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Transport Access and the Labour Market in the United States

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By Lachlan Priest

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Abstract

In this paper I analyse the effects that car ownership has on one's outcomes in the labour market, and the barriers that a lack of car access presents in the United States. I also analyse the transport mismatch hypothesis. I do this by looking at time series regressions using car ownership as the explanatory variable. I also look at how trip distances, and public transport wait time are affected by income, and the types of cities people live in. I find evidence that car access is associated with increased participation in the labour force overall, as well as commute times, but has a varied impact on salaries. The results also show that higher income is associated with longer travel distances. Higher income is also associated with shorter wait times for public transport, but this is less pronounced in cities that have a good public transport system.

Introduction

Famously, the culture of the United States places a large amount of emphasis on individualism, and views the role of the government sceptically. This has culminated in the United States having one of the highest levels of inequality in the OECD. Ranking 5th highest in terms of income inequality, 3rd highest in terms of the poverty gap (OECD, 2021), and highest in terms of mean to median wealth ratio (OECD, 2018)

The role that individualism plays in American culture not only results in this economic inequality that we see today (Eppard, 2020), but also results in the large role that the private automobile has, which in turn has had a large impact on how American cities are designed (McAllister, 2011).

This car centricity first began in the 1950s with the post-war boom. A housing shortage due to the Great Depression coupled with the Second World War necessitated a large amount of housing to be built. This along with the now affordable automobile led to suburban development and urban sprawl at a scale that had never been seen before.

Young white couples fled from the inner cities to the suburbs, drawn by larger block sizes, and made possible by the automobile. However, this was not made available to black families. The practice of redlining and segregation meant that black families could not move into these suburbs and were left to stay in the decaying inner cities that the white families had deserted.

These new suburbs far from the city centre were not only made possible due to the automobile, but they necessitated the use of the automobile due to the large distances between housing and essential services and shops.

Cities soon began to feel the ill effects of automobile dependency-particularly through congestion. The solution to this was the construction of large highways in order to facilitate moving those living in the suburbs to their jobs in the city centre. The construction of these highways however meant the destruction of poor and minority inner city neighbourhoods. On top of this, many public transport services were discontinued due to low ridership, the General Motors streetcar conspiracy (Marshall, 2016), and a preference towards the automobile by policymakers (National Museum of American History, 2020).

While there has been somewhat of a reversal in recent years, with inner city gentrification pushing minorities out, and an increase in the amount of black people living in the suburbs (Phippen and National Journal, 2015), the effects that suburbanisation has had can still be seen today. American cities are built with the car in mind, leaving those without a car, with dramatically less mobility.

This link between the way in which cities in the United States are constructed, and how this places a barrier to the labour market for the poor, is the issue on which this paper focuses on. However, other papers focus solely on the way in which access to automobiles affects one's participation in the labour market. This paper on the other hand, considers the role in which public transportation plays, and aims to analyse how the link between car access and participation in the labour market changes between cities which are very car dependant, and cities which have better public transport options. This consideration of public transport is important because firstly, while many people are dependent on private vehicles, this does not have to be the case. Secondly, this consideration is important because without it, many researchers are led to suggest that the way to combat this lack of access to the labour market, is simply by providing more cars to people, rather than examining the way our cities' car dependant structures causes this lack of mobility to those without a car in the first place.

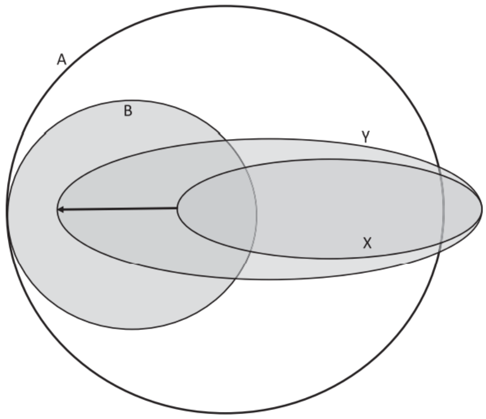
To analyse this link between car access and access to the labour market, I first look at the data of the Panel Study of Income Dynamics (PSID), and analyse the association between car ownership and a variety of other variables in subsequent waves. In particular I look at whether respondents subsequently join the workforce, how their salary changes, and change in commute times. Following this I use the National Household Travel Survey (NHTS). Because the NHTS is not a panel survey, I am unable to track the difference that access to automobiles and the like have on people's participation in the labour force. However, I am able to analyse various trends which relate to the relationship between transport access and access to the labour market.

