GENDER DIFFERENCES IN MOBILITY OF HISPANIC IMMIGRANTS

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ABSTRACT

The U.S. immigrant population is steadily increasing, and approximately half of this population is Hispanic. This paper aims to understand the mobility of Hispanic immigrants, particularly whether gender differences exist in their mobility. Using National Household Travel Survey data for 2009, this paper finds that the gender difference in mobility is greater among Hispanics, particularly for low-income Hispanic immigrants, than for other populations. Hispanic female immigrants are substantially less likely to be drivers than their male counterparts and females of other race/ethnicity groups. Moreover, the probability of being a driver is persistently low for Hispanic female immigrants even after years of residing in the U.S., while driver status of females in other race/ethnicity groups increases quickly as they stay longer in the U.S. Hispanic female immigrants are likely not actively choosing to be non-drivers; if they are drivers, they drive more than females of other race/ethnicity groups. Although regression analysis does not prove causal relationships between low-income status and driver status, there are policy implications if barriers to becoming a driver limit training or employment and contribute to low-income status. More detailed analysis is anticipated to detail the mobility challenges Hispanic female immigrants face.

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1. INTRODUCTION

The transportation behavior of immigrants warrants research attention because both documented and undocumented immigrants populations are steadily growing in the U.S.,[1] and these populations have different mobility characteristics compared to native U.S. citizens (Tal and Handy, 2010). Immigrants are more likely to use public transit or carpools and are less likely to own an auto, particularly within the first ten years of their residence in the U.S. (Blumenberg and Smart, 2010; Blumenberg and Smart, 2014; Casas, Arce, and Frye, 2004; Chatman and Klein, 2009; Tal and Handy, 2010 among others). Hispanics are the largest immigrant group, accounting for almost a half of the documented immigrant population as well as half the undocumented immigrant population (American Community Survey 1-year summary 2010; Riviera-Batiz, 2001). Hispanics carpool more than other race/ethnicity groups, sometimes in the form of informal transit services (Cline, Sparks, and Eschbach, 2009; Lovejoy and Handy, 2008; Lovejoy and Handy, 2011; Valenzuela, Schweitzer, and Robles, 2005).

The transportation modes immigrants use may not be actively chosen given the barriers they face in owning and traveling by private cars, compared to U.S. natives. First, becoming a driver may be more difficult for immigrants, particularly if they lack English language skills and/or are undocumented. Second, owning a private vehicle is financially difficult for immigrants. They often send a significant portion of their earnings to family or creditors in their home country, and they face limited opportunities and even discrimination in obtaining automobile loans or credit. (Blumenburg and Smart, 2011; Chatman and Klain, 2013; Cohen, 2006). Even after immigrants become a driver and get access to a private car, they may be reluctant to drive. Driving is illegal and anxiety-provoking for undocumented residents, and even legal immigrants often do not easily adjust to driving conditions in the U.S. (Chatman and Klein, 2013; Garni and Miller, 2008).

Autoless immigrants often get help from their local ethnic community in finding transportation (Blumenberg and Smart, 2014). However, many immigrants without cars are trapped in their neighborhoods, and the limitation is more serious for females (Bohon, Stamps, and Atiles, 2008; Chatman and Klein, 2013). Bohon, Stamps, and Atiles (2008) find that the primary workers in Hispanic immigrant households are more likely to be male, and these primary workers do not have commuting challenges because of employer-provided commuter bus services. Yet, these same workers suffer the inconvenience of car-sharing for non-work trips, and the households' non-primary workers, who are more likely to be female, face serious transportation barriers. As a result, female immigrants carpool more than male immigrants both within their households and the community as a whole, including friends, relatives and neighbors (Blumenberg and Smart, 2010; Blumenberg and Smart, 2014). In addition, geographic proximity is key for female immigrant workers in finding work in labor

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[1] Immigrant population increased from 31.1 million to 40.0 million during the 2000s (American Community Survey 1-year summary 2010), and the country continuously adds approximately one million permanent residents every year (U.S. Department of Homeland Security, 2013a). In addition, 11.4 million unauthorized population were estimated to live in the U.S. as of January, 2012 (U.S. Department of Homeland Security, 2013b).

market niches (Parks, 2004). The American Community Survey (ACS) data confirms the findings; the unemployment rate of Hispanic females is generally higher than Hispanic males, while the female unemployment rate is generally lower than male unemployment rate for other race/ethnicity groups.

In light of these disparities, this paper explores the mobility of Hispanic immigrants, and whether there is any difference in mobility by gender. Specifically, driver status and driving mileage of individuals are examined to illustrate mobility of the target populations. The analysis finds that the mobility of immigrants and females may be limited by the hurdles in becoming a driver, particularly for low-income Hispanic female immigrants. The gender gap in the probability of being a driver is significantly larger for Hispanics than non-Hispanic/non-Blacks or Blacks. In contrast, when Hispanic females are drivers, their personal driving mileage is greater than female immigrants of other race/ethnicity groups.

2. RESEARCH DESIGN AND DATA

This paper conducts two quantitative analyses to assess differences in individual driver status and driving mileage by race/ethnicity group and by gender. The first analysis examines the differences in the probability of being a driver because becoming a driver is the first hurdle immigrants must overcome to increase personal mobility. As is the case for U.S. citizens, immigrants need to submit an application and take exams to obtain a driver's license. However, the process may be difficult, if not impossible, for non-English speakers or undocumented immigrants. The second analysis examines the race/ethnicity and gender differences in the personal driving mileage and behavior of drivers. As literature documents, immigrants and/or females may have limited access to vehicles, and immigrants and minorities often feel uncomfortable driving on U.S. roads.

The data for this paper are taken from the National Household Travel Survey (NHTS) data collected in 2009. The NHTS data is constructed from randomized landline telephone surveys administered in English or Spanish to civilian, non-institutionalized populations in the U.S. The data contains various demographic and socioeconomic data of individuals and household. Among the race/ethnicity groups reported by the household respondents, our analyses consider three different groups: Hispanics, non-Hispanic Blacks/Afro-Americans (referred to as "Blacks" in the rest of the paper), and non-Hispanic/non-Blacks[2]. Blacks are separately considered in the analysis to highlight difference between two large minority groups in the U.S. As Table 1 shows, the vast majority of the households and adults, 87% of the study population, are non-Hispanic, non-Blacks. (The majority of this non-Hispanic/non-Black population are non-Hispanic Whites.) Next, 6.9% of the households and 7.2% of adults[3] are Hispanics. Blacks take a share of 6.1% of households and 5.5% of adults.

