips)



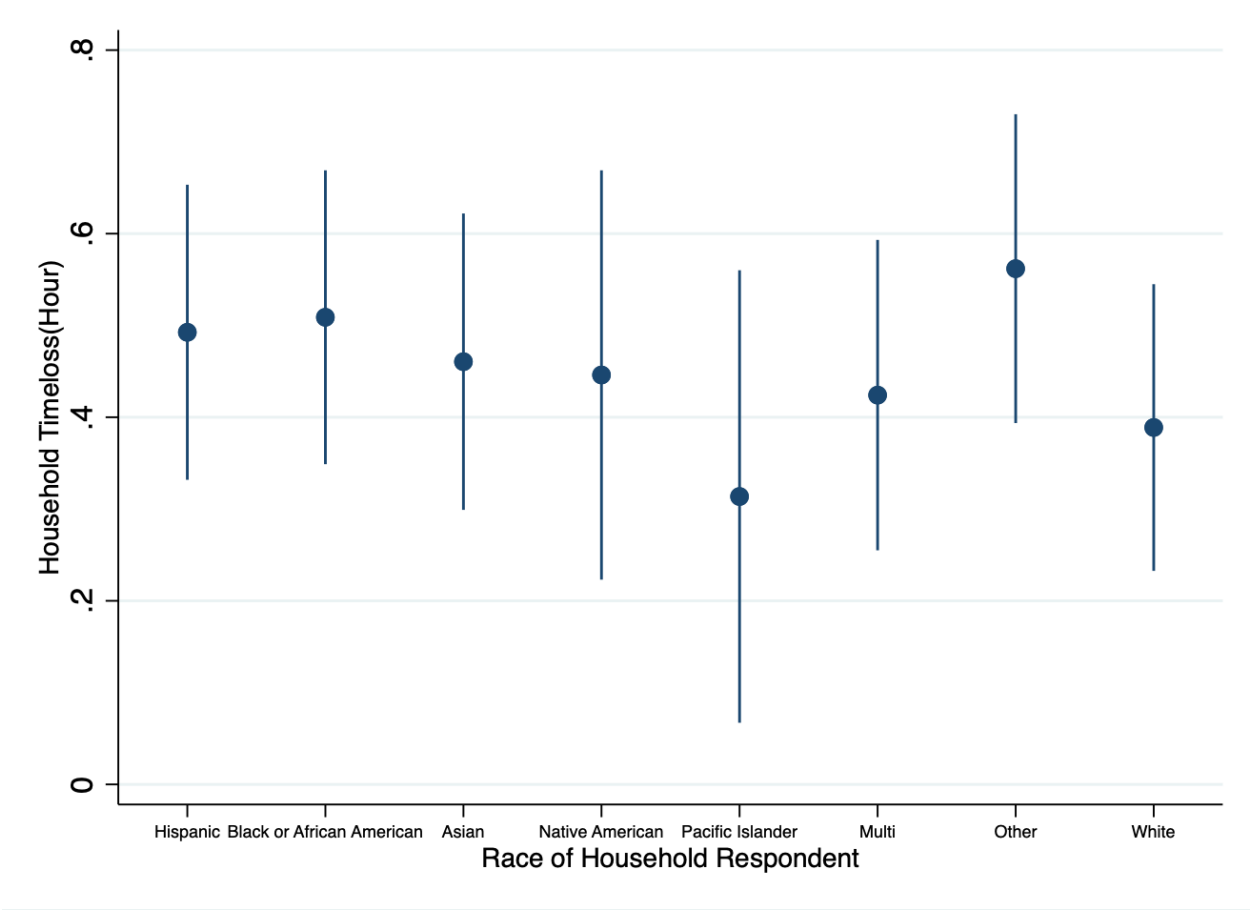
Same regression as Table 3 column (5)

Figure 6 Racial Congestion Time Loss Distribution without Categorical Variables (Urban-to-Urban trips)



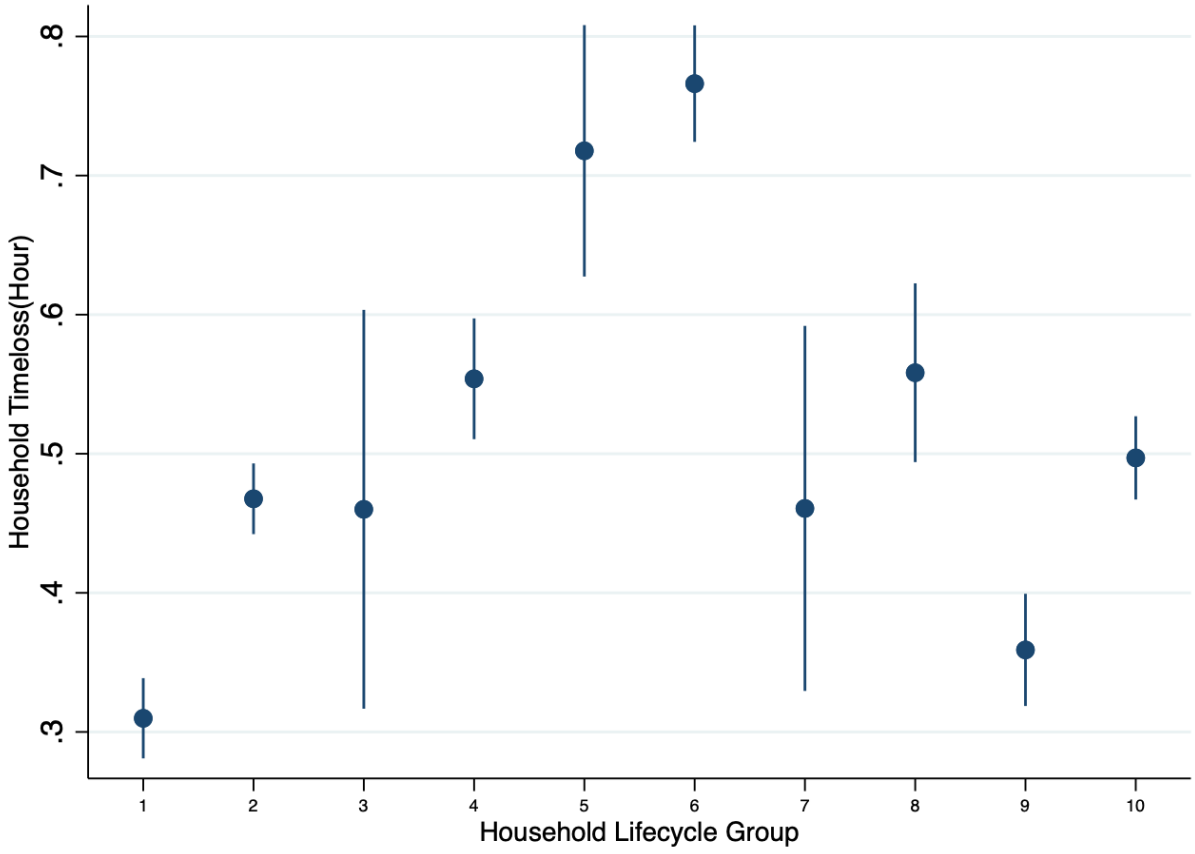
Same regression as Table 4 column (1)

Figure 7 Racial Congestion Time Loss Distribution with Categorical Variables (Urban-to-Urban trips)



Same regression as Table 4 column (5)

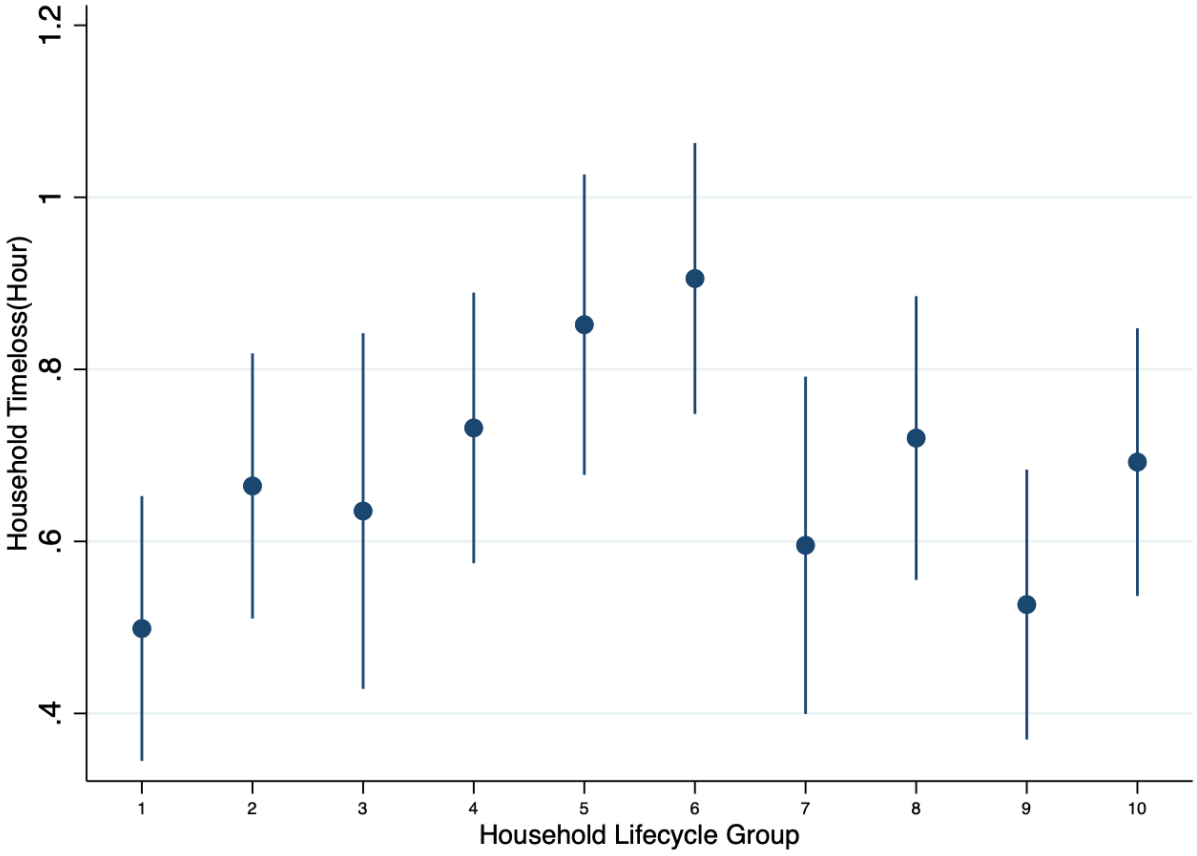
Figure 8 Congestion Time Loss Distribution among Household Lifecycle Group without Categorical Variables (Urban-to-Urban trips)



1: single households without children; 2: two-adult households without children; 3: single-parent households with a child or children aged below 5; 4: two-parent households with a child or children aged below 5; 5: single-parent households with a child or children aged 6-15; 6: two-parent households with a child or children aged 6-15; 7: single-parent households with a child or children aged below 16-21; 8: two-parent households with a child or children aged 16-21; 9: single-retiree households with no children; 10: two-retiree households with no children.

Same regression as Table 5 column (1)

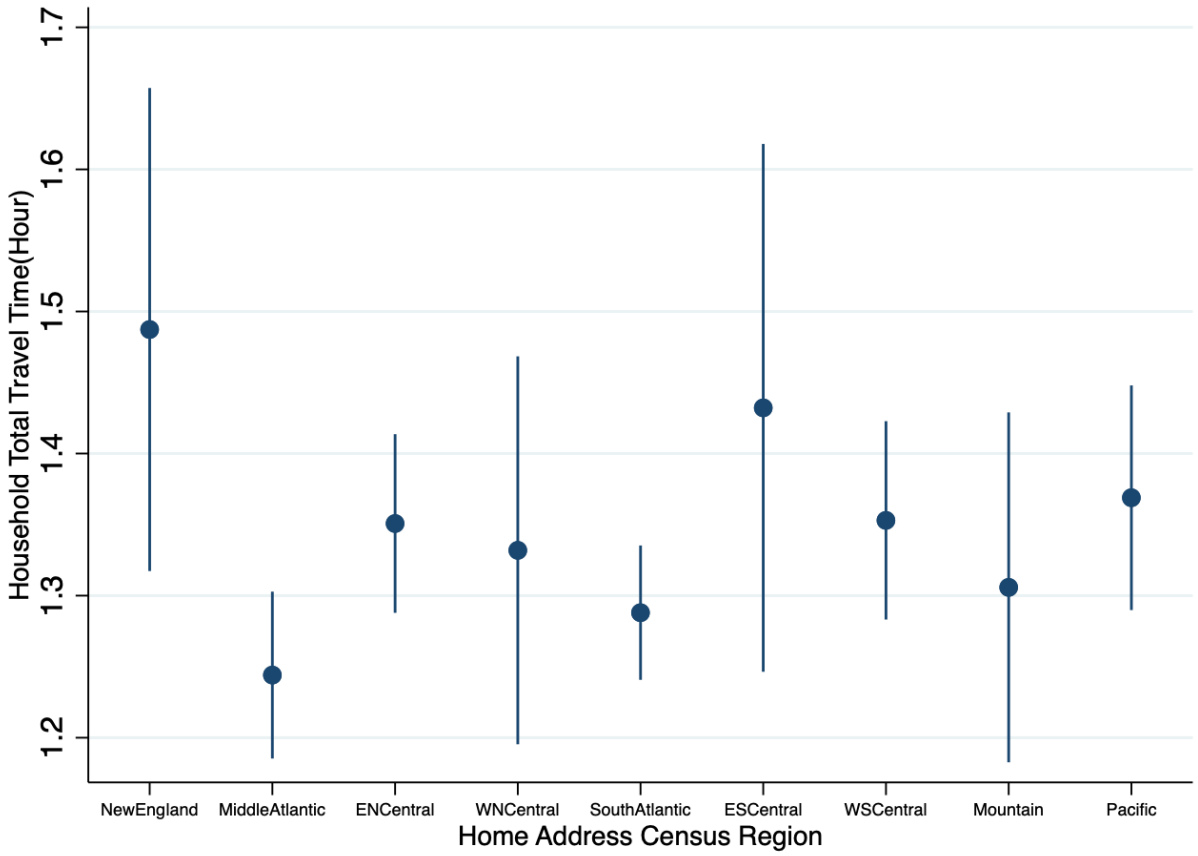
Figure 9 Congestion Time Loss Distribution among Household Lifecycle Group with Categorical Variables (Urban-to-Urban trips)



The household lifecycle that 1-10 represent can be found under Figure 8.

