Gender differences in mobility of Hispanic immigrants

Matsuo, Miwa

(Citation)
Transport Policy,52:209-230

(Issue Date)
2016-11

(Resource Type)
journal article

(Version)
Accepted Manuscript

(URL)
https://hdl.handle.net/20.500.14094/90003718

GENDER DIFFERENCES IN MOBILITY OF HISPANIC IMMIGRANTS

Miwa Matsuo

ABSTRACT

This paper examines the mobility of an increasingly important demographic group in the U.S., Hispanic immigrants. Using National Household Travel Survey data for 2009, this paper finds that, compared to the mobility of other populations, the mobility of Hispanic female immigrants is much lower, particularly when household income is low. Hispanic female immigrants are substantially less likely to be drivers than their male counterparts, and their probability of being a driver stagnates for decades after immigration, unlike female immigrants of other race/ethnicity groups. Hispanic female immigrants seem to remain non-drivers rather reluctantly. At the household level, Hispanic immigrants do not actively choose less auto-dependent lifestyles, and females clearly depend on others' mobility. Yet once Hispanic female immigrants become drivers, they drive more than females of other race/ethnicity groups. Their high, hidden demand for driving is likely not related to domestic needs because their driving mileage is unassociated with child-caring duties, and is associated with household income level. The association between low-income status and driver status of Hispanic female immigrants has policy implications, especially if the barriers to becoming a driver limit Hispanic female immigrants' access to training or employment and contribute to their low-income status. More detailed analysis is anticipated to detail the mobility challenges Hispanic female immigrants face.

Keywords: Mobility, Immigrants, Hispanics, Gender, National Household Travel Survey, Driver

1. INTRODUCTION

The transportation behavior of immigrants warrants research because documented and undocumented immigrants populations are both steadily growing in the U.S.,[1] and these populations have different mobility characteristics compared to U.S. natives (Chatman and Klein, 2009; Tal and Handy, 2010). Among the immigrants, Hispanics are the largest group, accounting for nearly half of the documented immigrant population as well as half of the undocumented immigrant population (U.S. Census Bureau, 2011; Riviera-Batiz, 2001). Hispanics are particularly known to 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 becoming a driver and 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. Third, even after immigrants become a driver and get access to a private car, they may be reluctant to drive. Research finds that certain immigrants do not easily adjust to driving conditions in the U.S. (Chatman and Klein, 2013; Garni and Miller, 2008), and driving is anxiety provoking for both legal and undocumented residents (Garni and Miller, 2008).

Autoless immigrants often get help from their local ethnic community in finding transportation. The mobility limitation is found to be more serious for female immigrants, and so, they carpool more than male immigrants both within their households and with their

[1] The immigrant population in the U.S. increased from 31.1 million to 40.0 million from 2000 to 2010 (U.S. Census Bureau, 2011), 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 individuals were estimated to live in the U.S. as of January 2012 (U.S. Department of Homeland Security, 2013b).

neighbors (Blumenberg and Smart, 2010; Blumenberg and Smart, 2014; Bohon, Stamps, and Atiles, 2008; Chatman and Klein, 2013). This limitation in mobility often leads to lower employment rates. Job seekers limit their search radius when auto commuting is not an option, and dependence on rides from others often discourages immigrants from moving out of their ethnic community to reside wherever jobs are. In fact, 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 (the American Community Survey five-year summary, 2010).

In light of these disparities, this paper explores gender differences in mobility, and whether the difference is greater for Hispanic immigrants. Specifically, driver status and driving mileage of individuals are examined to illustrate mobility of the target populations. The analysis finds that hurdles in becoming a driver may limit the mobility of Hispanic female immigrants. Hispanic female immigrants are much less likely to be drivers than their male counterparts, particularly when they live with other adults and/or in a low-income household. The gender gap in the driver status for Hispanics is also much greater and more persistent than that found for other race/ethnicity groups. The low probability of being a driver does not mean that Hispanic female immigrants actively choose less auto dependent lifestyles. At household level, Hispanic immigrants are overall not less auto dependent because Hispanic immigrant males are highly likely to be drivers and drive as many miles as U.S. native counterparts or non-Hispanic White counterparts. Moreover, Hispanic female immigrants drive more miles than female immigrants of other race/ethnicity groups, and this higher mileage is not associated with whether they have child-caring duties. Rather, driving mileage seems related to household income, suggesting that higher mobility among Hispanic female immigrants is associated with better job opportunities.

2. DIFFERENCE IN TRAVEL BEHAVIOR BETWEEN IMMIGRANTS AND NATIVES, AMONG RACE/ETHCNICITY GROUPS, AND BY GENDER

Prior research shows that travel behavior may differ between U.S. natives and immigrants, and the difference includes variations based on race/ethnicity background. Compared to U.S. natives, immigrants, particularly recent arrivals, are less likely to own a car, more likely to drive fewer miles, and more likely to carpool or use transit (Blumenberg and Smart, 2010; Blumenberg and Smart, 2014; Casas, Arce, and Frye, 2004; Chatman and Klein, 2009; Tal and Handy, 2010; among others).

These differences in travel behavior exist because immigrants have difficulties in becoming drivers, getting vehicles, and getting accustomed to driving on U.S. roads. Becoming a driver is difficult, if not impossible, if they are not proficient in English or undocumented. Vehicle ownership is financially difficult for immigrants because 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 Klein, 2013; Cohen, 2006). Even after immigrants ensure vehicle availability, they may have technical and emotional difficulties in driving on U.S. roads. The differences in driving conditions, such as congestion, driving rules, and parking style, make driving uncomfortable for many immigrants (Chatman and Klein, 2013). Immigrants, particularly those of color, may also feel intimidated in driving because of conscious or unconscious bias; notably, “police harassment affects everyone with ‘brown skin,’ not just undocumented migrants” (Garni and Miller, 2008, p444, lines 15-16). As a result, immigrants may choose residential locations that enable lower auto-dependent lifestyles or provide alternative transportation modes (Blumenberg and Smart, 2010; Blumenberg and Smart, 2014; Chatman and Klein, 2013; Chatman, 2014).

Autoless immigrants resort to carpooling within the ethnic community, and consequently, may be trapped in the neighborhood. Immigrants in ethnic communities are more likely to share a ride not only with family members but also with friends and neighbors for work and non-work trips than those who live in communities with fewer immigrants (Blumenberg and Smart, 2014). Bohon, Stamps, and Atiles (2008) find that Hispanic female immigrants in Hispanic immigrant communities in Georgia have limited transportation options, which prevents access to training and employment opportunities. More specifically, their study finds that for primary workers (typically males) in the Hispanic immigrant households, employers often provide commuter bus services. However, there are few transportation options for other members or their other travel needs. Bohon et al (2008) also found that the residential locations of Hispanic immigrants often lack public transit service, and those immigrants must rely on very inconvenient carpooling. As a result, the households' non-primary workers, who are more likely to be females, are often isolated in the ethnic community and experience low wages and unemployment.

Gender differences in mobility and travel behaviors are findings not unique to immigrants. Rather, research has found that gender differences in travel behavior are widely observed regardless of immigration status, country, and ethnic origin. Namely, females tend to take more responsibility for household-sustaining tasks than males do and make complex trip chaining to fulfill the role (Rosenbloom and Burns, 1993; Kwan, 1999; McGuckin and Murakami, 1999; Levinson and Kumar, 1995; McGuckin, Zmud, Nakamoto, 2005; Assaad and Arntz, 2005; among others). Taking care of household-sustaining errands often leaves females without the time or ability to access urban opportunities (e.g., jobs, education, and personal business), thereby lowering their job participation rate and/or limiting job choice (Kwan, 1999; Assaad and Arntz, 2005).

Although some gendered travel needs are universally observed across communities, travel behavior outcomes may vary widely by socioeconomic and cultural background. Rosenbloom (2006) points out important gender differences in travel behavior by race/ethnicity groups, despite low interest in travel behavior research overall. In the U.S., females, compared to males, drive alone more and, in order to make complex multi-destination trip chaining possible, are less likely to shift to alternative modes (Rosenbloom and Burns, 1993). In Germany, females rely less on auto usage than their male counterparts, although they also make more non-work trips compared to males (Best and Lanzendorf, 2005; Vance and Iovanna, 2007). In less developed countries, females are more likely to depend on public transit or carpooling, travel less frequently, and either take on longer commuting trips or are less likely to participate in the labor market (Assaad and Arntz, 2005; Elias, Newmark, and Shiftan, 2008; Elias, Benjamin, and Shiftan, 2015; Kwan and Kotsev, 2015). These variations in travel behavior imply that gender difference in mobility may differ greatly among U.S. natives and immigrants, and among natives and immigrants of different race/ethnicity groups, because people may follow gender roles and travel behaviors based on their cultural origins. However, most research focuses only on two demographic characteristics and not all three: gender, race/ethnicity group, and immigration status. Among them, immigration status attracts the least attention, possibly because of data availability and/or small sample sizes.

Certain socioeconomic and demographic factors aptly account for travel behavior differences between immigrants and natives, by race/ethnicity groups, or by gender. For example, literature finds that the coefficients of age, educational attainment, driver's license status, vehicle ownership, household size, household income, household lifecycle, employment status, location of workplace, and accessibility of neighborhood are significantly different by demographic group (Best and Lanzendorf, 2005; Boarnet and Sarmiento, 1998;

Elias et al. 2015; Kwan, 1999; Hanson and Pratt, 1995; Kwan and Kotsev, 2015, among others).

3. RESEARCH DESIGN AND DATA

This paper assesses differences by gender and by race/ethnicity group through two-step quantitative analyses: the first one assesses differences in individual driver status, and the second one assesses differences in driving mileage. A two-step analysis of driving status is employed because (1) despite certain behavioral changes related to public transit or lifestyle choice, driving is almost inevitable when living and working in the U.S.[2], and (2) there are multiple potential hurdles for immigrants to drive cars freely in the U.S. The first hurdle is becoming a driver, particularly in obtaining a legal driver's license. To get a driver's license, one must have legal immigration status, understand and complete the application process and exam, and have access to a road-worthy vehicle for the road test. These requirements may be difficult, if not impossible, for immigrants to complete, particularly for non-English speakers. Thus, the first analysis examines the differences in the probability of being a driver.[3]

Even after becoming a driver, immigrants face challenges to driving. As literature documents, they or their family may not own any vehicle, and may have to borrow one from neighbors or friends. Moreover, immigrants and minorities often feel uncomfortable driving on U.S. roads because of driving conditions that differ greatly from their native countries and

[2] There is increasing evidence that "Millennials" in the U.S. are delaying or not even obtaining driver's licenses or vehicles, and they may make this choice, as do some older drivers, for environmental reasons (Polzin, Chu, and Godfrey, 2014). However, this is a very limited phenomenon in the U.S. Limited mass transportation options in most U.S. cities still mean many people will drive at some point in their life or depend on another driver of a small passenger-vehicle.

[3] Driver status is based on a "yes" or "no" response to a question whether the person surveyed (or a person referenced) is a driver. Although it is unclear whether "being a driver" means having a driver's license or actively driving, this is the only variable in the NHTS that shows whether the person is able to drive.

fear of police harassment. As a result, they may choose where to live and plan daily travel in order to minimize driving distances. Thus, the second analysis examines the race/ethnicity and gender differences in the personal driving mileage and behavior of drivers.

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. Among the race/ethnicity groups reported by the household respondents, our analyses consider three different groups: non-Hispanic Whites, Hispanics, and non-Hispanic Blacks/Afro-Americans (referred to as "Blacks" in the rest of the paper).[4] Non-Hispanic Whites are selected as a baseline of the analysis because they are the majority (86.4% of households and 87.5% of adults as shown in Table 1). The target population, Hispanics, consists of 7.2% of the households and 6.7% of adult population in the data.[5] Blacks are separately considered in the analysis to highlight differences between two large minority groups in the U.S., although the sample size of Black immigrants is small.[6] Other minorities and mixed race/ethnicity groups are excluded from the analysis because they are known to have different travel behavior from non-Hispanic Whites, Hispanics, and Blacks (e.g., Tal and Handy, 2010), yet their sample size is too small to construct an independent group in the analysis.

[4] 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.
[5] This paper defines adults as a population of individuals 18 years old or older.
[6] Blacks account for 6.4% of households and 5.8% of adult population, but Black immigrants account only for 0.5% of households and 0.4% of adult population. As noted later, immigration status-related coefficients should be handled with caution because each immigrant category based on length-of-stay contains only dozens of Black immigrants.

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

	All sample	Three categories total	Non-Hisp Whites	% Sample	Hispanics	% Sample	Non-Hispanic Blacks	% Sample
Total								
Household	148,200	141,971	122,661	86.4%	10,246	7.2%	9,064	6.4%
Person	254,217	239,132	209,212	87.5%	16,108	6.7%	13,812	5.8%
Male	125,889	116,217	100,153		10,390		5,674	
Female	125,966	122,915	109,059		5,718		8,138	
US Natives								
Household	130,630	127,371	114,195	80.4%	4,840	3.4%	8,336	5.9%
Person	229,383	222,896	200,314	83.8%	9,601	4.0%	12,981	5.4%
Male	104,102	100,944	91,657		4,381		4,906	
Female	125,281	121,952	108,657		5,220		8,075	
Immigrants								
Household	17,570	14,600	8,466	6.0%	5,406	3.8%	728	0.5%
Person	24,834	19,890	10,162	4.2%	8,703	3.6%	1,025	0.4%
Male	10,621	8,362	4,160		3,775		427	
Female	14,213	11,528	6,002		4,928		598	

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).

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

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

where β_x, β_h, and β_e are coefficients of personal characteristics, household characteristics, and residential environment characteristics, respectively. For drivers who report non-zero driving mileage, natural log of personal driving mileage is analyzed through an ordinary least square model using the same set of explanatory variables (Equation 2).

$$ln(Personal\ Driving\ Mileage) = \gamma_x X + \gamma_h A_h + \gamma_e A_e + \varepsilon \qquad \ldots(2)$$

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 age 18 are excluded

from the analysis 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 has 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) is the population density of the household residential area, (HTPPOPD in NHTS 2009). The data records the census tract level of population density per square mile by seven categories, and takes the mid-point of the range as the representative density of the category. The NHTS data has other residential environment information, such as whether the metropolitan area has passenger rail services, and whether the residential area is urban or rural. However, these variables are eliminated from the analysis because they are insignificant across the analysis.