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[2] Race/ethnicity group is categorized based on the race/ethnicity group of the household respondent, following NHTS data. Race/ethnicity data of individual members in the household is not available in the NHTS.
[3] This paper defines adults as a population of individuals 18 years old or older.

TABLE 1 The Number of Observations in NHTS 2009 by Race/ethnicity Group and by Gender

	Total	Non-Hisp Non-Blacks		Hispanics		Non-Hispanic Blacks	
Household	148,586	129,250	87.0%	10,251	6.9%	9,085	6.1%
Person	254,737	222,399	87.3%	18,310	7.2%	14,028	5.5%
Male	115,059	101,552		8,160		5,347	
Female	139,678	120,847		10,150		8,681	

Driver status is analyzed through a Logit model (Equation 1). The probability of being a driver (a binary variable *DRIVER* being 1) is described as a function of personal characteristics of the individual (X), household characteristics of the individual (A_h), and residential environment characteristics of the individual's residential area (A_e).

$$L(DRIVER = 1) = \exp(F(X, A_h, A_e)) / (1 + \exp(F(X, A_h, A_e)))$$

$$\text{s.t. } F(X, A_h, A_e) = \beta_x X + \beta_h A_h + \beta_e A_e + \varepsilon \qquad \ldots(1)$$

where β_x, β_h, and β_e are coefficients of personal characteristics, household characteristics, and residential environment characteristics, respectively. Using the same set of explanatory variables, personal driving mileage is analyzed through an ordinary least square model (Equation 2).

$$y = \gamma_x X + \gamma_h A_h + \gamma_e A_e + \varepsilon \qquad \ldots(2)$$

where γ_x, γ_h, and γ_e are coefficients of personal characteristics, household characteristics, and residential environment characteristics, respectively.

As personal characteristics, X, age and immigration status are considered in addition to race/ethnicity group and gender. In the analysis, people younger than 18 are excluded from data because not all the U.S. states allow people younger than 18 years to obtain a driver's license. Individual-level immigration status is categorized by whether the person is an immigrant, and if the person is an immigrant, by how long has he/she stayed in the U.S. The length of stay is categorized as follows: less than five years, 5 to 10 years, 10 to 15 years, and 15 years or longer.

The analyses also control for the following household level socioeconomic characteristics (A_h): household income, the number of adults in the household, and life cycle of the household. For household income, the author uses the mid-point value of the household family income category. For example, the value of $7,500 is used if the household is in the annual income category of $5,000 to $9,999. Lifecycle of the household is examined through three characteristics: whether the household is a single-adult household, whether the household has at least one child, and whether the household is a retired-adult household.

Residential environment characteristics included in the analysis (A_e) are population density of the household residential area, whether their metropolitan area has passenger rail services, and whether the residential area is urban or rural. Population density of the household residential area is taken from the NHTS 2009 data of population density per square mile at tract level (HTPPOPD). The data records the census tract level of population density around the respondents' residential area based on seven categories, and takes the mid-point of the range as the representative density of the category. The existence of the rail service is recorded as RAIL variable, which is 1 if the metropolitan statistical area in which the respondent resides has passenger rail service and 0 otherwise. The urban-rural difference is

categorized by the NHTS variable of URBANSIZE. The author categorizes the residential area as a rural area when the URBANSIZE is 6, "not in an urbanized area."

Last, regional fixed effects are controlled using Bureau of Economic Analysis regions (BEA regions). BEA divides the U.S. into eight regions based on geographic area (Figure 1). The regional fixed effects are expected to capture unobservable regional characteristics that affect travel behavior such as culture, topography, and climate.
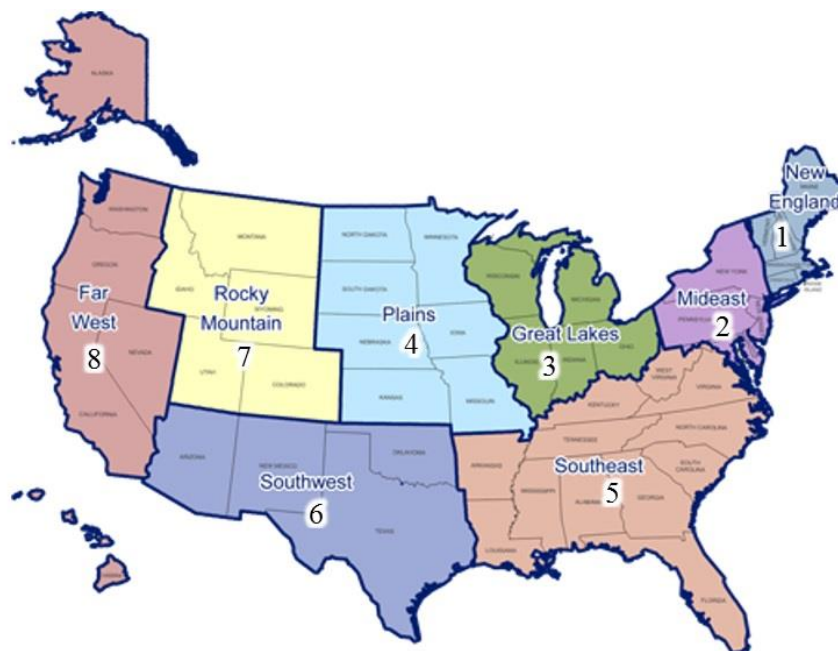
FIGURE 1 Bureau of Economic Analysis Regions

In the following analyses, this paper tries to exclude commercial drivers by removing households with large number of vehicles and individuals with extremely high driving mileage. First, 28 households (0.00019%) that each own ten or more automobiles (excluding motorcycles and golf carts) are removed. All 28 of these households are households with four or fewer adults, which indicates that not all vehicles are owned or operated for daily use. An additional 926 households (0.62%) are excluded because they own at least one vehicle that is driven more than 80,000 miles per year. Last, 852 adult drivers are removed from the analysis because they drive extremely long distances (annual driving mileage best estimate higher than 80,000 miles).

