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The Travel Behavior of Immigrants and Race/Ethnicity Groups: An Analysis of the 2001 National Household Transportation Survey

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ABSTRACT

The purpose of this paper is to examine the relationships between travel behavior and immigrant status. The National Household Travel Survey (NHTS) allows us to explore the relationships between travel behavior and characteristics that are usually hard to discern in surveys with smaller samples. The place of birth and year of immigration to the US on travel behavior was tested for commute mode and for general travel variables such as yearly miles driven, number of weekly walk trips, and number of daily trips by all modes. Full models that include spatial and socio-demographic variables were estimated for each of the dependent variables. The effects of place of birth and year of arriving to the US were found to be significant in the full models that control for commute mode and yearly miles driven but not for weekly walk trips or number of daily trips. Understanding the differences in travel behavior and the possible explanations for these differences can help in modeling travel demand, finding policies best suited to meeting the travel needs of foreign born communities, and addressing environmental justice concerns.

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1. Introduction

Approximately 33.5 million foreign-born people live in the United States - 11.7 percent of the US population. (US Census Bureau, 2005). Immigrants are expected to be a major source for population growth in many parts of the nation. In California, for example, the total population is expected to almost double between the years 1990 to 2040 mainly as a result of new immigrants (California Department of Finance, 2004).

Previous research suggests that the travel behavior of immigrants is different from the travel behavior of US-born residents for the first five to ten years from arrival to the US and that new immigrants are more likely than others to use public transportation (Myers; 1996, Deakin and Ferrell;2001, Purvis; 2003, Casas et al; 2004). The differences in travel behavior are usually associated with the socio-demographic and location characteristics of immigrants. In many cases, the travel patterns of immigrants mirror those of racial and ethnic minorities in the US, although these similarities decline the longer immigrants have lived in the US. However, immigration status and place of birth are seldom asked in travel and activity surveys, so that data on the travel behavior of immigrants are limited.

It is important to understand the travel behavior of minority groups in general and immigrant groups specifically for various reasons. First, understanding travel behavior and travel needs of specific groups in society enables the adoption of targeted policies and a more effective distribution of transportation resources; research on the travel behavior of these groups is thus important for addressing environmental justice concerns. Second, understanding the travel behavior of immigrants may help to improve travel demand forecasting, particularly for public transportation and ITS policies. Third,

immigrants who are not yet captives of American norms and attitudes may play an important role as agents of change, for example, by using new transit services.

The 2001 National Household Travel Survey (NHTS) allows us to explore the relationships between travel behavior and characteristics that are usually hard to discern in surveys with smaller samples. We tested the effect of place of birth and year of immigration to the US on travel behavior for commute mode and for general travel variables such as yearly miles driven (as reported by the respondent), number of weekly walk trips, and number of daily trips by all modes. Full models that include spatial and socio-demographic variables were estimated for each of the dependent variables. The effects of place of birth and year of arriving to the US were found to be significant in the full models that control for socio-demographic and location variables.

2. Prior Research on Immigrants and Travel

Travel patterns are the outcome of the needs and constraints of individuals and households and the location-specific set of opportunities provided by the transportation system and the distribution of activities. In this section we review previous research on immigrants' residential location decisions and travel patterns. The residential location patterns of immigrants are different in many ways from those of long term residents of the US and may have a strong effect on travel behavior both by affecting the availability of activities and transportation options.

2.1 Residential Location

Most immigrants to the US live in one of the top 25 metropolitan areas within the US, compared to only 50% of the native born population (Bartel, 1989). Two main theories are used to explain the location decisions of immigrants (Pamuk 2004). The human

ecology approach suggests that immigrants are willing to live in congested conditions as a transition phase before improving their socio-economic conditions and moving to middle class neighborhoods. The second theory maintains that ethnic clusters provide immigrants with socioeconomic and cultural networks and therefore immigrants are not likely to move out when their socioeconomic conditions improve. Both theories suggest a clustering pattern of new immigrants that may affect their cultural and behavioral experience and therefore their travel behavior.

In San Francisco, Pamuk (2004) found three different types of immigrant clustering among Chinese, Mexican, and Filipino immigrants: (1) low income ethnic clusters, (2) more wide spread middle-income ethnic communities, and (3) a high income Chinese cluster. The outcome of this research suggests that both theories can be applied in the city and that immigrant groups will not necessarily blend with the general population when their economic situations improve.

In a national study, Bartel (1989) concluded that more immigrants that first locate outside of the major metropolitan areas eventually move inside these areas than immigrants that first locate inside these areas move out. Immigrants with higher education levels are more likely to live in the major metropolitan areas. Asians and Europeans that are more educated are more likely to choose a location outside of the major metropolitan areas. Hispanic immigrants that are more educated tend to move out of these areas as a second migration within the United States.

According to the theories outlined above, immigrant segregation depends on time of arrival and socio-demographic factors such as education, income, household size, and others. Rolf (2001) explored the connection between density, sprawl, and segregation by

race and income in US Metropolitan Areas and found that high density development does not reduce economic segregation and ethnic segregation. Economic segregation in this case is highly correlated with ethnic segregation, but new Hispanic immigrants tend to be more segregated regardless of their economic situation.

2.2 Travel patterns

The few studies that have examined the travel patterns of immigrants have focused on changes in behavior over time. Myers (1996) that shows that after ten years in the US, the travel behavior of immigrants becomes similar to that of the US born population. In their first years in the US, immigrants' behave differently, for example by using more transit than the US born population. The extensive use of public transportation in the first years from arrival compared to the general population was also reported by Casas et al. (2004), who used 2001 NHTS data to evaluate travel behavior of "newcomer Hispanic" versus "settled" and native born residents.

Vehicle ownership is highly correlated with mode choice as households that cannot afford a car are more likely to use public transportation or other travel modes and as households that live in areas with high density and with good public transportation services have less motivation to purchase vehicles. McGuckin and Srinivasan (2003) found that 20.7% of the new immigrants live in households without vehicles versus only 8% of the immigrants who have lived in the US for ten years or more and 3.9% of the US born population. In areas where immigrants are highly concentrated, they may create an important portion of the demand for public transportation. Purvis (2003), for example, found that immigrants generate about one third of the public transportation commuting trips in San-Francisco.

The dependence of immigrants on public transportation together with unique activity patterns and cultural barriers that inhibit the use of regular public transportation can lead to ethnic-exclusive transportation services. For example, Camionetas are mini-vans privately operated as jitney services throughout cities in the US by Latino immigrants (Valenzuela et al, 2005). Douma (2004) used focus groups of specific populations to analyze ways of better serving these populations using ITS. This study focused on “non-traditional” populations such as immigrant, disabled, and retired groups. Focus groups were held with for homogenous groups of Latino, Somali and Hmong immigrants in both urban and rural areas. The focus groups showed that Latino immigrants are open to transit and more “social” types of travel, while privacy was an important consideration for the Hmong. All groups were found to prefer driving themselves.