Last, regional fixed effects are controlled using Bureau of Economic Analysis (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.

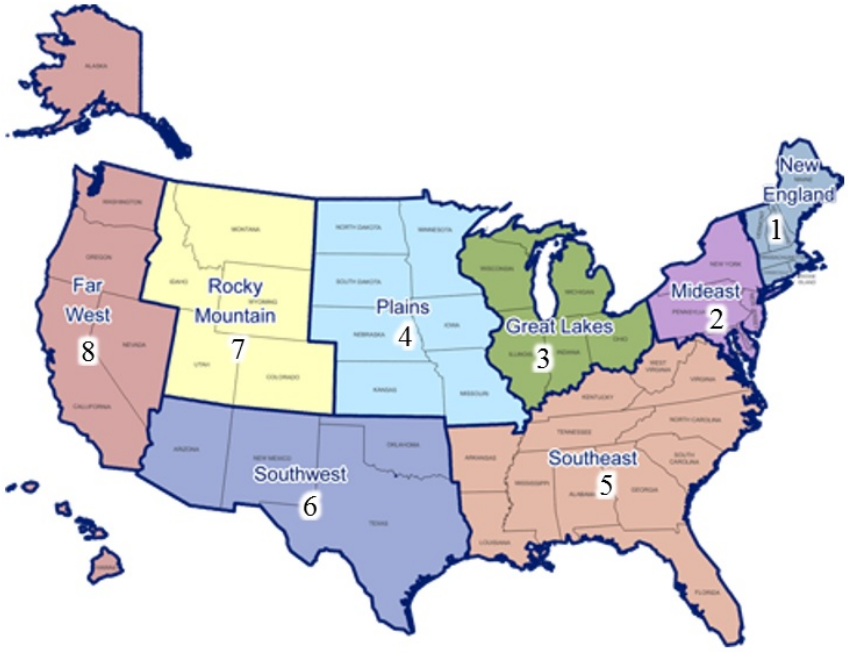

FIGURE 1 Bureau of Economic Analysis Regions

In the following analyses, this paper tries to exclude commercial drivers by removing households with large number of vehicles and also removing individuals with extremely high driving mileage. First, 415 households (0.28%) that own large number of vehicles are removed based on the following conditions: owning more than three automobiles per driver and more than three automobiles per adult.[7][8] These two standards are applied because (1) the number of adults is not equal to the number of drivers because some adults are non-drivers and some drivers are younger than 18, (2) yet, the number of adults remains important because more adults in a household suggests greater need for travel frequency. 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

[7] Automobiles are vehicles other than motorcycles and golf carts

[8] The average numbers of vehicle per adult and vehicle per driver are 1.10 and 1.13, respectively, and their standard deviations are 0.47 and 0.46. Considering the possibility of a person owning multiple vehicles for jobs and for leisure, this paper employs three vehicles as a threshold, which is approximately four standard deviations higher than the average.

because they drive extremely long distances (annual driving mileage best estimate was greater than 80,000 miles).

4. ANALYSIS OF PERSONAL MOBILITY

Descriptive statistics of driver status and personal driving mileage suggest that there are gender gaps and immigrant/U.S. native gaps in the probability of being a driver and driving mileage (Table 2). Across all race/ethnicity and immigrant groups, males are more likely to be drivers than females, and males drive more miles than females do. In fact, when it comes to driver status, male immigrants are far more likely to be drivers than female immigrants are. The gender gap in driver status is particularly large among Hispanic immigrants, suggesting that mobility of Hispanic female immigrants may be especially limited. The following analyses explore whether these gender differences remain evident even after controlling for other demographic, socioeconomic, and residential environment characteristics. Controls are particularly important because the factors vary widely across race/ethnicity groups and may have associations with the probability of being a driver and with driving mileage. Immigrants in all race/ethnicity groups live in higher density residential area than U.S. native counterparts, while only Hispanic immigrants have lower income than Hispanic U.S. natives.[9] The fact suggests that type of immigrants may be different across race/ethnicity groups, and their attitude towards transportation modes may also be greatly different among race/ethnicity groups and from U.S. native counterparts.

[9] The income disparity may be explained by the fact that the majority of Hispanic immigrants work in low-skilled manual position, while non-Hispanic White immigrants often include high-skilled workers.

TABLE 2 Descriptive Statistics of Individual Mobility

		Non-Hisp Whites		Hispanics		Non-Hispanic Blacks	
		US Native	Immigrant	US Native	Immigrant	US Native	Immigrant
Proportion Drivers							
Male		95.7%	96.1%	92.6%	89.4%	86.3%	90.2%
Female		93.0%	88.7%	87.3%	67.3%	80.1%	80.4%
Personal Vehicle Mile for Driving Drivers							
Male	Average	14,360	12,867	13,585	12,140	12,566	11,897
	(Std.Dev.)	(11,176)	(9,846)	(11,536)	(11,101)	(11,550)	(10,277)
Female	Average	9,956	8,892	10,161	9,160	9,530	9,869
	(Std.Dev.)	(8,265)	(7,318)	(9,082)	(8,222)	(10,090)	(10,007)
Avg. Household Family Income		71,603	81,610	64,062	39,733	47,962	60,094
Avg. Num. of Adults per Household		2.08	2.11	2.38	2.49	2.07	2.19
Avg. Population Density per Sq. Mile		2,538	4,444	5,105	7,932	4,340	9,033

4.1 Driver Status

First, a Logit regression based on Equation 1 is conducted to examine the driver status of individuals. To highlight variations in gender differences within the same race/ethnicity group, the analysis focuses on three separate regressions for each race/ethnicity group: (1) non-Hispanic Whites, (2) Hispanics, and (3) Blacks (Table 3, Models 1, 2, and 3 respectively). In each regression, all the demographic and socioeconomic factors are examined together with their cross-terms with a female dummy variable. In addition to analysis by race/ethnicity group, two regression analyses (Table 4 Models 1 and 2) are conducted to examine three issues: (1) significance of coefficient differences between race/ethnicity groups for females (Table 4 Model 1), (2) significance of coefficient differences between race/ethnicity groups for males (Table 4 Model 2), and (3) race/ethnicity group differences in gender difference in coefficients (Table 4 Model 2).

In Table 3, the left column ("base") of each regression result shows the baseline coefficients, namely, the coefficients for males of each race/ethnicity group. The center column in each regression shows the coefficient of female dummy variable and the coefficients of female cross-terms with socioeconomic and demographic factors. The

significance of total coefficient for females (i.e., coefficient for female-only data) are shown in the right columns. For example, as shown by Model 1 in Table 3, the difference in the probability of being a driver of non-Hispanic White adults in a household with and without children should be interpreted as follows: (1) for non-Hispanic White males adults, it is positive and significant with a coefficient of 0.67, (2) the gender difference in the effect of having children in a household is significant because the female-cross-term is significant in the center column, (3) for non-Hispanic White females, the coefficient of having children in a household is 0.37, the sum of 0.67 and -0.30, and (4) the coefficient for female (0.37) is significantly different from zero as the right column shows.

The bottom part of Table 3 shows the joint significance of immigration status-related factors. Joint F-test results of four immigration status-related factors that appear in baseline columns show the joint significance of an immigrant dummy variable and three length-of-stay variation dummy variables of males. The values in the female cross-term columns show the joint significance of the female cross-terms of those same four variables. The joint F-test results of eight immigration status- related factors show the significance of all baseline and female-cross-term factors combined.

In Table 4, Model 1 examines female-only data of three race/ethnicity groups with Hispanic and Black cross-terms, and Model 2 examines pooled data of all three race/ethnicity groups using two layers of cross-terms, by race/ethnicity group and by gender.[10] The table shows the signs of 5% level significant coefficients, and for both models, baseline coefficient results are omitted because they are the same as what is shown in Table 3 Model 1. More specifically, the left column of Table 4 Model 1 shows differences in coefficients between Hispanic females and non-Hispanic White females (later, this column is referred to as Model

[10] Because each factor and its female cross-terms are not perfectly independent, the significance of coefficients in Model 1 can be different from what is inferred from the variance of relevant coefficients in Model 2.

1-H), and the right column of Table 4 Model 1 shows differences in coefficients between Black females and non-Hispanic White females (later, this column is referred to as Model 1-B). The Hispanic and Black columns of Table 4 Model 2 show significance of race/ethnicity difference in coefficients for males (Model 2-H and 2-B, respectively). The female column shows the gender differences in coefficients for non-Hispanic White females (Model 2-F). The Hispanic female and Black female columns of Model 2 show the race/ethnicity differences in gender difference of coefficients (Model 2-HF and 2-BF); Model 2-HF shows differences between the gender difference for Hispanics and the gender difference for non-Hispanic Whites, and Model 2-BF shows differences between the gender difference for Blacks and the gender difference for non-Hispanic Whites. The bottom part of Table 4 shows the joint significance of immigration status variables in each cross-term category.

Overall, the fit of Logit regressions are excellent, with the pseudo R-squared of 0.2-0.25.[11] For non-Hispanic White male adults, the probability of being a driver is significantly different by personal, household, and residential environment characteristics (the left column of Table 3 Model 1). More specifically, middle-aged people are more likely to be drivers, with a peak around the mid-50s, and household income has a significant positive association with the probability of being a driver. Male adults in a household with a larger number of adults are less likely to be drivers, while the probability does not decrease much when the number of adults in a household increases from one to two. Male adults are more likely to be drivers when they are in a household with children and less likely to be drivers when they are in a retired household. Population density is significantly associated with the probability of being a driver.

[11] McFadden (1979, p307) states that "the values of 0.2 to 0.4 for ρ^2 represent an excellent fit."

Surprisingly, immigration status has an insignificant association with the probability of being a driver for non-Hispanic White male adults. The coefficients of immigration status are all insignificant, and they are also jointly insignificant. After controlling for demographic and socioeconomic factors, non-Hispanic White male immigrants, who are likely to be immigrants from European countries, are as likely to be drivers as their U.S. native counterparts.

The story for non-Hispanic White females differs from that of males because female cross-terms for non-Hispanic Whites are mostly significant (Table 3 Model 1, the center column). The driver status of non-Hispanic White female adults is significantly less associated by the household income than that of males. Moreover, their probability of being drivers decreases more than it does for males when they are in a household with a larger number of adults, and the degree of decrease is greater when a female in a single-adult household is compared with a female in a two-adult household. In other words, females tend to be more dependent on others' mobility when they live with other adults, particularly male adults. When they live with children, non-Hispanic White females are more likely to be drivers, but the difference between those living in households with and without children is significantly smaller than that of males. In a household with at least one retiree, females are more likely, rather than less likely, to be drivers, likely because of their longevity compared to male partners. The association between population density of residential area and the probability of being a driver is not significantly different between genders; residential density negatively associates with the probability of being a driver for females as well.[12]

[12] Although the female dummy variable is positive and significant, this does not simply suggest that females are more likely to be drivers. The associations between the probability of being a driver and all the socioeconomic and demographic factors are different between males and females, and the comparison of genders should consider all these differences as well.

TABLE 3 Gender Difference in the Probability of Being a Driver for Each Race/Ethnicity Group

	(1) Non-Hispanic White			(2) Hispanic			(3) Black		
	Base	Female cross-terms	Sig. of Coeff. for Female	Base	Female cross-terms	Sig. of Coeff. for Female	Base	Female cross-terms	Sig. of Coeff. for Female
Female		1.29**			-0.83			1.86	
		(0.38)			(1.07)			(1.28)	
Age	0.18**	0.0017	**	0.15**	-0.028	**	0.13**	0.00014	**
	(0.0049)	(0.0065)		(0.013)	(0.016)		(0.013)	(0.017)	
Age^2	-0.0017**	-0.00031**	**	-0.0016**	7.3e-06	**	-0.0012**	-0.00025	**
	(4.5e-05)	(5.8e-05)		(0.00013)	(0.00016)		(0.00013)	(0.00016)	
Immigrant (+)	0.13	-0.64**	**	0.017	-0.88**	**	0.16	-0.19	NS
	(0.10)	(0.12)		(0.11)	(0.14)		(0.209)	(0.26)	
Immigrant 10 to 15 yrs (+)	-0.29	0.25	NS	0.26	-0.67*	**	14.5**	-15.2**	NS
	(0.40)	(0.49)		(0.24)	(0.26)		(0.32)	(0.55)	
Immigrant 5 to 10 yrs (+)	-0.16	-0.92	**	-0.098	-0.49*	**	-0.44	1.10	NS
	(0.46)	(0.50)		(0.20)	(0.23)		(0.56)	(0.64)	
Immigrant 0 to 5 yrs (+)	-0.12	-1.49**	**	-1.06**	0.065	**	-0.29	-1.09	**
	(0.50)	(0.52)		(0.23)	(0.27)		(0.54)	(0.64)	
ln (HH Family Income)	0.92**	-0.066*	**	0.70**	0.048	**	0.80**	-0.012	**
	(0.021)	(0.027)		(0.048)	(0.054)		(0.044)	(0.053)	
Number of Adults	-0.57**	-0.058	**	-0.42**	0.15**	**	-0.43**	-0.086	**
	(0.029)	(0.033)		(0.052)	(0.057)		(0.067)	(0.079)	
Single Adult HH	-0.35**	0.64**	**	-0.65**	1.08**	**	-0.45**	0.29	NS
	('0.065)	(0.077)		(0.17)	(0.20)		(0.15)	(0.18)	
Child	0.67**	-0.30**	**	0.42**	-0.47**	NS	0.40**	-0.040	**
	(0.067)	(0.084)		(0.13)	(0.15)		(0.15)	(0.18)	
Retire	-0.31**	0.39**	*	-0.0090	0.43*	**	-0.28*	0.41*	NS
	(0.057)	(0.069)		(0.15)	(0.18)		(0.13)	(0.16)	
ln Population Density	-0.12**	0.012	**	-0.036	-0.048	**	-0.067*	-0.074*	**
	(0.012)	(0.015)		(0.030)	(0.036)		(0.031)	(0.037)	
BEA Region Variables	included	included		included	included		included	included	
Constant	-8.97**			-6.12**			-7.90**		
	(0.30)			(0.95)			(0.89)		
Joint F-test: Immigrant (+)									
Joint F-test for 4 variables	NS	**		**	**		**	**	
Joint F-test for 8 variables		**			**			**	
Observations	195,037			17,284			13,051		
Wald chi2	16402.6			6043.5			5902.1		
Pseudo R2	0.232			0.254			0.207		