3. ANALYSIS OF PERSONAL MOBILITY

Descriptive statistics of driver status and personal driving mileage suggest that there are gender gaps and immigrant-non-immigrant gaps in the probability of being a driver and driving mileage (Table 2). Across all race/ethnicity and immigrant groups, males are more likely than females to be a driver, and males drive more miles than females do. In fact, when it comes to driver status, immigrant males are far more likely than female immigrants to be drivers. The gender gap of the probability of being a driver is particularly large for Hispanic immigrants, suggesting that mobility of Hispanic female immigrants may be limited. The analyses will explore whether these gender difference, and differences among immigrants and

non-immigrant groups in gender difference, remain evident even after controlling for other demographic, socioeconomic, and residential environment characteristics.

TABLE 2 Descriptive Statistics of Individual Mobility

	Non-Hisp/Non-Black		Hispanic		Non-Hisp Black	
	US Native	Immigrant	US Native	Immigrant	US Native	Immigrant
Proportion of Drivers (%)						
Male	95.6%	96.2%	92.6%	89.4%	86.4%	90.2%
Female	92.8%	87.7%	87.3%	67.3%	80.1%	80.4%
Avg. Personal Vehicle Mile of Driving Drivers						
Male	14,365	12,432	13,588	12,137	12,586	11,897
Female	9,961	8,651	10,155	9,160	9,522	9,869
Avg. HH Family Income	71,581	83,262	64,078	39,738	48,018	60,094
Avg. Number of Adults per Household	2.088	2.219	2.376	2.488	2.069	2.191
Avg. Population Density per Sq.Mile	2,589	5,102	5,103	7,931	4,335	9,033
Females in Data (%)	54.1%	57.5%	56.6%	54.4%	62.2%	58.3%
Observations	192,107	14,043	9,161	8,130	12,127	954

3.1 Driver Status

First, a Logit regression based on Equation 1 is conducted to examine driver status of individuals to explore how socioeconomic status affects the probability of being a driver (Table 3). To highlight variations in gender differences, three separate regressions are conducted for each race/ethnicity group, (1) non-Hispanic non-Blacks, (2) Hispanics, and (3) Blacks. In each regression, all the demographic and socioeconomic factors are examined together with their cross-terms with female dummy variable. In Table 3, the left columns of each regression result show the baseline coefficients, namely the coefficients for males of each race/ethnicity group. The right columns show the coefficient of female dummy variable and the coefficients of female cross-terms with socioeconomic and demographic factors. Thus, the sum of the baseline and cross-term coefficients should be considered in interpreting the effect of factors for females. For example, the coefficients of the number of adults (-0.556) and its cross-term with female (-0.0575) should be added in order to interpret the association between the marginal increase in the number of adults in a household and driver status for non-Hispanic/non-Black females.

The majority of the factors and their female cross-terms are significant, suggesting that the probability of being a driver is significantly different by personal, household, and residential environment characteristics, and these differences further vary by gender and by race/ethnicity group. More specifically, middle-aged people are more likely to be a driver, and income of the household has a significant association with the driver status. Female dummy variable is large in magnitude, but it is unclear whether the difference remains after considering other factors.

TABLE 3 Gender Difference in the Probability of Being a Driver (Logit Model)