The evidence reviewed here suggest that the travel patterns of immigrants derive from both socio-demographic characteristics (in ways similar to the US born population) and unique requirements and needs related to cultural and attitudinal differences. Immigrant travel behavior may be different from US born travel behavior with the same socio-demographic characteristics for a variety of reasons: (1) activity patterns: immigrants may have different needs such as shopping in special ethnic food shops, or they may have different social and recreational habits, etc., (2) cognitive maps: immigrants may have different level of knowledge about their area that may be reflected in their activity patterns and in their route choices, (3) attitudes and beliefs: immigrants may have a different set of attitudes and beliefs about transportation that influence the amount and mode of travel. In the work that follows, we examine the relationship

between immigrant status and travel behavior, recognizing that immigrant status itself does not have a causal effect but rather serves as an indicator of these underlying differences.

3. Research Method

The 2001 National Household Travel Survey (NHTS) allows us to explore the relationships between travel behavior and characteristics that are usually hard to discern in surveys with smaller samples. The correlation of place of birth or alternatively race/ethnicity and year of immigration to the US on travel behavior was tested for commute mode and for general travel variables such as yearly miles driven (as reported by the respondent), number of weekly walk trips, and number of daily trips by all modes. Full models that include spatial and socio-demographic variables were estimated for each of the dependent variables. We tested separate models for the general population that includes the US born population and for immigrant only.

3.1 The Sample

The National Household Travel Survey (NHTS) is a national level survey comprising a questionnaire and a travel diary survey that is conducted every five to six years. There are approximately 66,000 households in the final 2001 NHTS dataset, including about 160,658 people; we used a smaller sample of 97,694 people after taking out all cases where travel data were not complete. All the cases where travel was part of the individual's job requirement and all cases where physical or other conditions limited the individual from traveling in any transportation mode were also excluded. The characteristics of the reduced sample are somewhat different from the regional sample;

for example, the reduced sample was 53.7% female in contrast to 51.9% female in the regional sample.

3.2 Immigrants' Characteristics

The sample used in the analysis includes 5,396 cases of foreign-born individuals, about half of which arrived in the US in the ten years prior to the survey (Table 1).

Table 1: Population by Year of Arriving to the US/ US born

Level	Count	Percent
Missing answer	250	4.63%
Move to the US Before 1981	2503	46.4%
Move to the US between 1981-1991	1197	22.1%
Move to the US between 1991-1996	722	13.3%
Move to the US between 1996-2001	724	13.4%
Total	5396	100%

The gender break down for foreign born respondents is 42.5% male and 57.5% female, higher than for the overall sample. The new arrivals to the US are distributed across all ages, though the largest share is in their 30s (Figure 1).

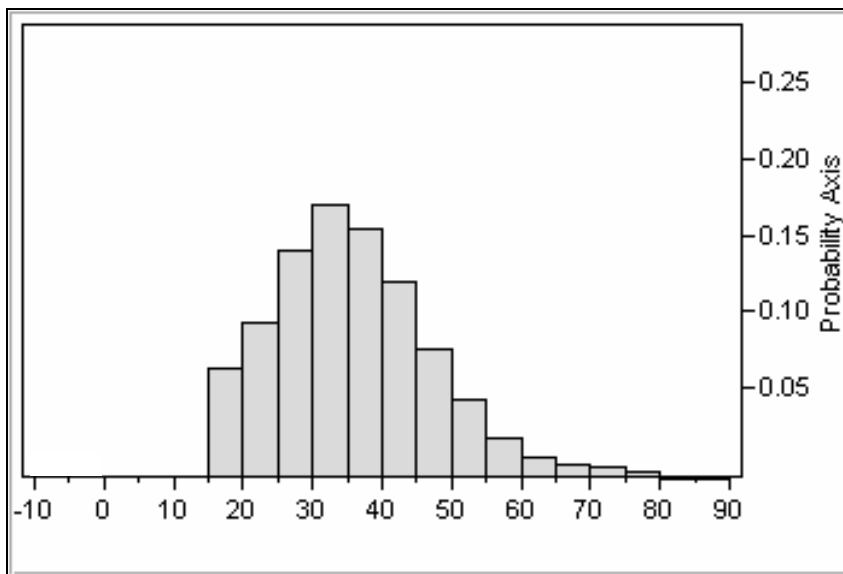


Figure 1: Current Age Distribution of Respondent Arrived to the US between 1981 and 2001

Despite the fact that immigrants arrive in the US at all ages, there is a clear trend in life cycle: a few years after arriving in the US the number of people in the household increases and respondents have more children. As shown in Figure 2, around 45% of households that include people who arrived in the US in the last five years contain one or two adult with no children; for households with people who arrived five to ten years before the survey, this share is around 30%; and for people who arrived 10 to 20 years ago, less than 25% live in households without children.

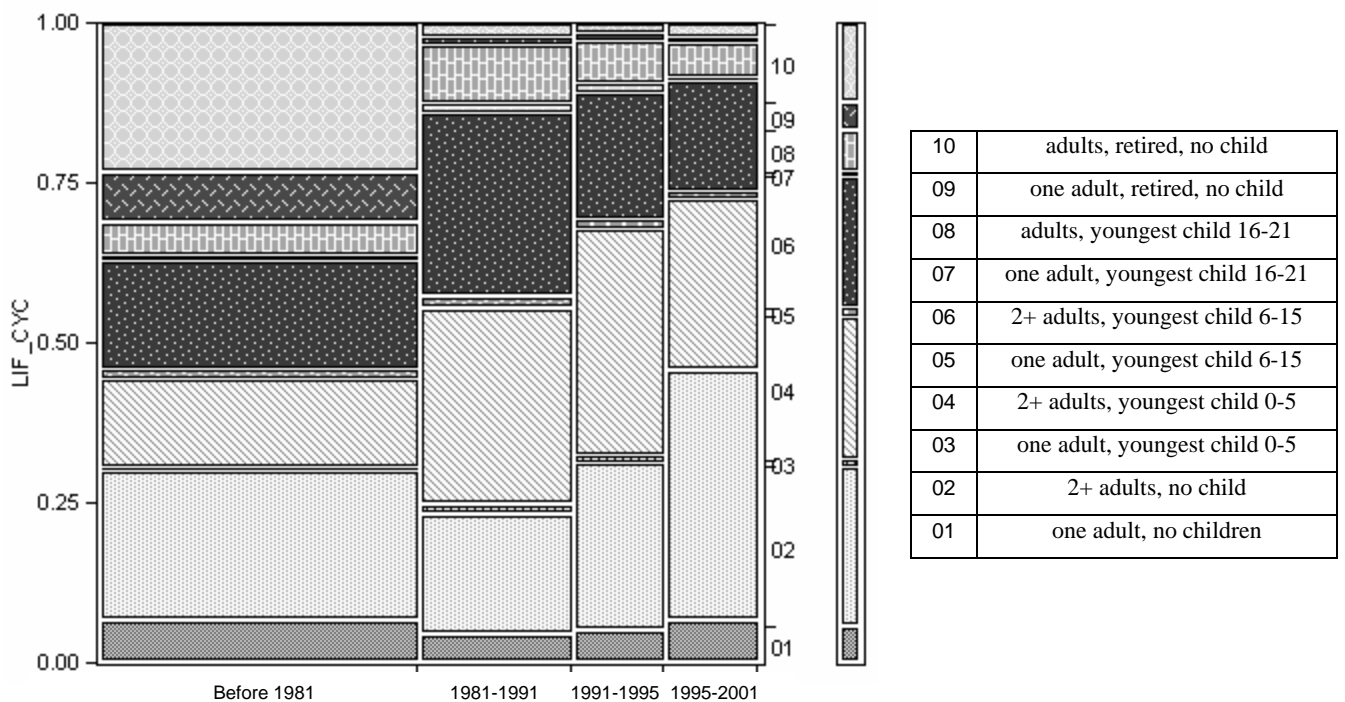


Figure 2: Arrived in the US by Household Life Cycle

The income of new arrivals (defined here as immigrants who arrived in the US in the last five years) appears to increase over time, as shown in Figure 3: people who arrived in the US recently are generally poorer than people who arrived before them. It is

also interesting that the biggest differences are in the very low income and very high income categories. In the first five year from arrival, 30% of respondents make less than \$30,000 per year; only about 20% of people who arrived 5 to 10 years before the survey and around 10% of the people who arrived more then 20 years before the survey are included in this income group. The share of high income households with income over \$100,000 per year is twice that for people who arrived more then 10 years ago compared to people who arrived in the last five years.