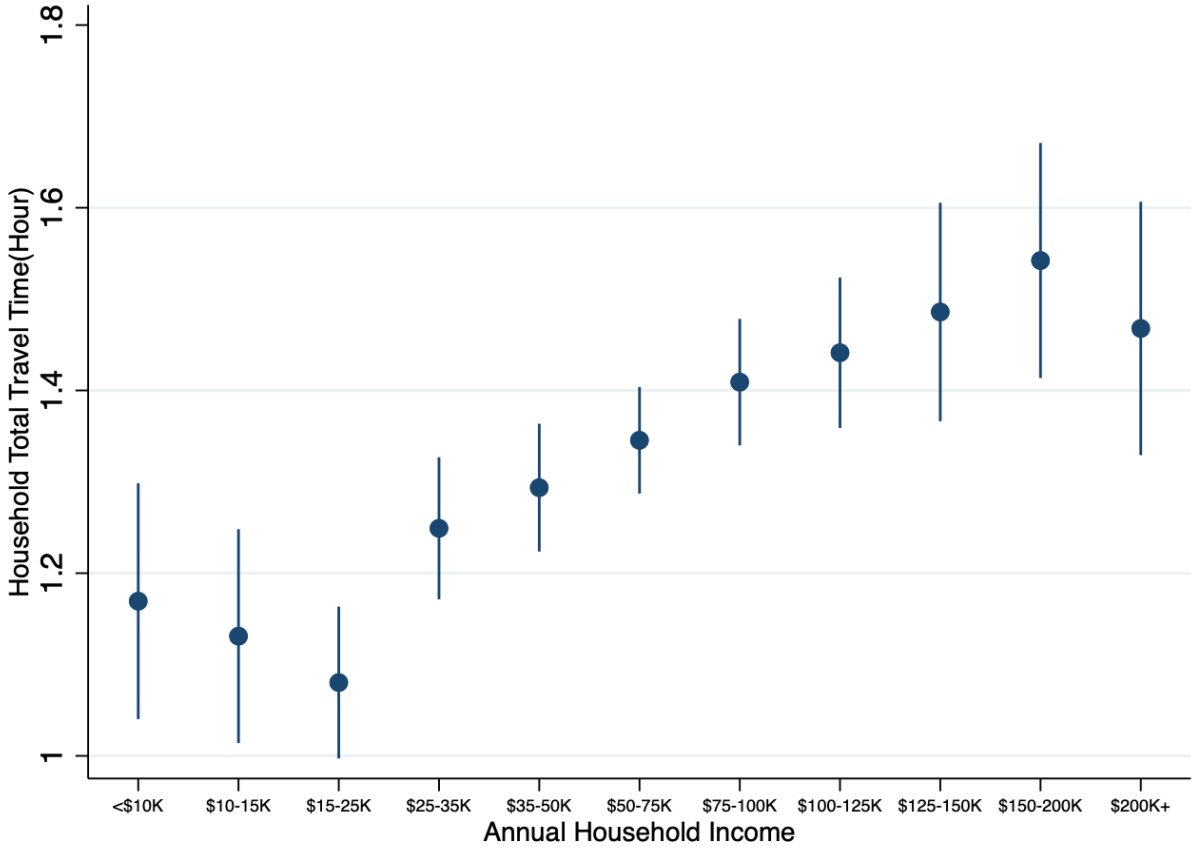
Same regression as Table 5 column (5)

Figure 10 Regional Total Travel Time Distribution without Categorical Variables (Rural-to-Rural trips)



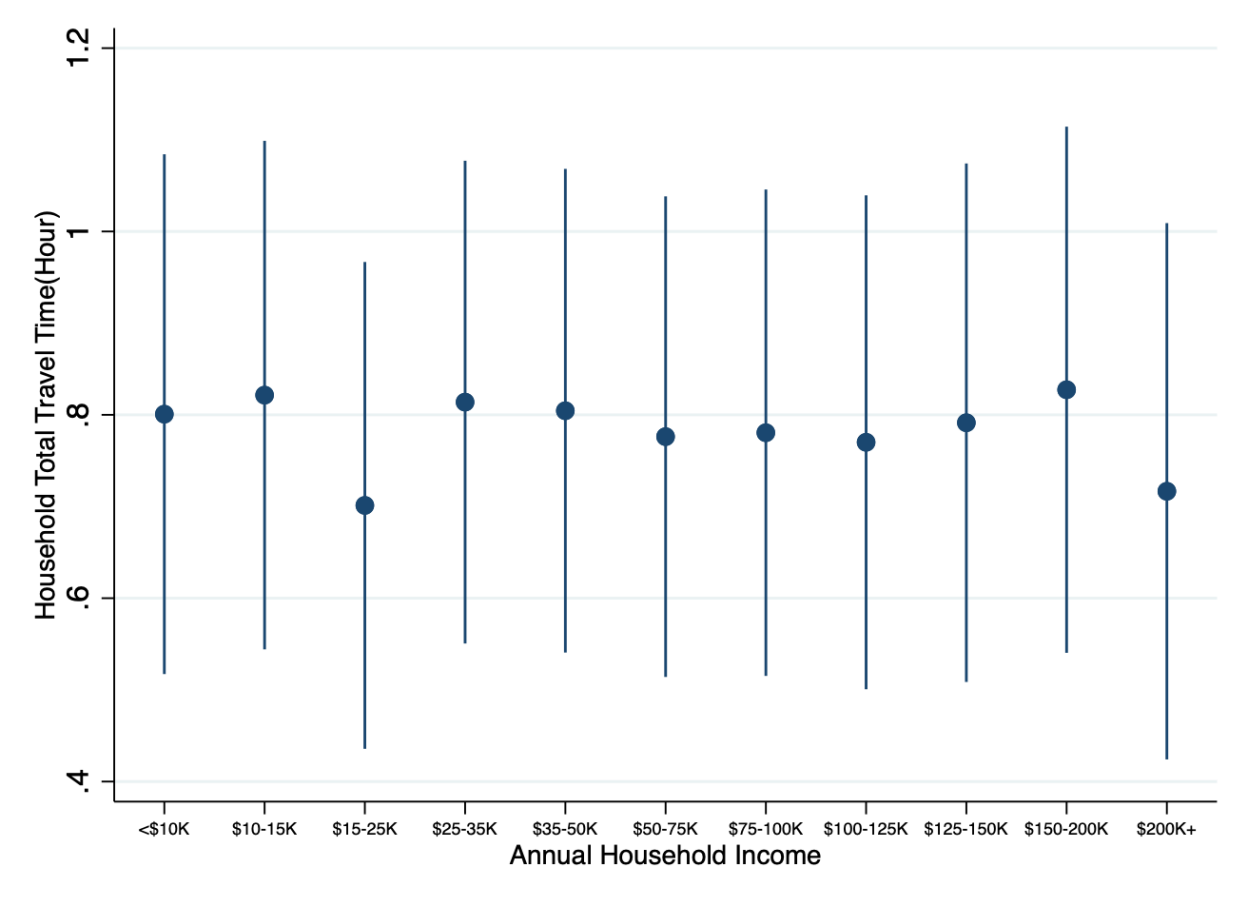
Same regression as Table 6 column (1)

Figure 11 Total Travel Time Distribution among Income Groups without Categorical Variables (Rural-to-Rural trips)



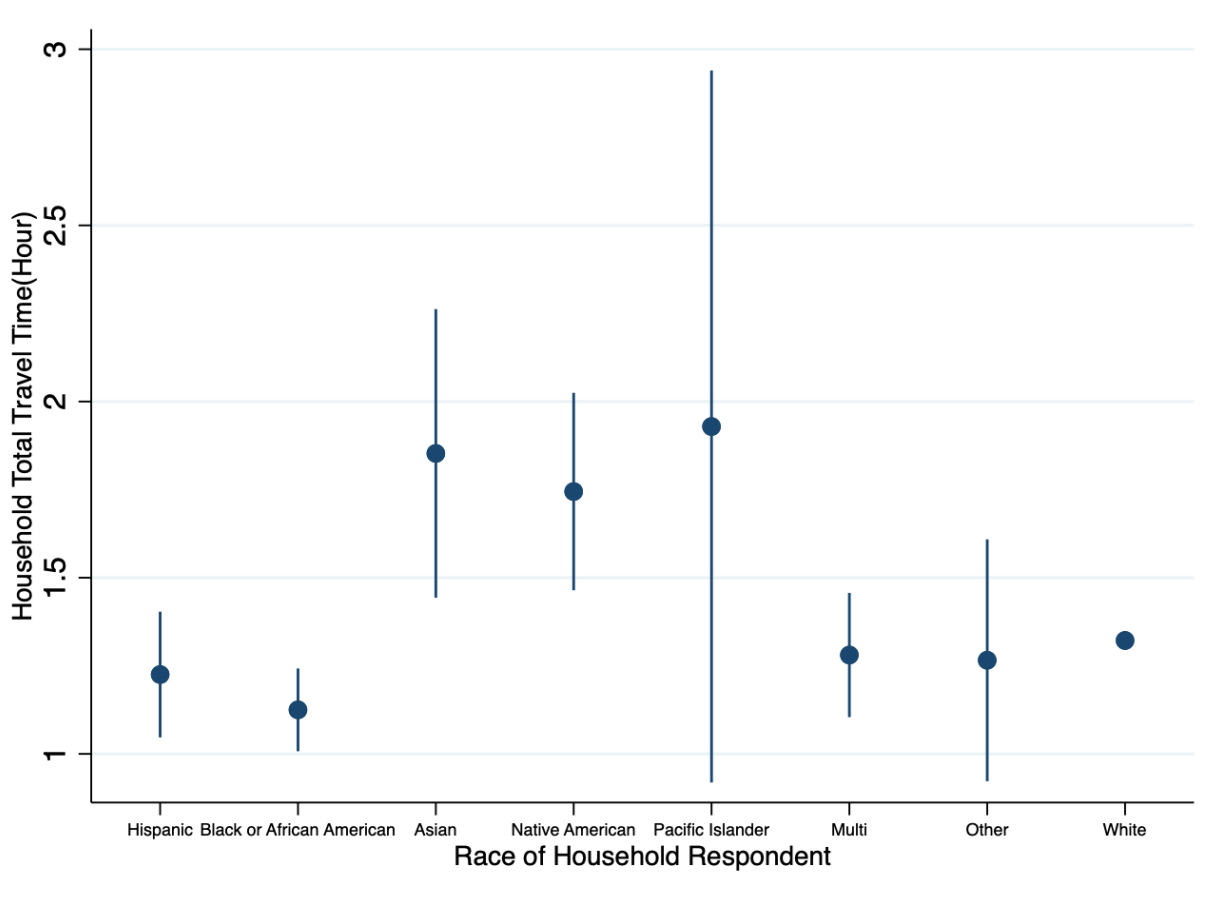
Same regression as Table 7 column (1)

Figure 12 Total Travel Time Distribution among Income Groups with Categorical Variables (Rural-to-Rural trips)



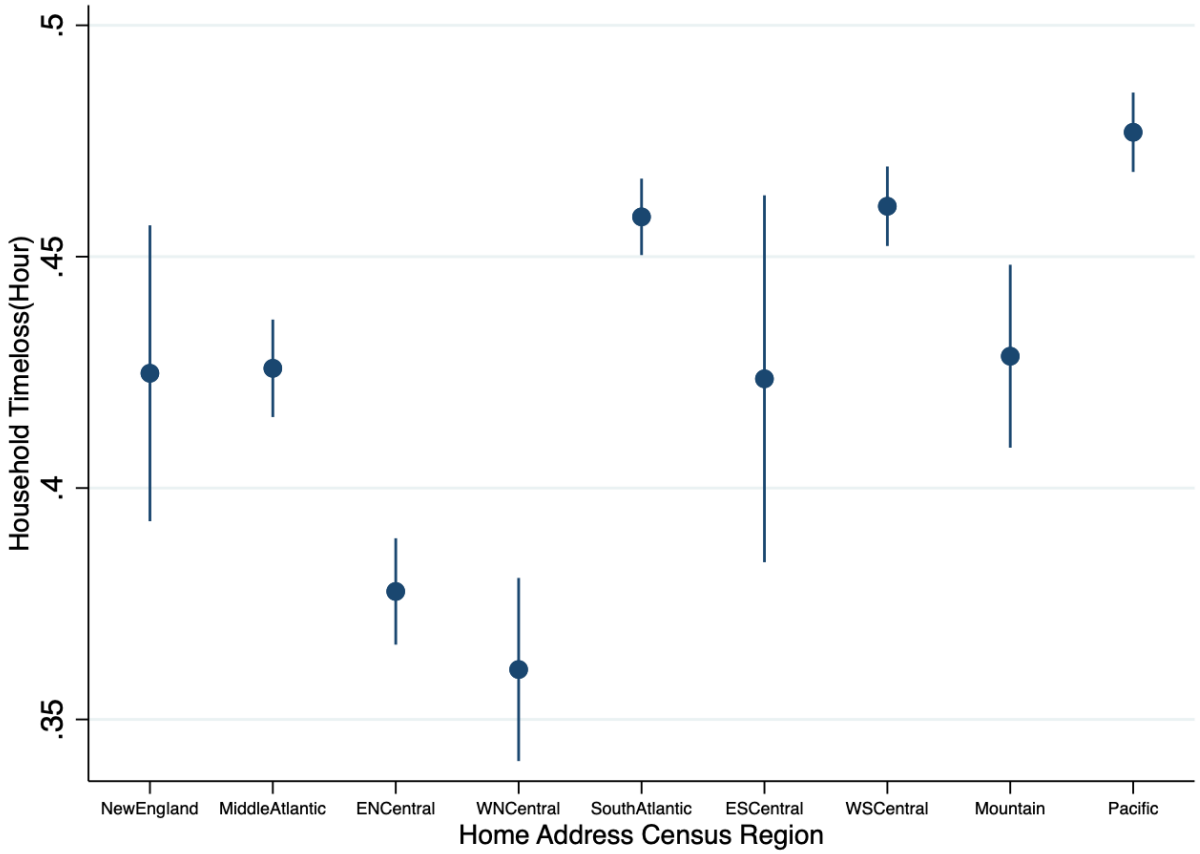
Same regression as Table 7 column (5)

Figure 13 Racial Total Travel Time Distribution without Categorical Variables (Rural-to-Rural trips)



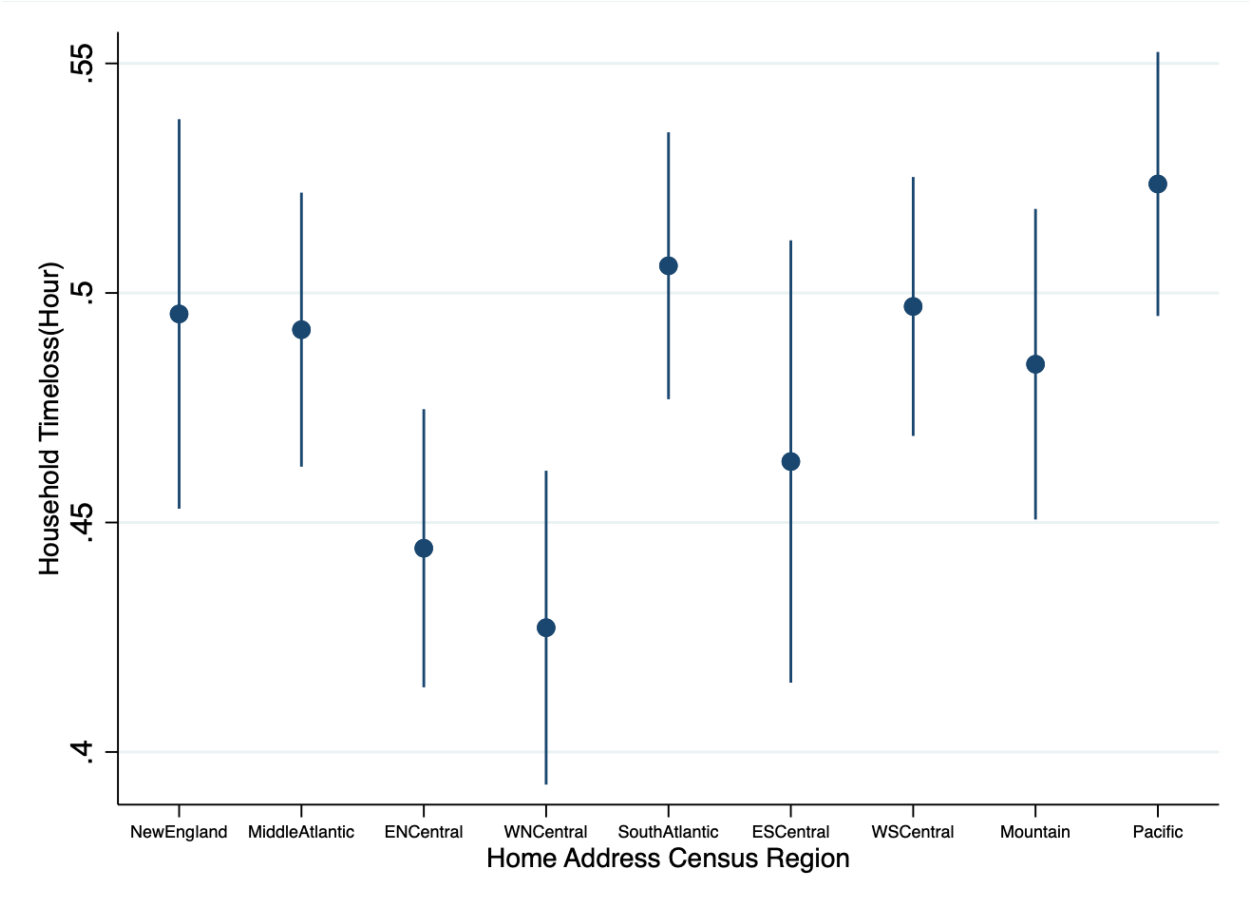
Same regression as Table 9 column (1)