VARIABLES	(1) Non-Hispanic/Non-Black		(2) Hispanic		(3) Black	
	Base	Female	Base	Female	Base	Female
Female		-4.672**		3.209		-13.62***
		(1.929)		(4.270)		(4.657)
Age	0.176***	-0.000453	0.152***	-0.0285*	0.128***	0.00553
	(0.00478)	(0.00629)	(0.0129)	(0.0159)	(0.0135)	(0.0168)
Age^2	-0.00163***	-0.000299***	-0.00160***	5.92e-06	-0.00118***	-0.000302*
	(4.38e-05)	(5.60e-05)	(0.000127)	(0.000155)	(0.000128)	(0.000157)
Immigrant	0.244***	-0.851***	0.0446	-0.853***	0.139	-0.199
	(0.0876)	(0.0992)	(0.113)	(0.133)	(0.213)	(0.264)
Immigrant 10 to 15 yrs	-0.0819	-0.268	0.223	-0.599**	15.63***	-16.29***
	(0.304)	(0.328)	(0.230)	(0.255)	(0.398)	(0.599)
Immigrant 5 to 10 yrs	-0.300	-0.706**	-0.0700	-0.474**	-0.271	0.947
	(0.304)	(0.321)	(0.198)	(0.224)	(0.582)	(0.652)
Immigrant 0 to 5 yrs	-0.197	-1.472***	-1.098***	0.115	0.00125	-1.356**
	(0.353)	(0.375)	(0.224)	(0.268)	(0.550)	(0.647)
ln(HH Family Income)	-0.820***	1.158***	-2.693***	-0.482	-3.823***	3.120***
	(0.317)	(0.383)	(0.764)	(0.884)	(0.815)	(0.957)
ln(HH Family Income)^2	0.0864***	-0.0614***	0.174***	0.0267	0.241***	-0.163***
	(0.0159)	(0.0192)	(0.0392)	(0.0455)	(0.0425)	(0.0499)
Number of Adults	-0.556***	-0.0575*	-0.418***	0.154***	-0.450***	-0.0671
	(0.0275)	(0.0307)	(0.0513)	(0.0574)	(0.0665)	(0.0796)
Single Adult HH	-0.321***	0.635***	-0.634***	1.084***	-0.414***	0.265
	(0.0613)	(0.0733)	(0.166)	(0.194)	(0.148)	(0.175)
HH with Child	0.619***	-0.304***	0.454***	-0.499***	0.394***	-0.0270
	(0.0632)	(0.0784)	(0.129)	(0.152)	(0.152)	(0.179)
Retired HH	-0.250***	0.364***	0.0278	0.444**	-0.215	0.359**
	(0.0548)	(0.0663)	(0.151)	(0.178)	(0.133)	(0.158)
ln(Population Density)	-0.130***	0.0133	-0.0186	-0.0834*	-0.0445	-0.0952*
	(0.0153)	(0.0190)	(0.0407)	(0.0472)	(0.0457)	(0.0554)
Rural	-0.0246	-0.0275	0.0230	-0.182	0.0782	-0.0461
	(0.0512)	(0.0634)	(0.157)	(0.179)	(0.164)	(0.199)
Rail	0.0125	-0.118*	-0.0935	0.0875	0.102	-0.140
	(0.0517)	(0.0611)	(0.113)	(0.122)	(0.148)	(0.165)
BEA Region 2	-0.0899		-0.0807		-0.696	
	(0.0753)		(0.328)		(0.468)	
BEA Region 3	0.227***		0.733*		-0.185	
	(0.0849)		(0.390)		(0.488)	
BEA Region 4	0.351***		0.341		-0.676	
	(0.0849)		(0.369)		(0.512)	
BEA Region 5	0.211***		0.888***		-0.357	
	(0.0722)		(0.319)		(0.460)	
BEA Region 6	0.271***		0.595*		-0.0988	
	(0.0752)		(0.318)		(0.464)	
BEA Region 7	0.534***		0.490		1.004	
	(0.143)		(0.547)		(1.181)	
BEA Region 8	0.169**		0.396		-0.101	
	(0.0764)		(0.315)		(0.471)	
Constant	-0.0915		9.283**		14.30***	
	(1.599)		(3.716)		(3.999)	
Observations	206,114		17,289		13,080	
Log Psuedo Likelihood	-35,351		-5,482		-4,613	
Psuedo R2	0.233		0.260		0.211	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Immigrants are less likely to be a driver, and among immigrants, more recent immigrants are less likely to be a driver. Moreover, the driver status difference by immigration status is significantly different by gender, and the gender difference is particularly strong for more recent immigrants. The gender gap is significant for non-Hispanic/non-Black and Hispanic immigrants staying in the U.S. longer than 15 years because the female cross-term for immigrant dummy variable is negative and significant. Furthermore, the gender gap is generally even greater for those who have stayed in the U.S. less than 15 years, as the three female cross-terms for immigrants staying in the U.S. less than 5 years, 5 to 10 years, and 10 to 15 years are negative and significant, and the magnitude becomes greater for more recent immigrants. The gender gap is greatest for non-Hispanic/non-Black immigrants than Hispanic immigrants if they are staying less than 5 years in the U.S. However, as they stay longer in the U.S., the gap for non-Hispanic/non-Black immigrants shrinks quickly, while the gap for Hispanic immigrants persists. The transition in the gender gap for Black immigrants is similar to that seen for non-Hispanic/non-Black immigrants, suggesting that the persistent gender gap is rather specific to Hispanic immigrants.

Household characteristics, such as household size, lifecycle of the household, and income of the household, also significantly predict driver status, and the association is different by gender and by race/ethnicity group. The probability of being a driver increases with the increase in household family income. Considering the magnitude of the income quadratic term, the rate of increase seems to be greater for Hispanics than non-Hispanic/non-Blacks, and the greatest for Blacks. The income effect is weaker for females than males for non-Hispanic/non-Blacks and Blacks, while the gender difference in the income effect is insignificant for Hispanics.

The number of adults in the household associates with the probability of carpooling within the household, and the lifecycle of the household associates with the travel needs of each adult. The number of adults in a household is negatively associated with the probability of being a driver for both male and female of all the race/ethnicity groups. In conjunction with the coefficient for the dummy variable for single adult household, for both genders in all race/ethnicity groups, with the exception of Hispanic males, the probability of being a driver steadily decreases with each additional adult member in the household. The probability of being a driver also decreases for Hispanic males when they are in a household with more than two adults. However, a Hispanic male in a two-adult household is more likely to be a driver than a Hispanic male in a single-adult household. The trend suggests that Hispanic males are likely to drive for other members in the household, that is, do errands on their behalf, as well as drive household members to destinations. This finding corresponds to Hispanic females depending on other drivers in the household.

Interestingly, across all groups, males, not females, in a household with children are more likely to be a driver than males in a childless household. In addition, in Hispanic households, the presence of children in the household does not increase the likelihood of a female adult being a driver, although it does increase the number of household trips females

drivers make[4]. Although females with children may need to make more daily transit trips to manage their life, the probability of being a driver does not always increase with the presence of children in a household. Particularly for Hispanic females in households with children, the analysis raise the question of how they can effectively manage the increased travel needs associated with children.

Last, the built environment of a residential area predicts the probability of being a driver as well. Although rail dummy variable is mostly insignificant, non-Hispanic/non-Blacks of both genders, Hispanic females, and Black females in high-density residential area are significantly less likely to be a driver. The probability of being a driver also varies by region, suggesting that regional, not local, urban environment and climate may affect the probability of being a driver as well.

Because it is difficult to determine the overall gender difference in driver status when using controls of basic demographic and socioeconomic characteristics, the probability of being a driver is estimated for specific cases using the estimated coefficients in Table 3. Figures 2 and 3 show the estimated relationships between the probability of being a driver and household family income for U.S. natives and immigrants who stay in the U.S. five to ten years. The probability of being a driver is estimated for people who are 40 years old, in households of two-adults with children, and living in an urban area of 7,500 people per square mile in the Plains (Region 4). Line color represents race/ethnicity group: black for Hispanics, blue (medium-gray) for non-Hispanic/non-Blacks, and light gray for Blacks. Solid lines are the estimations for males and dash lines are those for females.