Figure 3: Arrived To the US by Household Income Group

Figure 4 shows the race and ethnicity of immigrants for four main groups (White, African Americans/Black, Asian, and Hispanic of any race). White immigrants account for more than half of immigrants who arrived more than twenty years before the survey but only about one-third for immigrants who arrived more recently. Asians and Hispanics

represent about quarter of immigrants for each group who arrived in the twenty years prior to the survey while Black immigrants are about 5% of the total in these time periods.

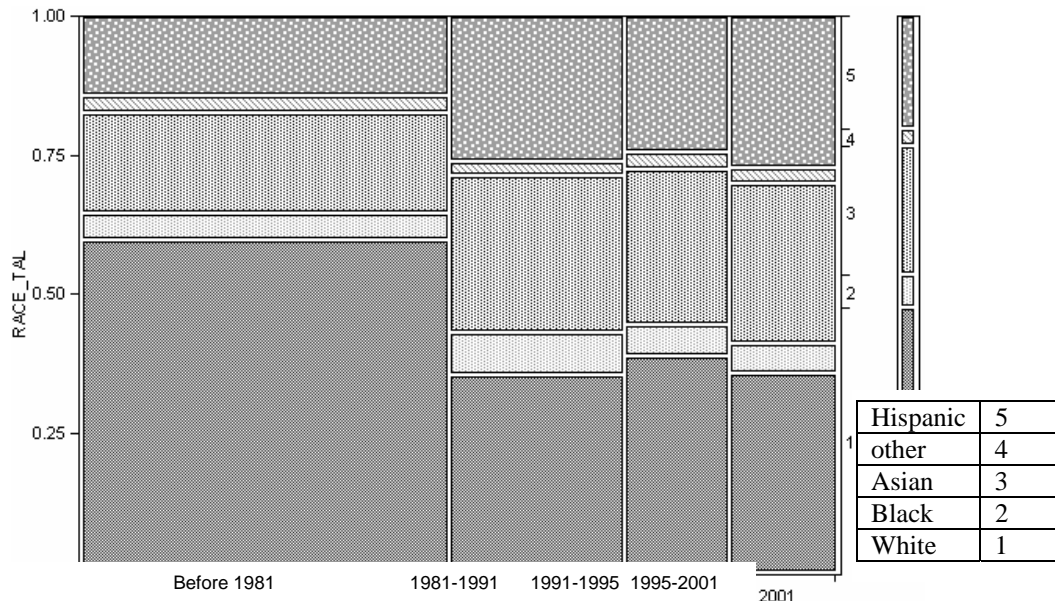


Figure 4: Arrived To the US By Race

Table 2 summarizes the socio-demographic variables of age, household size, and household yearly income by year of arriving to the US or US born status.

Table 2: Socio Demographic Variables by Year of arriving to the US

Year of arriving to the US	Respondent Age (years)			HH Size (people)			yearly HH income		
	Mean	Std Dev	t-test vs. US born*	Mean	Std Dev	t-test vs. US born*	Mean	Std Dev	t-test vs. US born*
US Born	37.17	23.13	-	3.23	1.50	-	54046	30467	-
Pre 1981	52.92	15.34	<0.0001	2.92	1.50	<0.0001	52791	32466	0.0567
1981-1991	37.61	12.08	0.2208	3.85	1.73	<0.0001	50868	32188	0.0007
1991-1996	35.49	11.59	0.0001	3.64	1.69	<0.0001	44625	30759	<0.0001
1996-2001	32.00	10.22	<0.0001	3.32	1.55	0.1203	40109	30635	<0.0001

* Probability that mean for this group is not different than the mean for the US born group.

3.3 Race and Ethnicity

Race and ethnicity constitute the second demographic variable of focus in this analysis. The NHTS data includes a race and ethnicity variable that specifies 17 categories of race or ethnicity or a combination of the two. We aggregated these categories into a new variable, as described in Table 3, with just five categories: (1) white only (2) African American/Black and a combination of Black and White, Black and Asian, Black and Hispanic (3) Asian, including White and Asian (4) American Indian, Alaskan Native, Native Hawaiian, other Pacific Islander and other combinations of two races or more, and (5) Hispanic of any race.

Table 3: Population by Race and Ethnicity

Level	Count	Percentage
-9 Missing	695	7.11%
1 White only	82151	84.09%
2 African American/Black	4237	4.33%
3 Asian	3800	3.89%
4 Other	2692	2.75%
5 Hispanic of any race	4119	4.21%
Total	97694	100%

The socio demographic characteristics of these racial/ethnic groups differ significantly (Table 4). The average ages of White and Asian respondents are similar, at just under 41 years, and significantly older than Black and Hispanic respondents; the average age of Hispanic respondents is almost 10 years lower than the average age of White respondents. This difference can be partly explained by the number of children per household; the average household size for Hispanic respondents is significantly higher than the average household size for white respondents. Similarly, White and Asian

respondents have considerably higher incomes on average, around to \$52,000 to 55,000\$ per year, while households of black and Hispanic respondents have average annual incomes of around \$41,000.

Table 4: Socio Demographic Variables by Race and Ethnicity

Race	Respondent Age (years)			HH Size (people)			yearly HH income		
	Mean	Std Dev	t-test vs. White*	Mean	Std Dev	t-test vs. White*	Mean	Std Dev	t-test vs. White*
White	40.93	21.51	-	3.16	1.45	-	55360	30378	-
Black	35.84	20.79	<0.0001	3.40	1.67	<0.0001	40308	28702	<0.0001
Asian	40.99	21.96	0.8691	3.51	1.77	<0.0001	52650	32497	<0.0001
Other	35.70	20.45	<0.0001	3.70	1.79	<0.0001	48712	29797	<0.0001
Hispanic	31.33	18.60	<0.0001	3.97	1.59	<0.0001	41338	28011	<0.0001

* Probability that mean for this group is not different than the mean for the White group.

4. Travel Behavior by Race/Ethnicity and Year of Immigration

In this section we examine differences in travel behavior in terms of commute mode, yearly miles driven, number of trips per day, and number of walk trips per week between racial/ethnic groups and by year of immigration to the US.

4.1 Travel Patterns by Year of Arriving To the US

In this section we focus on the travel behavior of foreign born respondents differentiated by year of arrival in the US. Respondents who arrived in the US in the five years before the survey make somewhat fewer trips per day on average than other respondents (Table 5). Given the large standard deviation, the differences are very small but still based on the student's t test people that arrived in the last 10 years generate statistically significant less trips than US born population.