Figure 14 Regional Congestion Time Loss Distribution without Categorical Variables (All trips)



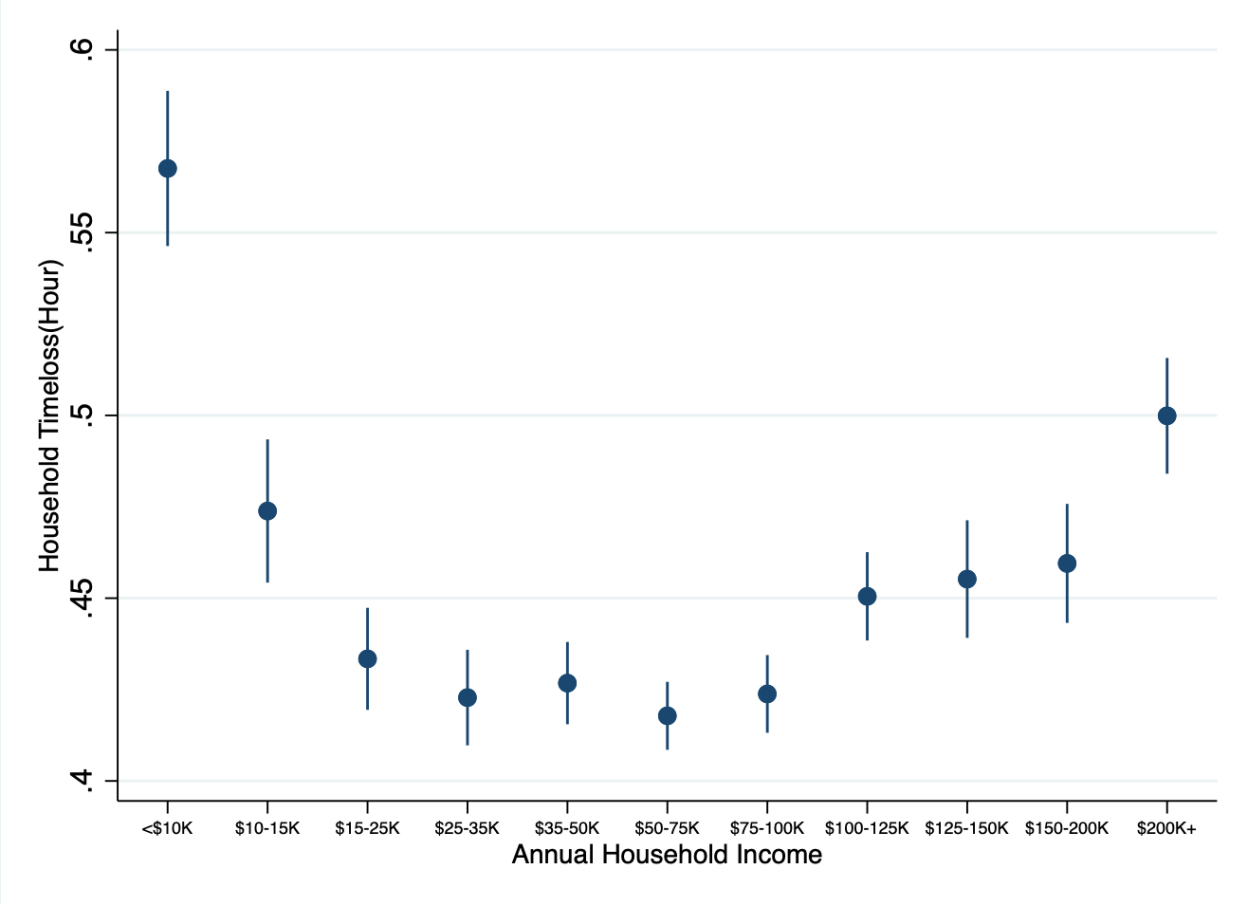
Same regression as Table 11 column (1)

Figure 15 Regional Congestion Time Loss Distribution with Categorical Variables (All trips)



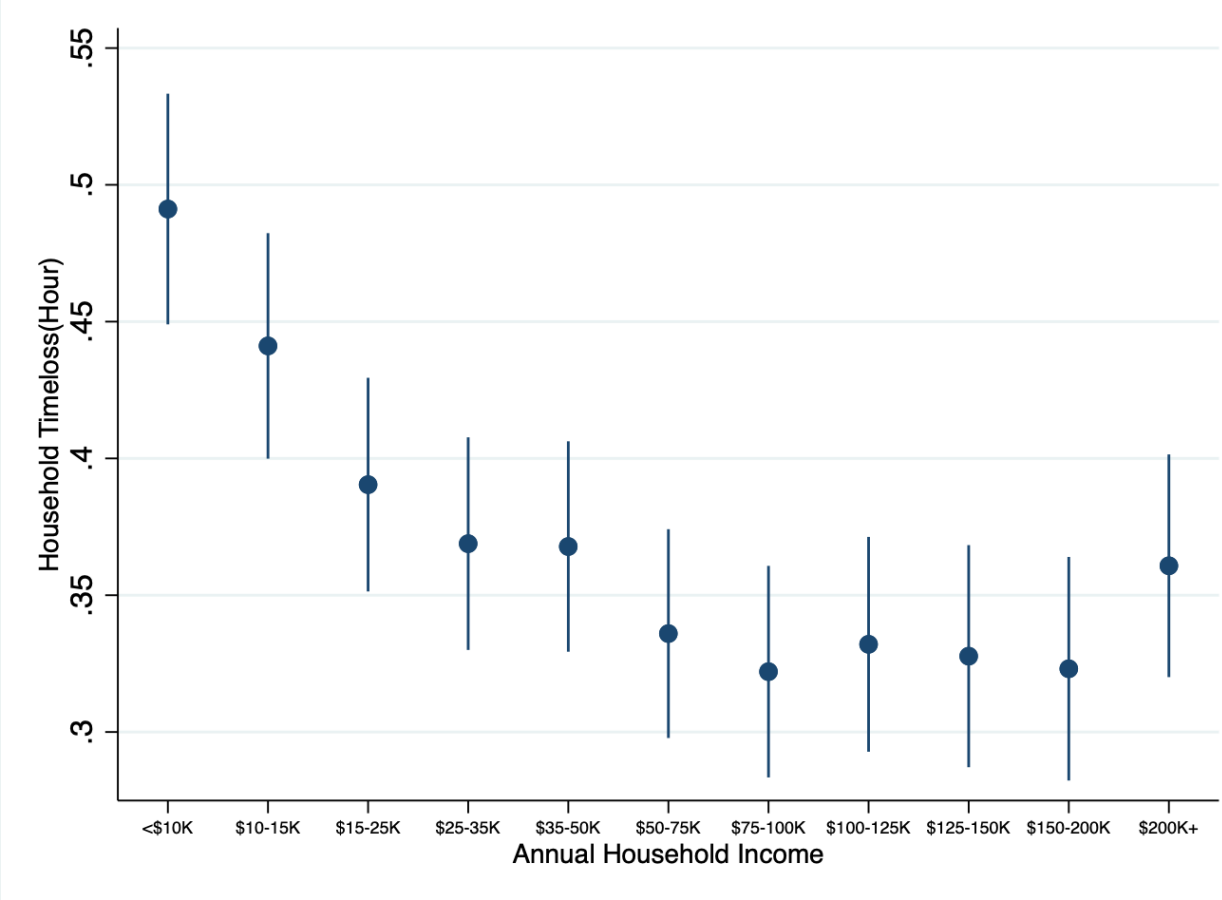
Same regression as Table 11 column (5)

Figure 16 Congestion Time Loss Distribution among Income Groups without Categorical Variables (All Trips)



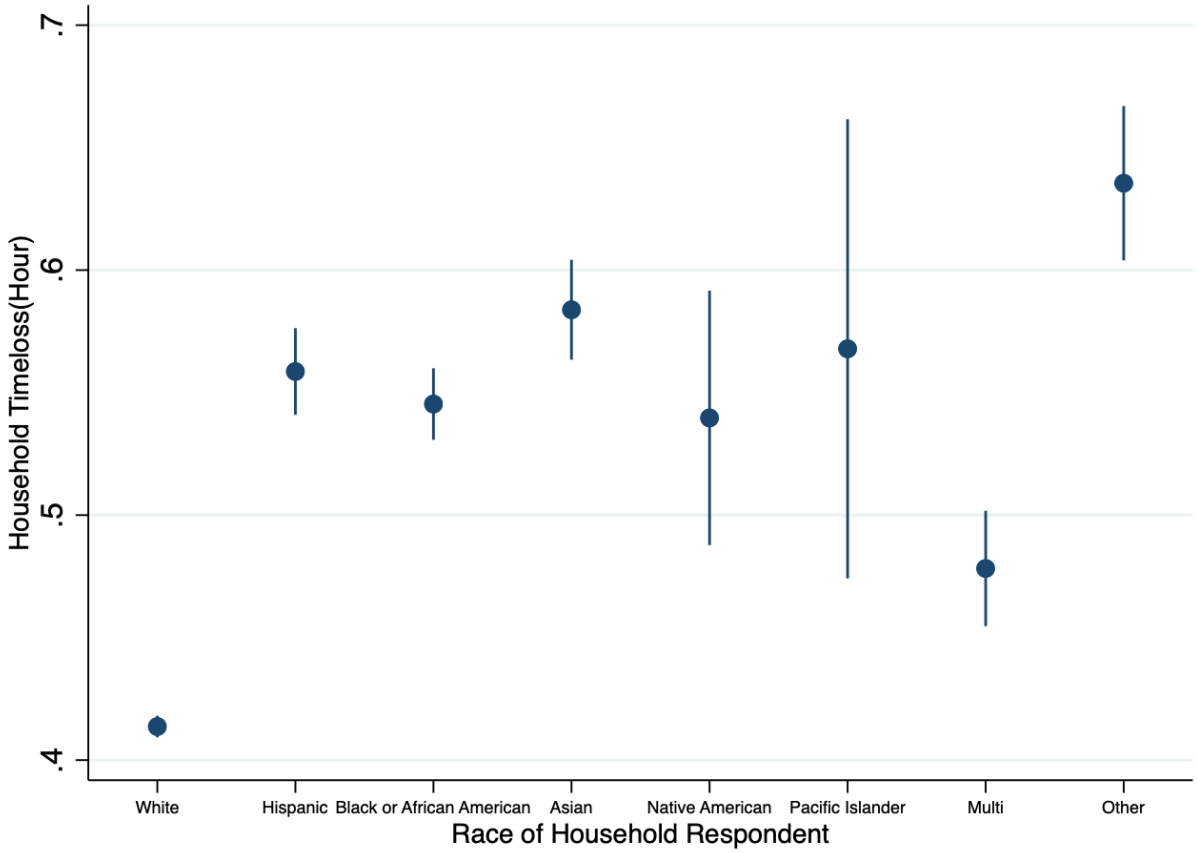
Same regression as Table 12 column (1)

Figure 17 Congestion Time Loss Distribution among Income Groups with Categorical Variables (All Trips)



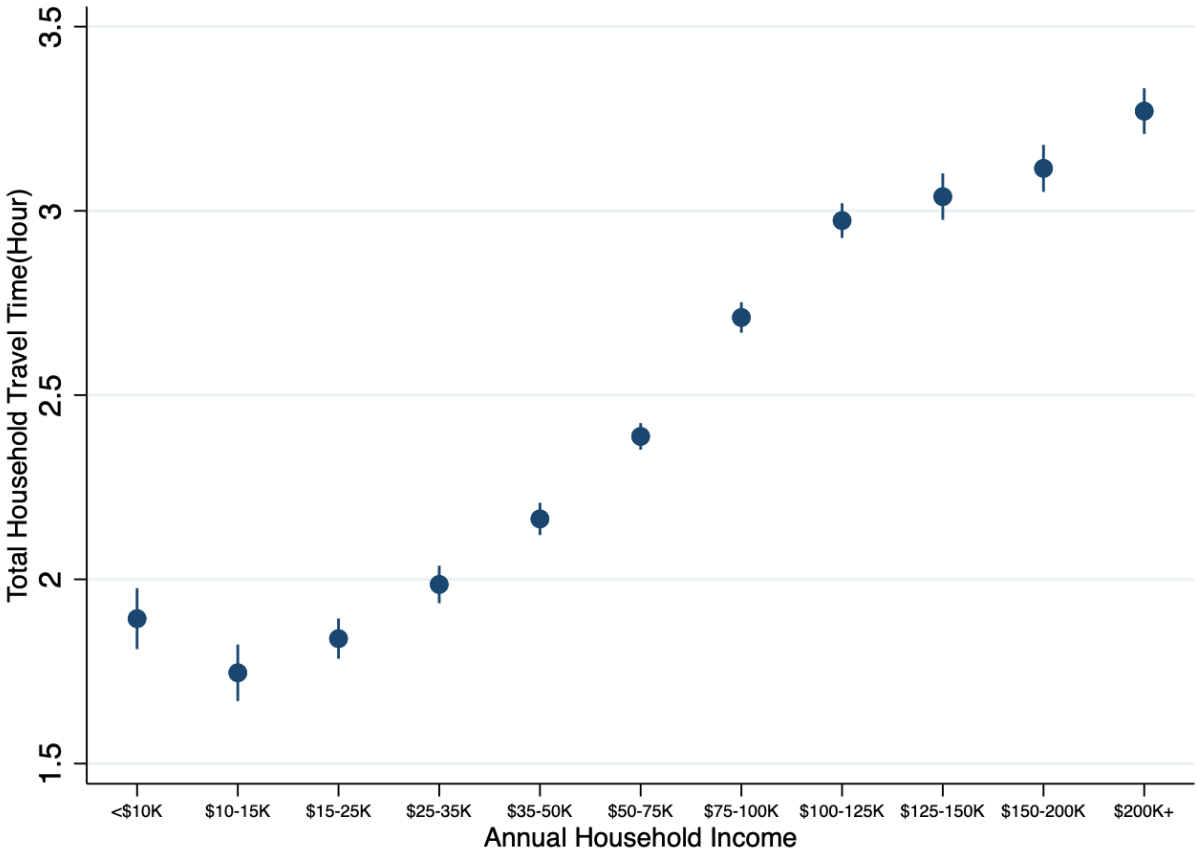
Same regression as Table 12 column (5)