Figures 2 and 3 show that immigrants are less likely to be a driver than U.S. natives even after staying in the U.S. more than five years, and gender and race/ethnicity variation in being a driver is greater if they are immigrants. For U.S. natives, the gender differences in the probability of being a driver is small and ignorable for non-Hispanic/non-Blacks and Blacks, while it is relatively small but observable for Hispanics. More than 90% of non-Hispanic/non-Black U.S. natives are drivers even if their income is low, and Hispanic U.S. native males are as much likely to be a driver as non-Hispanic/non-Black counterparts. In contrast, for Black U.S. natives and Hispanic U.S. native females the probability of being a driver is strongly associated with income, and the probability is not high when income is low. Driver status of immigrants are substantially different by gender, and the gender difference is the greatest for Hispanics, particularly when they are in low-income households. More than 90% of non-Hispanic/non-Black males and Hispanics males are drivers even if they are immigrants and their income is low, while their female counterparts are much less likely to be drivers. The probability of being a driver increases quickly with a rise in income for non-Hispanic/non-Black females; however, the probability increases slowly for Hispanic females. At the household family income threshold of $40,000, more than 90% of non-Hispanic/non-Black females are expected to be drivers, while less than 80% of Hispanic females are expected to be drivers. With regard to Black immigrants, the probability of being a driver is

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[4] Literature documents that females make shorter but more frequent trips than males, and many of these trips are household-related. Crane (2007) explains existing research and recent trends in the U.S.

higher for females than males, which is the opposite of the findings for other race/ethnicity groups.
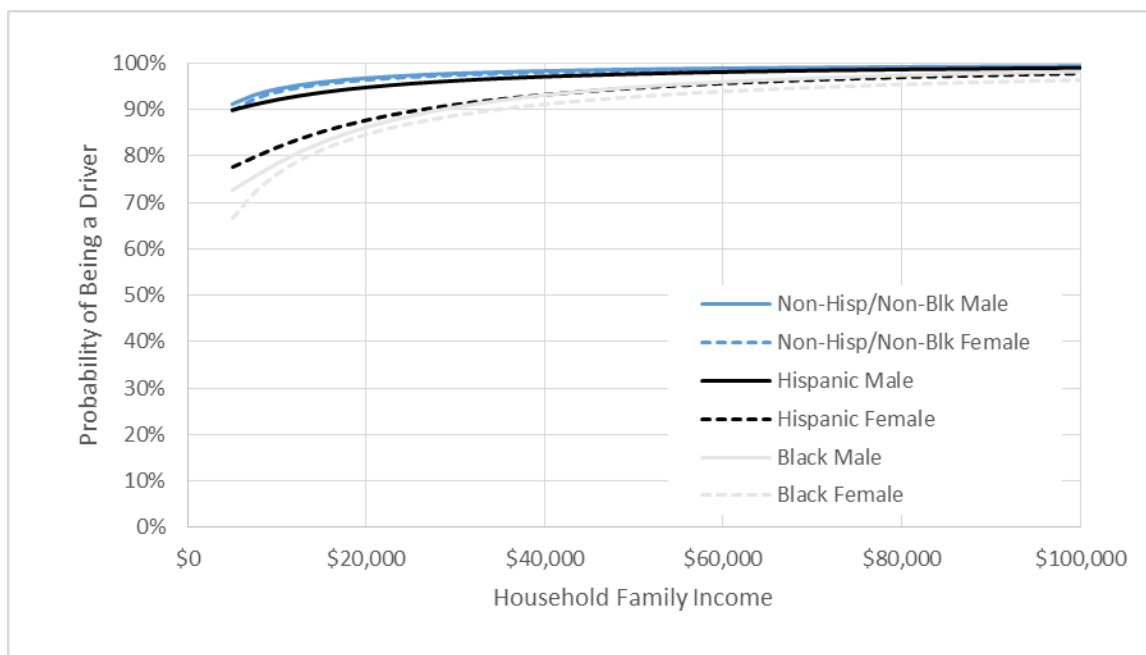
FIGURE 2 The Probability of Being a Driver and the Household Family Income for U.S. Natives (40 Year Old Adults Living in a Household of Two-Adults with Children)
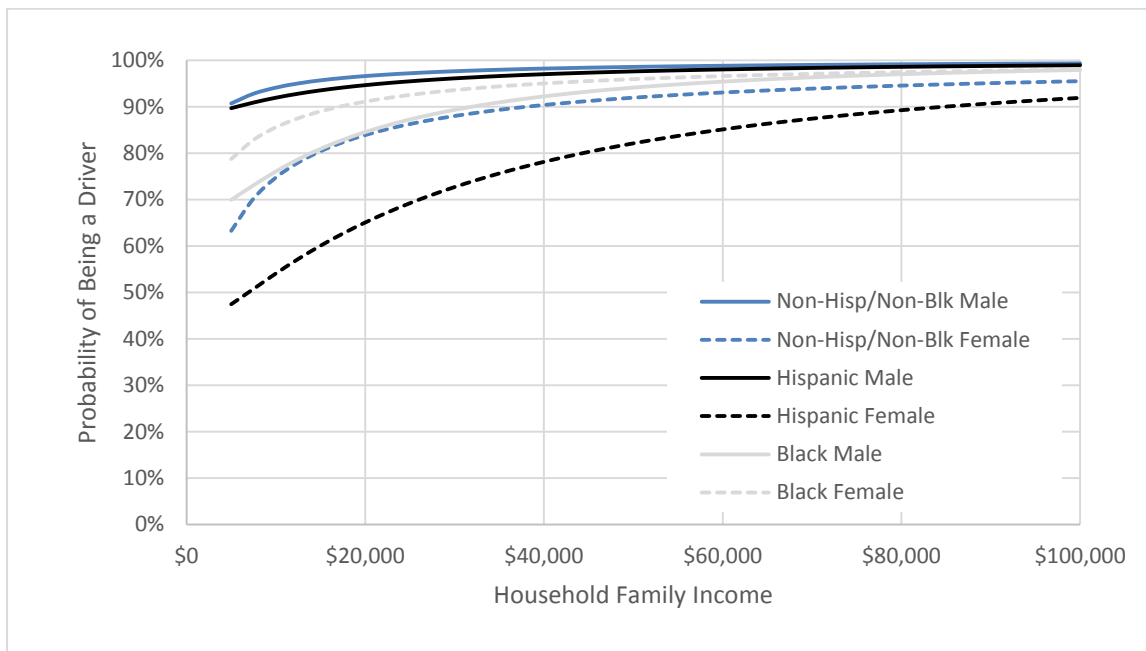
FIGURE 3 The Probability of Being a Driver and the Household Family Income for Immigrants Staying in the U.S. 5 to 10 Years (40 Year Old Adults Living in a Household of Two-Adults with Children)

In sum, driver status is substantially different by gender and by race/ethnicity group, particularly for low-income immigrants. Even after more than five years of stay in the U.S., immigrants' driver status is considerably different from that of U.S. natives. Moreover, Hispanic female immigrants appear to have a fairly low probability of being a driver, particularly when their income is low. Although this regression analysis does not reveal the causal relationships between the income and driver status, it is clearly problematic if barriers to becoming a driver cause poverty.