Table 5: Daily Trips per Person

Year of arriving to the US	Number	Mean	Std Dev	t-test vs. US born*
US Born	84900	4.36	2.7679	-
Pre 1981	2238	4.37	2.7535	0.8654
1981-1991	1102	4.41	2.6416	0.5328
1991-1996	642	4.09	2.4925	0.0065
1996-2001	655	3.99	2.5062	0.0002

* Probability that mean for this group is not different than the mean for the US born group

The number of private vehicles per person in immigrant households differs by year of arriving in the US and compared to US born respondents (Table 6). Recent arrivals (within the five years before the survey) drive on average 7,230 miles per year, arrivals five to ten year before the survey drive about 9,500 miles per year, and immigrants that arrived more than 10 years before the survey drive about 10,500 miles per year. Recent arrivals may be driving less than others because of more limited availability of a car: the average number of vehicles per person is 0.45 for the households of recent immigrants, compared to 0.58 vehicles per person for respondents who arrived 10 to 15 years before the survey. The household of immigrants who arrived more than 20 years ago have a much higher level of automobile ownership, with almost 0.8 vehicles per person on average.

Table 6: HH Vehicle Ownership per Person

Year of arriving to the US	Number	Mean	Std Dev	t-test vs. US born*
US Born	92298	0.81	0.4702	-
Pre 1981	2503	0.79	0.4290	0.0218
1981-1991	1197	0.58	0.3456	<0.0001
1991-1996	722	0.55	0.3514	<0.0001
1996-2001	724	0.45	0.3484	<0.0001

* Probability that mean for this group is not different than the mean for the US born group

The average number of walk trips per week is highest for respondents who arrived in the last five years at 3.6 trips per week (Table 7); respondents who arrived before 1981 make fewer than three walk trips per week by comparison. US born respondents make three trips per week on average, significantly lower than new arrivals. Similarly, recent immigrants make about 0.4 bicycle trips per week on average, versus 0.26 per week on average for immigrants who have lived in the US for five to ten years and 0.2 trips per week on average for the entire sample.

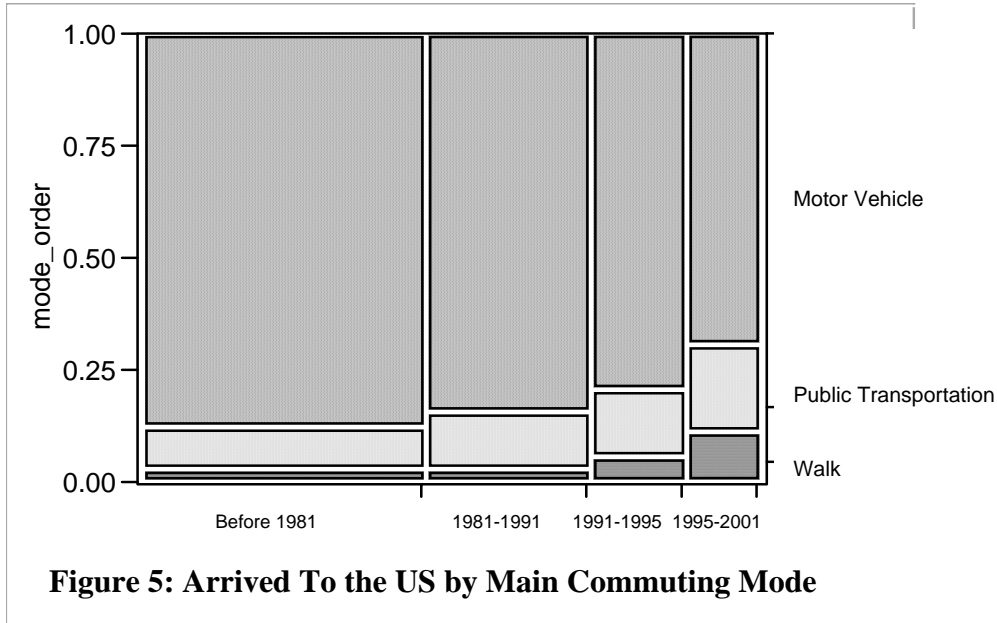
Table 7: Number of Walk trips per Week

Year of arriving to the US	Number	Mean	Std Dev	t-test vs. US born*
US Born	67926	3.0153	5.2688	-
Pre 1981	2488	2.9501	4.8459	0.5112
1981-1991	1189	2.9133	4.8714	0.4749
1991-1996	715	3.200	6.2600	0.4321
1996-2001	717	3.5815	6.2678	0.0162

* Probability that mean for this group is not different than the mean for the US born group

For the entire sample, 93% of respondents commute by motor vehicle, 4% by public transportation, and 3% by walking. Among the 2866 foreign born commuters, the distribution across modes is significantly different depending on year of arrival in the US (Figure 5). About 12% of the commuters who arrived in the US in the five years before the survey walk as their commute mode, though only about 3% of respondents who arrived 10 years before the survey walk. Differences for public transportation are also significant, with just fewer than 20% of recent arrivals commuting by public transportation but only 10% of immigrants who have in the US for more than 20 years using public transportation. However, the share using public transportation for the

immigrants who have been in the US for the longest is still higher than for US born respondents.



4.2 Travel Patterns by Race and Ethnicity

In this section we will explore the correlation between race and travel behavior. The total number of daily trips varies significantly: white respondents make more trips per day than the other race/ethnicity groups, which average 4.41 for the White group and between 3.8 and 3.9 to black Asian and other race and ethnic groups. The Hispanic group travel similar number of trips as The White groups (Table 8).

Table 8: Total Daily Trips per Person

Race	Number	Mean	Std Dev	t-test vs. White*
<i>White</i>	82151	4.41	2.7812	-
<i>Black</i>	4237	3.80	2.5142	<0.0001
<i>Asian</i>	3800	3.87	2.6679	<0.0001
<i>Other</i>	2692	3.92	2.7148	<0.0001
<i>Hispanic</i>	4119	4.15	2.6587	<0.0001

* Probability that mean for this group is not different than the mean for the White group

Differences in commute mode also differ for the race/ethnicity groups. Although driving dominates as a commute for all groups, this dominance is greatest for white respondents and least for black respondents, whose share of commute trips by walking is twice as high as the share for white respondents and whose share of commute trips by public transportation is ten times as high as for white respondents and twice as high as for other race/ethnicity groups (Figure 6).