Figure 18 Racial Congestion Time Loss Distribution without Categorical Variables (All trips)



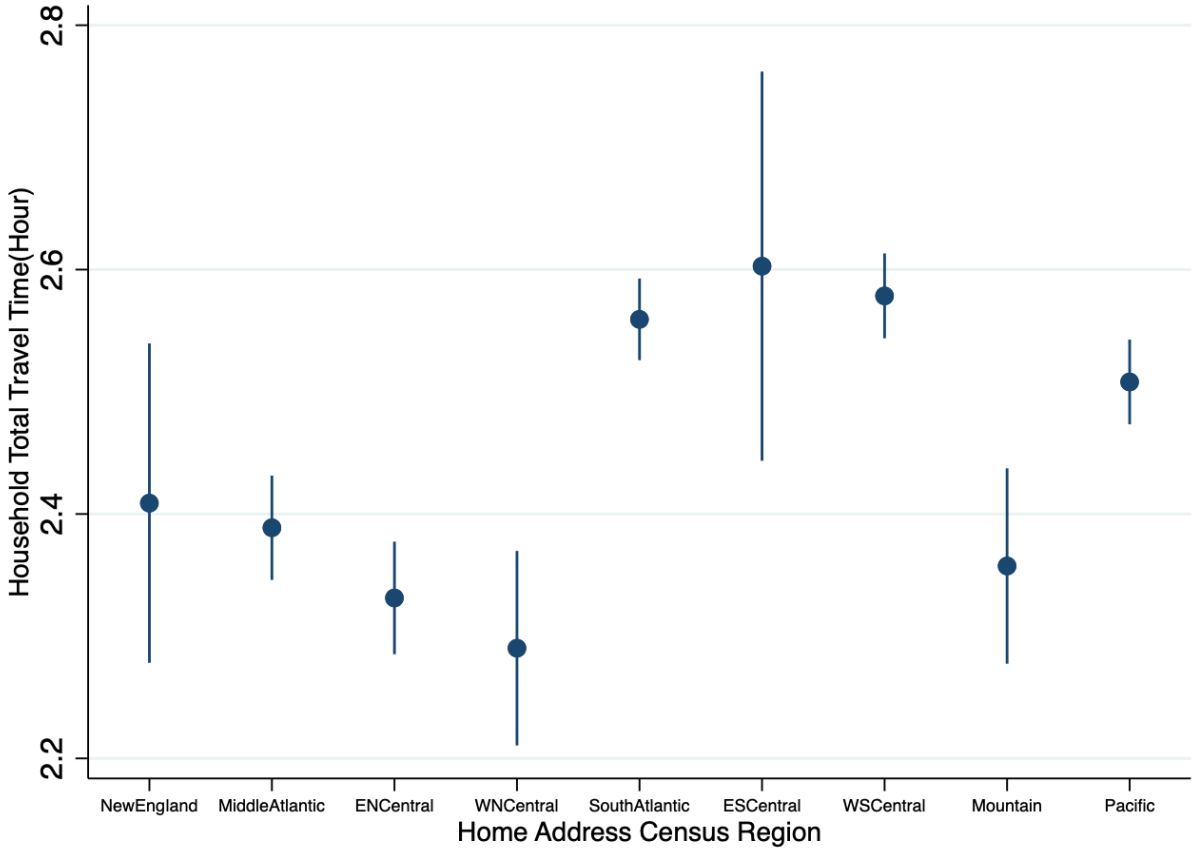
Same regression as Table 13 column (1)

Figure 19 Total Household Travel Time Distribution among Income Groups without Categorical Variables (All Trips)



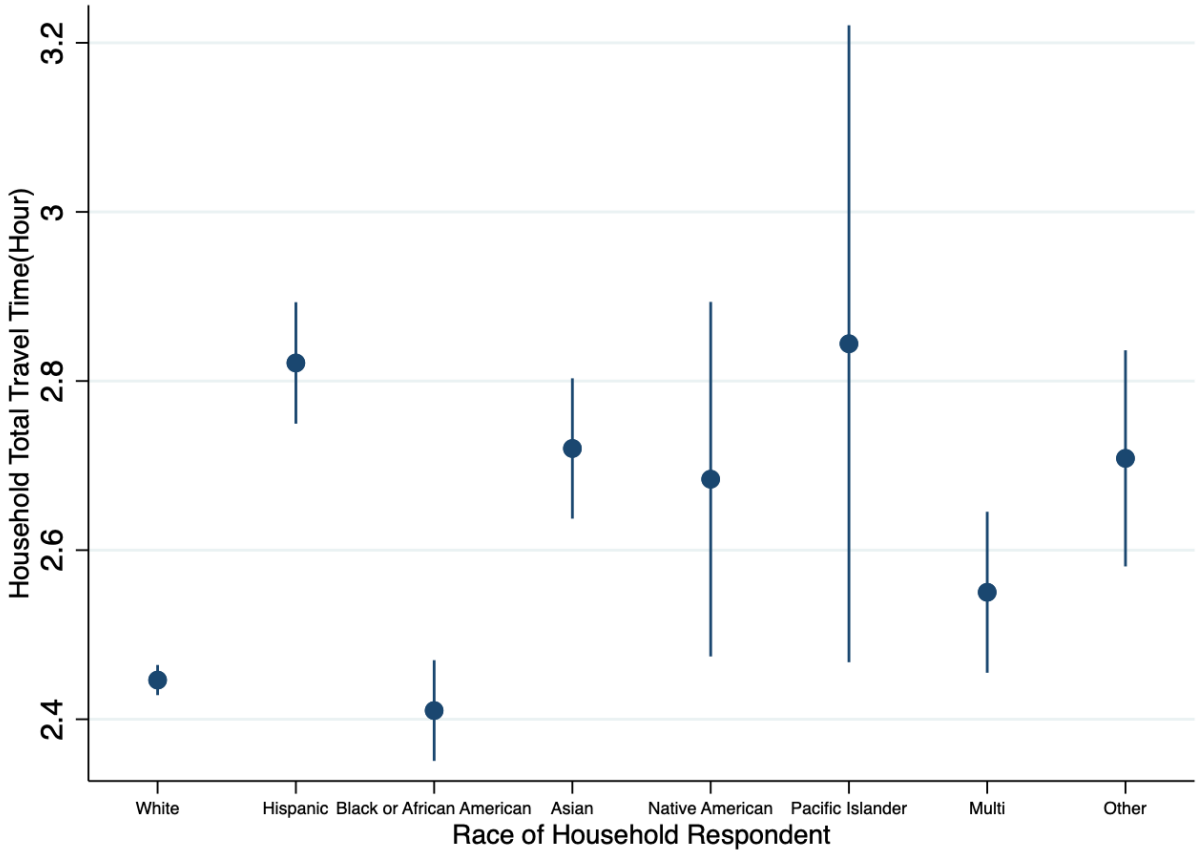
Same regression as Table 14 column (1)

Figure 20 Regional Total Household Travel Time Distribution without Categorical Variables (All trips)



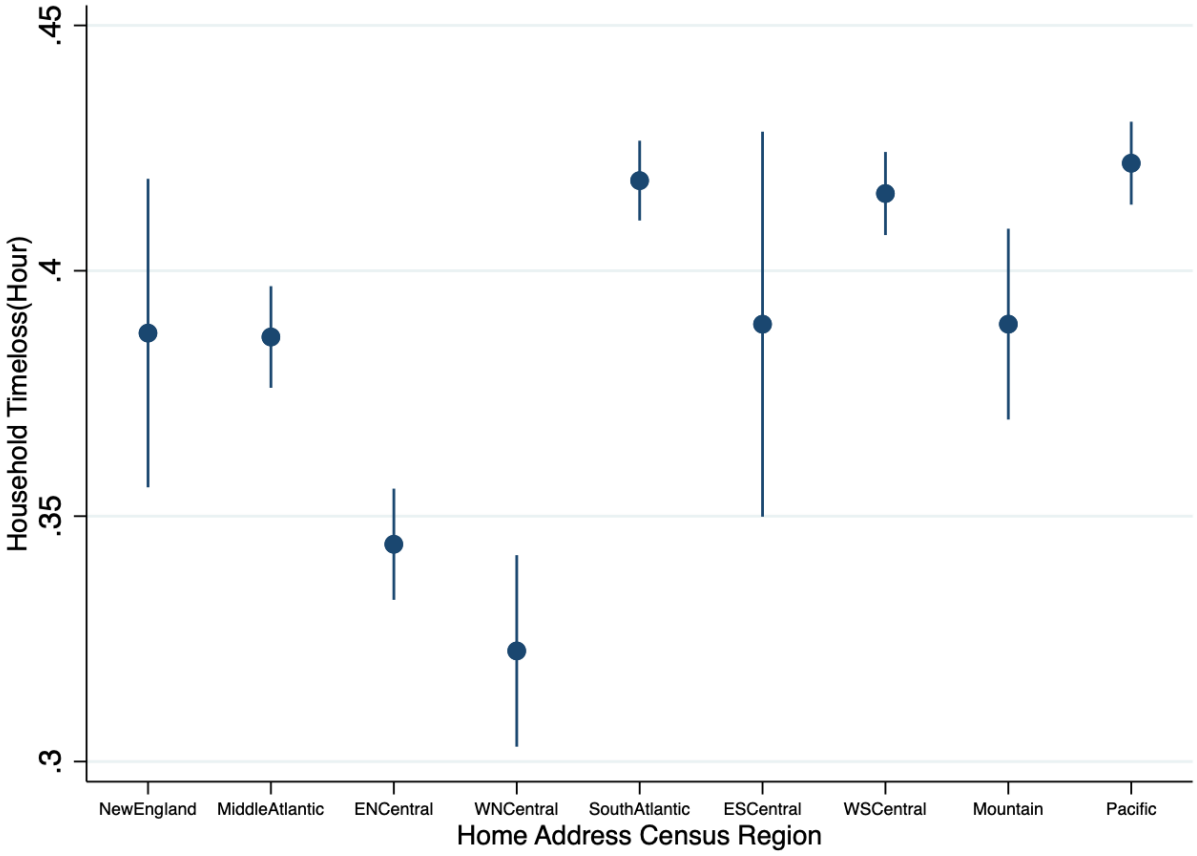
Same regression as Table 15 column (1)

Figure 21 Racial Household Total Travel Time Distribution without Categorical Variables (All trips)



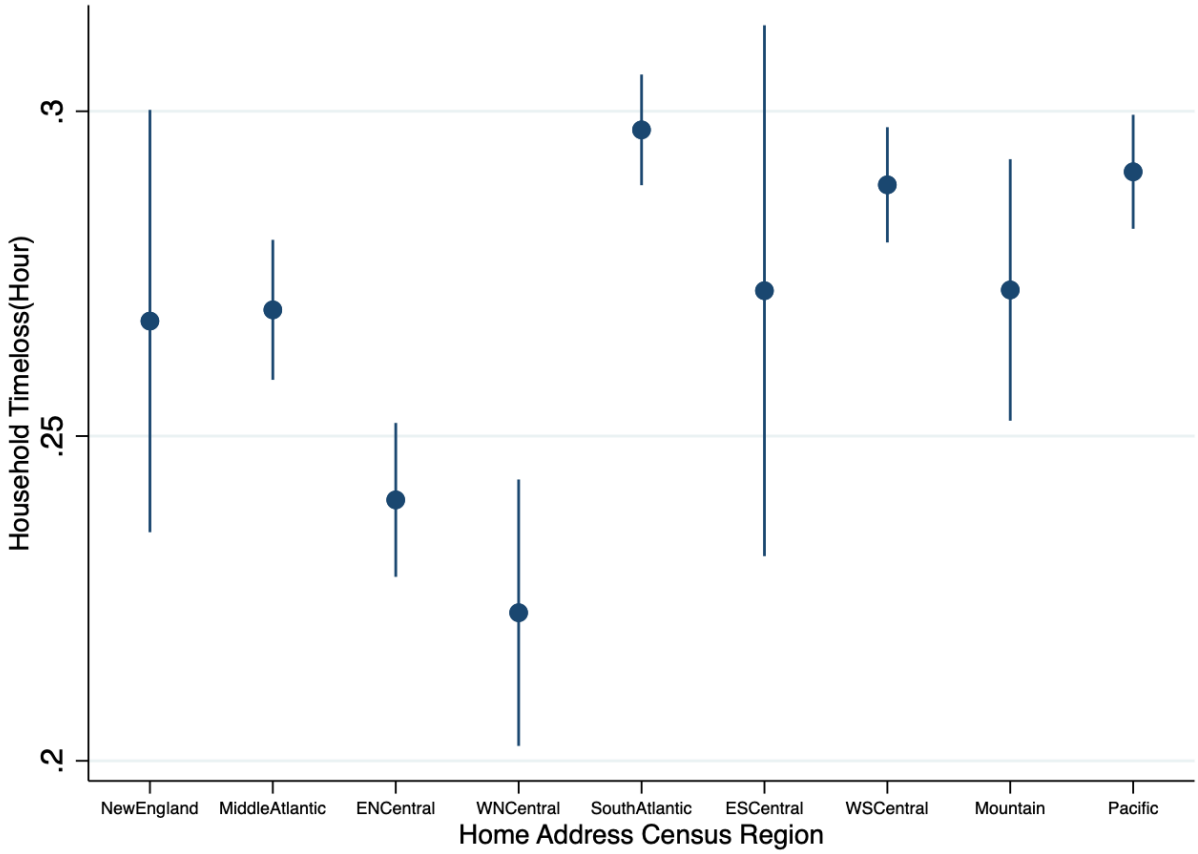
Same regression as Table 16 column (1)

Figure 22 Regional Congestion Time Loss Distribution without Categorical Variables with median trip speed as free-flow speed (All trips)



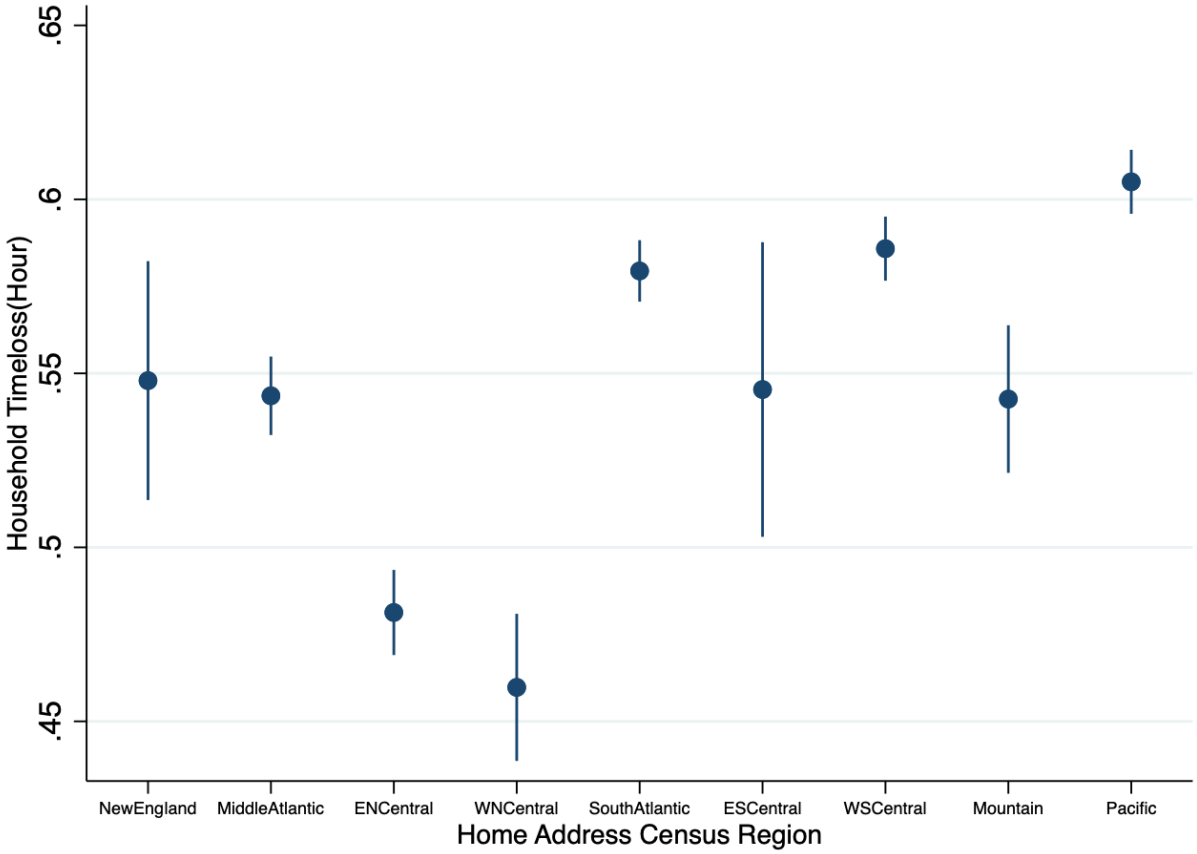
Same regression as Table 17 column (1)