3.2 Driving Mileage of Individuals

Even when a person is a driver, s/he may not drive much. As literature documents, an immigrant or minority drivers, compared to other drivers, drive less if they feel uncomfortable driving or lack access to a vehicle (Chatman and Klein, 2013; Garni and Miller, 2008). This section assesses the natural log of the self-reported annual driving mileage, using an OLS model for each race/ethnicity group (Equation 2). Table 4 shows the three regressions conducted for each race/ethnicity group as previous table (Table 3). In each pair set of columns, the left column shows base (i.e. male) coefficients, and the right columns shows coefficients of the female dummy variable and the female cross-terms with socioeconomic and demographic factors.

Even if immigrants are drivers, they often drive fewer miles than U.S. natives. However, the trend is small or insignificant for Hispanic and Black immigrants. Specifically, non-Hispanic/non-Black immigrants drive significantly fewer miles than U.S. natives, and the trend is stronger if they are recent immigrants and/or females. Hispanic male immigrants tend to drive shorter distances than U.S. natives even after 15 years of stay in the U.S. but the difference is smaller than non-Hispanic/non-Blacks. Moreover, recent Hispanic male immigrants do not drive significantly fewer miles than those who stay longer in the U.S. A similar trend is observed for Black male immigrants; the driving mileage of Black male immigrants is not significantly less than that of U.S. native counterparts.

Gender difference is evident in the difference in driving mileage between U.S. natives and immigrants, but unlike driver status analyzed in the previous section, the gender difference is not significantly different across race/ethnicity groups. The driving mileage of female immigrants is significantly less than that of male immigrants, and the gender difference is greater for more recent immigrants. When immigrants come to the U.S., females are substantially less likely to be a driver than male counterparts. However, the gender difference shrinks quickly as they stay longer in the U.S. After 15 years of stay in the U.S., the driving mileage of non-Hispanic/non-Black or Black female immigrants is not significantly different from their male counterparts. In contrast, Hispanic female immigrants who reside in the U.S. 15 years or longer drive significantly more miles than male counterparts, although the difference is economically not meaningful.

TABLE 4 Gender Differences in Personal Driving Mileage

	(1) Non-Hispanic/Non-Black		(2) Hispanics		(3) Blacks	
	Base	Female	Base	Female	Base	Female
Female		-0.0834		-4.155		-4.128
		(1.006)		(3.581)		(3.811)
Age	0.0580***	0.00232	0.0723***	-0.0131	0.0692***	-0.00156
	(0.00155)	(0.00238)	(0.00719)	(0.0117)	(0.0101)	(0.0148)
Age^2	-0.000574***	-0.000165***	-0.000765***	-3.40e-05	-0.000676***	-0.000166
	(1.45e-05)	(2.29e-05)	(7.39e-05)	(0.000123)	(9.66e-05)	(0.000143)
Immigrant	-0.121***	-0.0106	-0.0840**	0.114*	-0.0824	0.147
	(0.0149)	(0.0238)	(0.0404)	(0.0635)	(0.0947)	(0.134)
Immigrant 10 to 15 yrs	0.000400	-0.246***	0.0604	-0.300*	-0.163	0.0126
	(0.0429)	(0.0740)	(0.0949)	(0.155)	(0.297)	(0.459)
Immigrant 5 to 10 yrs	-0.127**	-0.302***	0.0105	-0.306*	0.555***	-0.872**
	(0.0586)	(0.0937)	(0.103)	(0.170)	(0.211)	(0.392)
Immigrant 0 to 5 yrs	-0.313***	-0.609***	0.00272	-0.503*	0.0124	-0.271
	(0.0821)	(0.137)	(0.181)	(0.285)	(0.451)	(0.597)
ln(HH Family Income)	1.278***	-0.140	1.091***	0.695	0.557	0.726
	(0.128)	(0.184)	(0.393)	(0.670)	(0.570)	(0.713)
ln(HH Family Income)^2	-0.0450***	0.0115	-0.0339*	-0.0281	-0.00257	-0.0319
	(0.00585)	(0.00841)	(0.0184)	(0.0312)	(0.0267)	(0.0337)
Number of Adults	-0.0854***	0.0350***	-0.0711***	0.0670*	-0.180***	0.0635
	(0.00782)	(0.0109)	(0.0238)	(0.0369)	(0.0418)	(0.0574)
Single Adult HH	-0.0535***	0.487***	-0.266***	0.754***	-0.0651	0.154
	(0.0148)	(0.0214)	(0.0856)	(0.116)	(0.0886)	(0.115)
HH with Child	0.0210**	0.0311**	-0.0105	0.00295	0.0268	-0.0151
	(0.00873)	(0.0130)	(0.0423)	(0.0647)	(0.0576)	(0.0792)
Retired HH	-0.245***	0.0627***	-0.189***	0.0956	-0.210***	0.0107
	(0.0101)	(0.0158)	(0.0569)	(0.0885)	(0.0684)	(0.0951)
ln(Population Density)	-0.0712***	-0.00972**	-0.0405**	-0.0100	-0.0985***	-0.0112
	(0.00306)	(0.00471)	(0.0159)	(0.0235)	(0.0211)	(0.0299)
Rural	0.0199**	-0.0286*	0.0443	-0.00307	-0.108	0.0163
	(0.00984)	(0.0155)	(0.0524)	(0.0836)	(0.0695)	(0.0985)
Rail	-0.0315***	0.0180	0.00884	-0.0371	-0.0538	0.00789
	(0.00999)	(0.0145)	(0.0432)	(0.0599)	(0.0677)	(0.0878)
BEA Region 2	-0.0673***		-0.129		-0.435*	
	(0.0200)		(0.194)		(0.239)	
BEA Region 3	-0.0198		0.0375		-0.228	
	(0.0221)		(0.225)		(0.254)	
BEA Region 4	-0.0456**		0.104		-0.556*	
	(0.0214)		(0.218)		(0.289)	
BEA Region 5	0.0205		0.200		-0.160	
	(0.0189)		(0.185)		(0.229)	
BEA Region 6	0.0429**		0.0162		-0.0991	
	(0.0196)		(0.184)		(0.233)	
BEA Region 7	-0.0997***		-0.307		0.177	
	(0.0348)		(0.270)		(0.379)	
BEA Region 8	0.00124		0.0889		-0.116	
	(0.0200)		(0.185)		(0.234)	
Constant	0.0826		0.188		2.986	
	(0.705)		(2.109)		(3.067)	
Observations	156,601		9,618		7,235	
R2	0.223		0.176		0.204	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Findings on how personal driving mileage is predicted by the person's household size are similar to the findings on driver status (Table 3). Each additional adult in the household associates with fewer miles driven per adult in the household. Namely, adults in a household with many adults drive fewer miles than adults in a household with fewer adults. The effect is weaker for females when they are already in a household with more than two adults. When a person in a two-adult household is compared to a person in a single-adult household, however, the effect is significantly greater for females than for males. The coefficient of female cross-term with the single adult household dummy variable is large, positive, and significant, suggesting that females become more dependent on other adult member in the household than males, if the household includes any other adult.