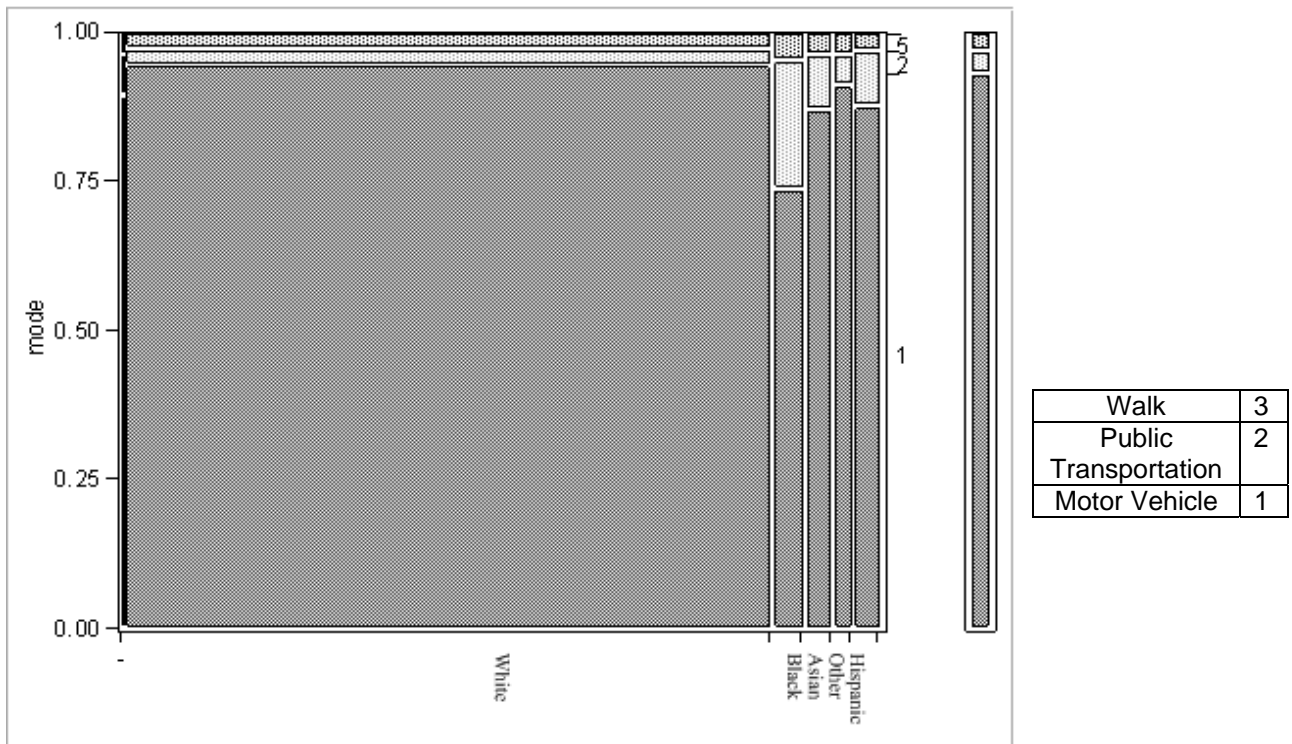


Figure 6: Commuter Mode Choice by Race

One of the explanations for these differences in commute mode may be differences in vehicle ownership per person, which varied from 0.84 on average for white respondents to 0.51 on average for black respondents (Table 9).

Table 9: HH Vehicle Ownership per Parson

Race	Number	Mean	Std Dev	t-test vs. White*
<i>White</i>	82151	0.84	0.4682	-
<i>Black</i>	4237	0.51	0.4362	<0.0001
<i>Asian</i>	3800	0.68	0.3755	<0.0001
<i>Other</i>	2692	0.70	0.4397	<0.0001
<i>Hispanic</i>	4119	0.56	0.3810	<0.0001

* Probability that mean for this group is not different than the mean for the White group

The yearly mileage driven by drivers in each group paints a different picture from the previous variables (Table 10). White respondents drive about 12,000 miles per year on average while black respondents drive just over 10,000 miles per year on average. Asian respondents drive the least on average, at 8600 miles per year.

Table 10: Yearly Miles Driven (Drivers only)

Race	Number	Mean	Std Dev	t-test vs. White*
<i>White</i>	47862	12091	10082	-
<i>Black</i>	1524	10275	12860	<0.0001
<i>Asian</i>	1789	8619	7267	<0.0001
<i>Other</i>	1197	11497	10859	0.0614
<i>Hispanic</i>	1527	11750	13542	0.3295

* Probability that mean for this group is not different than the mean for the White group

Walk trips may be the outcome of necessity or of choice. White respondents make the most walking trips per week (3.13), followed by black respondents (3.00) and Hispanic respondents (2.82) (Table 11). All of these groups make over twice as many walking trips as Asian respondents. White respondents also make more bicycle trips per

week then the other groups with average of about 0.19 trips per week. Asian respondents make the fewest bicycle trips per week, just under 0.01 trips per week. Note that bicycle trips are significantly less frequent than walking trips.

Table 11: Walk Trip per Week by Race/Ethnicity

Race	Number	Mean	Std Dev	t-test vs. White*
<i>White</i>	62302	3.1277	5.3040	-
<i>Black</i>	2946	2.9966	5.7502	0.2251
<i>Asian</i>	2910	1.3879	3.7862	<0.0001
<i>Other</i>	1880	2.3473	5.0466	<0.0001
<i>Hispanic</i>	2675	2.8231	5.1928	0.0030

* Probability that mean for this group is not different than the mean for the White group

5. Perceptions of Transportation Services among immigrants and US Born

As part of the NHTS survey the respondents were asked about their perceptions regarding different traffic situations. The questions focused on infrastructure conditions and traffic conditions on roads and did not address public transportation. The response rate varies considerably from question to question as some questions were asked randomly and not to all the respondents.

When asked about “worrying about a traffic accident,” immigrants express more concern than US born respondents (Table 12). For those born in the US, less than 40% of respondents consider traffic accidents as a somewhat of a problem, very much of a problem, or a severe problem, in contrast to around 50% in the immigrant population. More than 18% of immigrants who arrived since 1996 see traffic accidents as a severe problem, compared to less than 10% of the US born population.

Table 12: Perceptions of “Worrying about a traffic accident” as a Problem by Year of Arriving to the US/ Born in the US (n=18,882)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	34.1	27.44	19.73	8.78	9.96
Pre 1981	30.9	22.92	20.1	9.63	16.45
1981-1991	25.47	25.47	20.97	13.11	14.98
1991-1996	25.33	21.33	24	11.33	18
1996-2001	31.61	20.65	20	9.03	18.71
Overall	33.79	27.16	19.79	8.89	10.37

*Chi square = 70.3, p-value<0.001

About three times as many respondents answered the question on highway congestion (Table 13). There are no differences between US Born respondents and foreign born respondents who arrived in the US prior to 1996 (i.e, have lived in the US

more than five years). About 50% of these respondents do not consider highway congestion a problem or consider it a little problem. New immigrants (with less than five years in the US) tend to consider congestion less of a problem than the other groups, probably as a result of lower use of private vehicles. The results for traffic or road conditions in general (Table 14) are similar to those for highway congestion (Table 13)

Table 13: Perceptions of “Highway congestion” as a Problem by Year of Arriving to the US/ Born in the US (n=53,518)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	32.72	23.12	21.67	11.29	11.20
Pre 1981	29.95	18.61	20.62	13.31	17.51
1981-1991	28.27	18.59	23.30	12.43	17.41
1991-1996	32.31	17.69	25.55	12.88	11.57
1996-2001	32.24	22.00	26.36	12.20	7.19
Overall	32.56	22.85	21.74	11.39	11.47

*Chi square = 133.26; p-value<0.001

Table 14: Perceptions of “Traffic or road congestion” as a Problem by Year of Arriving to the US/ Born in the US (n=13,632)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	31.97	24.67	19.93	12.35	11.09
Pre 1981	26.22	24.59	19.95	17.63	11.60
1981-1991	23.00	25.50	21.50	11.00	19.00
1991-1996	30.36	21.43	15.18	16.96	16.07
1996-2001	29.67	31.87	13.19	10.99	14.29
Overall	31.62	24.70	19.87	12.52	11.28

*Chi square = 27.3; p-value<0.0375

Respondents were also asked about their perceptions of driver behavior as a problem – distracted drivers (Table 15), drunk drivers (Table 16), aggressive drivers (Table 17), and speeding (Table 18). On almost all questions, the differences between immigrant groups and the US born population are significant, though the patterns of differences are not consistent across questions. For example, a higher share of those who

arrived between 1981 and 1991 than other groups think that distracted drivers are a problem, while a higher share of those who arrived between 1996 and 2001 than other groups think that drivers speeding are not a problem. The reasons for these differences are not readily apparent, though they could be tied to age differences for the different immigrant groups.