Review of the Literature

My paper, as well as many others, takes inspiration from the spatial mismatch hypothesis, which was first hypothesised in 1968. It contended that one factor of income inequality between the rich and the poor was due to where the rich and the poor lived in relation to jobs. The further distances that the poor had to travel from the outer suburbs and rural areas led to them being able to participate less easily in the labour market, in comparison to the wealthier who lived closer to city centres.

However, this hypothesis only focuses on the distance between where people live and their jobs, and ignores the role that different forms of transport play in linking people between their homes and their jobs. This is important when comparing suburbs which have highway connections, public transport, and a population with high car ownership, with a neighbourhood which is instead split by a highway, has limited public transport, and low car ownership. Under the spatial mismatch hypothesis these factors are not considered, unlike in the transport mismatch hypothesis (Gautier & Zenou).

Frederick & Gilderbloom's (2017) paper explains the transport mismatch hypothesis well with their diagram as shown:



This diagram explains the transport mismatch hypothesis by showing how various transport methods allow for differing labour market participation. In this diagram, circle A represents the entire surrounding metropolitan area of the city in question, while circle B represents the space of the metropolitan area in which the jobs are located. Frederick & Gilderbloom assume that owners of cars are able to access all areas in the metropolitan area, therefore all of circle B. Circles X and Y on the other hand represent the mobility of those without a car in different urban environments. Circle X represents an urban environment which is car dependant, and which has "built environments and transportation policies that create a low level of non-SOV (single occupant vehicle) mobility". Whereas circle Y represents built environments which allow for a higher degree of non-SOV mobility. This elevated mobility in the circle Y urban environment, therefore allows those without a car to gain access to a higher proportion of the labour market (circle B), than those in circle X. Therefore, in a city with higher mobility for those without a car, there is less income inequality between those with and without a car, as there is less of a gap in how much of the labour market is accessible.

Using this framework, Frederick & Gilderbloom hypothesised that greater modal diversity leads to higher wages for those without access to a car, as well as decreased income for those with access to an automobile. In order to test this hypothesis, Frederick & Gilderbloom analysed 148 midsized US cities which have populations over 50,000, and were not situated close to other cities, in order to limit any spill over effects from other neighbouring cities. In order to measure modal diversity, they used the proportion of people using a mode of transport which was not a single occupancy vehicle. They found that greater modal diversity did indeed lead to "higher wages for marginalised workers", but that it wasn't accompanied by a reduction in wages for workers with an automobile.

While Frederick & Gilderbloom's paper does indeed focus on the relationship between access to public transport and urban form, and increased income for those without access to a car, far more papers have looked into the labour market benefits for increasing access to automobiles to those who did not have prior access.

Ong's (2001) paper which was carried out using a 1999-2000 survey in Los Angeles with TANF (Temporary Assistance to Needy Families), showed that "an automobile facilitates employment in automobile-dominated metropolitan areas such as Los Angeles". This led Ong to the policy recommendation that "A sound welfare policy should include programs that facilitate access to a car".

In Gurley & Bruce's (2005) paper with panel data in Tennessee, it was shown that car access improves employment rates. As such they recommended improving car access as a way to improve "employment and hourly wage outcomes for welfare recipients and recent leavers".

And finally, in Matsuo & Iseki's (2020) paper, data was used from the Survey of Income and Program Participation (SIPP) 2008 panel. Using that data, it was found that single mothers in particular benefited from access to an automobile as it led to increased labour force participation rates, and higher employment rates. This led Matsuo & Iseki to conclude that "car availability is critical when policy plans to encourage single mothers (to) leave welfare and work".

There are some papers which look at commuting distance more closely and how it relates to the labour market. Such as Mulalic, Van Ommeren, and Pilegaard's (2013) paper which looks at how "wages respond to changes in commuting distance induced by firm relocations". They found that "a 1 km increase in commuting distance induces an almost negligible wage increase in the year after the relocation but a more substantial wage increase of about 0.15% three years later".

Similarly, Severen (2018) looks at exogenous shocks relating to transport, however this paper focus more on mobility, and not on the labour market. Severen uses the exogenous shock of the construction of the Los Angeles Metro Rail. He found that "the subway causes a 7%-13% increase in commuting between pairs of connected tracts", resulting in an aggregated welfare of $246 million per annum.