Figure 23 Regional Congestion Time Loss Distribution without Categorical Variables with lower quartile trip speed as free-flow speed (All trips)



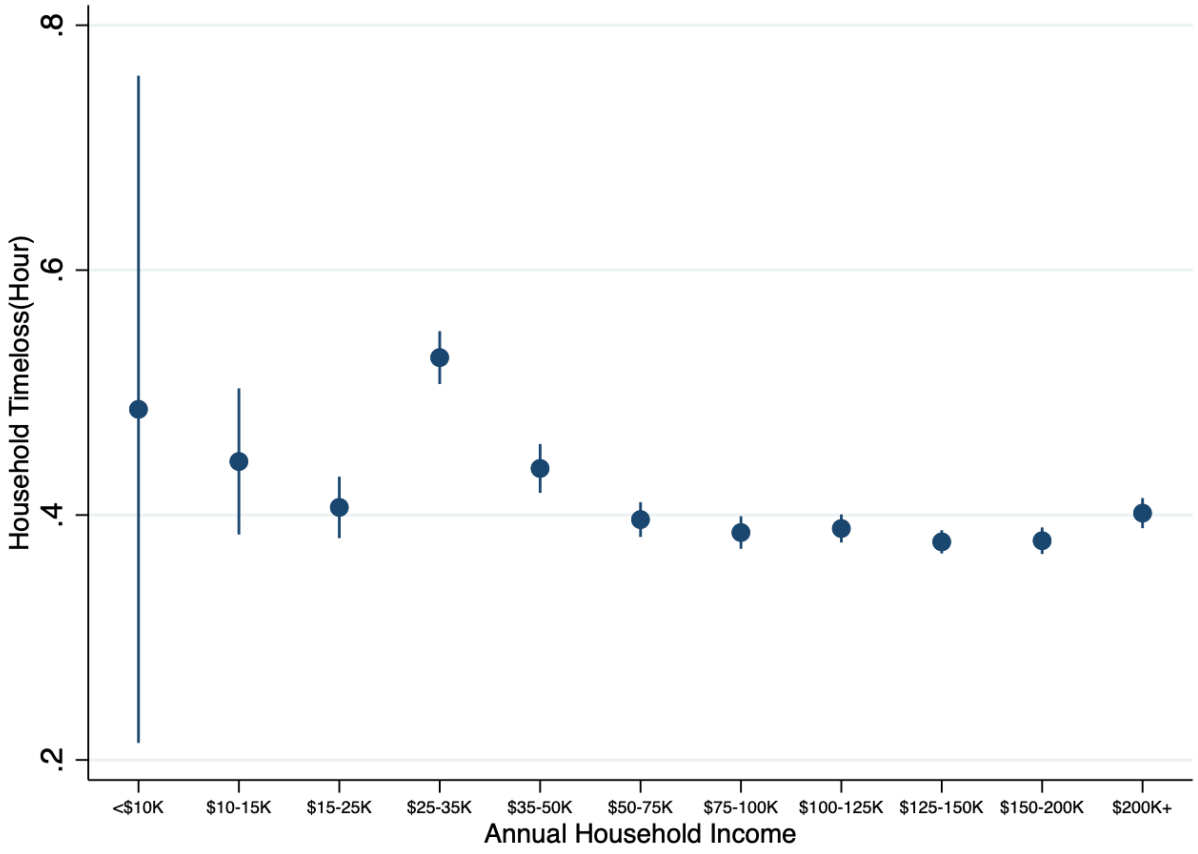
Same regression as Table 18 column (1)

Figure 24 Regional Congestion Time Loss Distribution without Categorical Variables with upper quartile trip speed as free-flow speed (All trips)



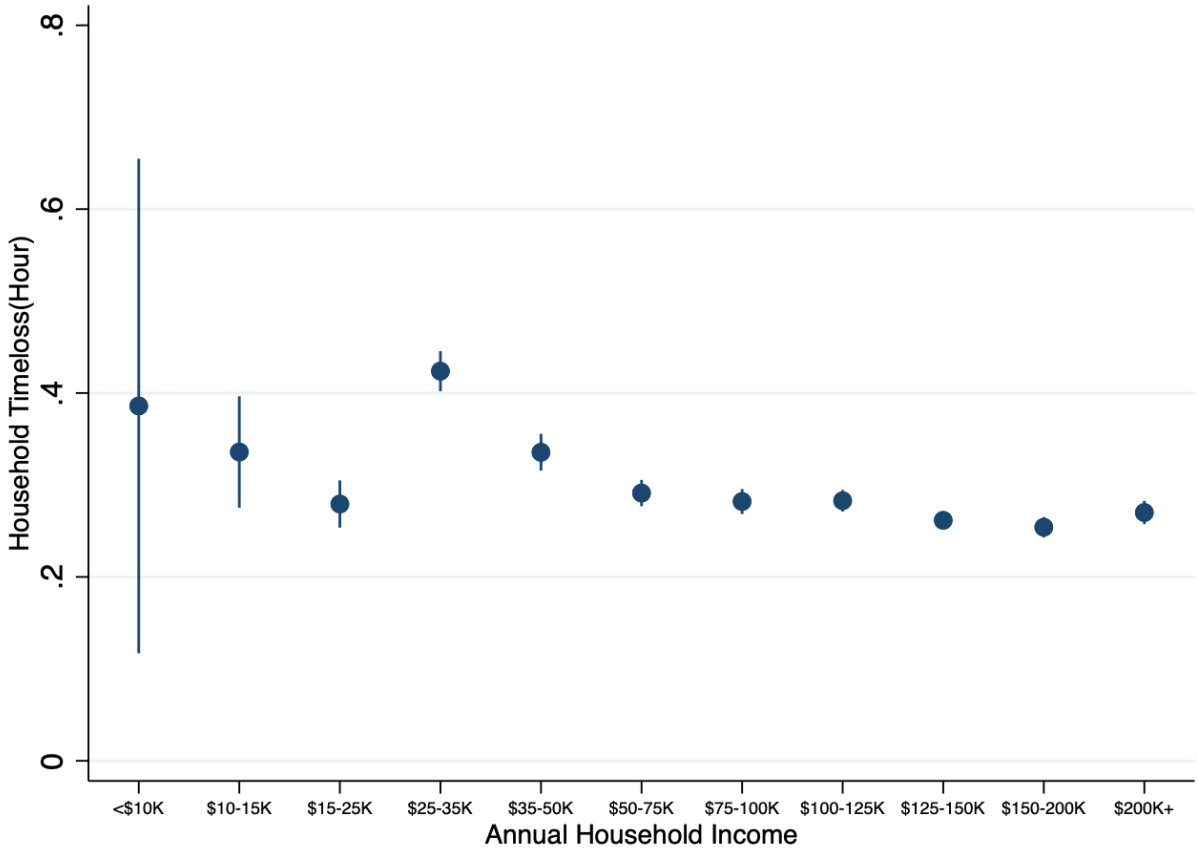
Same regression as Table 19 column (1)

Figure 25 Congestion Time Loss Distribution among Income Groups without Categorical Variables with median trip speed as free-flow speed (All Trips)



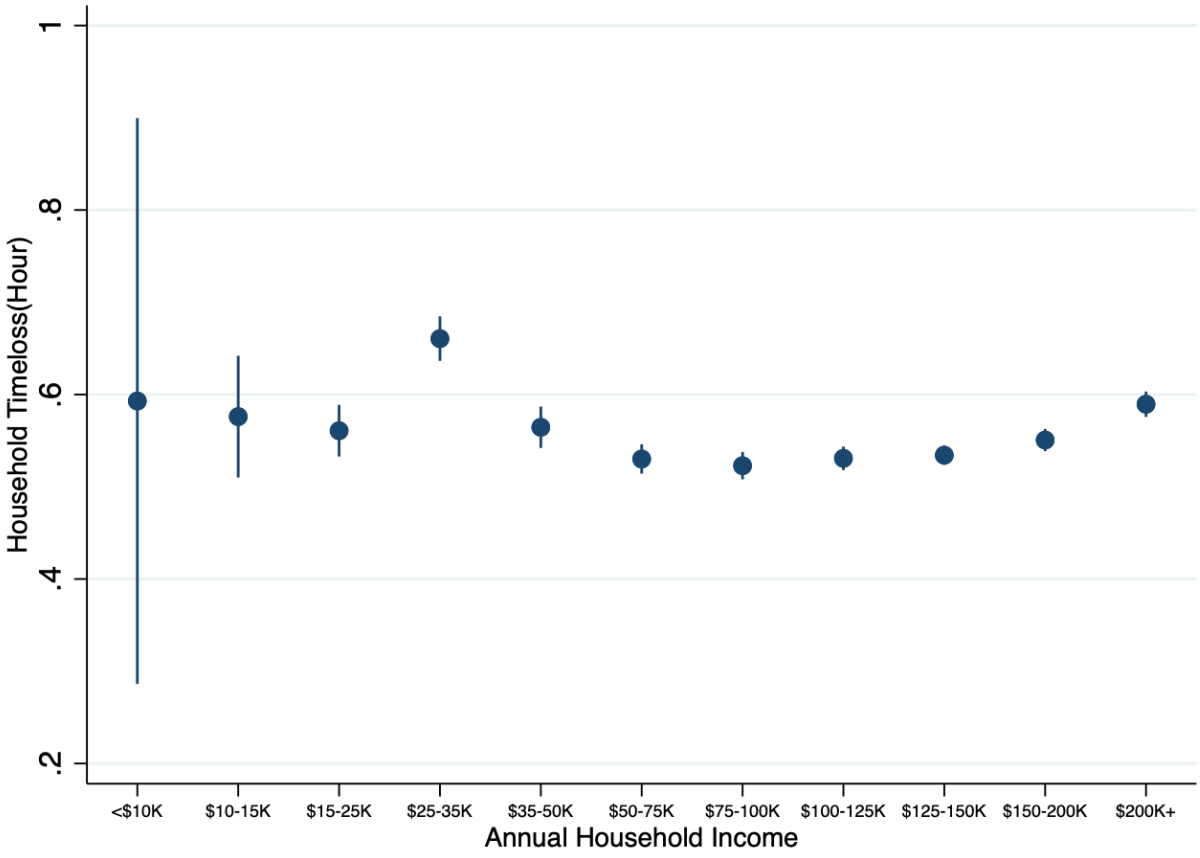
Same regression as Table 20 column (1)

Figure 26 Congestion Time Loss Distribution among Income Groups without Categorical Variables with lower quartile trip speed as free-flow speed (All Trips)



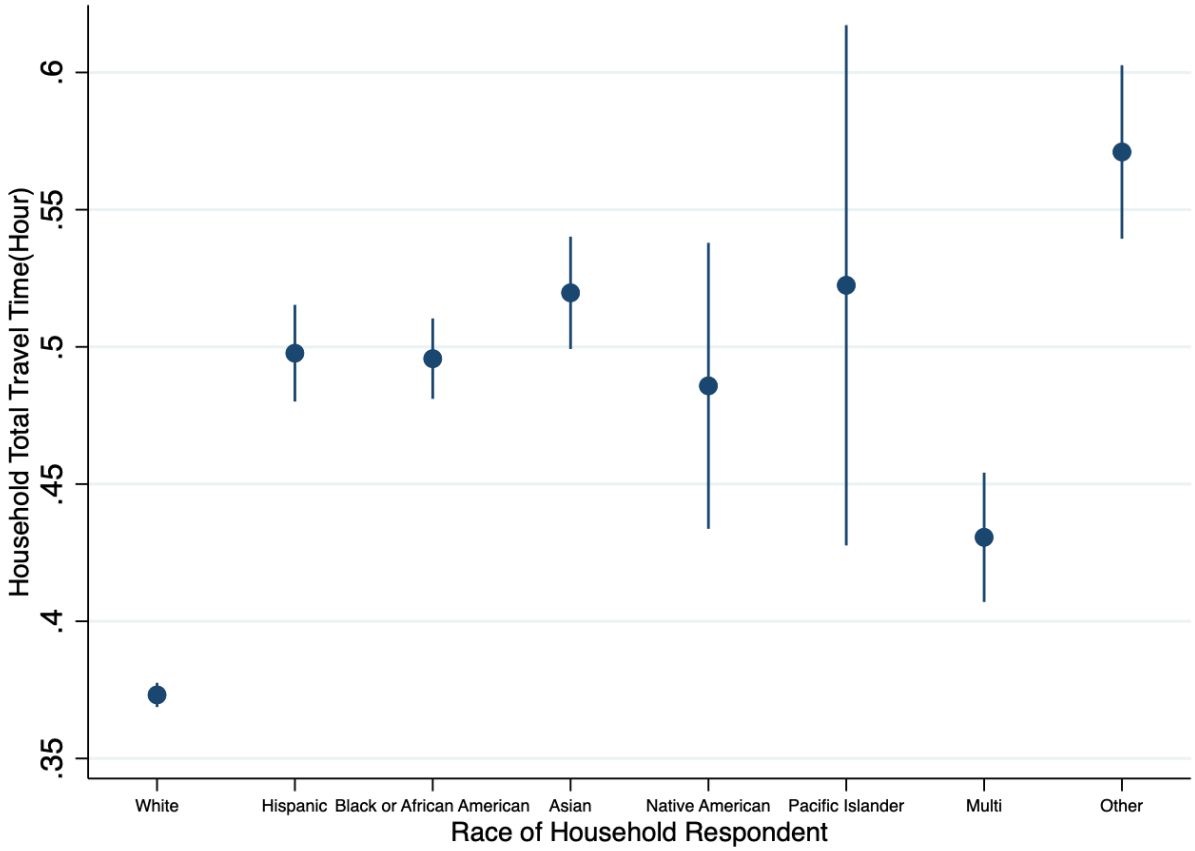
Same regression as Table 21 column (1)

Figure 27 Congestion Time Loss Distribution among Income Groups without Categorical Variables with upper quartile trip speed as free-flow speed (All Trips)