Among non-Hispanic/non-Blacks, adults in a household with children drive more than adults in childless households; this effect is generally not observed for minorities.[5] In addition, females in households with children increase their driving mileage even more than males do. The finding is consistent with a hypothesis that adults, particularly females, drive more to manage additional trips for their children. In contrast, the association is insignificant for both genders of Hispanics and Blacks. Interestingly, the difference remains even after controlling for income and residential area characteristics. The finding suggests that travel patterns of Hispanics and Blacks with children may differ from those of non-Hispanic/non-Blacks with children, and raises the question of how they manage the additional travel needs associated with their children.

Last, the coefficients of age and income terms are not significantly different by gender. Considering the face value of the coefficients, however, for all race/ethnicity groups, females appear to hit their peak in driving mileage at a younger age than males do: age 40 compared to age 50.

To explore the overall differences in driving mileage, Figures 4 and 5 show estimated personal driving mileage, using the coefficients estimated in the Table 4. These figures illustrate driving mileages estimated for U.S natives and immigrants staying in the U.S. for five to ten years, assuming that they are 40-year old-adults in a household of two adults with children, living in an urban area with 7,500 people per square mile in the Plains states. As with previous figures, line color indicates race/ethnicity group: black for Hispanics, blue (medium-grey) for non-Hispanic/non-Blacks, and light grey for Blacks. Line type indicates the gender: solid lines for males and dashed lines for females.
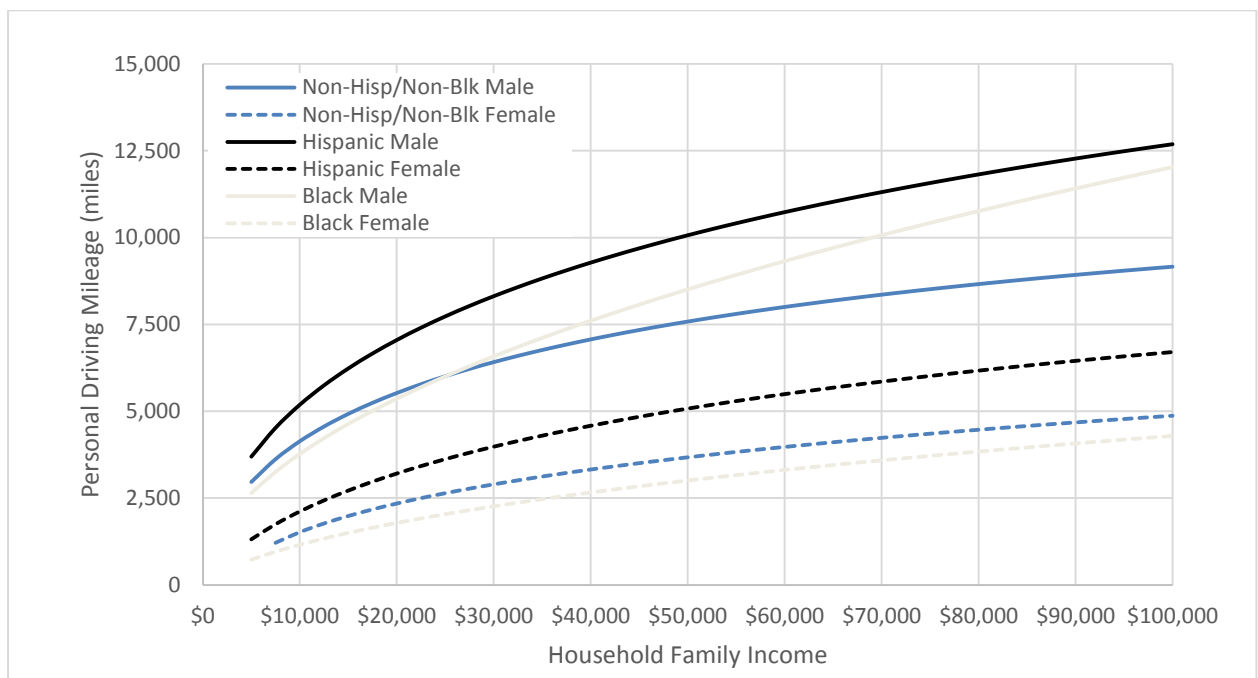
Driving mileage increases with household family income, and the mileage of U.S. natives, compared to immigrants, is more responsive to income. Hispanic males, whether they are U.S. natives or immigrants, increase their driving mileage more than non-Hispanic/non-Black males. Among the U.S. natives, Black males and Black females drive much less than males and females of other race/ethnicity groups, particularly when their income is high. Although other race/ethnicity groups increase their driving mileage greatly with their income, Blacks do not increase driving mileage as much.