Therefore, while Frederick & Gilderbloom analysed labour market participation and access to automobiles and public transport from the perspective that increased access to public transport is the solution to inequality in labour market participation, this is not the case for the majority of papers. Instead, many do not consider why there is such a need for personal automobiles, and hence limit the scope of their research, as well as their conclusions and suggestions, for solutions within the bounds of still designing cities for personal vehicles.

This is how I aim to differentiate my research from other papers. I explore how access to the automobile impacts labour force participation, in a similar fashion to Ong, Matuso & Iseki, and Gurley & Bruce. However, I will do so from a similar perspective to that of Frederick & Gilderbloom, by viewing increased access to automobiles not as a solution, but as a possible symptom of the problem. It is also worth mentioning that my data is more similar to that of Frederick & Gilderbloom as I do not use quasi natural experiments like Ong, Matsuo & Iseki, Gurley & Bruce, Mulalic, Van Ommeren, & Pilegaard, and Severen.

Data & Methodology

In this section I will explain what data is used in this research paper, as well as my methodology in using the data.

I use data from two different sources. I use the 2017 National Household Travel Survey (NHTS), which is conducted by the Federal Highway Administration in the United States. I also use the 2005-2019 editions of the Panel Study of Income Dynamics (PSID), which is conducted by the Survey Research Center at the University of Michigan. The NHTS has 923,572 trip observations, from 264,234 persons, and 129,966 households. As the name suggests the PSID is a panel survey, with 15,725 respondents. However not all participants respond to all waves of the survey, meaning that there were 71,175 responses in total. In terms of the datasets' contents, the NHTS includes data surrounding respondents' trip taken, transport habits, and basic personal information. Unlike the NHTS, the PSID is not focused on transport, however it is extremely detailed, so there are a number of variables relating to transport.

Panel Survey of Income Dynamics (PSID) Methodology

Firstly, data from the 2005-2019 editions of the PSID are used. As the PSID is a panel survey, I am able to build upon the work of other studies, in analysing the effect that car ownership has on a variety of factors associated with the labour force by using time series regressions. In order to see how car ownership affects a variety of variables, I use a lagged vehicle ownership dummy variable. This allows me to more closely see the effect that car ownership has on other variables, rather than the effect that other variables (such as income), has on the likelihood of car ownership. I also analyse the association between car ownership and commute times. Race is considered in these time series regressions, as regressions are calculated for white and non-white respondents. It is worth noting that in the PSID there is no distinction made between Latino and non-Latino whites. I also analyse the differing results between the household "head" (usually a male), and the household "spouse" (usually a female), as well as when the household head is a female and without a spouse. I do this to build upon Matuso and Iseki's work, in order to further understand how car ownership affects women specifically, and how this differs to men. This is particularly pertinent considering the differing roles that men and women often have within the household in terms of participating in the labour force. The results for commute times are also presented for both those earning less than $30,000 and those earning $90,000. This represents the bottom 25% and top 25% of incomes in the survey.

National Household Travel Survey (NHTS) Methodology

Following this I then use the NHTS data. In the NHTS data, information is given about respondent's trip distances, as well as time spent waiting for public transport. The NHTS also asks respondents whether transport is a financial burden to them, and whether they use public transport to reduce this financial burden, as well as which Metropolitan Statistical Area (MSA) that the respondent lives in. This allows me to view the relationship between these financial variables and respondents' trip characteristics, and whether this relationship changes between cities by using a number of regressions. Therefore, allowing me to test the transport hypothesis theory. In order to use the data provided by the NHTS a number of modifications had to be made. Firstly, household income is provided categorically using income bands, rather than actual income. There were also a number of responses not stating respondents' incomes, instead replying with "I prefer not to answer", "I don't know", or "Not ascertained".

The table below presents the values the responses were given in order to perform the regression analyses involving household incomes.

Table 1: Ascribed values for "Household Family Income"

Number in dataset	Meaning	Ascribed value for regression purposes
-7	I prefer not to answer	Not included
-8	I don't know	Not included
-9	Not ascertained	Not included
1	Less than $10,000	5,000
2	$10,000 to $14,999	12,500
3	$15,000 to $24,999	20,000
4	$25,000 to $34,999	30,000
5	$35,000 to $49,999	42,500
6	$50,000 to $74,999	62,500
7	$75,000 to $99,999	82,500
8	$100,000 to $124,999	112,500
9	$125,000 to $149,000	137,500
10	$150,000 to $199,999	175,000
11	$200,000 or more	250,000

A similar process was involved when using responses for variables "Travel is a financial burden" and "Public transportation to reduce financial burden of travel" for regressions. The values used for regressions involving both variables are listed in the table below.