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

TABLE 4 Significance of Gender Difference in the Probability of Being a Driver

(Pooled Data of All Females and Pooled Data of All Males and Females)

	(1)		(2)				
	Female-only		Three groups pooled				
	Hispanic	Black	Hispanic	Black	Female	Hispanic Female	Black Female
Race/Ethnicity Dummy	NS	+	+	NS			
Female Dummy					+	NS	NS
Age	-	-	-	-	NS	NS	NS
Age^2	+	+	NS	+	-	NS	NS
Immigrant (+)	-	+	NS	NS	-	NS	NS
Immigrant 10 to 15 yrs (+)	NS	NS	NS	+	NS	NS	-
Immigrant 5 to 10 yrs (+)	+	+	NS	NS	NS	NS	+
Immigrant 0 to 5 yrs (+)	+	NS	NS	NS	-	+	NS
ln (HH Family Income)	-	NS	-	-	-	NS	NS
Number of Adults	+	+	+	+	NS	+	NS
Single Adult HH	NS	-	NS	NS	+	+	NS
Child	-	NS	NS	NS	-	NS	NS
Retire	+	NS	NS	NS	+	NS	NS
ln Population Density	NS	NS	+	NS	NS	NS	-
BEA Region Dummy Varaibles (++)			included	included	included	included	included
Joint F-test: Immigrant (+) for 4 variables	**	**	NS	**	**	*	**
Observations	123,079		225,372				
Wald chi2	14874.19		28304.26				
Pseudo R2	0.2738		0.2542				
Comparison	Hisp F vs. White F	Black F vs. White F	Hisp M vs. White M	Black M vs. White M	Gender Diff. For White	Gender Diff for Hisp vs. Gender Diff for White	Gender Diff for Black vs. Gender Diff for White

+ and - signs show the signs of 5% level significant coefficients, NS for insignificant coefficients, ** p<0.01, * p<0.05
Model 1: Logit regression of female-only data with baseline factors and their crossterms of Hispanic and Black. The results of baseline coefficients are omitted from the table
Model 2: Logit regression of pooled data with baseline factors and their crossterms of Hispanic, Black, female, Hispanic female, and Black female. The results of the baseline coefficients are omitted from the table.
Full regression results are shown in Appendix

Unlike their male counterparts, non-Hispanic White female immigrants are significantly less likely to be drivers than U.S. natives. Their probability is particularly smaller if they stay less than ten years in the U.S. Although their adjustment seems to increase the probability of being a driver, immigrant females are significantly less likely to be drivers than U.S. native females, even after a 10-year stay in the U.S.

Hispanic males are also more likely to be drivers when they are wealthier, live in a household with a larger number of adults, and/or when live in a household with children; however, the probability is less sensitive to these factors compared to non-Hispanic Whites (Table 3 Model 2 left column and Table 4 Model 2-H). Moreover, the probability of being a driver for Hispanics is not significantly associated with the population density of their residential area, which is different from non-Hispanic White males. The associations with income and the number of adults in the household are also weaker for Black males than non-Hispanic White males, while the association with population density for Black males are not significantly different from that for non-Hispanic White males (Table 4 Model 2-H and 2-B).

What is commonly found among all males across the race/ethnicity groups is that immigration status variables are mostly insignificant to the driver status. With regard to Hispanic males, the coefficients are all insignificant except for the coefficient for stays of less than five years in the U.S. In other words, Hispanic male immigrants tend to become drivers soon after their arrival in the U.S., and the probability of being a driver equals that of U.S. natives within five years.

Hispanic females seem to be strongly dependent on others for rides, or they use alternative modes when they are in a high-density neighborhood. As Table 3 Model 2 shows, Hispanic females are significantly more likely to depend on others for rides when they live in a two-adult household compared with those in a single-adult household. This dependency on other household members is significantly stronger than dependency seen among non-Hispanic Whites as well as Blacks, and thus is specific to Hispanics (Table 4 Model 2-HF and 2-BF). Hispanic females not only depend on others for rides but also use alternative mode of transportation because they are less likely to be drivers when they live in a high-density residential area, unlike male counterparts whose driving status is not affected by residential density.

Interestingly, the probability of being a driver for Hispanic females is not associated with whether the household has children (Table 3 Model 2, right), which is significantly different from what is found for their male counterparts (Tables 3 Model 2 center). The finding is specific to Hispanic females because females of other race/ethnicity groups are more likely to be drivers if their household has children (Table 3 Model 1, right, and Model 3, right). Moreover, the coefficients are not significantly different between non-Hispanic White females and Black females, while the coefficient of Hispanic female is significantly smaller than that of non-Hispanic White females (Table 4 Model 1-H and 1-B). Another interesting feature of Hispanic females' driver status is the association with household income. Gender difference is not observed for Hispanics in the association with household income (Table 3 Model 2, center), but the association with household income for Hispanic females is significantly lower than that of non-Hispanic White females (Tables 4 Model 1-H).

Whereas Hispanic immigrant males and U.S. natives eventually share driver status similarities, immigrant-U.S. native differences persist among Hispanic females (Table 3 Model 2, right, and joint F-test result). As previously stated, within five years of their residency in the U.S., Hispanic male immigrants catch up with U.S. natives; however, the probability of being a driver of Hispanic female immigrants stagnates even after a 15-year stay in the U.S. Their catch-up process is even slower than that of non-Hispanic White female immigrants, who catch up with U.S. natives within 10 years.[13]

Because it is difficult to compare the overall gender difference in driver status, the probability of being a driver is estimated for specific cases using the estimated coefficients in Table 3. This paper employs U.S. natives and immigrants in a family household with mid-age parents and children as representative examples.[14] The households are assumed to be located

[13] The immigration status coefficients for Black females are not discussed because of the small sample size.
[14] More comprehensive discussions are shown in the Appendix.

in a mid-density urban area located in an inland area of the U.S., and immigrant parents are of working age when they come to the U.S. Specifically, 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 Whites, and light gray for Blacks. Solid lines are the estimations for males, and dash lines are estimations for females.

Figures 2 and 3 show that even after more than five years in the U.S., immigrants are less likely than U.S. natives to be drivers, and gender and race/ethnicity variations in driver status is greater for immigrants. Among U.S. natives, the gender differences in the probability of being a driver is small and ignorable for non-Hispanic Whites, while it is relatively small but observable for Hispanics and Blacks. More than 90% of non-Hispanic White U.S. natives are drivers even if their income is low, and Hispanic U.S. native males are as likely to be drivers as non-Hispanic White counterparts. In contrast, the probability of being a driver for Hispanic U.S. native females and Black U.S. native males and females is not high when their household income is low.

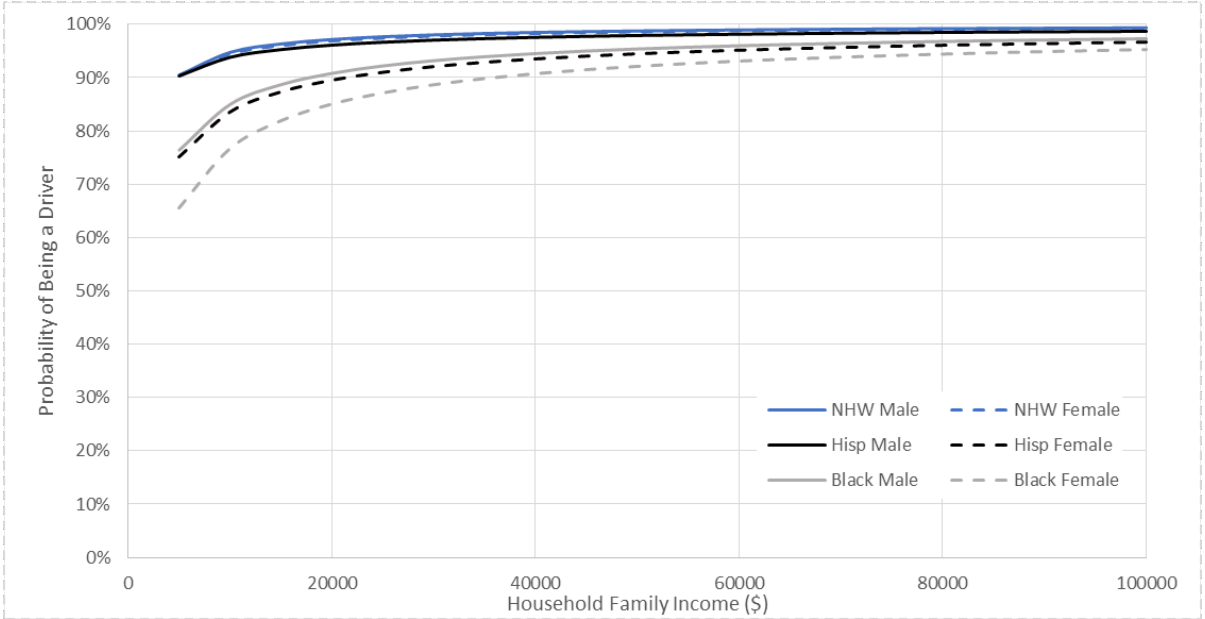

FIGURE 2 The Probability of Being a Driver and the Household Family Income for U.S. Natives (40 Year Old Adults Living in a Household of Two Adults with Children)

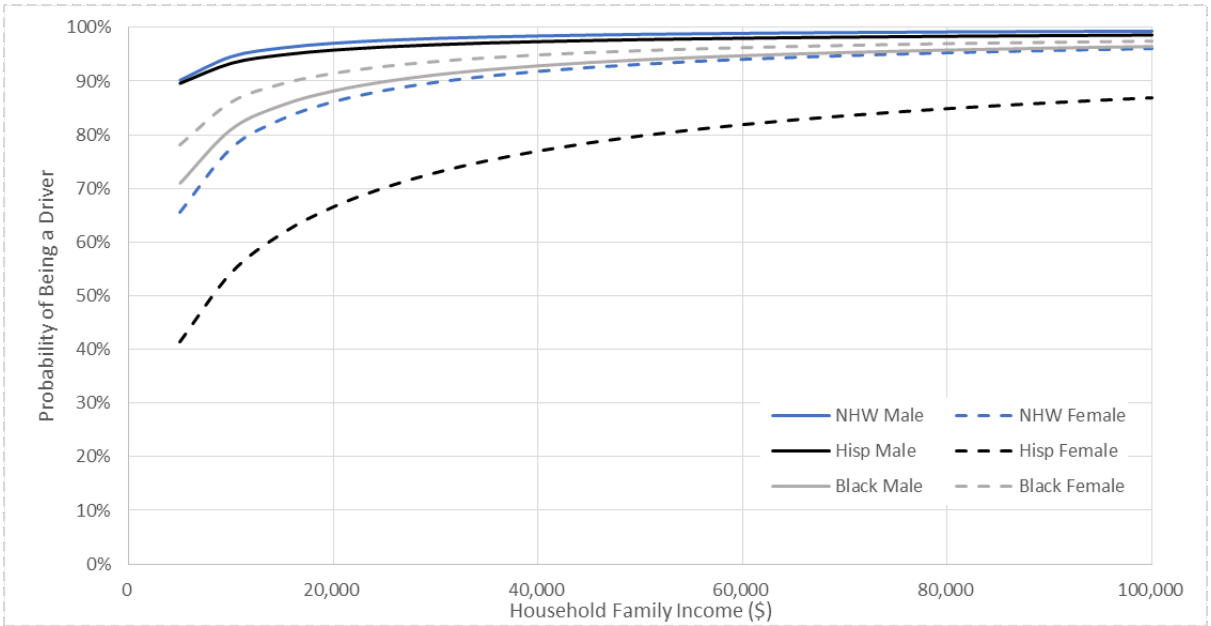

FIGURE 3 The Probability of Being a Driver and the Household Family Income for Immigrants Staying in the U.S. 5 to 10 Years (40 Year Old Adults Living in a Household of Two Adults with Children)

Gender differences in driver status are evident for non-Hispanic White immigrants and Hispanic immigrants, and the difference is greatest for low-income Hispanic immigrants. More than 90% of Hispanics males are drivers even if they are immigrants and their income is low, while less than a half of Hispanic female immigrants are drivers when household income is very low. The probability of being a driver for non-Hispanic White female immigrants gradually catches up with that of their male counterparts as income increases. However, the probability of Hispanic female immigrants being drivers remains noticeably lower than that of male counterparts even with the steady increase in income, because their baseline probability is very low. With regard to Black immigrants, the probability of being a driver is higher for females than males, which is the opposite of the findings of other race/ethnicity groups and inconsistent with the average statistics shown in Table 2. The gap between estimation and statistics is observed probably because the sample size of Black immigrants is too small and because average household characteristics are different by gender.

In sum, driver status is substantially different by gender and by race/ethnicity group, particularly for Hispanic low-income immigrants. Even after more than 15 years of stay in the U.S., Hispanic female immigrants' driver status is considerably different from that of U.S. natives. Hispanic female immigrants have a low probability of being a driver, particularly when their income is low; less than 70% are drivers when the household income is below $20,000, and less than 80% are drivers even when the household income is $40,000.[15]

[15] A 70% probability of being a driver may not be low in some urban areas in the U.S. and other countries. However, in most U.S. cities, the figure is considered to be low. For perspective, among U.S. natives, only those in households with income below $5,000 also have a 70% probability of being a driver; and those U.S natives with incomes below $10,000 have an 80% probability of being a driver; native groups with higher incomes all have higher driver shares. Thus, the high driver share, regardless of income, implies that most U.S. cities remain auto-centric, and it is difficult to live without a car.

4.2 Driving Mileage of Individuals

Even when a person is a driver, s/he may not drive much. As literature documents, compared to other drivers, immigrant or minority drivers drive less because they feel uncomfortable driving or lack access to a vehicle (Chatman and Klein, 2013; Garni and Miller, 2008). This section assesses the self-reported annual driving mileage, using an OLS model for each race/ethnicity group (Equation 2). Natural log of the driving mileage is employed as a dependent variable because driving mileage is more likely to change proportionally rather than linearly when travel behavior changes.