Table 15: Perceptions of “Distracted drivers” as a Problem by Year of Arriving to the US/ Born In The US (n=13,102)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	16.70	23.97	27.63	17.13	14.57
Pre 1981	18.94	19.86	24.94	17.55	18.71
1981-1991	14.97	22.75	23.35	18.56	20.36
1991-1996	15.09	26.42	21.70	16.98	19.81
1996-2001	24.79	27.35	21.37	11.11	15.38
Overall	16.81	23.87	27.39	17.10	14.83

**Chi square = 15.7; p-value<0.047

Table 16: Perceptions of “Drunk drivers” as a Problem by Year of Arriving to the US/ Born in the US (n=13,541)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	42.87	18.46	11.71	6.52	20.45
Pre 1981	44.52	18.88	11.89	6.76	17.95
1981-1991	36.87	15.66	13.64	7.07	26.77
1991-1996	43.36	14.16	8.85	7.96	25.66
1996-2001	40.22	17.39	8.70	10.87	22.83
Overall	42.82	18.39	11.70	6.57	20.52

*Chi square = 140.0; p -value<0.001

Table 17: Perceptions of “Aggressive drivers on the road” as a Problem by Year of Arriving to the US/ Born in the US (n=13,570)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	17.28	23.02	25.14	17.76	16.80
Pre 1981	18.60	18.60	21.88	17.94	22.98
1981-1991	18.50	24.00	20.00	20.50	17.00
1991-1996	16.26	21.14	29.27	17.07	16.26
1996-2001	29.13	22.05	16.54	16.54	15.75
Overall	17.44	22.86	24.92	17.79	16.99

*Chi square = 77.9; p-value<0.001

Table 18: Perceptions of “Drivers speeding” as a Problem by Year of Arriving to the US/ Born in the US (n=13,224)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	20.20	23.31	23.64	16.81	16.05
Pre 1981	18.87	19.61	27.45	16.42	17.65
1981-1991	14.29	23.98	23.98	20.92	16.84
1991-1996	18.10	24.14	21.55	18.10	18.10
1996-2001	27.05	23.77	19.67	14.75	14.75
Overall	20.11	23.22	23.71	16.85	16.11

*Chi square = 67.1; p-value<0.001

The results suggest that recent immigrants do not consider gas price a problem to the same degree as less recent immigrants and US born respondents: only about 11% of recent immigrants consider gas price a severe problem compared to about 15% of immigrants who have been in the US for 5 to 10 years and over 20% for US born respondents. This difference in perception can be attributed to the lower use of private vehicles for recent immigrants and by the recent memory of higher gas prices in the country of origin for the recent immigrants.

Table 19: Perceptions of “Price of gasoline” as a Problem by Year of Arriving to the US/ Born in the US (n=47,773)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	18.20	18.90	26.03	15.43	21.44
Pre 1981	21.51	15.84	24.38	17.67	20.60
1981-1991	22.04	18.25	22.63	17.81	19.27
1991-1996	29.83	21.00	22.20	12.41	14.56
1996-2001	31.90	22.14	22.38	12.14	11.43
Overall	18.58	18.84	25.86	15.48	21.23

*Chi square = 140.3; p-value<0.001

Only one question focused on non-motorized modes in asking about “lack of sidewalks and walkways” as a problem (Table 20). Compared to the previous questions, few respondents in any group considered lack of sidewalks a problem. However, recent immigrants perceive lack of sidewalk as a problem to a greater degree than the other groups. The concern on the part of recent immigrants may reflect their lower use of private vehicles and their residential location within urban areas. Immigrants that arrived to the US prior to 1981 also see a lack of sidewalks as a problem to a greater degree than other groups; this difference may be attributable to the fact that this group is on average a little older than the general population.

Table 20: Perceptions of “Lack of walkways or sidewalks” as a Problem by Year of Arriving to the US/ Born in the US (n=13,547)

	Not a problem	A little problem	Somewhat of a problem	Very much of a problem	A severe problem
US Born	57.99	17.23	10.83	6.30	7.65
Pre 1981	46.72	19.00	14.85	8.73	10.70
1981-1991	39.80	21.39	18.41	12.44	7.96
1991-1996	49.19	19.35	14.52	9.68	7.26
1996-2001	42.52	19.69	16.54	5.51	15.75
Overall	57.11	17.39	11.17	6.50	7.83

*Chi square = 77.3; p-value<0.001

6. Multivariate Analysis of Travel Behavior by Year of Immigration and Race/Ethnicity

In order understand the relationship of travel behavior with immigration status and race/ethnicity group while controlling for socio-demographic characteristics such as income as well as location, we estimated a series of multivariate models for two measures of travel behavior: commute mode and yearly miles driven. First we present models for foreign born respondents only, focusing on the year of immigration and either race/ethnicity group or place of birth as explanatory variables. Second, we present models for the entire sample, to compare travel behavior for foreign born versus US born respondents, focusing on foreign born and race/ethnicity group as explanatory variables. Table 21 includes the definitions of all variables used in this section.

Table 21: Variables Names and Definitions

Dependent variables	
Variable name	Definition
Miles Driven per Year	Miles respondent reported on driving in the last 12 months
Foreign Born Commute Mode	Transportation mode to work last week by two categories: (1) motor vehicle (car, Van, SUV, Pickup truck, other truck, motorcycle) ; (2) public transportation (local public transit bus, commuter bus, city to city bus, AMTRACK, commuter train, subway, street car/trolley)
Commute Mode for all Sample	Transportation mode to work last week by three categories: (1) motor vehicle (car, Van, SUV, Pickup truck, other truck, motorcycle) ; (2) public transportation (local public transit bus, commuter bus, city to city bus, AMTRACK, commuter train, subway, street car/trolley) (3) non motorized trip (walk, bicycle)
Independent Variables	
Variable name	Definition
YRTOUS_N	Number of years in the US between 0 for arriving in 2001 to 45 for people entered the US prior to 1958
YTOUS_L	US born
YTOUS_5	In the US for 0 to 5 years
YTOUS_10	In the US for 5 to 10 years
YTOUS_15	In the US for 10 to 15 years