Table 2: Ascribed values for "Travel is a financial burden" & "Public transportation to reduce financial burden of travel"

Number in dataset	Meaning	Ascribed value for regression purposes
-7	I prefer not to answer	Not included
-8	I don’t know	Not included
-9	Not ascertained	Not included
1	Strongly agree	5
2	Agree	4
3	Neither agree or disagree	3
4	Disagree	2
5	Strongly disagree	1

In my regressions using NHTS data I also differentiate between residents who do not live in an MSA with over 1 million residents (considered henceforth as a large city), residents who do live in a “large city” which is not rated highly in terms of public transport, as well as residents who live in a “large city” with a top-rated public transport. In order to determine which cities have top rated public transport I use the results of a study titled “The Best Cities for Public Transportation in 2016” (Wallace, 2019). This study considers average commute times, commute time differences between those using and not using public transport, percentage of people using public transport, the total number of public transport users, and the difference in median income of those who use and don’t use public transport. This allows me to then investigate trip distance, and wait time for public transport, and how it is affected by income, and the characteristics of the city/town in which the respondent lives. I do not control for density of cities when considering public transport. This is because the transport mismatch hypothesis refers to urban form as a whole, not just solely the transport network. Density is also closely linked with the success of public transport systems; therefore, I want to include any effects that density has in my regressions. It is also worth mentioning that it would be beneficial if the NHTS was a panel survey like the PSID so that the effect that car ownership has can be studied. However, the NHTS still allows aspects of the transport mismatch hypothesis to be investigated. Like the PSID time series regressions, I consider race in my analyses. Similar to the PSID, the NHTS does not differentiate between Latino and non-Latino whites. However, in the NHTS regressions I analyse the differences between white and black respondents.

Results

In this section I will present my main findings. Firstly, I will present the time series regressions which have been formulated from the PSID data. These relate to metrics involving the labour market, as well as average commute time. Finally, I will present the regressions which have been sourced from the NHTS data. These focus on the distance travelled by respondents, as well as time waiting for public transport. These statistics are broken down by race, and city type.

PSID Regression Results

In table 3 we can see the association between car ownership and respondent's salaries in the following wave. Other variables such as education, age, age squared, and the wave number were also included. The associations between vehicle ownership and salary were not statistically significant when looking at the various heads. However, the association between car ownership and the spouse's salary was statistically significant, and positive. While statistically insignificant, for the head's salary, association between it and car ownership was opposite between white and non-white respondents. The association of vehicle ownership and salary was most negative for female “head” respondents.

Table 4 is similar to table 3, however it considers car ownership and labour force participation instead. Statistical significance for vehicle ownership is not found at all. However, for males, there is a positive association between vehicle ownership and labour force participation, while for females (both as the head, and the “spouse”), the association is negative.

Finally, table 5 looks at car ownership and commute time. Across races, and incomes, the associations are not statistically significant, however they do differ. Compared to respondents with a salary of less the $30,000, car ownership is associated with commute times nearly 8 times greater for respondents earning more than $90,000. The coefficient for car ownership is similar for white and non-white respondents in terms of magnitude, but are opposite. Car ownership is associated with increased commute times for white respondents, but decreased commute times for non-white respondents.

Table 3: Association between car ownership and salary

	(All) Salary (Head)	(White) Salary (Head)	(Non-White) Salary (Head)	(Spouse) Salary (Spouse)	(Female Head) Salary (Head)
Ownership of Vehicle Lagged Dummy	-284.3	-491.0	257.3	644.8*	-701.9
	(-0.45)	(-0.57)	(0.48)	(2.51)	(-1.10)
Years of Education (Head)	477.8	847.7*	-291.2		314.0
	(1.66)	(2.27)	(-0.81)		(0.82)
Years of Education (Spouse)				2048.6***	
				(10.07)	
Age (Head)	4314.5***	4887.9***	2303.1***		1945.5*
	(7.80)	(6.71)	(3.97)		(2.28)
Age (Spouse)				-288.6***	
				(-6.54)	
Age Squared (Head)	-26.67***	-29.77***	-14.06***		-13.8***
	(-17.20)	(-16.02)	(-6.46)		(-7.23)
Age Squared (Spouse)				0.268***	
				(6.33)	
Wave 2	16457.0*	19157.9*	8276.7	-2678.7***	4318.9
	(2.54)	(2.20)	(1.48)	(-7.06)	(0.43)
Wave 3	11746.5*	13937.5	5019.5	-2769.7***	2424.5
	(2.20)	(1.94)	(1.05)	(-7.23)	(0.29)
Wave 4	8854.8*	10671.2	3163.2	-2337.7***	2667.9
	(2.06)	(1.85)	(0.80)	(-6.72)	(0.40)
Wave 5	6460.9*	7815.3	2122.7	-1993.6***	1711.2
	(2.00)	(1.80)	(0.71)	(-5.24)	(0.34)
Wave 6	4289.4	5273.5	1086.0	-1456.2***	297.1
	(1.95)	(1.79)	(0.51)	(-5.60)	(0.09)
Wave 7	2215.2	2919.7	-119.6	-981.1***	418.5
	(1.86)	(1.85)	(-0.10)	(-4.10)	(0.25)
N	50049	29290	20759	50512	15111