TABLE 5 Gender Differences in Personal Driving Mileage for Each Race/Ethnicity Group

	(1) Non-Hispanic White			(2) Hispanic			(3) Black		
	Base	Female cross-terms	Sig. of Coeff. for Female	Base	Female cross-terms	Sig. of Coeff. for Female	Base	Female cross-terms	Sig. of Coeff. for Female
Female		-1.42**			-0.56			-1.19	
		(0.13)			(0.58)			(0.74)	
Age	0.058**	0.0023	**	0.072**	-0.013	**	0.069**	-0.0016	**
	(0.0016)	(0.0024)		(0.0072)	(0.012)		(0.010)	(0.015)	
Age^2	-0.00057**	-0.00017**	**	-0.00076**	-3.4e-05	**	-0.00068**	-0.00017	**
	(1.5e-05)	(2.3e-05)		(7.4e-05)	(0.00012)		(9.7e-05)	(0.00014)	
Immigrant (+)	-0.080**	-0.0029	**	-0.070	0.10	NS	-0.1	0.16	NS
	(0.017)	(0.027)		(0.041)	(0.065)		(0.093)	(0.13)	
Immigrant 10 to 15 yrs (+)	-0.02	-0.18	*	0.050	-0.28	NS	-0.16	0.030	NS
	(0.058)	(0.096)		(0.095)	(0.16)		(0.30)	(0.46)	
Immigrant 5 to 10 yrs (+)	-0.17*	-0.12	**	-0.00078	-0.29	*	0.55**	-0.86*	NS
	(0.078)	(0.12)		(0.10)	(0.17)		(0.21)	(0.39)	
Immigrant 0 to 5 yrs (+)	-0.25*	-0.50**	**	-0.026	-0.48	*	0.0014	-0.22	NS
	(0.10)	(0.15)		(0.18)	(0.28)		(0.45)	(0.60)	
ln (HH Family Income)	0.32**	0.11**	**	0.38**	0.11**	**	0.51**	0.067	**
	(0.0065)	(0.0099)		(0.024)	(0.040)		(0.037)	(0.048)	
Number of Adults	-0.083**	0.031**	**	-0.070**	0.067	NS	-0.18**	0.066	*
	(0.0077)	(0.011)		(0.024)	(0.037)		(0.042)	(0.058)	
Single Adult HH	-0.059**	0.49**	**	-0.27**	0.77**	**	-0.063	0.17	NS
	(0.015)	(0.022)		(0.086)	(0.12)		(0.089)	(0.12)	
Child	0.027**	0.034*	**	-0.0063	-0.0074	NS	0.024	-0.022	NS
	(0.0090)	(0.013)		(0.042)	(0.065)		(0.058)	(0.079)	
Retire	-0.24**	0.057**	**	-0.18**	0.090	NS	-0.22**	0.017	**
	(0.010)	(0.016)		(0.057)	(0.089)		(0.069)	(0.095)	
ln Population Density	-0.075**	-0.0058	**	-0.046**	-0.016	**	-0.069**	-0.032	**
	(0.0022)	(0.0035)		(0.012)	(0.018)		(0.016)	(0.023)	
BEA Region Dummy Variables	included	included		included	included		included	included	
Constant	5.17**			3.70**			3.28**		
	(0.087)			(0.42)			(0.54)		
Joint F-test: Immigrant (+)									
Joint F-test for 4 variables	**	**		NS	NS		NS	NS	
Joint F-test for 8 variables		**			NS			NS	
Observations	148,631			9,613			7,220		
R-squared	0.227			0.176			0.204		

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

TABLE 6 Significance of Gender Differences in Personal Driving Mileage (Pooled Data of All Females and Pooled Data of All Males and Females)

	(1)		(2)				
	Female-only		Three groups pooled				
	Hispanic	Black	Hispanic	Black	Female	Hispanic Female	Black Female
Race/Ethnicity Dummy	NS	-	-	-			
Female Dummy					-	NS	NS
Age	NS	NS	NS	NS	NS	NS	NS
Age^2	NS	NS	-	NS	-	NS	NS
Immigrant (+)	+	NS	NS	NS	NS	NS	NS
Immigrant 10 to 15 yrs (+)	NS	NS	NS	NS	NS	NS	NS
Immigrant 5 to 10 yrs (+)	NS	NS	NS	+	NS	NS	NS
Immigrant 0 to 5 yrs (+)	NS	NS	NS	NS	-	NS	NS
ln HH Family Income	NS	+	+	+	+	NS	NS
Number of Adults	NS	NS	NS	-	+	NS	NS
Single Adult HH	NS	-	-	NS	+	+	-
Child	NS	NS	NS	NS	+	NS	NS
Retire	NS	NS	NS	NS	+	NS	NS
ln Population Density	NS	NS	+	NS	NS	NS	NS
BEA Region Dummy Variables	included	included	included	included	included	included	included
Joint F-test: Immigrant (+)	NS	NS	NS	*	**	NS	NS
Observations	81,768		165,464				
R-squared	0.202		0.225				
Comparison	Hisp F vs. White F	Black F vs. White F	Hisp M vs. White M	Black M vs. White M	Gender Diff. For White	Gender Diff for Hisp vs. Gender Diff for White	Gender Diff for Black vs. Gender Diff for White

+ and - signs show the signs of 5% level significant coefficients, NS for insignificant coefficients, ** p<0.01, * p<0.05
Model 1: Regression of female-only data with baseline factors and their crossterms of Hispanic and Black. The results of baseline coefficients are omitted from the table.
Model 2: Regression of pooled data with baseline factors and their crossterms of Hispanic, Black, female, Hispanic female, and Black female. The results of the baseline coefficients are omitted from the table.
Full regression results are shown in Appendix

Table 5 shows the three regressions conducted for driving drivers of each race/ethnicity group.[16] In each set of columns, the left column shows base (i.e. male) coefficients, the middle column shows coefficients of female cross-terms, and the right

[16] Driving drivers considered here are drivers who drove more than zero miles in the last twelve months.

column shows the significance of total coefficients for females. Table 6 illustrates the signs of race/ethnicity group difference for females (Hispanic and Black columns of Model 1, referred to as Models 1-H and 1-B, respectively), the signs of race/ethnicity group differences for males (Hispanic and Black columns in Model 2, Models 2-H and 2-B), the signs of female cross-terms (Model 2 female column, Model 2-F), and the inter-race/ethnicity group difference in gender difference (Hispanic female and Black female columns in Model 2, Models 2-HF and 2-HB). The plus and minus signs show whether the differences are positive or negative significant at the 5% level. In both tables, joint significance F-tests are conducted for four immigration status-related factors in each column.

Findings on personal driving mileage are similar to the findings on driver status. For non-Hispanic White males, driving mileage peaks around the mid-50s and positively associates with household income (Table 5 Model 1, left). Every one percent increase in household family income associates with a 0.3% increase in driving mileage, controlling for other factors. Non-Hispanic White male adults in a larger household tend to drive fewer miles, although the decrease is small when male adults in a two-adult household are compared with those who in a single-adult household. Non-Hispanic White males drive more miles when they are in a household with children, but drive fewer miles when they are in a retired household. The finding suggests that non-Hispanic White males take on child-related travel responsibilities or commute longer distances when they have children. Driving mileage is smaller when these males live in an area with high population density.

Although the probability of being a driver among non-Hispanic White males is not significantly different between U.S. natives and immigrants, non-Hispanic White male immigrants drive significantly fewer miles than their U.S. native counterparts (Table 5 Model 1, left). The driving mileage is particularly less for those who immigrated within ten years. In other words, non-Hispanic White male immigrants become drivers fairly readily, but their

lifestyles are less auto-dependent than those of their U.S. native counterparts, particularly immediately after immigration.

The driving mileage of non-Hispanic White females suggests that they are secondary drivers in multiple-adult households, while their travel behavior strongly differs by household income and whether they have children (Table 5 Model 1, center and right columns). Their driving mileage is substantially less when they are in a two-adult household than when they are in a single-adult household. Non-Hispanic White females drive more miles when they are in higher income households, and the degree of increase is even greater than that for males. They also drive more miles if their household has children, and the increase in driving mileage is greater than that for males. The finding suggests that many non-Hispanic White females with children play a substantial role in handling child-related trips by car. The result is consistent with literature that finds traditional gender-role responsibility in trip making.[17]

Non-Hispanic White female immigrants drive less than U.S. native counterparts (Table 5 Model 1, right), and the immigrant-U.S. native difference is not significantly different from that for males after a five-year stay in the U.S. (Table 5 Model 1, center). The result contrasts with findings on driver status. Non-Hispanic White immigrant females are more likely than males to delay becoming a driver, even after decades of stay in the U.S.; however, once they become a driver, the immigrant-U.S. native difference for non-Hispanic White females in driving mileage is not significantly different from that of males.

Compared to non-Hispanic Whites, the personal driving mileage of Hispanic and Black males strongly associates with household family income (Table 6 Model 2-H and 2-B). In particular, Hispanic males in a two-adult household tend to drive more than, not less than or as much as, those in a single-adult household. The finding is consistent with findings on

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

driver status: Hispanic males tend to be the only or primary driver of their household when they live with female adults, and drive for their family errands. In comparison, Black males share driving responsibilities with other adults in their household: driving mileage is lower compared to non-Hispanic Whites (Table 6 Model 2-B), and this degree of decrease is not significantly different between one- and two-adult households (Table 5 Model 3, left). The association with population density in the residential area is weaker for Hispanic males than for non-Hispanic White males, which contrasts with the findings on driver status. Hispanic males are likely to be drivers even if they live in high-density area, but their driving behavior, compared to that of non-Hispanics White males, is affected more strongly by the residential density. The finding is specific to Hispanic males because Black males are not significantly different from non-Hispanic White males in this regard (Table 6 Model 2-B).

Hispanic male immigrant drivers drive as much as their U.S. native counterparts, even when they have just arrived to the U.S. The coefficients of immigrant 0 to 5 years and 5 to 10 years are not only insignificant but also very small in magnitude, suggesting that recent immigrants truly drive as much as those who stay longer in the U.S. Although Hispanic immigrants newly arrived to the U.S. may not immediately become drivers, once they begin driving, they drive as much as immigrants who have been in the U.S. longer or U.S. natives.

The driving mileage of Hispanic female drivers is not significantly different from that of non-Hispanic White female drivers, particularly when considering U.S. natives. Moreover, Hispanic female immigrants who stay in the U.S. more than ten years tend to drive as much as their U.S. native counterparts, suggesting they reach parity faster than non-Hispanic White female immigrants do.

Gender difference in the driving mileage of Hispanics and non-Hispanic Whites is not significantly different, except for two-person households (Table 6 Model 2-HF) where

Hispanic females are more likely than non-Hispanic White females to depend on male adults to be the primary driver.

To explore the overall differences in driving mileage, Figures 4 and 5 illustrate estimated personal driving mileage, using the coefficients in the Table 5. These figures illustrate driving mileages estimated for the same demographic as shown in Figures 2 and 3: U.S natives and immigrants staying in the U.S. for five to ten years, assumed to be 40-year old-adults in a household of two adults with children and 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 Whites, 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, drive more mileage than non-Hispanic White male counterparts. Among U.S. natives, it again appears that Black males and Black females drive much less than males and females of other race/ethnicity groups.

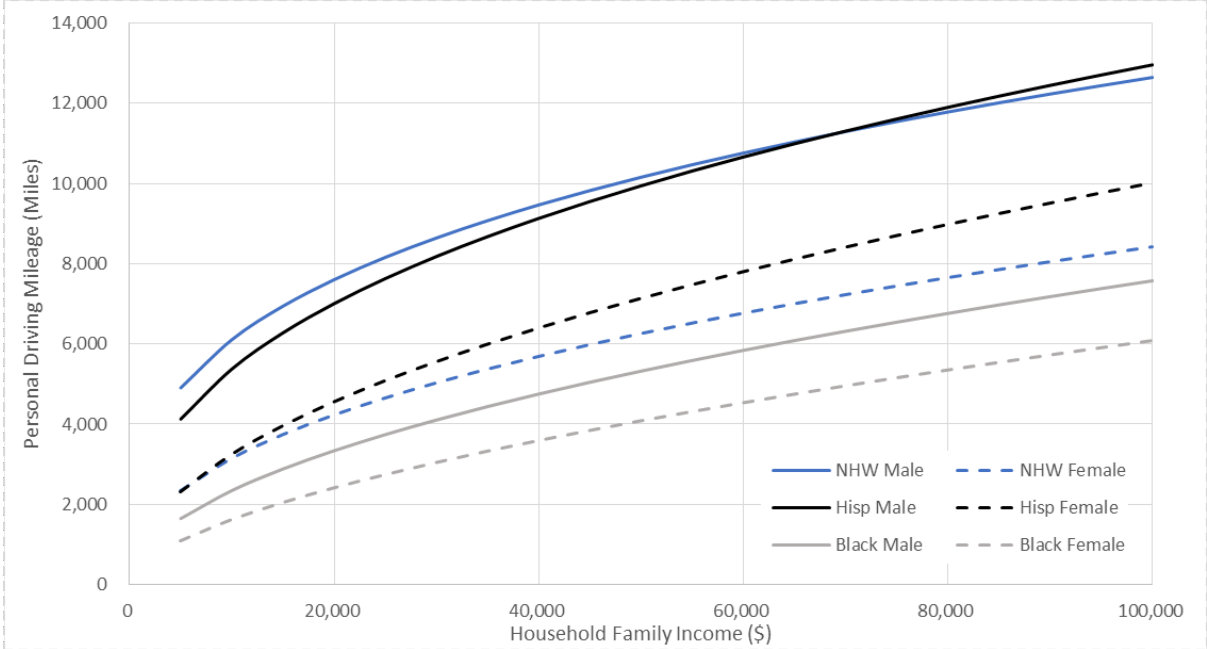

FIGURE 4 Personal Driving Mileage and Household Family Income of U.S. Natives (40 Year Old Adults Living in a Household of Two-adults with Children)