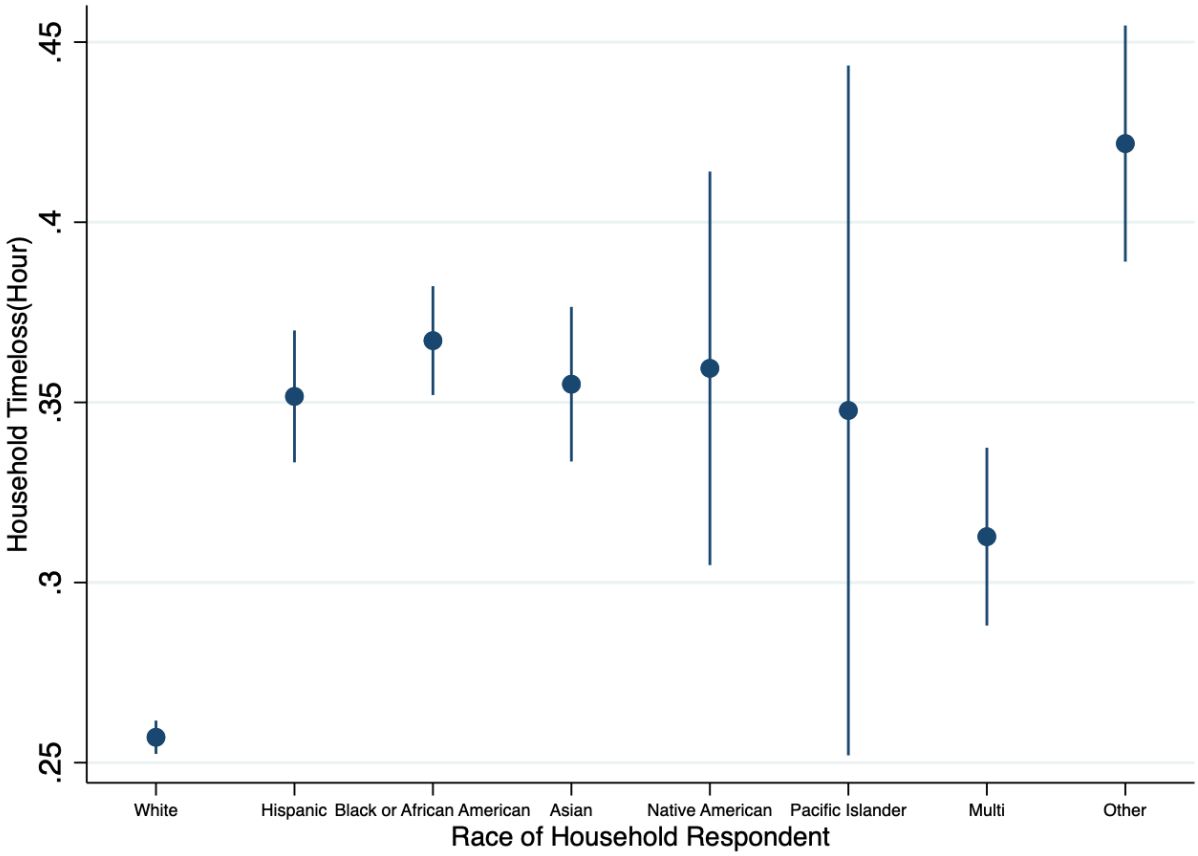
Same regression as Table 22 column (1)

Figure 28 Racial Congestion Time Loss Distribution without Categorical Variables with median trip speed as free-flow speed (All trips)



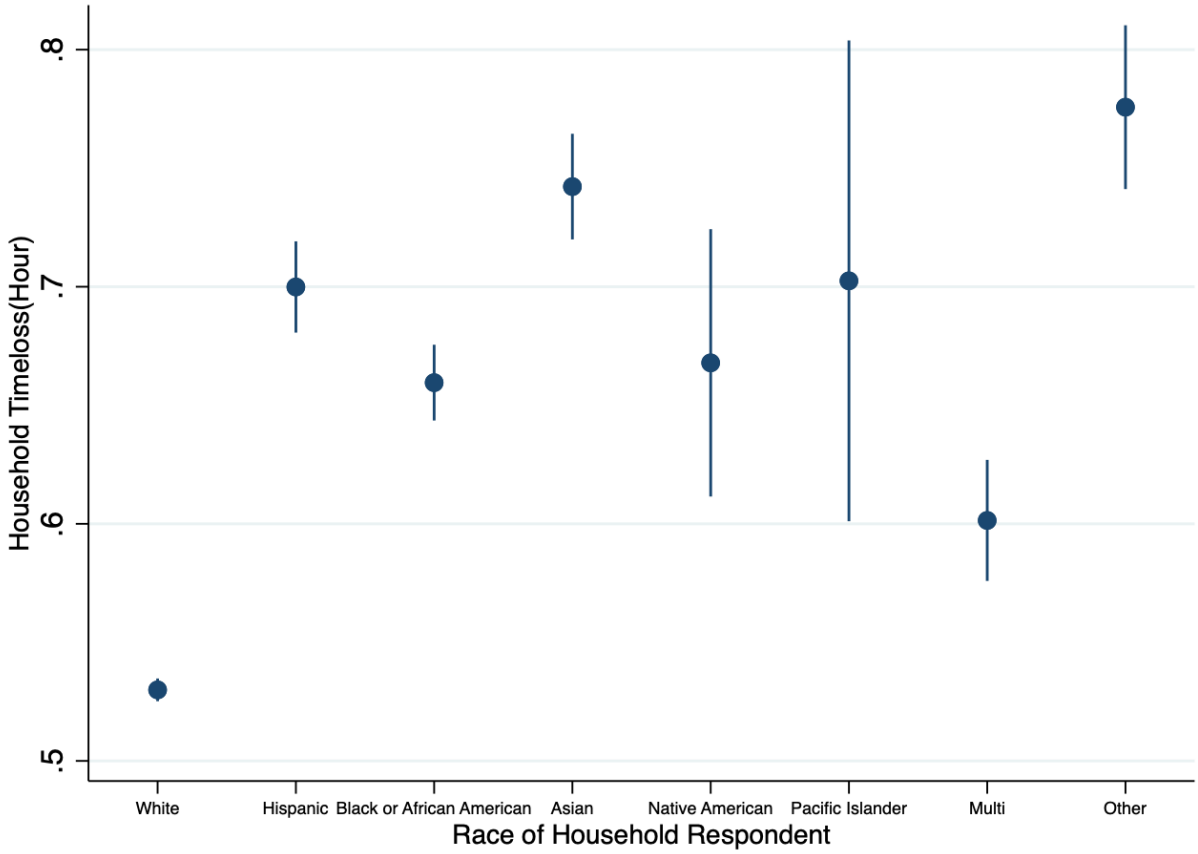
Same regression as Table 23 column (1)

Figure 29 Racial Congestion Time Loss Distribution without Categorical Variables with lower quartile trip speed as free-flow speed (All trips)



Same regression as Table 24 column (1)

Figure 30 Racial Congestion Time Loss Distribution without Categorical Variables with upper quartile trip speed as free-flow speed (All trips)



Same regression as Table 25 column (1)

Figure 31 U.S. Census Region Map

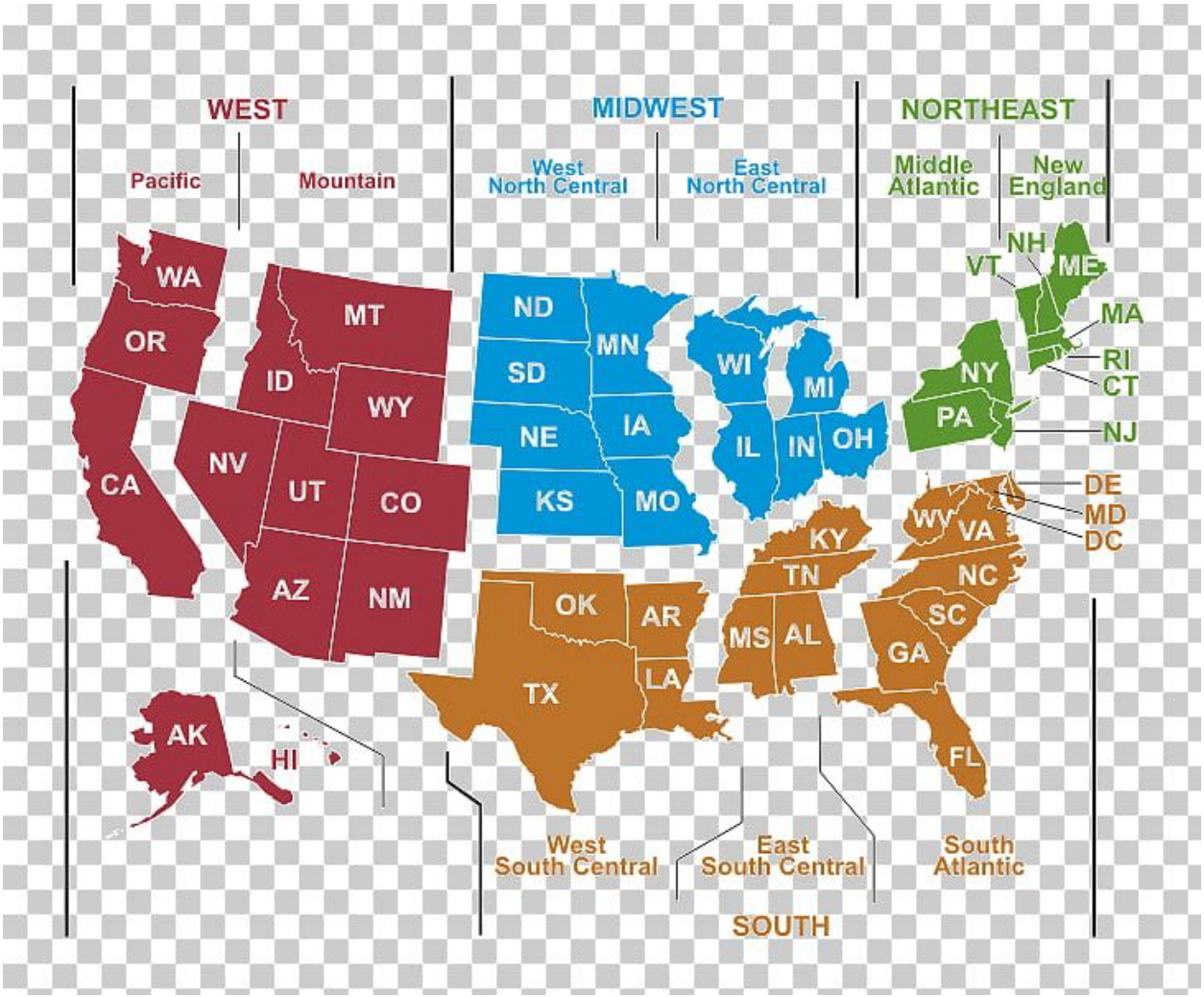


Table 1

25 Types of Trips		
Notation(j)	Type of Trip	Number of trips
1	Urban-to-urban trip	54,667
2	Rural-to-rural trip	79,891
3	Suburban-to-suburban trip	116,908
4	Second city-to-second city trip	81,153
5	Small town-to-small town trip	104,632
6	Urban-to-rural trip	1,251
7	Rural-to-urban trip	1,341
8	Urban-to-Suburban trip	20,653
9	Suburban-to-urban trip	20,577
10	Urban-to-second city trip	3,386
11	Second city-to-urban trip	3,278
12	Urban-to-small town trip	2,381
13	Small town-to-urban trip	2,489
14	Rural-to-suburban trip	10,181
15	Suburban-to-rural trip	10,065
16	Rural-to-second city trip	11,504
17	Second city-to-rural trip	11,322
18	Rural-to-small town trip	32,725
19	Small town-to-rural trip	33,185
20	Suburban-to-second city trip	45,978
21	Second city-to-suburban trip	46,247
22	Suburban-to-small town trip	25,973
23	Small town-to-suburban trip	25,524
24	Second city-to-small town trip	24,263
25	Small town-to-second city trip	24,362

Table 2 Regional Congestion Time Loss Distribution (Urban-to-Urban trips)					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
New England	0.413***	0.515***	0.424***	0.633***	0.494***
	(0.068)	(0.077)	(0.076)	(0.079)	(0.078)
Middle Atlantic	0.632***	0.748***	0.610***	0.849***	0.669***
	(0.022)	(0.040)	(0.040)	(0.044)	(0.044)
ENCentral	0.376***	0.481***	0.363***	0.593***	0.428***
	(0.022)	(0.039)	(0.039)	(0.043)	(0.044)
WNCentral	0.410***	0.493***	0.370***	0.615***	0.443***
	(0.071)	(0.080)	(0.079)	(0.082)	(0.081)
South Atlantic	0.535***	0.641***	0.533***	0.735***	0.584***
	(0.029)	(0.045)	(0.044)	(0.048)	(0.048)
ESCentral	0.343*	0.443**	0.334*	0.567***	0.405**
	(0.186)	(0.190)	(0.186)	(0.190)	(0.186)
WSCentral	0.407***	0.514***	0.398***	0.601***	0.449***
	(0.013)	(0.036)	(0.035)	(0.039)	(0.039)
Mountain	0.384***	0.488***	0.357***	0.606***	0.432***
	(0.029)	(0.044)	(0.044)	(0.047)	(0.047)
Pacific	0.479***	0.584***	0.461***	0.678***	0.519***
	(0.009)	(0.035)	(0.035)	(0.039)	(0.039)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	10,641	10,353	10,353	10,353	10,353
R-squared	0.344	0.346	0.373	0.354	0.377
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 3 Congestion Time Loss Distribution among Income Groups (Urban-to-Urban trips)					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
<$10K	0.594***	0.515***	0.424***	0.633***	0.494***
	(0.035)	(0.077)	(0.076)	(0.079)	(0.078)
$10-15K	0.593***	0.466***	0.392***	0.602***	0.472***
	(0.035)	(0.077)	(0.076)	(0.079)	(0.078)
$15-25K	0.480***	0.417***	0.339***	0.553***	0.420***
	(0.026)	(0.073)	(0.072)	(0.075)	(0.074)
$25-35K	0.485***	0.422***	0.334***	0.560***	0.417***
	(0.024)	(0.073)	(0.071)	(0.075)	(0.074)
$35-50K	0.449***	0.402***	0.305***	0.552***	0.397***
	(0.021)	(0.071)	(0.070)	(0.074)	(0.073)
$50-75K	0.467***	0.396***	0.291***	0.551***	0.387***
	(0.017)	(0.071)	(0.070)	(0.073)	(0.073)
$75-100K	0.445***	0.369***	0.241***	0.534***	0.346***
	(0.018)	(0.071)	(0.070)	(0.074)	(0.073)
$100-125K	0.456***	0.404***	0.257***	0.570***	0.363***
	(0.020)	(0.072)	(0.071)	(0.074)	(0.074)
$125-150K	0.453***	0.393***	0.230***	0.564***	0.341***
	(0.026)	(0.073)	(0.073)	(0.076)	(0.076)
$150-200K	0.464***	0.401***	0.234***	0.574***	0.346***
	(0.024)	(0.073)	(0.072)	(0.075)	(0.075)
$200K+	0.500***	0.439***	0.261***	0.617***	0.377***
	(0.020)	(0.071)	(0.071)	(0.074)	(0.074)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	11,261	10,353	10,353	10,353	10,353
R-squared	0.306	0.346	0.373	0.354	0.377
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 4 Racial Congestion Time Loss Distribution (Urban-to-Urban trips)					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
Hispanic	0.588***	0.562***	0.400***	0.647***	0.493***
	(0.021)	(0.076)	(0.075)	(0.084)	(0.082)
Black or African American	0.570***	0.529***	0.423***	0.608***	0.509***
	(0.022)	(0.077)	(0.075)	(0.083)	(0.082)
Asian	0.560***	0.513***	0.357***	0.593***	0.461***
	(0.021)	(0.077)	(0.076)	(0.084)	(0.082)
Native American	0.555***	0.527***	0.367***	0.608***	0.446***
	(0.084)	(0.111)	(0.109)	(0.116)	(0.114)
Pacific Islander	0.426***	0.381***	0.233*	0.458***	0.314**
	(0.100)	(0.124)	(0.122)	(0.128)	(0.126)
Multiple Races	0.524***	0.481***	0.324***	0.564***	0.424***
	(0.034)	(0.081)	(0.080)	(0.088)	(0.086)
Other	0.693***	0.638***	0.483***	0.715***	0.562***
	(0.035)	(0.081)	(0.080)	(0.087)	(0.086)
White	0.414***	0.381***	0.276***	0.465***	0.389***
	(0.008)	(0.073)	(0.072)	(0.081)	(0.080)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	11,488	11,183	11,183	11,183	11,183
R-squared	0.320	0.325	0.356	0.327	0.359
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 5 Congestion Time Loss Distribution among Household Lifecycle Group (Urban-to-Urban trips)

VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
struc1	0.310***	0.286***	0.419***	0.409***	0.499***
	(0.015)	(0.069)	(0.077)	(0.072)	(0.079)
struc2	0.468***	0.431***	0.589***	0.558***	0.664***
	(0.013)	(0.069)	(0.077)	(0.071)	(0.079)
struc3	0.460***	0.478***	0.578***	0.564***	0.635***
	(0.073)	(0.100)	(0.104)	(0.101)	(0.105)
struc4	0.554***	0.514***	0.672***	0.625***	0.732***
	(0.022)	(0.071)	(0.079)	(0.073)	(0.080)
struc5	0.718***	0.682***	0.801***	0.767***	0.852***
	(0.046)	(0.082)	(0.088)	(0.084)	(0.089)
struc6	0.766***	0.688***	0.848***	0.797***	0.906***
	(0.021)	(0.071)	(0.079)	(0.073)	(0.080)
struc7	0.461***	0.414***	0.534***	0.512***	0.595***
	(0.067)	(0.093)	(0.099)	(0.095)	(0.100)
struc8	0.558***	0.500***	0.659***	0.612***	0.720***
	(0.033)	(0.075)	(0.083)	(0.077)	(0.084)
struc9	0.359***	0.325***	0.436***	0.452***	0.527***
	(0.021)	(0.071)	(0.078)	(0.073)	(0.080)
struc10	0.497***	0.465***	0.612***	0.592***	0.692***
	(0.015)	(0.070)	(0.078)	(0.072)	(0.079)
Region categorical variable	X	√	√	√	√
Income categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	11,576	10,353	10,353	10,353	10,353
R-squared	0.328	0.366	0.370	0.372	0.374

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The household lifecycle that struc1-struc10 represent can be found under Figure 8.

Table 6 Regional Total Travel Time Distribution (Rural-to-Rural Trips)

VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
New England	1.487***	1.326***	1.026***	1.236***	0.801***
	(0.088)	(0.112)	(0.111)	(0.146)	(0.145)
Middle Atlantic	1.239***	1.066***	0.737***	0.976***	0.512***
	(0.030)	(0.074)	(0.074)	(0.119)	(0.118)
ENCentral	1.350***	1.183***	0.837***	1.093***	0.612***
	(0.032)	(0.075)	(0.075)	(0.120)	(0.119)
WNCentral	1.335***	1.166***	0.823***	1.075***	0.598***
	(0.070)	(0.098)	(0.098)	(0.136)	(0.134)
South Atlantic	1.287***	1.152***	0.795***	1.077***	0.588***
	(0.024)	(0.070)	(0.070)	(0.117)	(0.117)
ESCentral	1.444***	1.325***	0.935***	1.245***	0.722***
	(0.096)	(0.117)	(0.116)	(0.150)	(0.149)
WSCentral	1.360***	1.193***	0.829***	1.110***	0.622***
	(0.036)	(0.076)	(0.077)	(0.116)	(0.116)
Mountain	1.311***	1.142***	0.811***	1.037***	0.579***
	(0.064)	(0.094)	(0.093)	(0.130)	(0.129)
Pacific	1.369***	1.185***	0.871***	1.085***	0.643***
	(0.042)	(0.080)	(0.080)	(0.121)	(0.120)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	18,328	17,767	17,767	17,767	17,767
R-squared	0.351	0.354	0.379	0.355	0.379

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7 Total Travel Time Distribution among Income Groups (Rural-to-Rural Trips)					
VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
<$10K	1.169***	1.326***	1.026***	1.236***	0.801***
	(0.066)	(0.112)	(0.111)	(0.146)	(0.145)
$10-15K	1.131***	1.293***	1.050***	1.204***	0.822***
	(0.060)	(0.108)	(0.107)	(0.143)	(0.141)
$15-25K	1.080***	1.236***	0.931***	1.146***	0.701***
	(0.042)	(0.099)	(0.099)	(0.137)	(0.135)
$25-35K	1.249***	1.416***	1.042***	1.327***	0.814***
	(0.040)	(0.098)	(0.098)	(0.135)	(0.134)
$35-50K	1.294***	1.475***	1.039***	1.382***	0.804***
	(0.036)	(0.097)	(0.097)	(0.135)	(0.135)
$50-75K	1.345***	1.516***	1.012***	1.423***	0.776***
	(0.030)	(0.094)	(0.096)	(0.133)	(0.134)
$75-100K	1.409***	1.580***	1.018***	1.484***	0.781***
	(0.035)	(0.096)	(0.098)	(0.134)	(0.135)
$100-125K	1.441***	1.613***	1.005***	1.520***	0.770***
	(0.042)	(0.099)	(0.101)	(0.136)	(0.137)
$125-150K	1.486***	1.650***	1.027***	1.557***	0.791***
	(0.061)	(0.108)	(0.110)	(0.143)	(0.144)
$150-200K	1.542***	1.712***	1.068***	1.613***	0.827***
	(0.066)	(0.111)	(0.113)	(0.145)	(0.146)
$200K+	1.468***	1.593***	0.958***	1.495***	0.717***
	(0.071)	(0.114)	(0.116)	(0.148)	(0.149)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	18,302	17,767	17,767	17,767	17,767
R-squared	0.354	0.354	0.379	0.355	0.379
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 8	
VARIABLES	(1) Income
hhsize	10,314.985***
	(329.167)
Constant	48,094.189***
	(850.103)
Observations	17,767
R-squared	0.052
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 9 Racial Total Travel Time Distribution (Rural-to-Rural trips)					
VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
Hispanic	1.225***	1.393***	0.779***	1.234***	0.807***
	(0.091)	(0.129)	(0.129)	(0.145)	(0.143)
Black or African American	1.125***	1.293***	0.865***	1.204***	0.895***
	(0.060)	(0.110)	(0.110)	(0.125)	(0.123)
Asian	1.853***	2.034***	1.407***	1.848***	1.441***
	(0.209)	(0.230)	(0.227)	(0.239)	(0.236)
Native American	1.745***	1.804***	1.343***	1.706***	1.369***
	(0.143)	(0.171)	(0.169)	(0.180)	(0.177)
Pacific Islander	1.929***	2.089***	1.405***	1.917***	1.435***
	(0.515)	(0.526)	(0.516)	(0.529)	(0.520)
Multiple Races	1.281***	1.448***	0.925***	1.313***	0.956***
	(0.090)	(0.127)	(0.126)	(0.142)	(0.140)
Other	1.266***	1.454***	0.895***	1.339***	0.925***
	(0.175)	(0.203)	(0.200)	(0.212)	(0.208)
White	1.322***	1.495***	1.006***	1.324***	1.038***
	(0.014)	(0.089)	(0.090)	(0.111)	(0.110)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	18,826	18,248	18,248	18,248	18,248
R-squared	0.353	0.352	0.379	0.355	0.379
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 10		
Household respondent's race	Frequency	Percentage
White	16,815	89.32
Hispanic	385	2.05
Black or African American	887	4.71
Asian	73	0.39
Native American	156	0.83
Pacific Islander	12	0.06
Multiple Races	394	2.09
Other	104	0.55
Total	18,826	100.00

Table 11 Regional Congestion Time Loss Distribution (All Trips)

VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
New England	0.425***	0.539***	0.440***	0.643***	0.495***
	(0.016)	(0.020)	(0.020)	(0.022)	(0.022)
Middle Atlantic	0.426***	0.543***	0.439***	0.644***	0.492***
	(0.005)	(0.012)	(0.012)	(0.015)	(0.015)
ENCentral	0.378***	0.497***	0.389***	0.602***	0.444***
	(0.006)	(0.012)	(0.012)	(0.015)	(0.015)
WNCentral	0.361***	0.478***	0.372***	0.582***	0.427***
	(0.010)	(0.015)	(0.015)	(0.017)	(0.017)
South Atlantic	0.459***	0.577***	0.467***	0.663***	0.506***
	(0.004)	(0.012)	(0.012)	(0.015)	(0.015)
ESCentral	0.424***	0.535***	0.418***	0.628***	0.463***
	(0.020)	(0.023)	(0.023)	(0.025)	(0.025)
WSCentral	0.461***	0.573***	0.461***	0.650***	0.497***
	(0.004)	(0.012)	(0.012)	(0.014)	(0.014)
Mountain	0.428***	0.544***	0.433***	0.641***	0.484***
	(0.010)	(0.015)	(0.015)	(0.017)	(0.017)
Pacific	0.477***	0.586***	0.483***	0.669***	0.524***
	(0.004)	(0.012)	(0.012)	(0.015)	(0.015)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	103,981	96,082	96,082	96,082	96,082
R-squared	0.322	0.327	0.349	0.331	0.352