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[5] While males in households with children are more likely to be drivers than males in households without children, the presence of children in a household does not relate to an increase in the number of miles driven by male adults.
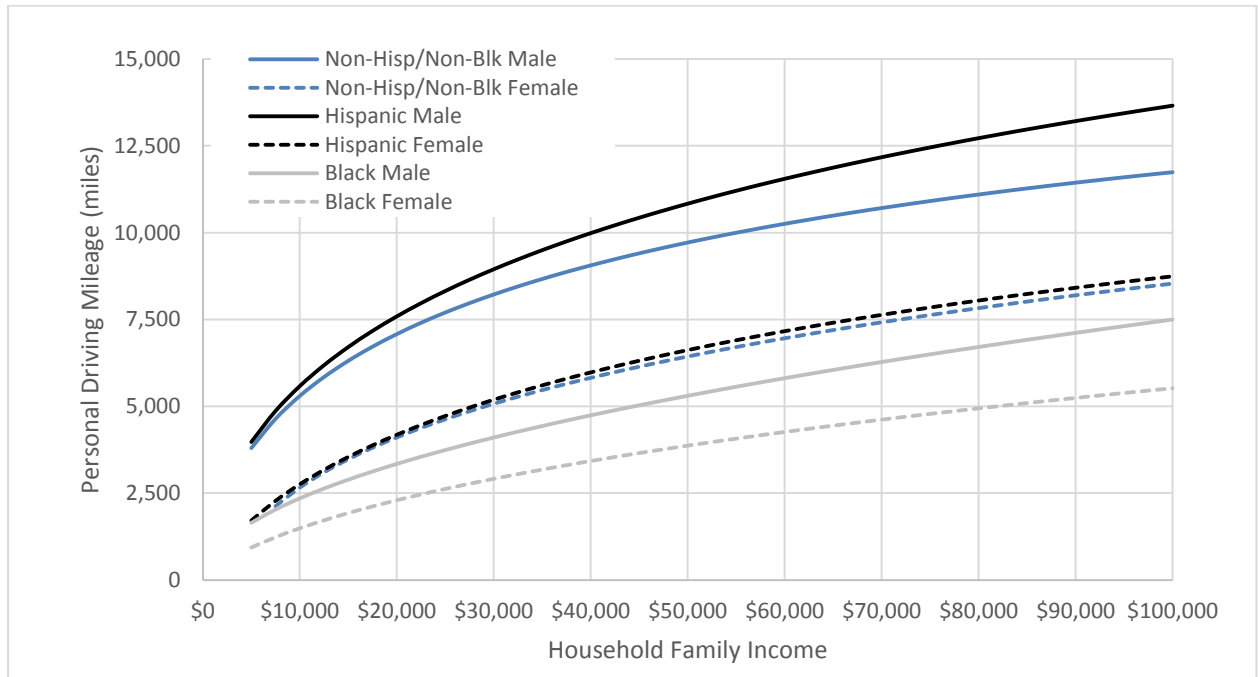
FIGURE 4 Personal Driving Mileage and Household Family Income of U.S. Natives (40 Year Old Adults Living in a Household of Two-adults with Children)

FIGURE 5 Personal Driving Mileage and Household Family Income of Immigrants Staying in the U.S. 5 to 10 Years (40 Year Old Adults Living in a Household of Two-adults with Children)

While a significant gender difference in driver status exists only for Hispanics and immigrants, a large gender difference in driving mileage exists for all groups: male drivers of all race/ethnicity groups drive much more than female counterparts, and the trend is observed for both U.S. natives and immigrants. Interestingly, in this respect, Hispanic female

immigrants do not seem to be disadvantaged in mobility when they are drivers. Although they drive less than Hispanic male immigrants, they drive more than non-Hispanic/non-Black and Black females.

The high driving mileage of Hispanic female immigrants who are drivers suggests the hidden driving needs of their non-driving counterparts. Although the probability of Hispanic female immigrants of being a driver is very low compared to other population groups, as just noted, they drive more than female immigrants of other race/ethnicity groups if they are drivers. Thus, Hispanic female immigrants are unlikely to choose not to be a driver. This suggests there is a hurdle in becoming a driver, which limits mobility of low-income Hispanic female immigrants.

4. CONCLUSION AND FUTURE DIRECTIONS

The analysis finds that males and females have different mobility characteristics such as the probability of being a driver and the personal driving mileage. The gender differences vary by race/ethnicity group and immigration status. Hispanic female immigrants seem to be persistently suffering from low mobility.

The mobility of Hispanic female immigrants is limited particularly by the process in becoming a driver. With regard to the probability of being a driver, females are basically less likely to be a driver, and immigrants are less likely to be a driver than U.S. native counterparts. The gender difference in the probability of being a driver is greater for Hispanics and for immigrants, particularly when their income is low. As a result, Hispanic female immigrants are even less likely to be a driver than female immigrants of other race/ethnicity groups. Moreover, the probability of being a driver for Hispanic female immigrant is persistently low years after their arrival to the U.S. a stagnation not observed for female immigrants of other race/ethnicity groups.

The low probability of being a driver does not seem result from a low need to drive. When Hispanic female immigrants are drivers, they drive more than females of other race/ethnicity groups. While Hispanic female immigrants drive shorter distance than Hispanic male immigrants, the gender difference in the driving mileage is comparable to those of other race/ethnicity groups. As Hispanic females tend to drive significantly shorter distance when they live with another adult, their mobility seems to be deprioritized within the household.

The findings are consistent with the finding of Bohon, Stamps, and Atiles (2008) in two ways: the mobility of Hispanic female immigrants is deprioritized in the household and limited compared to male immigrants, and low income is associated with low probability of being a driver. Although regression analysis does not prove causal relationships, low mobility of Hispanic female immigrants seems to make it more difficult in finding job or receiving training, and more likely to result in poverty. If difficulty in becoming a driver especially causes poverty for Hispanic female immigrants, it demands policy remedies tailored for this population group.

Future study is anticipated to explore why Hispanic female immigrants have difficulties in becoming a driver, and how they manage daily travel needs. Since immigrants' travel behavior differs substantially by race/ethnicity group and by gender, different support may be needed to satisfy the mobility needs of each population group.

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