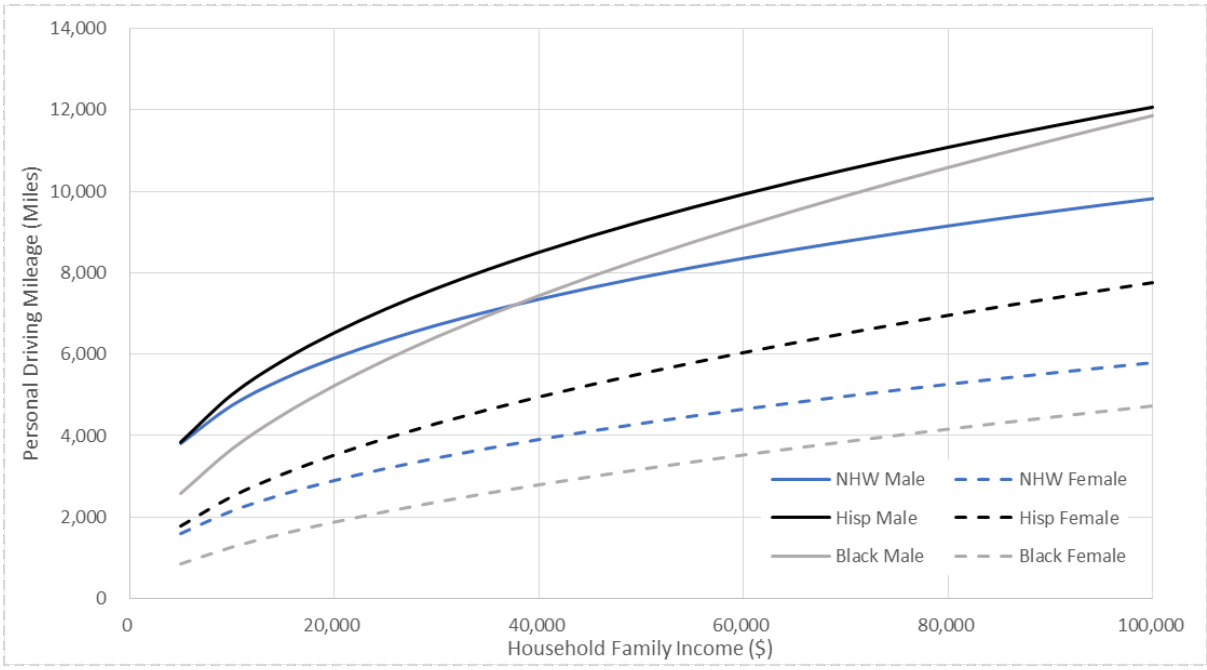

FIGURE 5 Personal Driving Mileage and Household Family Income of Immigrants Staying in the U.S. 5 to 10 Years (40 Year Old Adults Living in a Household of Two-adults with Children)

While a significant gender difference in driver status is observed only for non-Hispanic White immigrants, Hispanic immigrants, and Hispanic U.S. natives, a large gender difference in driving mileage exists for all groups: male drivers of all race/ethnicity groups drive much more than female counterparts, whether they are U.S. natives or immigrants. Interestingly, once they become drivers, U.S. native and immigrant Hispanic females drive more than their non-Hispanic White and Black female counterparts. Moreover, immigrant Hispanics females are more likely than native Hispanic females to increase their mileage.

The high driving mileage of Hispanic female immigrant 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, they drive more than female immigrants of other race/ethnicity groups if they are drivers. Moreover, Hispanic female immigrants increase their driving mileage quickly as they stay longer in the U.S. Thus, Hispanic female immigrants are unlikely to choose to be non-drivers or adopt less-auto-dependent lifestyles. There seems to be a strong hurdle in becoming a driver that prevents them from becoming drivers, although Hispanic female immigrants want or need to drive more than they do.

Another interesting feature of the driving mileage of Hispanic females is that their high driving mileage does not seem to be associated with a traditional labor division within the household; unlike non-Hispanic White females, the driving mileage of Hispanic females is not associated with whether they have children. In deciding who becomes a driver or the primary driver in a household, Hispanics seem to follow a traditional gender divide: males are the only or primary drivers, and females depend on others for mobility. However, for children-related trips, a gender difference is not observed for Hispanics. Rather, it is evident in non-Hispanic White households; when they have children, females increase their driving mileage more than males do in these households.

5. CONCLUSIONS AND FUTURE DIRECTIONS

The analysis finds that males and females have different mobility characteristics in the probability of being a driver and the amount of personal driving mileage. The gender differences vary by race/ethnicity group and immigration status. Hispanic female immigrants seem to be persistently low in mobility, particularly when they are in a low-income household that seems to need for a driver or additional driver.

The mobility of Hispanic female immigrants is limited particularly by the process of becoming a driver. Although gender difference in driver status is also observed for non-Hispanic Whites, the probability of being a driver stagnates for a great length of time—more than 15 years—only for Hispanic female immigrants. The delay in becoming a driver for these women is unlikely to originate solely from language or legal barriers: While Hispanic male immigrants may become drivers to meet immediate travel demands of their family and friends, the fact that they become drivers soon after arriving in the U.S. suggests they are overcoming hurdles related to being a Hispanic immigrant.

Gender difference is not problematic if it is not associated with any difficulties; however, Hispanic female immigrants seem to remain non-drivers reluctantly. At the household level, Hispanic immigrants do not choose less auto-dependent lifestyles considering the driver status and driving mileage of Hispanic male immigrants. Hispanic females tend be highly dependent on any male adults in their household, suggesting that females' mobility seems to be deprioritized within the household. Yet, there seems to be strong hidden demand for driving because once Hispanic female immigrants are drivers, they drive more than females of other race/ethnicity groups. Moreover, the Hispanic females' demand for drive is unlikely to be mainly for domestic errands because the higher driving mileage is not associated with child-caring duties. Rather, it seems to be related to household

income, which suggests that being a driver provides more or better job opportunities for Hispanic females.

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 that of male counterparts; and low income is associated with the low probability of being a driver. Although regression analysis does not prove causal relationships, the low mobility of Hispanic female immigrants seems to make it more difficult for them to find employment or receive training, and more likely to result in poverty, and points to the potential need for policy remedies that would make it easier for this population to become drivers. .

Future study is anticipated to explore why Hispanic female immigrants have difficulties in becoming a driver, how they manage daily travel needs, and whether driver status restricts employment or other opportunities for them. 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.

ACKNOWLEDGEMENT:

The author acknowledges financial support from Mid-American Transportation Center (Contract number: DTRT12-G-UTC07).

REFERENCES

Assaad, R., Arntz, M., 2005. "Constrained geographical mobility and gendered labor market outcomes under structural adjustment: evidence from Egypt," *World Development*, 33(3): 431-454

Best, H., Lanzendorf, M., 2005. “Division of labour and gender differences in metropolitan car use: an empirical study in Cologne, Germany,” *Journal of Transport Geography,* 13(2): 109-121

Blumenberg, E., Smart, M., 2010. “Brother can you spare a ride? Carpooling in immigrant neighbourhoods,” *Urban Studies,* 51(9): 1871-1890

Blumenberg, E., Smart, M., 2014. “Getting by with a little help from my friends…and family: immigrants and carpooling,” *Transportation,* 37: 429-446

Boarnet, M.G., Sarmiento, S., 1998. “Can land-use policy really affect travel behaviour? A study of the link between non-work travel and land-use characteristics,” *Urban Studies,* 35(7): 1155-1169

Bohon, S.A., Stamps, K., Atiles, J.H., 2008. “Transportation and Migrant Adjustment in Georgia,” *Population Research and Policy Review,* 27: 273-291

Casas, J., Arce, C., and Frye, C., 2004. "Latino immigration and its impact on future travel behavior." National Household Travel Survey Conference: Understanding Our Nation’s Travel, Washington, DC.

Chatman, D.G., 2014. “Explaining the ‘‘immigrant effect’’ on auto use: the influences of neighborhoods and preferences,” *Transportation,* 41(3): 441-461

Chatman, D.G., Klein, N.J., 2009. “Immigrants and Travel Demand in the United States: Implications for Transportation Policy and Future Research,” *Public Works Management & Policy,* 13(4): 312-327

Chatman, D.G., Klein, N.J., 2013. “Why do immigrants drive less? Confirmations, complications, and new hypotheses from a qualitative study in New Jersey, USA.” *Transport policy* 30: 336-344.

Cline, M.E., Sparks, C., Eschbach, K., 2009. “Understanding Carpool Use by Hispanics in Texas,” *Transportation Research Record,* 2118: 39-46

Cohen, M.A., 2006. “Imperfect competition in auto lending: Subjective markup, racial disparity, and class action litigation.” Vanderbilt Law and Economics Research Papers. Vanderbilt University, Owen Graduate School of Management, Nashville, TN.

Crane, R., 2007. "Is there a quiet revolution in women's travel? Revisiting the gender gap in commuting." *Journal of the American Planning Association* 73(3): 298-316

Elias, W., Benjamin, J., Shiftan, Y., 2015. “Gender differences in activity and travel behavior in the Arab world,” *Transport Policy*, 44(1): 19-27

Elias, W., Newmark, G., Shiftan, Y., 2008. “Gender and travel behavior in two Arab communities in Israel,” *Transportation Research Record*, 2067: 75-83

Garni, A., Miller, A., 2008. “Localized immigration policy and migrant life experiences: The case of Mexican migrants in southern California”. Journal of Immigrant and Refugee Studies 6(3), 435–450

Hanson, S., Pratt, G., 1995. *Gender, Work, and Space*, Routledge, London

Kwan, M.P., 1999. “Gender, the home-work link, and space-time patterns of non-employment activities,” *Economic Geography*, 75: 370-394

Kwan, M.P., Kotsev, A., 2015. “Gender differences in commute time and accessibility in Sofia, Bulgaria: a study using 3D geovisualisation,” *The Geographical Journal*, 181(1): 83-96

Levinson, D., Kumar, A., 1995. “Activity, travel, and the allocation of time,” *Journal of American Planning Association*, 61(4): 458-470

Lovejoy, K. and Handy, S., 2008. “A case for measuring individuals’ access to private-vehicle travel as a matter of degrees: lessons from focus groups with Mexican immigrants in California,” *Transportation*, 35: 601-612

Lovejoy, K., Handy, S., 2011. "Social networks as a source of private-vehicle transportation: The practice of getting rides and borrowing vehicles among Mexican immigrants in California." *Transportation research part A: policy and practice* 45(4): 248-257

McFadden, D. 1979. “Quantitative methods for analyzing travel behavior of individuals: Some recent developments,” in Hensher, D. and Stopher, P. (Ed.) *Behavioural Travel Modeling* (pp.279-318). London: Groom Helm

McGuckin, N., Murakami, E., 1999. “Understanding trip-chaining behavior: a comparison of travel by men and women,” *Transportation Research Record,* 1683: 79-85

McGuckin, N., Zmud, J., Nakamoto, Y., 2005. “Trip-chaining trends in the United States: understanding travel behavior for policy making,” *Transportation Research Record,* 1917: 199-204

Polzin, S., Chu, X., Godfrey, J., 2014. “The impact of millennials’ travel behavior on future personal vehicle travel,” *Energy Strategy Reviews,* 5: 59-65

Rivera-Batiz, F.L., 2001. "Illegal immigrants in the US economy: a comparative analysis of Mexican and non-Mexican undocumented workers." *International Migration: Trends, Policies and Economic Impact*.

Rosenbloom, S. 2006. “Understanding women’s and men’s travel patterns: The research challenge,” In *Research on women’s issues in transportation,* vol.1, Washington, DC: Transportation Research Board

Rosenbloom, S., Burns, E., 1993. “Gender differences in commuter travel in Tucson: implications for travel demand management programs,” *Transportation Research Record,* 1404: 82-90

Tal, G. and Handy, S., 2010. “Travel behavior of immigrants: Analysis of the 2001 National Household Transportation Survey,” *Transport Policy,* 17: 85-93

U.S. Census Bureau, 2011. *American Community Survey 1-year Summary File*, Retrieved from http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

U.S. Department of Homeland Security, 2013a. 2012 Yearbook of Immigration Statistics. Washington, DC: Office of Immigration Statistics.

U.S. Department of Homeland Security, 2013b. *Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2012.* Washington, DC: Office of Immigration Statistics.

Valenzuela, A., Schweitzer, L., and Robles, A., 2005. "*Camionetas*: Informal travel among immigrants," *Transportation Research Part A*, 39: 895-911

Vance, C., Iovanna, R., 2007. "Gender and the automobile: an analysis of non-work service trips," *Transportation Research Record*, 2013: 54-61

APPENDIX:

GENDER DIFFERENCES IN MOBILITY OF HISPANIC IMMIGRANTS

A-1. DETAILED IMMIGRANT STATISTICS

As discussed in the article, the sample size of non-Hispanic Black immigrants is too small to construct reliable estimation, particularly when immigrants are sub-categorized by their length of stay (Table A-1). Thus, the author omits discussion about Black immigrants in this appendix, as well.