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Association between car ownership and labour force participation

	(All) In Labour Force (Head)	(White) In Labour Force (Head)	(Non-White) In Labour Force (Head)	(Spouse) In Labour Force (Spouse)	(Female Head) In Labour Force (Head)
Ownership of Vehicle Lagged Dummy	0.00604	0.00550	0.00802	-0.00108	-0.000761
	(0.78)	(0.58)	(0.61)	(-0.08)	(-0.06)
Years of Education (Head)	0.0109*	0.0167***	-0.00458		0.00969
	(2.48)	(3.33)	(-0.55)		(0.98)
Years of Education (Spouse)				0.0274***	
				(4.64)	
Age (Head)	0.0597***	0.0548***	0.0790***		0.0620***
	(8.53)	(6.29)	(6.89)		(3.97)
Age (Spouse)				0.0156*	
				(2.43)	
Age Squared (Head)	-0.000403***	-0.000385***	-0.000488***		-0.000311***
	(-18.04)	(-15.84)	(-9.37)		(-8.06)
Age Squared (Spouse)				-0.0000147*	
				(-2.36)	
Wave 2	0.391***	0.355***	0.521***	0.344***	0.541**
	(4.90)	(3.49)	(4.48)	(4.86)	(3.01)
Wave 3	0.324***	0.292***	0.438***	0.278***	0.455**
	(4.85)	(3.44)	(4.45)	(4.71)	(3.03)
Wave 4	0.256***	0.229***	0.351***	0.227***	0.356**
	(4.79)	(3.37)	(4.45)	(4.77)	(2.95)
Wave 5	0.191***	0.171***	0.266***	0.175***	0.264**
	(4.73)	(3.33)	(4.32)	(4.83)	(2.93)
Wave 6	0.112***	0.0988**	0.160***	0.110***	0.175**
	(4.13)	(2.87)	(3.92)	(4.52)	(2.91)
Wave 7	0.0494***	0.0420*	0.0763***	0.0532***	0.0798**
	(3.55)	(2.41)	(3.43)	(3.98)	(2.58)
N	50640	29554	21086	26852	15228

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Association between car ownership and commute time

	(All) Commute Time (Head)	(White) Commute Time (Head)	(Non-White) Commute Time (Head)	(<$30,000 Salary) Commute Time (Head)	(>$90,000 Salary) Commute Time (Head)
Ownership of Vehicle Lagged Dummy	0.462	1.565	-1.857	0.462	3.623
	(0.57)	(1.65)	(-1.23)	(0.57)	(0.92)
Age (Head)	2.170**	1.827*	3.126*	2.170**	-4.721
	(3.03)	(2.22)	(2.16)	(3.03)	(-1.15)
Age Squared (Head)	-0.0144***	-0.0143***	-0.0121**	-0.0144***	0.0168
	(-6.82)	(-5.99)	(-2.64)	(-6.82)	(0.70)
Wave 4	11.00*	8.891	18.37	11.00*	-23.01
	(1.99)	(1.40)	(1.67)	(1.99)	(-0.81)
Wave 5	7.972	5.993	15.05	7.972	-18.89
	(1.92)	(1.26)	(1.80)	(1.92)	(-0.89)
Wave 6	5.312	4.029	9.858	5.312	-9.696
	(1.91)	(1.25)	(1.77)	(1.91)	(-0.68)
Wave 7	3.254*	2.449	6.017*	3.254*	-5.395
	(2.30)	(1.49)	(2.14)	(2.30)	(-0.76)
N	33393	18760	14633	33393	1921

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

NHTS Regression Results

Now looking back at the NHTS data, table 6 examines the link between whether travel is a financial burden, and the distance of respondents’ trips in miles. The constant is relatively similar among the various groups, except for black respondents-where the constant is around half of that of all respondents. Travel being a financial burden is statistically significant and positively associated with trip distance when looking at black respondents, and those not living in a large city, while it is statistically significant and negatively associated for those living in a large city with a top-rated public transport system.