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12 Congestion Time Loss Distribution among Income Groups (All Trips)					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
<$10K	0.568***	0.536***	0.435***	0.640***	0.491***
	(0.011)	(0.020)	(0.020)	(0.022)	(0.022)
$10-15K	0.474***	0.453***	0.375***	0.569***	0.441***
	(0.010)	(0.019)	(0.019)	(0.021)	(0.021)
$15-25K	0.433***	0.411***	0.319***	0.533***	0.390***
	(0.007)	(0.018)	(0.018)	(0.020)	(0.020)
$25-35K	0.423***	0.402***	0.295***	0.528***	0.369***
	(0.007)	(0.018)	(0.018)	(0.020)	(0.020)
$35-50K	0.427***	0.410***	0.292***	0.538***	0.368***
	(0.006)	(0.017)	(0.017)	(0.020)	(0.020)
$50-75K	0.418***	0.398***	0.258***	0.528***	0.336***
	(0.005)	(0.017)	(0.017)	(0.019)	(0.019)
$75-100K	0.424***	0.405***	0.242***	0.537***	0.322***
	(0.005)	(0.017)	(0.017)	(0.020)	(0.020)
$100-125K	0.451***	0.432***	0.251***	0.565***	0.332***
	(0.006)	(0.017)	(0.018)	(0.020)	(0.020)
$125-150K	0.455***	0.436***	0.246***	0.569***	0.328***
	(0.008)	(0.018)	(0.018)	(0.020)	(0.021)
$150-200K	0.460***	0.439***	0.242***	0.572***	0.323***
	(0.008)	(0.018)	(0.019)	(0.021)	(0.021)
$200K+	0.500***	0.476***	0.277***	0.612***	0.361***
	(0.008)	(0.018)	(0.018)	(0.020)	(0.021)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	100,830	98,875	98,875	98,875	98,875
R-squared	0.320	0.325	0.349	0.329	0.351
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 13 Racial Congestion Time Loss Distribution (All Trips)					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
White	0.413***	0.414***	0.286***	0.508***	0.415***
	(0.002)	(0.017)	(0.017)	(0.020)	(0.020)
Hispanic	0.558***	0.549***	0.376***	0.644***	0.495***
	(0.009)	(0.019)	(0.019)	(0.022)	(0.022)
Black or African American	0.543***	0.535***	0.416***	0.625***	0.523***
	(0.008)	(0.018)	(0.018)	(0.021)	(0.021)
Asian	0.586***	0.574***	0.402***	0.661***	0.529***
	(0.011)	(0.020)	(0.020)	(0.022)	(0.022)
Native American	0.535***	0.528***	0.386***	0.617***	0.492***
	(0.027)	(0.032)	(0.031)	(0.033)	(0.033)
Pacific Islander	0.567***	0.551***	0.377***	0.646***	0.498***
	(0.048)	(0.051)	(0.051)	(0.052)	(0.051)
Multiple Races	0.479***	0.471***	0.321***	0.563***	0.438***
	(0.012)	(0.021)	(0.021)	(0.023)	(0.023)
Other	0.638***	0.626***	0.460***	0.719***	0.566***
	(0.016)	(0.023)	(0.023)	(0.026)	(0.025)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	100,414	100,414	100,414	100,414	100,414
R-squared	0.325	0.326	0.346	0.327	0.349
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 14 Total Household Travel Time Distribution among Income Groups (All Trips)					
VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
<$10K	1.890***	1.748***	1.081***	2.146***	1.116***
	(0.043)	(0.078)	(0.075)	(0.086)	(0.083)
$10-15K	1.739***	1.609***	1.100***	2.031***	1.141***
	(0.040)	(0.076)	(0.073)	(0.085)	(0.081)
$15-25K	1.822***	1.696***	1.094***	2.128***	1.140***
	(0.028)	(0.071)	(0.068)	(0.080)	(0.077)
$25-35K	1.971***	1.851***	1.155***	2.288***	1.203***
	(0.026)	(0.070)	(0.068)	(0.079)	(0.076)
$35-50K	2.156***	2.038***	1.268***	2.481***	1.319***
	(0.023)	(0.069)	(0.067)	(0.078)	(0.076)
$50-75K	2.377***	2.260***	1.347***	2.708***	1.401***
	(0.019)	(0.068)	(0.066)	(0.077)	(0.075)
$75-100K	2.705***	2.592***	1.523***	3.044***	1.578***
	(0.021)	(0.069)	(0.067)	(0.078)	(0.076)
$100-125K	2.973***	2.860***	1.665***	3.317***	1.722***
	(0.024)	(0.070)	(0.068)	(0.079)	(0.077)
$125-150K	3.036***	2.926***	1.668***	3.381***	1.726***
	(0.032)	(0.073)	(0.071)	(0.082)	(0.080)
$150-200K	3.116***	3.004***	1.687***	3.461***	1.747***
	(0.033)	(0.073)	(0.071)	(0.082)	(0.080)
$200K+	3.268***	3.158***	1.833***	3.623***	1.896***
	(0.032)	(0.072)	(0.071)	(0.082)	(0.080)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	104,940	104,940	104,940	104,940	104,940
R-squared	0.485	0.486	0.537	0.487	0.537
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 15 Regional Total Household Travel Time Distribution (All Trips)					
VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
New England	2.391***	1.735***	1.071***	2.139***	1.104***
	(0.067)	(0.079)	(0.076)	(0.087)	(0.084)
Middle Atlantic	2.388***	1.763***	1.065***	2.162***	1.097***
	(0.022)	(0.049)	(0.047)	(0.061)	(0.059)
ENCentral	2.335***	1.766***	1.049***	2.172***	1.081***
	(0.024)	(0.049)	(0.048)	(0.061)	(0.059)
WNCentral	2.293***	1.698***	0.983***	2.103***	1.016***
	(0.041)	(0.059)	(0.057)	(0.070)	(0.067)
South Atlantic	2.553***	2.014***	1.282***	2.391***	1.300***
	(0.017)	(0.046)	(0.044)	(0.059)	(0.057)
ESCentral	2.600***	2.108***	1.317***	2.497***	1.339***
	(0.082)	(0.091)	(0.087)	(0.098)	(0.094)
WSCentral	2.578***	1.935***	1.190***	2.272***	1.213***
	(0.018)	(0.047)	(0.045)	(0.057)	(0.055)
Mountain	2.356***	1.819***	1.084***	2.194***	1.112***
	(0.042)	(0.060)	(0.057)	(0.069)	(0.066)
Pacific	2.488***	1.798***	1.114***	2.155***	1.149***
	(0.018)	(0.047)	(0.046)	(0.058)	(0.056)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	101,983	101,983	101,983	101,983	101,983
R-squared	0.470	0.487	0.539	0.488	0.539
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 16 Racial Total Household Travel Time Distribution (All Trips)					
VARIABLES	(1) TTime	(2) TTime	(3) TTime	(4) TTime	(5) TTime
White	2.446***	2.397***	1.319***	1.671***	1.059***
	(0.009)	(0.067)	(0.064)	(0.078)	(0.075)
Hispanic	2.821***	2.737***	1.292***	2.137***	1.116***
	(0.037)	(0.077)	(0.073)	(0.086)	(0.082)
Black or African American	2.410***	2.292***	1.302***	1.841***	1.159***
	(0.030)	(0.074)	(0.070)	(0.082)	(0.079)
Asian	2.720***	2.656***	1.214***	1.846***	0.938***
	(0.042)	(0.079)	(0.076)	(0.089)	(0.085)
Native American	2.684***	2.619***	1.429***	2.148***	1.294***
	(0.107)	(0.126)	(0.119)	(0.130)	(0.124)
Pacific Islander	2.844***	2.791***	1.418***	2.178***	1.229***
	(0.192)	(0.204)	(0.191)	(0.204)	(0.194)
Multiple Races	2.550***	2.484***	1.240***	1.880***	1.048***
	(0.049)	(0.082)	(0.078)	(0.091)	(0.087)
Other	2.709***	2.639***	1.276***	2.186***	1.160***
	(0.065)	(0.094)	(0.089)	(0.100)	(0.096)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	106,581	106,581	106,581	106,581	106,581
R-squared	0.469	0.470	0.534	0.487	0.538
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 17 Regional Congestion Time Loss Distribution (All Trips) [Median speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
New England	0.385***	0.507***	0.419***	0.584***	0.493***
	(0.016)	(0.020)	(0.019)	(0.021)	(0.020)
Middle Atlantic	0.384***	0.509***	0.416***	0.583***	0.489***
	(0.005)	(0.012)	(0.012)	(0.014)	(0.014)
ENCentral	0.342***	0.468***	0.371***	0.544***	0.445***
	(0.006)	(0.012)	(0.012)	(0.014)	(0.014)
WNCentral	0.319***	0.444***	0.349***	0.520***	0.423***
	(0.010)	(0.015)	(0.015)	(0.016)	(0.016)
South Atlantic	0.417***	0.540***	0.442***	0.602***	0.502***
	(0.004)	(0.011)	(0.011)	(0.013)	(0.013)
ESCentral	0.384***	0.503***	0.398***	0.569***	0.462***
	(0.020)	(0.023)	(0.023)	(0.023)	(0.023)
WSCentral	0.410***	0.533***	0.432***	0.598***	0.497***
	(0.004)	(0.012)	(0.012)	(0.013)	(0.013)
Mountain	0.387***	0.509***	0.409***	0.585***	0.483***
	(0.010)	(0.015)	(0.015)	(0.016)	(0.016)
Pacific	0.415***	0.538***	0.446***	0.603***	0.511***
	(0.004)	(0.012)	(0.012)	(0.013)	(0.013)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	96,732	93,850	93,850	93,850	93,850
R-squared	0.294	0.294	0.314	0.296	0.315
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 18 Regional Congestion Time Loss Distribution (All Trips) [Lower quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
New England	0.267***	0.407***	0.347***	0.470***	0.408***
	(0.016)	(0.020)	(0.020)	(0.021)	(0.021)
Middle Atlantic	0.268***	0.409***	0.346***	0.470***	0.405***
	(0.005)	(0.012)	(0.013)	(0.014)	(0.014)
ENCentral	0.239***	0.380***	0.313***	0.442***	0.373***
	(0.006)	(0.013)	(0.013)	(0.014)	(0.014)
WNCentral	0.220***	0.359***	0.294***	0.421***	0.354***
	(0.010)	(0.015)	(0.015)	(0.017)	(0.017)
South Atlantic	0.296***	0.433***	0.364***	0.483***	0.413***
	(0.004)	(0.012)	(0.012)	(0.013)	(0.013)
ESCentral	0.268***	0.399***	0.328***	0.454***	0.381***
	(0.021)	(0.024)	(0.024)	(0.024)	(0.024)
WSCentral	0.283***	0.423***	0.354***	0.478***	0.407***
	(0.005)	(0.012)	(0.012)	(0.013)	(0.014)
Mountain	0.271***	0.407***	0.339***	0.469***	0.399***
	(0.010)	(0.015)	(0.015)	(0.017)	(0.017)
Pacific	0.285***	0.427***	0.364***	0.482***	0.418***
	(0.005)	(0.012)	(0.012)	(0.014)	(0.014)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	82,086	79,643	79,643	79,643	79,643
R-squared	0.180	0.181	0.191	0.182	0.193
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 19 Regional Congestion Time Loss Distribution (All Trips) [Upper quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
New England	0.545***	0.633***	0.506***	0.722***	0.591***
	(0.017)	(0.021)	(0.021)	(0.022)	(0.022)
Middle Atlantic	0.541***	0.631***	0.498***	0.717***	0.581***
	(0.006)	(0.013)	(0.013)	(0.015)	(0.015)
ENCentral	0.479***	0.575***	0.436***	0.663***	0.521***
	(0.006)	(0.013)	(0.013)	(0.015)	(0.015)
WNCentral	0.457***	0.550***	0.414***	0.638***	0.498***
	(0.011)	(0.016)	(0.016)	(0.017)	(0.017)
South Atlantic	0.578***	0.673***	0.531***	0.744***	0.601***
	(0.004)	(0.012)	(0.012)	(0.014)	(0.014)
ESCentral	0.540***	0.634***	0.482***	0.711***	0.556***
	(0.021)	(0.025)	(0.024)	(0.025)	(0.025)
WSCentral	0.581***	0.669***	0.525***	0.744***	0.599***
	(0.005)	(0.013)	(0.013)	(0.014)	(0.014)
Mountain	0.540***	0.633***	0.491***	0.721***	0.575***
	(0.011)	(0.016)	(0.016)	(0.018)	(0.017)
Pacific	0.596***	0.682***	0.550***	0.755***	0.624***
	(0.005)	(0.013)	(0.013)	(0.015)	(0.014)
Income categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Household race categorical variable	X	X	X	√	√
Observations	102,674	99,595	99,595	99,595	99,595
R-squared	0.397	0.398	0.426	0.400	0.428
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 20 Congestion Time Loss Distribution among Income Groups (All Trips) [Median speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
<$10K	0.486***	0.099	0.284**	0.076	0.261**
	(0.137)	(0.132)	(0.130)	(0.132)	(0.130)
$10-15K	0.438***	0.058*	0.132***	0.049	0.122***
	(0.031)	(0.030)	(0.030)	(0.030)	(0.030)
$15-25K	0.405***	0.025*	0.078***	0.025*	0.076***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
$25-35K	0.518***	0.130***	0.208***	0.110***	0.189***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
$35-50K	0.435***	0.050***	0.150***	0.039***	0.138***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)
$50-75K	0.390***	0.007	0.092***	0.001	0.086***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
$75-100K	0.380***	-0.001	0.068***	-0.005	0.063***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
$100-125K	0.388***	0.006	0.065***	0.003	0.061***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
$125-150K	0.374***	-0.008	0.030***	-0.010	0.028***
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
$150-200K	0.376***	-0.006	0.011	-0.006	0.010
	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
$200K+	0.400***	0.018**	0.016**	0.018**	0.016**
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	99,509	99,509	99,509	99,509	99,509
R-squared	0.235	0.290	0.314	0.293	0.315
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 21 Congestion Time Loss Distribution among Income Groups (All Trips) [Lower quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
<$10K	0.386***	0.139	0.264**	0.118	0.243*
	(0.135)	(0.133)	(0.132)	(0.133)	(0.132)
$10-15K	0.331***	0.087***	0.134***	0.080***	0.127***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
$15-25K	0.279***	0.036***	0.071***	0.035**	0.069***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
$25-35K	0.412***	0.164***	0.216***	0.146***	0.199***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
$35-50K	0.333***	0.086***	0.153***	0.076***	0.143***
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)
$50-75K	0.287***	0.041***	0.098***	0.035***	0.092***
	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
$75-100K	0.277***	0.033***	0.078***	0.029***	0.073***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
$100-125K	0.282***	0.038***	0.076***	0.035***	0.072***
	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
$125-150K	0.258***	0.013**	0.037***	0.011*	0.035***
	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
$150-200K	0.252***	0.007	0.017**	0.006	0.016**
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
$200K+	0.269***	0.024***	0.023***	0.024***	0.022***
	(0.006)	(0.008)	(0.008)	(0.008)	(0.008)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	84,437	84,437	84,437	84,437	84,437
R-squared	0.150	0.179	0.192	0.181	0.194
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 22 Congestion Time Loss Distribution among Income Groups (All Trips) [Upper quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
<$10K	0.593***	0.014	0.281**	-0.016	0.252*
	(0.155)	(0.145)	(0.141)	(0.145)	(0.141)
$10-15K	0.567***	0.001	0.109***	-0.009	0.097***
	(0.034)	(0.032)	(0.032)	(0.032)	(0.032)
$15-25K	0.559***	-0.007	0.072***	-0.007	0.070***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
$25-35K	0.649***	0.073***	0.186***	0.050***	0.164***
	(0.012)	(0.013)	(0.012)	(0.013)	(0.013)
$35-50K	0.561***	-0.012	0.132***	-0.024**	0.119***
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
$50-75K	0.523***	-0.047***	0.077***	-0.054***	0.069***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
$75-100K	0.516***	-0.051***	0.051***	-0.055***	0.046***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
$100-125K	0.529***	-0.039***	0.048***	-0.042***	0.044***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
$125-150K	0.529***	-0.040***	0.018**	-0.041***	0.015**
	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)
$150-200K	0.547***	-0.021***	0.004	-0.021***	0.003
	(0.006)	(0.008)	(0.007)	(0.008)	(0.007)
$200K+	0.588***	0.018**	0.017**	0.018**	0.017**
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Region categorical variable	X	√	√	√	√
Household Size categorical variable	X	X	√	X	√
Household Race categorical variable	X	X	X	√	√
Observations	105,638	105,638	105,638	105,638	105,638
R-squared	0.308	0.391	0.425	0.394	0.426
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 23 Racial Congestion Time Loss Distribution (All Trips) [Median speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
White	0.373***	0.377***	0.265***	0.478***	0.396***
	(0.002)	(0.016)	(0.016)	(0.020)	(0.019)
Hispanic	0.498***	0.495***	0.344***	0.596***	0.463***
	(0.009)	(0.019)	(0.019)	(0.021)	(0.021)
Black or African American	0.496***	0.490***	0.386***	0.585***	0.493***
	(0.007)	(0.018)	(0.018)	(0.021)	(0.020)
Asian	0.520***	0.516***	0.366***	0.612***	0.495***
	(0.010)	(0.020)	(0.020)	(0.022)	(0.022)
Native American	0.486***	0.485***	0.360***	0.578***	0.466***
	(0.027)	(0.031)	(0.031)	(0.033)	(0.032)
Pacific Islander	0.522***	0.516***	0.361***	0.617***	0.482***
	(0.048)	(0.051)	(0.051)	(0.052)	(0.051)
Multiple Races	0.431***	0.429***	0.297***	0.527***	0.416***
	(0.012)	(0.020)	(0.020)	(0.023)	(0.023)
Other	0.571***	0.567***	0.423***	0.664***	0.529***
	(0.016)	(0.023)	(0.023)	(0.025)	(0.025)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	98,080	98,080	98,080	98,080	98,080
R-squared	0.292	0.293	0.310	0.294	0.313
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 24 Racial Congestion Time Loss Distribution (All Trips) [Lower quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
White	0.257***	0.259***	0.191***	0.384***	0.327***
	(0.002)	(0.017)	(0.017)	(0.020)	(0.020)
Hispanic	0.352***	0.351***	0.259***	0.471***	0.382***
	(0.009)	(0.020)	(0.020)	(0.022)	(0.022)
Black or African American	0.367***	0.362***	0.297***	0.470***	0.407***
	(0.008)	(0.019)	(0.019)	(0.021)	(0.021)
Asian	0.355***	0.353***	0.262***	0.477***	0.397***
	(0.011)	(0.020)	(0.021)	(0.023)	(0.023)
Native American	0.359***	0.358***	0.282***	0.467***	0.391***
	(0.028)	(0.033)	(0.033)	(0.034)	(0.034)
Pacific Islander	0.348***	0.344***	0.248***	0.464***	0.371***
	(0.049)	(0.052)	(0.052)	(0.053)	(0.053)
Multiple Races	0.313***	0.311***	0.230***	0.429***	0.353***
	(0.013)	(0.021)	(0.021)	(0.024)	(0.024)
Other	0.422***	0.420***	0.330***	0.531***	0.438***
	(0.017)	(0.024)	(0.024)	(0.026)	(0.026)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	83,251	83,251	83,251	83,251	83,251
R-squared	0.179	0.179	0.188	0.181	0.192
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 25 Racial Congestion Time Loss Distribution (All Trips) [Upper quartile speed]					
VARIABLES	(1) Tloss	(2) Tloss	(3) Tloss	(4) Tloss	(5) Tloss
White	0.530***	0.537***	0.363***	0.597***	0.479***
	(0.002)	(0.018)	(0.018)	(0.021)	(0.021)
Hispanic	0.700***	0.693***	0.459***	0.761***	0.568***
	(0.010)	(0.021)	(0.020)	(0.023)	(0.023)
Black or African American	0.660***	0.654***	0.493***	0.723***	0.592***
	(0.008)	(0.020)	(0.020)	(0.022)	(0.022)
Asian	0.742***	0.733***	0.499***	0.784***	0.612***
	(0.011)	(0.021)	(0.021)	(0.024)	(0.024)
Native American	0.668***	0.666***	0.473***	0.732***	0.571***
	(0.029)	(0.034)	(0.033)	(0.035)	(0.035)
Pacific Islander	0.702***	0.687***	0.454***	0.755***	0.565***
	(0.052)	(0.055)	(0.054)	(0.056)	(0.055)
Multiple Races	0.601***	0.597***	0.395***	0.661***	0.502***
	(0.013)	(0.022)	(0.022)	(0.025)	(0.024)
Other	0.776***	0.767***	0.542***	0.838***	0.641***
	(0.018)	(0.025)	(0.025)	(0.027)	(0.027)
Region categorical variable	X	√	√	√	√
Household size categorical variable	X	X	√	X	√
Income categorical variable	X	X	X	√	√
Observations	104,082	104,082	104,082	104,082	104,082
R-squared	0.394	0.396	0.424	0.397	0.425
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1					