Table A- 1 Detailed Immigrant Statistics by Length of Stay

	All sample	Three categories total	Non-Hisp Whites		Hispanics		Non-Hispanic Blacks	
Immigrant Household								
Household	17,570	14,600	8,466		5,406		728	
Immigrant person			Male	Female	Male	Female	Male	Female
	21,787	16,073	4,160	6,002	3,775	4,928	427	598
with immigration status information			4,159	5,999	3,773	4,926	427	598
Length of stay#								
15 yr +	21,787	16,073	3,544	5,122	2,823	3,756	341	479
% driver			97.4%	88.6%	89.7%	68.2%	89.1%	80.4%
10-15yr	1,328	1,736	290	380	430	544	41	51
% driver			96.6%	93.4%	92.1%	65.1%	97.6%	82.4%
5-10yr	1,034	1,443	186	295	404	480	34	44
% driver			97.3%	88.5%	87.1%	62.5%	91.2%	90.9%
0-5yr	685	638	139	202	116	146	11	24
% driver			95.7%	81.2%	80.2%	69.2%	90.9%	58.3%

shared value among household members, the length of the longest-staying person in the household

A-2. FULL REGRESSION RESULTS OF ANSLYSES WITH DOUBLE-CROSS-TERMS

Table A- 2 Full Regression Results of Table 4 Model 1

Dependent variable: Driver (driver=1 if a person is a driver, 0 otherwise)			
	(1)		
	Females of Three Groups Pooled		
	Base	Hisp	Blk
Race/Ethnicity		0.738	1.647*
		(0.657)	(0.944)
Age	0.183***	-0.0577***	-0.0489***
	(0.00427)	(0.0107)	(0.0111)
Age^2	-0.00198***	0.000365***	0.000490***
	(3.63e-05)	(0.000100)	(9.93e-05)
Immigrant (+)	-0.513***	-0.354***	0.479***
	(0.0585)	(0.0946)	(0.170)
Immigrant 10 to 15 yrs (+)	-0.0423	-0.370	-0.648
	(0.287)	(0.310)	(0.525)
Immigrant 5 to 10 yrs (+)	-1.083***	0.499**	1.749***
	(0.194)	(0.224)	(0.476)
Immigrant 0 to 5 yrs (+)	-1.613***	0.623**	0.239
	(0.225)	(0.273)	(0.446)
ln HH Family Income	0.856***	-0.109***	-0.0643*
	(0.0174)	(0.0381)	(0.0364)
Number of Adults	-0.630***	0.366***	0.118**
	(0.0264)	(0.0448)	(0.0554)
Single Adult HH	0.295***	0.142	-0.451***
	(0.0501)	(0.117)	(0.111)
Child	0.374***	-0.428***	-0.0112
	(0.0551)	(0.105)	(0.114)
Retire	0.0871**	0.332***	0.0440
	(0.0406)	(0.108)	(0.0983)
ln Population Density	-0.111***	0.0267	-0.0304
	(0.00894)	(0.0232)	(0.0245)
BEA Region 2 (++)	-0.202**	0.578	-0.966
	(0.0967)	(0.417)	(0.790)
BEA Region 3 (++)	0.160	0.809*	-0.632
	(0.109)	(0.480)	(0.810)
BEA Region 4 (++)	0.356***	0.227	-1.487*
	(0.109)	(0.464)	(0.835)
BEA Region 5 (++)	0.222**	1.074***	-0.910
	(0.0929)	(0.405)	(0.783)
BEA Region 6 (++)	0.317***	0.576	-0.745
	(0.0966)	(0.403)	(0.787)
BEA Region 7 (++)	0.515***	-0.148	-
	(0.186)	(0.650)	
BEA Region 8 (++)	0.185*	0.477	-0.612
	(0.0991)	(0.403)	(0.792)
Constant	-7.683***		
	(0.258)		
Joint F-test: Immigrant (+)			
Chi2(4)		21.92	32.22
p-value		0.0002	0.0000
Joint F-test: BEA Region (++)			
Chi2(7)		48.22	14.14
p-value		0.0000	0.0281
Observations	123,079		

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

Table A- 3 Full-regression result of Table 4 Model 2

Dependent variable: Driver (driver=1 if a person is a driver, 0 otherwise)						
	(1)					
	Three Groups Pooled					
	Base	Hispanic	Black	Female	Hisp Female	Blk Female
Race/Ethnicity		2.857***	1.073			
		(0.992)	(0.938)			
Female				1.288***	-2.118*	0.574
				(0.383)	(1.137)	(1.339)
Age	0.181***	-0.0273**	-0.0473***	0.00166	-0.0304*	-0.00152
	(0.00493)	(0.0138)	(0.0141)	(0.00650)	(0.0172)	(0.0178)
Age^2	-0.00167***	4.80e-05	0.000429***	-0.000310***	0.000317*	6.12e-05
	(4.47e-05)	(0.000134)	(0.000133)	(5.75e-05)	(0.000165)	(0.000165)
Immigrant (+)	0.129	-0.112	0.0263	-0.642***	-0.242	0.453
	(0.101)	(0.152)	(0.232)	(0.116)	(0.178)	(0.285)
Immigrant 10 to 15 yrs (+)	-0.293	0.551	14.97***	0.251	-0.922*	-15.61***
	(0.396)	(0.462)	(0.508)	(0.489)	(0.555)	(0.738)
Immigrant 5 to 10 yrs (+)	-0.163	0.0649	-0.274	-0.921*	0.434	2.023**
	(0.456)	(0.498)	(0.725)	(0.495)	(0.544)	(0.806)
Immigrant 0 to 5 yrs (+)	-0.119	-0.935*	-0.168	-1.494***	1.558***	0.407
	(0.495)	(0.545)	(0.735)	(0.517)	(0.584)	(0.819)
ln HH Family Income	0.923***	-0.224***	-0.118**	-0.0664**	0.114*	0.0540
	(0.0214)	(0.0521)	(0.0489)	(0.0265)	(0.0597)	(0.0590)
Number of Adults	-0.572***	0.155***	0.147**	-0.0581*	0.211***	-0.0282
	(0.0294)	(0.0598)	(0.0727)	(0.0334)	(0.0663)	(0.0860)
Single Adult HH	-0.348***	-0.297	-0.101	0.643***	0.439**	-0.349*
	(0.0645)	(0.181)	(0.163)	(0.0773)	(0.212)	(0.193)
Child	0.670***	-0.254*	-0.267	-0.296***	-0.174	0.256
	(0.0668)	(0.145)	(0.166)	(0.0835)	(0.174)	(0.197)
Retire	-0.305***	0.296*	0.0280	0.392***	0.0358	0.0160
	(0.0567)	(0.163)	(0.146)	(0.0688)	(0.192)	(0.174)
ln Population Density	-0.122***	0.0864***	0.0547*	0.0117	-0.0597	-0.0851**
	(0.0116)	(0.0323)	(0.0327)	(0.0145)	(0.0386)	(0.0400)
BEA Region 2 (++)	0.130	-1.260*	-0.121	-0.332**	1.838**	-0.844
	(0.123)	(0.730)	(0.694)	(0.153)	(0.806)	(1.084)
BEA Region 3 (++)	0.319**	-0.217	-0.324	-0.159	1.026	-0.308
	(0.138)	(0.801)	(0.735)	(0.172)	(0.882)	(1.124)
BEA Region 4 (++)	0.357***	-0.791	-0.456	-0.000880	1.018	-1.031
	(0.137)	(0.790)	(0.759)	(0.172)	(0.885)	(1.157)
BEA Region 5 (++)	0.189	-0.306	-0.276	0.0325	1.380*	-0.634
	(0.115)	(0.722)	(0.677)	(0.145)	(0.795)	(1.067)
BEA Region 6 (++)	0.249**	-0.449	-0.0198	0.0685	1.024	-0.725
	(0.120)	(0.719)	(0.687)	(0.151)	(0.792)	(1.077)
BEA Region 7 (++)	0.577**	13.52***	-0.423	-0.0627	-13.67***	-
	(0.237)	(0.804)	(1.235)	(0.298)	(1.012)	
BEA Region 8 (++)	0.183	-0.574	0.0913	0.00250	1.051	-0.703
	(0.124)	(0.721)	(0.702)	(0.156)	(0.793)	(1.091)
Constant	-8.971***					
	(0.302)					
Joint F-test: Immigrant (+)						
Chi2(4)	1.81	5.50	1063.37	58.65	12.59	519.92
p-value	0.7702	0.2395	0.0000	0.0000	0.0135	0.0000
Joint F-test: BEA Region (++)						
Chi2(7)	16.02	1392.02	6.31	34.47	549.45	3.14
p-value	0.0250	0.0000	0.5039	0.0000	0.0000	0.7913
Observations	225,372					

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

Table A- 4 Full-regression result of Table 6 Model 1

Dependent variable: ln(Year Mile)	(1)		
	Females of Three Groups Pooled		
	Base	Hispanic	Black
Race/Ethnicity		-0.617	-1.665***
		(0.463)	(0.559)
Age	0.0601***	-0.00117	0.00747
	(0.00187)	(0.00953)	(0.0112)
Age^2	-0.000736***	-6.08e-05	-0.000104
	(1.81e-05)	(0.000101)	(0.000109)
Immigrant (+)	-0.0829***	0.116**	0.144
	(0.0215)	(0.0561)	(0.106)
Immigrant 10 to 15 yrs (+)	-0.195**	-0.0305	0.0655
	(0.0788)	(0.148)	(0.374)
Immigrant 5 to 10 yrs (+)	-0.292***	0.00140	-0.0191
	(0.0883)	(0.163)	(0.350)
Immigrant 0 to 5 yrs (+)	-0.753***	0.244	0.534
	(0.125)	(0.255)	(0.495)
ln HH Family Income	0.429***	0.0598*	0.148***
	(0.00795)	(0.0355)	(0.0351)
Number of Adults	-0.0518***	0.0496	-0.0632
	(0.00917)	(0.0320)	(0.0459)
Single Adult HH	0.434***	0.0664	-0.332***
	(0.0168)	(0.0815)	(0.0791)
Child	0.0604***	-0.0741	-0.0586
	(0.0108)	(0.0538)	(0.0616)
Retire	-0.179***	0.0887	-0.0181
	(0.0129)	(0.0734)	(0.0715)
ln Population Density	-0.0806***	0.0192	-0.0199
	(0.00286)	(0.0148)	(0.0182)
BEA Region 2 (++)	-0.0919***	-0.425**	-0.110
	(0.0306)	(0.185)	(0.295)
BEA Region 3 (++)	-0.0695**	-0.332	0.0890
	(0.0341)	(0.247)	(0.311)
BEA Region 4 (++)	-0.115***	0.0452	-0.129
	(0.0327)	(0.199)	(0.400)
BEA Region 5 (++)	-0.00619	-0.0944	0.0754
	(0.0288)	(0.162)	(0.276)
BEA Region 6 (++)	0.0123	-0.285*	0.169
	(0.0298)	(0.160)	(0.280)
BEA Region 7 (++)	-0.214***	-0.475	1.124**
	(0.0564)	(0.374)	(0.450)
BEA Region 8 (++)	0.00916	-0.175	0.142
	(0.0306)	(0.162)	(0.284)
Constant	3.757***		
	(0.104)		
Joint F-test: Immigrant (+)			
Chi2(4)		6.37	4.08
p-value		0.1734	0.3954
Joint F-test: BEA Region (++)			
Chi2(7)		22.94	14.77
p-value		0.0017	0.0391
Observations	81,768		
R-Squared	0.202		

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

Table A- 5 Full regression result of Table 6 Model 2

Dependent variable: ln(Year Mile)						
	(1)					
	Three Groups Pooled					
	Base	Hispanic	Black	Female	Hisp Female	Blk Female
Race/Ethnicity		-1.471***	-1.893***			
		(0.432)	(0.543)			
Female				-1.416***	0.854	0.229
				(0.131)	(0.596)	(0.749)
Age	0.0578***	0.0142*	0.0114	0.00225	-0.0153	-0.00389
	(0.00159)	(0.00739)	(0.0102)	(0.00243)	(0.0120)	(0.0150)
Age^2	-0.000571***	-0.000193**	-0.000104	-0.000166***	0.000132	5.35e-08
	(1.48e-05)	(7.56e-05)	(9.78e-05)	(2.33e-05)	(0.000125)	(0.000145)
Immigrant (+)	-0.0799***	0.00956	-0.0209	-0.00294	0.107	0.165
	(0.0172)	(0.0442)	(0.0946)	(0.0273)	(0.0701)	(0.136)
Immigrant 10 to 15 yrs (+)	-0.0201	0.0698	-0.139	-0.175*	-0.100	0.205
	(0.0579)	(0.112)	(0.302)	(0.0955)	(0.182)	(0.469)
Immigrant 5 to 10 yrs (+)	-0.173**	0.173	0.722***	-0.119	-0.171	-0.741*
	(0.0781)	(0.129)	(0.224)	(0.117)	(0.204)	(0.407)
Immigrant 0 to 5 yrs (+)	-0.250**	0.224	0.251	-0.503***	0.0195	0.282
	(0.0999)	(0.206)	(0.462)	(0.151)	(0.321)	(0.615)
ln HH Family Income	0.316***	0.0656***	0.193***	0.113***	-0.00572	-0.0454
	(0.00651)	(0.0249)	(0.0373)	(0.00986)	(0.0414)	(0.0491)
Number of Adults	-0.0832***	0.0136	-0.0978**	0.0314***	0.0360	0.0347
	(0.00771)	(0.0250)	(0.0429)	(0.0111)	(0.0385)	(0.0589)
Single Adult HH	-0.0594***	-0.206**	-0.00329	0.494***	0.272**	-0.329***
	(0.0150)	(0.0877)	(0.0903)	(0.0219)	(0.119)	(0.118)
Child	0.0268***	-0.0330	-0.00249	0.0337**	-0.0410	-0.0561
	(0.00898)	(0.0431)	(0.0582)	(0.0132)	(0.0658)	(0.0804)
Retire	-0.236***	0.0558	0.0213	0.0568***	0.0329	-0.0394
	(0.0103)	(0.0578)	(0.0694)	(0.0160)	(0.0901)	(0.0966)
ln Population Density	-0.0748***	0.0290**	0.00574	-0.00584*	-0.00979	-0.0256
	(0.00222)	(0.0122)	(0.0161)	(0.00348)	(0.0179)	(0.0232)
BEA Region 2 (++)	-0.0271	0.188	-0.822***	-0.0649*	-0.613*	0.712*
	(0.0233)	(0.291)	(0.303)	(0.0362)	(0.321)	(0.398)
BEA Region 3 (++)	0.0457*	0.337	-0.615*	-0.115***	-0.670*	0.704
	(0.0255)	(0.309)	(0.332)	(0.0402)	(0.351)	(0.429)
BEA Region 4 (++)	0.0435*	0.223	-0.985***	-0.159***	-0.178	0.855*
	(0.0249)	(0.327)	(0.328)	(0.0387)	(0.352)	(0.479)
BEA Region 5 (++)	0.0623***	0.360	-0.522*	-0.0685**	-0.454	0.598
	(0.0218)	(0.282)	(0.290)	(0.0339)	(0.301)	(0.375)
BEA Region 6 (++)	0.0864***	0.163	-0.552*	-0.0741**	-0.447	0.721*
	(0.0227)	(0.282)	(0.294)	(0.0352)	(0.299)	(0.381)
BEA Region 7 (++)	0.0166	0.0201	-0.977***	-0.230***	-0.495	2.100***
	(0.0398)	(0.354)	(0.304)	(0.0664)	(0.497)	(0.530)
BEA Region 8 (++)	-0.0158	0.307	-0.528*	0.0250	-0.482	0.671*
	(0.0235)	(0.282)	(0.299)	(0.0362)	(0.302)	(0.388)
Constant	5.172***					
	(0.0869)					
Joint F-test: Immigrant (+)						
Chi2(4)	46.17	3.32	12.06	16.33	2.72	5.02
p-value	0.0000	0.5060	0.0169	0.0026	0.6056	0.2854
Joint F-test: BEA Region (++)						
Chi2(7)	138.15	24.79	38.27	76.34	7.72	20.79
p-value	0.0000	**0.0008**	0.0000	0.0000	0.3581	0.0041
Observations	165,464					
R-squared	0.225					

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A-3. SENSITIVITY OF THE ESTIMATED PROBABILITY OF BEING A DRIVER AND DRIVING MILEAGE

Figures A-1 and A-2 illustrate how the probability of being a driver and personal driving mileage increase as length of stay in the U.S. increases. The estimations employ the same socioeconomic and demographic information other than immigration status as the example shown in the article: 40-year-old adults in a two-adult household with children, living in the city with 7,500 people per square mile in the Plains. For each set of four graphs in A-1 and A-2, the top two graphs show the results of non-Hispanic Whites: males (left) and females (right). The bottom two graphs show the results of Hispanics: males (left) and females (right). The black solid line shows the estimation for U.S. natives. The four other lines--blue solid line, blue dotted line, yellow dotted line, and yellow solid line--show the results of immigrants staying in the U.S. for more than 15 years, 10 to 15 years, 5 to 10 years, and zero to five years, respectively.