While table 6 looked at all trips made, table 7 looks at trips made only using public transport, and instead has whether public transport is used to reduce the financial burden of travel as the explanatory variable. Using public transport to reduce the financial burden of travel is associated with shorter trip distances across all subgroups, with all being statistically significant, except for black respondents, and those living in a large city without a top-rated public transport system. Both the constant, and the coefficient vary widely between subgroups.

Table 8 is similar to table 7, however it instead has public transport wait time as the dependant variable. While only statistically significant for large cities without a top public transport system, public transport being used to reduce the financial burden of travel is broadly associated with higher wait times. However, this is not the case among black respondents, and for those living in a large city with a top public transport system.

Tables 9 and 10 are similar to tables 6 and 7, however household income is used as the explanatory variable.

In table 9, it is shown that increased household income is associated with increased trip distances across all subgroups, and this is statistically significant for all subgroups. To give some context, when looking at all respondents, the coefficient of 0.0000315 means that for every increase of $10,000 in household income, it is expected that the distance of the trip will increase by 0.315 miles. While the constant is smaller for large cities with a top public transport system than large cities without a top public transport system, household income has a greater impact on distance travelled for large cities with a top public transport system. This combination of lower constant, and higher coefficient can also be seen when looking at black and white respondents.

Table 10 looks at household income and trip distance, but only for trips made with public transport. It shows a positive, statistically significant association between household income and trip distance across all subgroups. The constant is relatively similar across subgroups, except among residents not in large cities, where the constant is approximately half of other subgroups.

In table 11, the relationship between household income and wait time for public transport is shown. Like in tables 9 and 10, across all subgroups the relationship between income and wait time is statistically significant. Except for among respondents not living in a large city, increased household income is associated with decreased wait time.

Table 6: Association between "Travel is a financial burden" and trip distance

	(All)	(White)	(Black)	<1 million pop.	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)
Travel is a financial burden	-0.112	-0.0193	1.184***	0.176*	-0.115	-0.781**
	(-1.72)	(-0.27)	(5.16)	(2.33)	(-1.13)	(-2.59)
Constant	11.10***	10.92***	5.581***	10.13***	11.10***	13.33***
	(50.26)	(46.57)	(6.69)	(39.08)	(32.78)	(13.12)
N	906,388	758,864	59,148	504,837	320,426	81,125

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Association between "Public Transport used to reduce financial burden of travel" and trip distance for public transport users

	(All)	(White)	(Black)	<1 million pop.	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)
Public Transport used to reduce financial burden of travel	-2.024***	-2.655***	-0.0931	-5.414***	-0.447	-1.798***
	(-9.33)	(-7.64)	(-0.41)	(-6.69)	(-1.83)	(-7.47)
Constant	18.52***	22.06***	8.884***	32.15***	11.27***	18.07***
	(21.58)	(16.45)	(9.66)	(9.99)	(11.92)	(18.83)
N	10,841	6,587	2,078	2,685	3,629	4,527

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Association between "Public Transport used to reduce financial burden of travel" and public transport wait time for public transport users

	(All)	(White)	(Black)	(<1 million pop.)	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time
Public Transport used to reduce financial burden of travel	0.0140	0.0386	-0.133	0.181	0.390**	-0.130
	(0.20)	(0.45)	(-0.81)	(1.22)	(2.90)	(-1.37)
Constant	8.944***	8.317***	10.53***	8.777***	9.510***	8.527***
	(32.74)	(24.99)	(15.96)	(14.89)	(18.30)	(22.43)
N	10,841	6,587	2,078	2,685	3,629	4,527

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Association between household income and trip distance

	(All)	(White)	(Black)	(<1 million pop.)	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)
Household income	0.0000315***	0.0000279***	0.0000432***	0.0000327***	0.0000302***	0.0000374***
	(29.85)	(25.12)	(8.43)	(23.54)	(18.40)	(8.71)
Constant	7.943***	8.214***	7.270***	8.205***	8.022***	6.513***
	(70.72)	(65.85)	(20.04)	(65.17)	(44.57)	(11.44)
N	898,140	750,010	60,440	501,562	316,732	79,846

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Association between household income and trip distance for public transport users