Income_m	House Hold income per year in \$
race_W1	Race = White Non Hispanic
race_B1	Race=Black Non Hispanic
race_A1	Race=Asian
race_H1	Race=Hispanic
veh per driver_to1	Vehicle per Driver up to a ratio of one
R_SEX	Sex 1=male
R_AGE	Respondent age in years
HHSIZE	Number of people in the household
MSACAT_1t	Metropolitan statistical area of 1 million or more, with heavy transit
MSACAT_2n	Metropolitan statistical area of million or more, not in 1
MSACAT_3	Metropolitan statistical area less than 1 million
Bornin01	Place of birth: Canada, US Territories
Bornin02	Place of birth: Central and South America
Bornin03	Place of birth: Europe & Scandinavia/Polar Regions
Bornin04	Place of birth: Eastern Europe & Russia/USSR
Bornin05	Place of birth: East Asia
Bornin06	Place of birth: Indian Subcontinent
Bornin07	Place of birth: Caribbean/Atlantic Islands

6.1 Commute Mode Models For Foreign Born

A sample of 2450 foreign born commuters was used to estimate a model to test the association between commute mode and number of years in the US, race/ethnicity group, other socio-demographic variables, and location variables. We limited the modes in the model to motor vehicle or public transportation because of the small number of respondents in this sample that walked (14) or used other modes. The initial model with all variables, estimated using logistic regression, had a pseudo R-square of 0.34. The initial model was used to identify variables that have no effect on commute mode for foreign born respondents. Insignificant variables included income, all race/ethnicity groups, and medium MSA size.

The final model presented in Table 22 has a pseudo R-square of 0.337. Not surprisingly, the average number of vehicles per household is highly significant, with a higher number of vehicles per driver in the household associated with a lower likelihood

of taking transit. Size of metropolitan area is also significant: residents of smaller metropolitan areas are less likely to use transit, while residents of large metropolitan areas with heavy transit are more likely to use transit. Gender is also significant (men are less likely to use transit), as is household size (larger household size means less likely to take transit). Although no race/ethnicity groups were significant in the initial model, the variable for the black group was significant in the final model: black respondents were more likely to take transit. Once these variables have been accounted for, the effect of years in the US is significant: more recent immigrants are more likely to take transit. Although household income is often shown to be associated with mode, it was not significant in this model; the number of vehicles per household may partially account for the effect of income.

Table 22: Model for Commute Mode – Foreign Born and Race/Ethnicity
Public transportation over private vehicle

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	1.1270	0.3789	8.85	0.0029
YRTOUS_N	-0.0192	0.006	8.55	0.0035
race_B1[0]	-0.3977	0.1165	11.65	0.0006
veh per driver_to1	-3.5144	0.2212	252.33	<.0001
R_SEX[1]	-0.1374	0.0752	3.33	0.0680
R_AGE	0.0135	0.0072	3.46	0.0629
HHSIZE	-0.1585	0.0496	10.18	0.0014
MSACAT_1t[0]	-0.6196	0.0822	56.69	<.0001
MSACAT_3[0]	0.4421	0.1446	9.34	0.0022

A second model with a sample of 2862 foreign born commuters was used to estimate a model to test the association between commute mode and number of years in the US using a region-of-birth variable instead of race/ethnicity and the same variables as in the previous model (Table 21). The final model had a pseudo R-square of 0.33. This model shows some similarities with the model presented in Table 23, which included year of immigration: vehicles per driven and household size were significant in both

models, although age dropped out in the second model. Most interesting, two places of birth were significant: immigrants that were born in the former USSR and immigrants from the Caribbean are more likely to use public transportation for their commuting trips. In this model, the effect of years in the US was insignificant, perhaps because it is related to place of birth.

Table 23: Model for Commute Mode – Foreign Born and Place of Birth
Public transportation over private vehicle

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	-1.52368640	0.2884688	27.90	<.0001
HHSIZE	0.15968678	0.0464779	11.80	0.0006
veh per driver_to1	3.62745344	0.2031541	318.83	<.0001
MSACAT_1t[0]	0.68642611	0.0767311	80.03	<.0001
MSACAT_3[0]	-0.40679020	0.1310651	9.63	0.0019
born04[0]	0.26425604	0.1280314	4.26	0.0390
born07[0]	0.21936416	0.1182788	3.44	0.0636

6.2 Foreign Born Miles Driven per Year

A multivariate linear model was estimated for the sample of foreign born respondents for the dependent variable miles driven per year. An important limitation of this analysis is the lack of data on the role of the respondent as a member of the household; household responsibilities influence the activity and travel patterns of individual household members. In addition, the annual mileage as reported by the respondent may be inaccurate. Nevertheless, the multivariate model can help to identify variables associated with driving levels and provide a basis for further research.

The initial model for miles driven in the last 12 months with race/ethnicity variable, estimated using ordinary least squares regression is based on 2865 observations and has an adjusted R-square of about 0.08. The low R-square suggests that relatively little of the variation in miles driven per year is explained by the variables in the model. The variables found insignificant in the initial model were dropped one by one and the

model re-estimated with the reduced set of variables. The initial model shows that race/ethnicity, location, and household size are not significant in predicting miles driven per year.

The final model, presented in Table 24, includes just seven variables but achieves a similar adjusted R-square of 0.076. Scaled estimates, the standardized effect of each variable on miles per year, shows more clearly the relative importance of each variable in predicting miles driven. These estimates show that the number of vehicles per driver (capped at one to account for the limited effect that having more vehicles than drivers is likely to have on travel behavior) is the most significant variable, followed by age, Hispanic race/ethnicity, and gender. An increase of 0.5 in the ratio of vehicles per driver is associated with an increase of 2425 miles per year. Women drive 2212 fewer miles per year than men. Respondents of Hispanic origin drive 1357 more miles per year on average than non-Hispanic respondents; white respondents drive 945 more than non-white respondents. After accounting for these effects, recent immigrants drive 968 fewer miles per year than less recent immigrants and US born respondents.

Table 24: Model for Miles Driven Last 12 Months – Foreign Born and Race/Ethnicity

Term	Scaled Estimate*	Estimate	Std Error	t Ratio	Prob> t
Intercept	10736.22	6356.2342	1185.167	5.36	<.0001
veh per driver_to1	2425.50	6468.0195	1090.769	5.93	<.0001
income_m	1389.32	0.0292489	0.007151	4.09	<.0001
race_W1[0]	-945.62	-945.6208	227.8208	-4.15	<.0001
race_H1[0]	-1357.40	-1357.403	315.0955	-4.31	<.0001
R_AGE	-3510.76	-73.1409	13.53064	-5.41	<.0001
R_SEX[1]	2212.27	2212.2764	196.7093	11.25	<.0001
YTOUS_5[0]	968.03	968.03405	342.4276	2.83	0.0047

*Nominal factors expanded to all levels

*Continuous factors centered by mean, scaled by range/2 i.e. the scaled estimate shows the change in the dependent variable for an increase of ½ of the range of the independent variable.

A similar model was estimated for the sample of 3024 foreign born respondents using the region of birth variable instead of the race/ethnicity variable. The model, presented in Table 25, has an adjusted R-square of 0.133 - higher than the model that used race/ethnicity to define immigrant groups. Scaled estimates show that this model is similar to the previous one, in that the number of vehicles per driver is the most important variable. The effect of the year of arriving to the US is stronger in this model, with both five and ten years in the US significant. Respondents born in Canada, American territories, and Western Europe drive about 600 to 700 more miles per year than other immigrants.