As the graphs illustrate, both the probability of being a driver and personal driving mileage steadily increase with the length of stay in the U.S., particularly for females. Thus, immigrants who stay in the U.S. for 5 to 10 years seem to appropriately represent the adjustment process of immigrants.

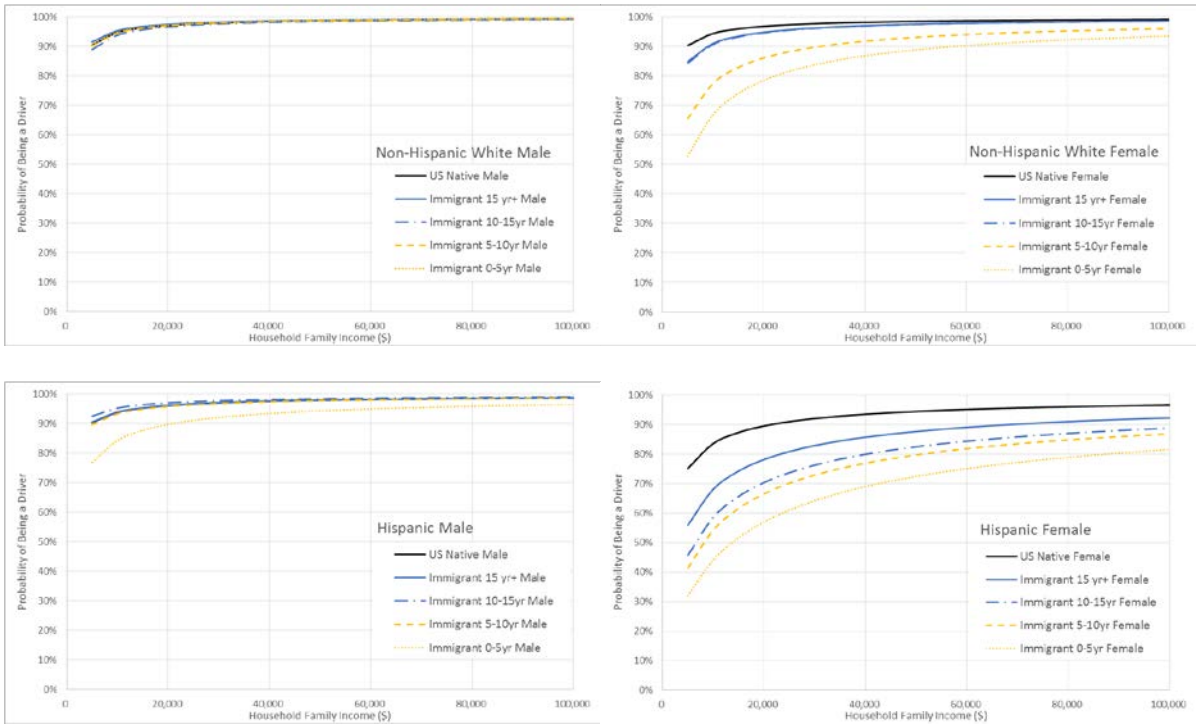

Figure A- 1 Probability of being a driver by length of stay in the U.S.

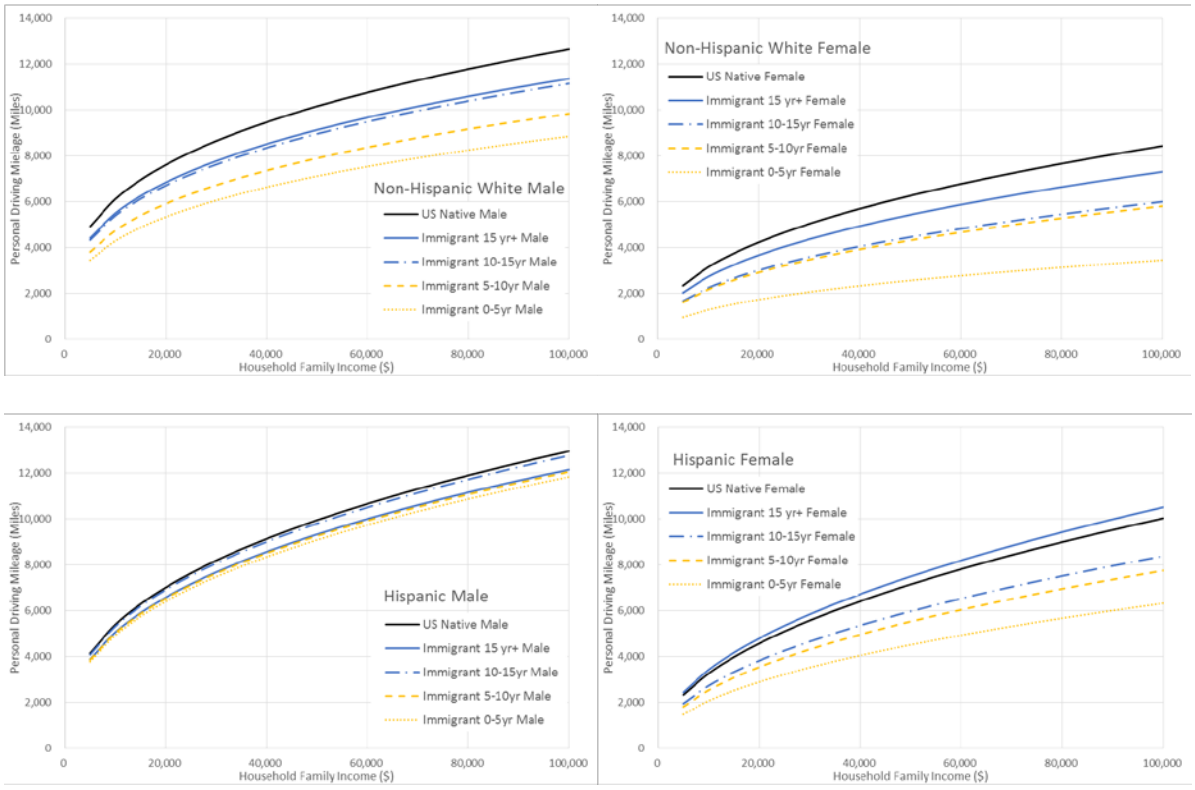

Figure A- 2 Driving mileage of drivers by length of stay in the U.S.

Figures A-3 and A-4 illustrate the effects of household family status on estimated driver status and driving mileage for immigrants staying in the U.S. for 5 to 10 years. More specifically, the graphs show the differences in the estimated results by whether the household has children and is a single-adult or two-adult household. In both figures, the top graphs illustrate the results of non-Hispanic Whites, and the bottom graphs illustrate the results of Hispanics. For each set (row), the graphs on the right show the estimations for those who live in a two-adult household, and the graphs on the left show the estimations for a single-adult household. In each graph, black solid lines are the estimation of males in a household with no child, blue solid lines are the estimation of males in a household with children, black dotted lines are the estimation of females in a household with no child, and blue dotted lines are the estimation of females in a household with children. Other socioeconomic conditions are the same as those used in the article.

As the figures show, insignificant effect of children on driver status and driving mileage is specific to Hispanic females. The probability of being a driver is very low for Hispanic females in a two-adult household, while driving mileage of Hispanic females is slightly greater than that of non-Hispanic White females. Thus, it is important to account for the gap through future research. With regard to single-adult households, the gender gap in the driver status is smaller, and driving mileage of females is much higher than for those who live in a two-adult households whether they are Hispanic or non-Hispanic White. Future research might also investigate why Hispanic females in single-adult households drive so many more miles than their male counterparts or females in two-adult households.

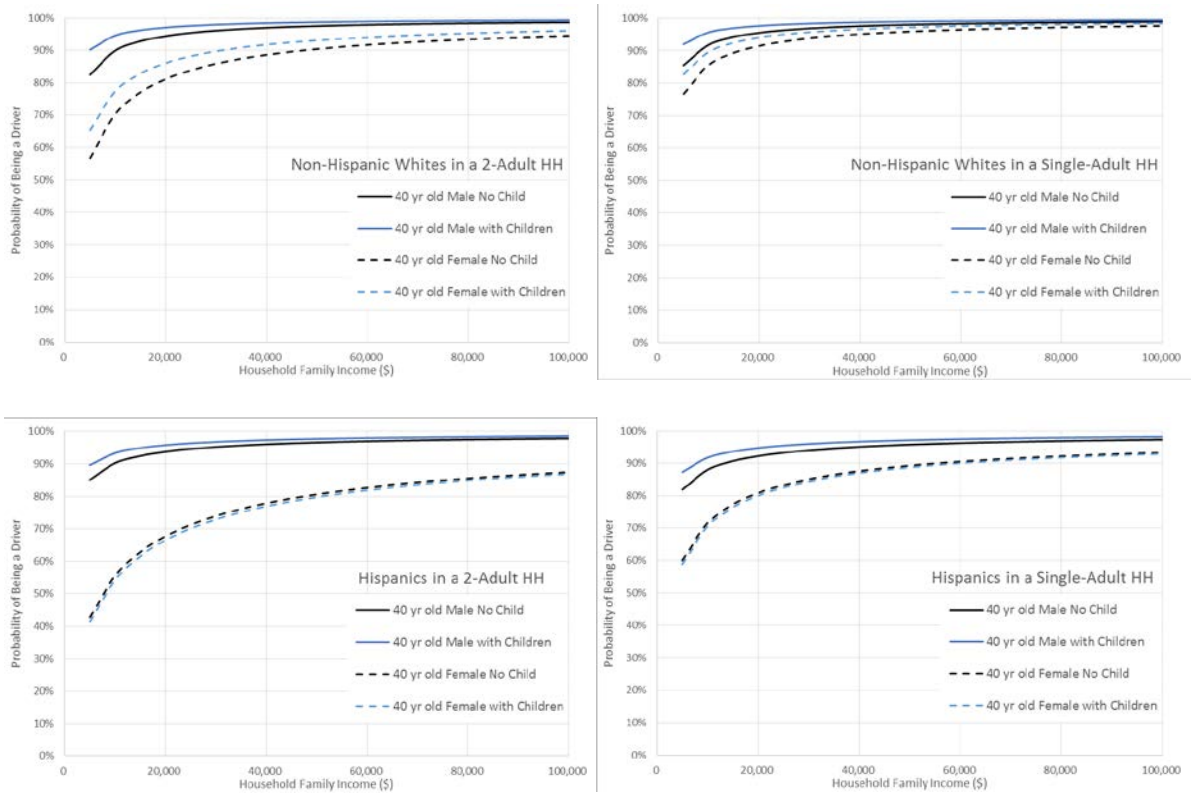

Figure A- 3 Probability of being a driver by household family status (Immigrants)

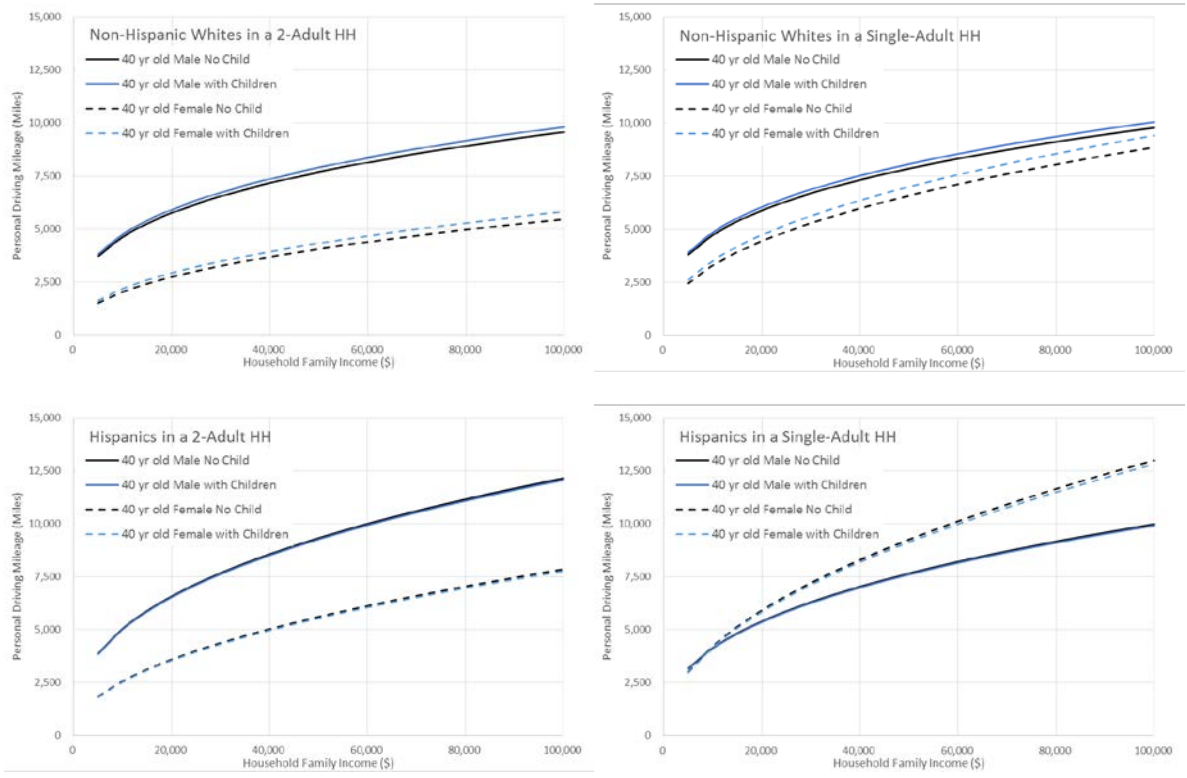

Figure A- 4 Driving mileage of drivers by household family status (Immigrants)

Figure A-5 shows the probability of being a driver by age for males (top graphs) and females (bottom graphs) in households with income of $20,000 (left) and $50,000 (right). Line colors indicates results for race/ethnicity groups: blue for non-Hispanic Whites and black for Hispanics. For both race/ethnicity groups, solid lines represent U.S. natives and dotted lines represent immigrants. Figures A-6 and A-7 show the probability of being a driver of immigrants staying in the U.S. for 5 to 10 years by income for different age groups and for different residential density areas. Graphs on the right show the estimation results for non-Hispanic Whites, and graphs on the left show the results for Hispanics. In addition, darker colors illustrate estimations with higher age or higher density.