	(All)	(White)	(Black)	(<1 million pop.)	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)	Distance of trip (miles)
Household income	0.0000591***	0.0000558***	0.0000485***	0.000211***	0.0000639***	0.0000481***
	(15.52)	(9.68)	(7.31)	(9.94)	(11.37)	(12.25)
Constant	6.664***	7.214***	6.812***	3.380*	6.802***	6.848***
	(17.41)	(10.42)	(17.77)	(2.54)	(16.84)	(14.81)
N	10772	6537	2055	2689	3603	4480

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Association between household income and public transport wait time for public transport users

	(All)	(White)	(Black)	<1 million pop.	(>1 million pop. Poor Pub Trans)	(>1 million pop. Top Pub Trans)
	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time	Public transport wait time
Household income	-0.0000129***	-0.0000101***	-0.0000195***	0.0000228***	-0.0000111***	-0.00000986***
	(-10.00)	(-6.51)	(-4.14)	(5.74)	(-3.61)	(-5.98)
Constant	11.14***	10.74***	11.94***	10.76***	12.78***	9.735***
	(84.83)	(56.60)	(43.83)	(39.23)	(55.49)	(49.44)
N	11,797	7,407	2,112	3,184	4,000	4,613

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Discussion

The results from the PSID at times mirror previous research on the topic of car ownership and the labour market, however this is largely not statistically significant. As expected, vehicle ownership is associated with increased labour force participation for men, however interestingly, this is not the case for women-both when the female is the “spouse” of the household, as well as the head of the household. We expect increased labour force participation as car ownership allows for greater mobility across cities, thereby making more jobs accessible. For the same reason, we expect to see car ownership associated with higher salaries. With greater mobility, comes greater access to jobs, and therefore increased salaries. However, the results seen do not mirror this expectation when looking at all household heads, white household heads, and female household heads. Only when looking at non-white household heads, and the salaries of spouses do we see the expected result of car ownership being associated with higher salaries. The cause of this is unclear, however it could be that car ownership allows for more hours worked by the spouse, while the head works the same amount, however this should also coincide with greater labour force participation by the spouse. More research is needed to explain this, as well as to explain for the difference between races in how car ownership affects salary, and the reason why car ownership is associated with a comparatively large decrease in salaries for single female households.

In relation to the PSID results regarding commute times, the results may at first seem counter intuitive. However, given the urban form of the United States and its residents, there may be an answer for why we see increased commute times associated with car ownership for all except non-white respondents, as well as the large difference we see between those earning below $30,000 and above $90,000. As previously mentioned, broadly speaking, the suburbs further out from the city centre tend to be areas with a large number of wealthy white residents, while inner city areas tend to have proportionally more minorities. Therefore, a reason why we see this difference between white and non-white respondents, may be that for white people, car ownership allows them to travel further from the low-density suburbs (thereby taking more time). While for non-white respondents, car ownership allows places to be reached that are close by, but impractical or time consuming to get to without a car. However, more work is needed to be done in order to properly explain these results.

When looking at the results from the NHTS data, the results are broadly intuitive and reflect the current literature on the topic at a statistically significant level. In our results, we expect four sets of results which would fall in line with the transport mismatch hypothesis theory. Firstly, a positive association between household income and trip distance. Secondly, trip distance by those using cars being greater than trip distance for those using public transport. Thirdly, trip distances for those using public transport being greater for those in cities with a good public transport system. And finally, greater wait times for public transport for those in cities without a good public transport system. How the results meet or don’t meet these expectations will now be discussed.

Firstly, in regards to household income and trip distance, we can see that the results confirm our expectation, as there is a statistically significant positive association between household income and trip distance. We also see an association between shorter trips and both travel being a financial burden, and public transport being used to reduce this financial burden. Therefore, the results confirm the expectation that household income is associated with greater distance travelled. We expect this as those who are able to travel further under the transport mismatch hypothesis are able to access a greater number of jobs in the market, and therefore gain a better salary.

Secondly when comparing tables 9 and 10, we can see the difference in distance travelled between all respondents, and only those using public transport. For every subgroup, except large cities with a top public transport system, the constant for distance travelled is much higher for respondents using all forms of transport (including cars), compared to those using only public transport. This is broadly in line with the transport hypothesis theorem which states that those using public transport generally have poorer mobility than those with a car.

Thirdly, we would expect that cities with better public transport allow for better mobility among those using public transport. Therefore, this relates to the tables looking at household income, using public transport to reduce the financial burden of travel, and travel distance. We should see the constant being higher for cities with better public transport (reflecting a starting point of greater mobility), as well as the coefficient having less magnitude (reflecting the fact that mobility should be less dependent on income in these areas).