Table 25: Model for Miles Driven Last 12 Months – Foreign Born and Place of Birth

Term	Scaled Estimate*	Estimate	Std Error	t Ratio	Prob> t
Intercept	9636	6721.4362	729.2614	9.22	<.0001
R_AGE	-2114	-66.06994	11.06299	-5.97	<.0001
R_SEX[1]	2016	2016.5933	148.2866	13.60	<.0001
income_m	1305	0.027491	0.005223	5.26	<.0001
vec per driver	10584	4233.7262	373.028	11.35	<.0001
YTOUS_5[0]	1312	1312.9011	256.6887	5.11	<.0001
YTOUS10[0]	516	516.28949	234.5614	2.20	0.0278
bornin01[0]	-660	-660.0625	270.4028	-2.44	0.0147
bornin03[0]	-715	-715.0786	182.1884	-3.92	<.0001

*Nominal factors expanded to all levels

*Continuous factors centered by mean, scaled by range/2 i.e. the scaled estimate shows the change in the dependent variable for an increase of ½ of the range of the independent variable.

6.3 Commute Mode for Full Sample

In this section we identify factors associated with commute mode for the full sample that includes foreign- and US-born respondents. This larger sample of 37,565 respondents enables an analysis of three modes: private vehicle, public transportation, and non-motorized modes (such as walk and bicycle). The model, estimated using

logistic regression, thus comprises two submodels – one for the likelihood of public transportation relative to private vehicle, and one for the likelihood of non-motorized relative to private vehicle. The initial model included all variables and had a relatively high explanatory power with a pseudo R-square of 0.26. The final submodel for public transportation includes size of metropolitan area as well as socio demographic variables such as age, income, number of vehicles, and household size (Table 26). US-born was not significant in this model, and white race/ethnicity was only marginally significant. In contrast, US-born and white, black, and Asian race/ethnicity were significant: white respondents walk more than others, while Asian and black respondents walk less, and respondents born in the US walk less than foreign-born respondents. These results thus suggest that race/ethnicity and place of birth have more of an effect on the use of non-motorized modes than they do on transit.

Table 26: Commute Mode Model* - Full Sample

	Term	Estimate	Std Error	ChiSquare	Prob>ChiSq	Odds Ratio
public transportation/ private vehicle	Intercept	-3.5539	3.5864	0.98	0.3217	.
	YTOUS_L[0]	-4.2436	3.5788	1.41	0.2357	0.0002
	race_W1[0]	-0.1364	0.0779	3.07	0.0799	0.7613
	race_B1[0]	0.0790	0.1068	0.55	0.4596	1.1712
	race_A1[0]	-0.0963	0.1400	0.47	0.4913	0.8248
	income_m	0.0000	0.0000	55.44	<.0001	0.3581
	veh per driver_to1	-3.4230	0.1156	877.08	<.0001	0.0326
	R_AGE	-0.0101	0.0027	14.46	0.0001	0.4780
	HHSIZE	-0.0609	0.0271	5.04	0.0247	0.4528
	MSACAT_1t[0]	-0.3483	0.0542	41.29	<.0001	0.4982
	MSACAT_2n[0]	0.1523	0.0582	6.84	0.0089	1.3562
	MSACAT_3[0]	0.1062	0.0467	5.16	0.0231	1.2366
walk/ private vehicle	Intercept	1.7927	0.1993	80.88	<.0001	6.0057
	YTOUS_L[0]	0.1800	0.0495	13.24	0.0003	1.4334
	race_W1[0]	0.2102	0.0587	12.81	0.0003	1.5227
	race_B1[0]	-0.2462	0.0685	12.93	0.0003	0.6112
	race_A1[0]	-0.2862	0.0782	13.39	0.0003	0.5641
	income_m	0.0000	0.0000	13.01	0.0003	1.5385
	veh per driver	-4.0302	0.1006	1605.3	0.0000	0.0178
	R_AGE	-0.0038	0.0025	2.35	0.1253	0.7564
	HHSIZE	-0.1676	0.0245	46.76	<.0001	0.1132
	MSACAT_1t[0]	-1.1465	0.0578	392.92	<.0001	0.1010
	MSACAT_2n[0]	-0.4384	0.0621	49.8	<.0001	0.4161
	MSACAT_3[0]	0.1124	0.0671	2.8	0.0940	1.2520

For log odds of (public transportation/ private vehicle), (walk/ private vehicle)

6.4 Miles Driven per Year for Full Sample

The final model examines the association of miles driven per year with race/ethnicity and immigration status, after accounting for socio-demographic variables and location variables (Table 27). The initial model was based on 54260 observations and had an adjusted R-square of 0.092. The final model, presented in Table 30, includes six variables and has a similar explanatory power with an adjusted R-square of 0.090.

The scaled estimates for the variables help to show the relative influence of each variable on miles driven per year. As expected, the number of vehicles per driver has the largest effect, but gender, age, and household income also have substantial effects. US-born respondents drive 339 miles more per year than foreign-born respondents, and recent immigrants drive 580 miles less per year than others. Thus, immigrants in general drive less but the influence is more significant for recent arrivals. Among race/ethnicity groups, black respondents drove 1700 fewer miles per year than others.

Table 27: Linear Model of Yearly Mile Driven

Term	Scaled Estimate*	Estimate	Std Error	t Ratio	Prob> t
Intercept	8954	1781.88	391.34	4.55	<.0001
YTOUS_L[0]	-338.77	-338.77	95.91	-3.53	0.0004
YTOUS_5[0]	580.42	580.42	274.54	2.11	0.0345
MSACAT_1t[0]	593.38	593.38	73.39	8.08	<.0001
MSACAT_2n[0]	223.00	223.00	64.67	3.45	0.0006
MSACAT_3[0]	346.25	346.25	56.19	6.16	<.0001
race_A1[0]	1710.88	1710.88	124.12	13.78	<.0001
income_m	1908.05	0.03	0.01	26.38	<.0001
R_AGE	-2514.90	-52.39	2.58	-20.27	<.0001
R_SEX[1]	2081.95	2081.95	42.15	49.39	0.0000
HHSIZE	533.71	82.11	35.41	2.32	0.0204
veh per driver_to1	5801.35	7735.14	245.71	31.48	<.0001

*Nominal factors expanded to all levels

*Continuous factors centered by mean, scaled by range/2

7. Conclusions

The analysis presented here shows that recent immigrants have different patterns of travel than people born in the US and than immigrants who have lived in the US for longer periods of time. Travel patterns also differ for immigrants by race/ethnicity and by place of birth. The descriptive analysis revealed significant differences in income level, household lifecycle stage, and age for immigrant groups living in the US for different periods of time and for different race/ethnicity groups. These socio-demographic variables may in part explain differences in travel behavior. However, multivariate analyses show that immigrant status, race/ethnicity, and place of birth are associated with certain aspects of travel behavior even after accounting for these socio-demographic factors.

Although the evidence for associations between travel behavior and immigrant status as well as both race/ethnicity and place of birth is strong, the evidence for a causal relationship is not. It is hard to come up with a plausible explanation for how or why race/ethnicity or immigrant status itself would influence travel behavior. Rather, these variables are likely associated with factors such as needs, limitations, preferences, attitudes, culture, and prior experiences that have some influence on travel behavior. Understanding the factors that explain the observed differences in travel behavior requires further research, and both qualitative and quantitative methods may be helpful. This understanding can help in modeling travel demand, finding policies best suited to meeting the travel needs of foreign born communities, and addressing environmental justice concerns.

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