Figure A-8 shows the estimated driving mileage by age for males (top graphs) and females (bottom graphs) in households with income of $20,000 (left) and $50,000 (right). As with Figure A-5, blue lines show the estimation for non-Hispanic Whites and black lines show the estimation for Hispanics; solid lines for U.S. natives and dotted lines for immigrants. Figures A-9 and A-10 show the estimated driving mileage of immigrants staying in the U.S. for 5 to 10 years by income for different age groups and for different residential density areas. Graphs on the right show the estimation results of non-Hispanic Whites, and graphs on the left show the results of Hispanics. In addition, darker colors illustrate estimations with higher age or higher density.

Figures A-5 and A-8 show that both the probability of being a driver and driving mileage are around the peak for all race/ethnicity groups, particularly for Hispanic female immigrants. The differences between genders and among race/ethnicity groups are relatively small around age 40, and less affected by the assumption of quadratic functional form. Moreover, Figures A-6, A-7, A-9, and A-10 show weak effects of age and population density on both driver status and on driving mileage, particularly when middle age and mid-to-high density are assumed. Thus, the assumptions of age 40 and residential density of 7,500 people

per square mile seem to be valid in assessing the driver status of mid-aged people living in urban areas.

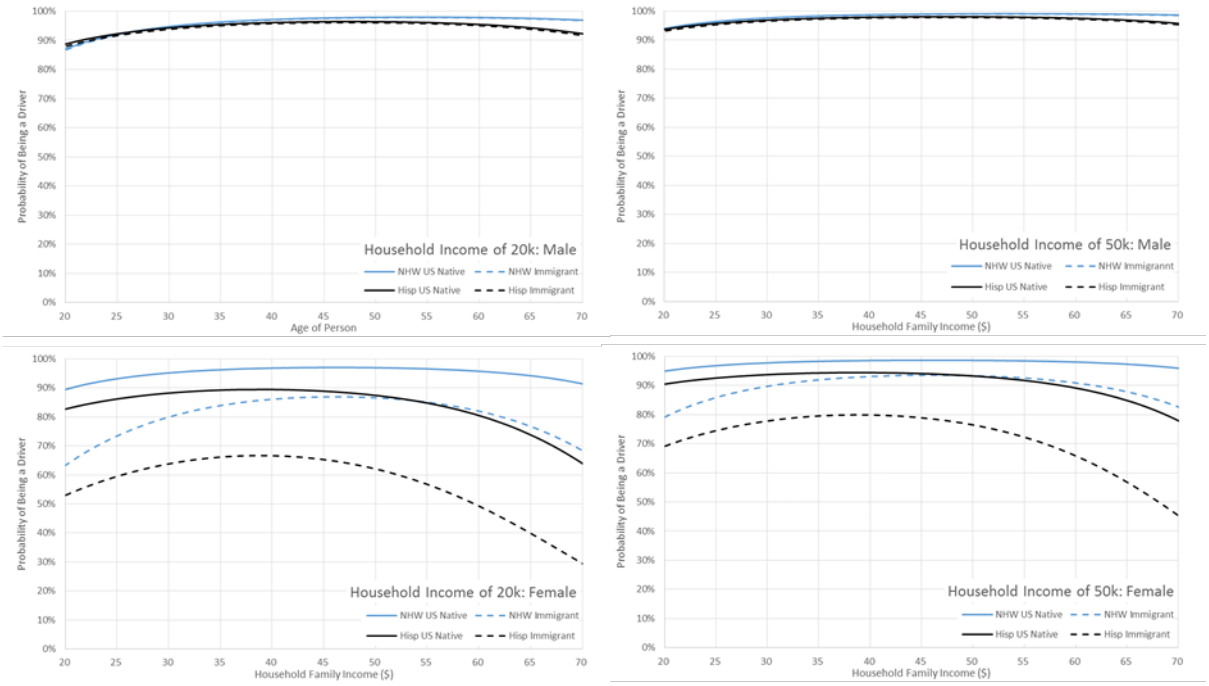

Figure A- 5 Probability of being a driver by age

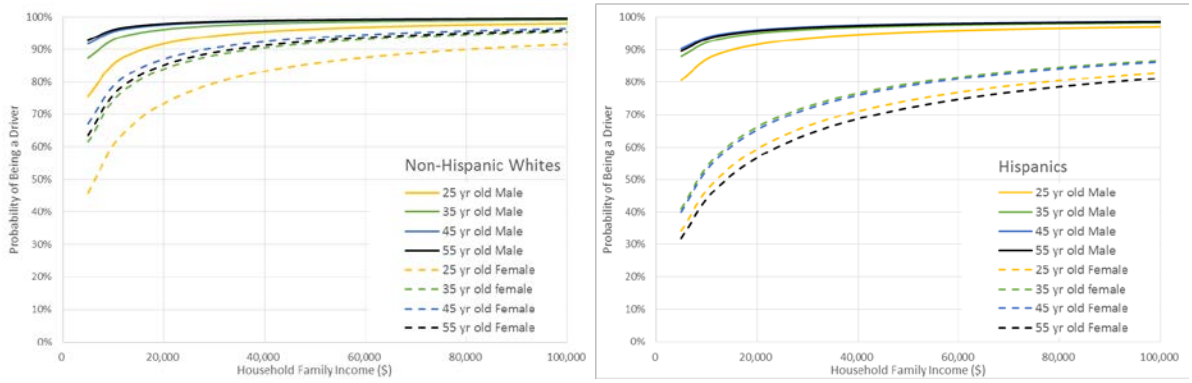

Figure A- 6 Probability of being a driver by income and age (Immigrants)

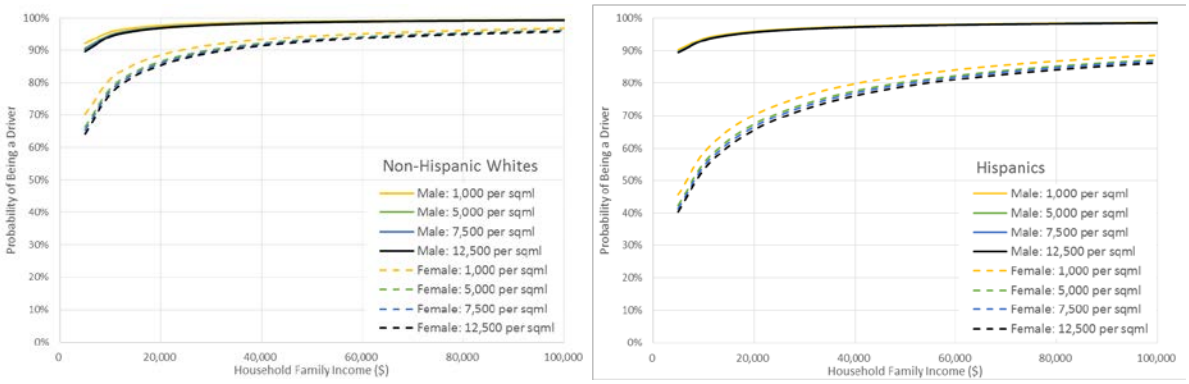

Figure A- 7 Probability of being a driver by income and residential population density (Immigrants)

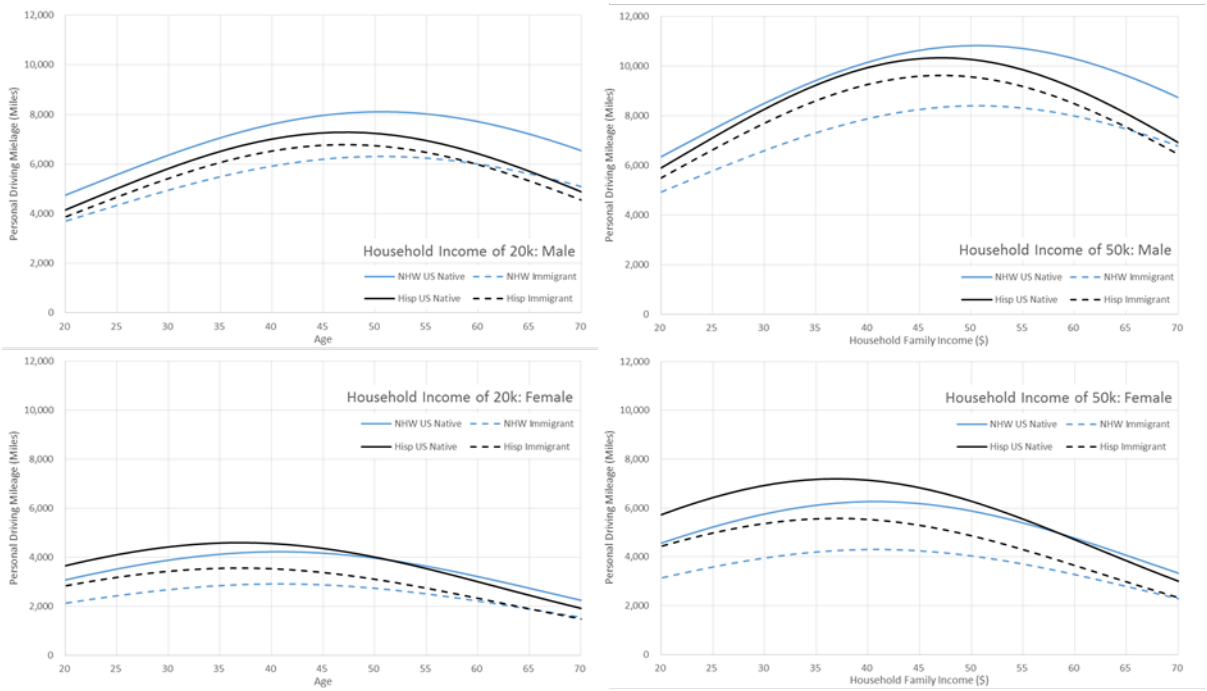

Figure A- 8 Driving mileage of drivers by age

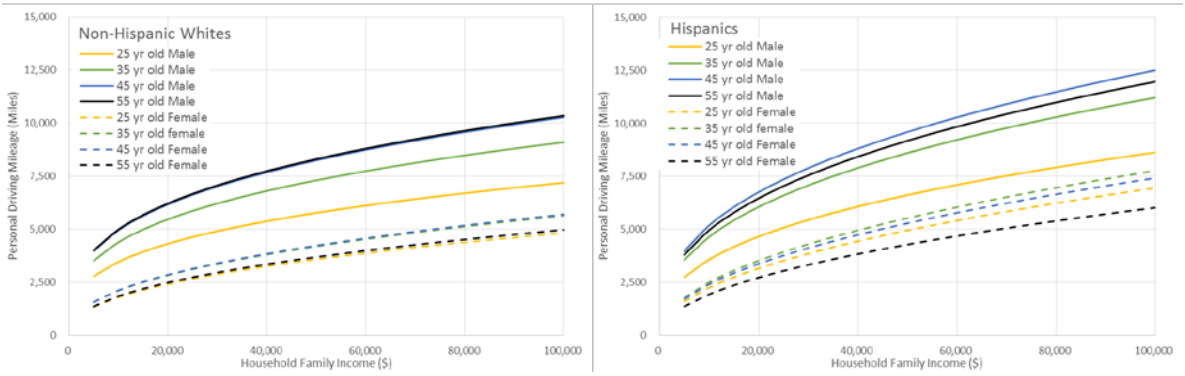

Figure A- 9 Driving mileage of drivers by income and age (Immigrants)

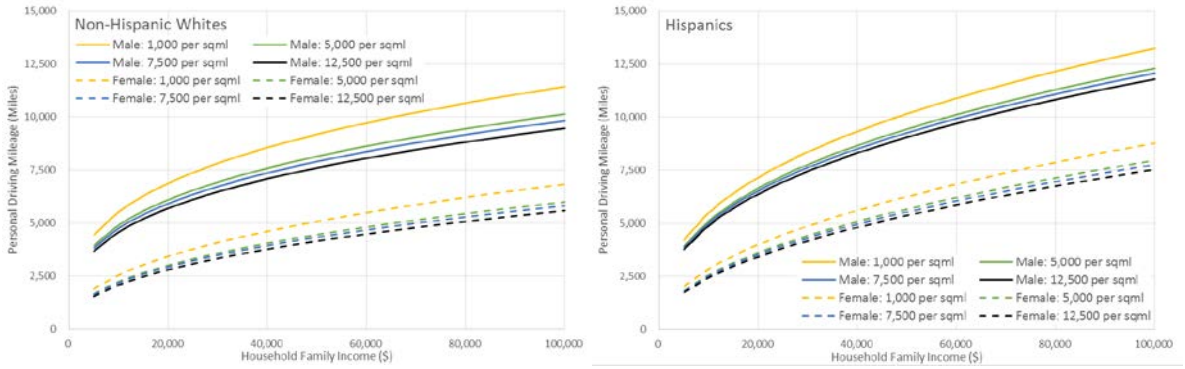

Figure A- 10 Driving mileage of drivers by income and residential population density (Immigrants)