When looking at table 7 we do see the higher constant for cities with a top-rated public transport system compared to other large cities, however the coefficient is of greater magnitude-reflecting higher sensitivity. This means, that using the constants and coefficients in table 7, when looking at those who answered "Strongly Agree" to using public transport to reduce the financial burden of travel, and henceforth given a 5 in the regression, the predicted trip distance for large cities with a top-rated public transport system (9.08 miles) is about the same as the predicted trip distance for other large cities (9.035). Therefore table 7 only partially confirms this part of the transport hypothesis theorem, as those who use public transport to reduce the financial burden of travel in fact are predicted to travel further in cities without a good public transport system.

When we look at table 10 both aspects of the regression results at first glance support the transport hypothesis theorem. While the differences are marginal, the constant for trip distance for cities with a top-rated public transport system is higher than that of other cities. The coefficient is also of lesser magnitude for these cities when comparing to cities without a top-rated public transport system. While these are two things we look for, when comparing the two regressions given, it is predicted that top rated public transport cities are associated with greater trip distance only for households with an income of $2,911 or less. With households earning more than that travelling further distances. Therefore, for all income levels (as the lowest income level is $5,000), people travel further on public transport in cities without a top-rated public transport system. Therefore, the results in table 10 in fact do not support the transport hypothesis theorem, as a “better” public transport system has not shown to be associated with greater mobility.

Fourthly, while not directly related to the transport hypothesis theorem, the results of tables 8 and 11 should be noted. In both regressions, the constants for wait time is significantly smaller for large cities with a top-rated public transport system, when compared to other large cities. In terms of the coefficients, when looking at public transport being used to reduce the financial burden of travel, we see that this is actually associated with reduced wait times in large cities with good public transport systems. While in other large cities, it is associated with greater wait times. While looking at table 11, using the constants and coefficients given, it is only predicted for those with a household income of over $2.4 million, that the wait time is smaller in cities without a top-rated public transport system. Wait time is important to look at as it is another indicator of public transport mobility, and efficiency. Therefore tables 8 and 11 do support the contention that cities with better public transport systems allow for greater mobility (when wait time is used as a measure of mobility).

Finally, the limitations of this paper should be noted. In terms of the NHTS data, firstly, data surrounding MSAs is not perfect due to the size of the various MSAs, and the lack of data indicating where in the MSA the respondent is located. Therefore, there can be a huge degree of variation within MSAs surrounding access to public transport, car dependency, and density. Secondly, the broad range of household income bands may have impacted the results. More specific household income data (such as what exists in the PSID data) would be beneficial. Also worth covering is, as aforementioned, the data used is not similar to that of other papers which use quasi-natural experiments based around exogenous shocks, such as programs to increase car ownership, firm relocation, or construction of public transport. Therefore, there are problems surrounding endogeneity which I am aware of. Other papers use these shocks in order to attempt to prove causality. However, due to the lack of exogenous shocks in the data being used, correlation in this paper is investigated rather than causation. It is worth noting however, that despite the concerns of endogeneity in this paper, the same sorts of results are seen in this paper, as in other papers which employ exogenous shocks.

Therefore, future studies should aim to find data which has more granular information in terms of where the respondents live, as it allows researchers to more accurately investigate the relationship between neighbourhood characteristics, and the outcome variables in question. Panel surveys would also be invaluable for future studies as it allows researchers to investigate the effect that various changes in urban form have on labour market outcomes, rather than looking at just correlations.

Conclusion

I have completed this analysis in order to investigate the link between transport access and how it affects one’s participation in the labour market. I have done this first by examining how car access affects labour force participation, salary, and average commute time. The results of which are mixed, some of which supporting the contention that car ownership leads to better outcomes in the labour market, though not at a statistically significant level. I have also investigated the transport mismatch hypothesis theory. This states that those with a car have greater mobility than those without a car, and that those without a car in a city with a better public transport system are more mobile than those without a car living elsewhere. The results broadly confirm these contentions at a statistically significant level. In line with the transport mismatch hypothesis theory, we see greater trip distance associated with greater household income, greater trip distance associated with car usage, and less wait time for public transport users in cities with a top-rated public transport system. We see all these at a statistically significant level. However, we do not see greater trip distances for those using public transport in large cities with a top-rated public transport system, compared to those using public transport in other large cities.

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