Title
Stalled On The Road To Adulthood? Analyzing the Nature of Recent Travel Changes for Young Adults in America, 1995 to 2009

Author
Ralph, Kelcie Mechelle

Publication Date
2015

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA
Los Angeles

Stalled On The Road To Adulthood?
Analyzing the Nature of Recent Travel Changes for Young Adults in America, 1995 to 2009

A dissertation submitted in partial satisfaction
of the requirements for the degree
Doctor of Philosophy in Urban Planning

by

Kelcie Mechelle Ralph

2015

ABSTRACT OF DISSERTATION

Stalled on the road to adulthood?
Analyzing the Nature of Recent Travel Changes
for Young Adults in America, 1995 to 2009

By

Kelcie Mechelle Ralph
Doctor of Philosophy in Urban Planning
University of California, Los Angeles, 2015
Professor Brian D. Taylor, Chair

Young people in the 2000s traveled fewer miles, owned fewer vehicles, and were less likely to hold a driver's license than young people in the 1990s. Scholars, policymakers, and journalists proffered a host of possible explanations for this trend: attitudes and preferences about travel fundamentally changed due in part to the increased availability of communication technologies; economic conditions limited activities (including employment) and constrained travel options; young adults became less likely to attain adult roles like marriage and child-birth; young people lead a back-to-the-city movement where the utility of non-automobiles modes improved; and/or racial and ethnic minorities are less likely to drive and the population became more diverse. Whichever of these explanations is the principal cause, perhaps the American love affair with the car was over.

I assess the evidence for these hypotheses using data from the 1995, 2001, and 2009 national travel surveys in the United States. I identify four distinct traveler types using latent profile analysis of travel patterns over a single day and an extended period. These types—Drivers, Long-distance Trekkers, Multimodals, and Car-less—serve as the

dependent variable in the subsequent analysis, where I evaluate changes in the prevalence of each type over time for specific subgroups and use multinomial logistic regression to identify the independent relationship between traveler type and economic resources, adult roles, residential location, and race/ethnicity.

I find that economic constraints, role deferment, and racial/ethnic compositional changes in the population primarily explain the travel trends during this period. The evidence in support of preferences and residential location explanations was substantially more limited. The concluding chapter contextualizes these findings, arguing that a large and growing share of young adults suffer from transportation disadvantage. The most important take-away from this work is that the decline in driving by young people in the 2000's deserves our attention—not as an unmitigated success story, but as an early indication of a problem.

The dissertation of Kelcie Mechelle Ralph is approved.

Evelyn Blumenberg

Martin Wachs

Matthew Kahn

Brian D. Taylor, Committee Chair

University of California, Los Angeles

2015

Table of Contents

List of Figures

List of Tables

ACKNOWLEDGEMENTS

The Marshall Aid Commemoration Commission, the Environmental Protection Agency, the UCCONNECT Doctoral Dissertation Award, and the Federal Highways Administration provided generous financial support for this project.

The U.S. Department of Transportation commissioned the national travel surveys analyzed here. I am grateful that the surveys exist and I look forward to a lifetime of analyzing future installments of the data.

I am indebted to Evelyn Blumenberg, Martin Wachs, Mathew Kahn, and particularly Brian D. Taylor for their insightful feedback along the way. I am also grateful to Lois Takahashi and Paavo Monkkonen who provided feedback on early versions of this work.

My doctoral experience would not have been possible without the early support and guidance from the University of Alaska, Anchorage's Honors College and Office of Undergraduate Research. Thank you for giving me my start as a researcher and hooking me to a lifetime of inquiry.

Most of all I am grateful for the support of my family: my sister, whose love of cities and public transit inspires me; my parents who patiently tolerated (and even encouraged) my precociousness and inquisitive streak; and finally, Christopher Monahan who serves as an invaluable sounding board for my crazy ideas and ardent supporter of my not-so-crazy ones.

VITA

EDUCATION

2009 **B.A.** Economics
University of Alaska, Anchorage
Graduated *Summa cum laude* (4.0/4.0) with Leadership Honors

2010 **MSc** City Design and Social Science
London School of Economics
Graduated with Merit

2011 **MPhil** Environmental Policy
University of Cambridge
Graduated with Special Commendation

AWARDS

2011-2014 **Environmental Protection Agency Marshall Scholar**
Three-year fellowship for completing a doctoral degree in an environmental field in the United States or the United Kingdom. One scholar is selected from each Marshall class.
(Value: $113,000)

2009-2011 **Marshall Scholar**
Two year fellowship for graduate study in the United Kingdom.
(Value: $90,000)

2005 **National Merit Scholar**
Academic scholarship based on performance on the Preliminary SAT (PSAT), academic performance, leadership experience, and extracurricular activity participation.
(Value: $2,500)

PUBLICATIONS

Reports

2014 Smart, Michael, Kelcie Ralph, Brian D. Taylor, Carole Turley, and Anne E. Brown. *Honey, can you pick-up groceries on your way home? Analyzing Activities and Travel in Non-Traditional Households.* Los Angeles, CA: University of California Transportation Center.

2012 Blumenberg, Evelyn, Brian Taylor, Michael Smart, Kelcie Ralph, Madeline Wander, and Stephen Brumbaugh. *What's Youth Got To Do With It? Exploring the Travel Behavior of Teens and Young Adults*. Los Angeles, CA: University of California Transportation Center.

2009 Ralph, Kelcie and Marcus Welker. *Municipality of Anchorage Baseline Greenhouse Gas Emissions Inventory.* Anchorage, Alaska: Municipality of Anchorage.

2008 Szymoniak, Nick, Kelcie Ralph, and Steve Colt. *University of Alaska, Anchorage Inventory: Greenhouse Gas Emissions from Transportation*. Anchorage, Alaska: Institute of Social and Economic Research.

2008 Ralph, Kelcie. *A Benefit Study of the Anchorage Public Library*. Anchorage, Alaska: Institute of Social and Economic Research.

CONFERENCE ACTIVITY

Conference Activity: Refereed Papers

2014 Taylor, Brian, Kelcie Ralph (presenter), and Michael Smart. "What explains the gender gap in schlepping? Testing various explanations for gender differences in household-serving travel," presentation at the *93rd Annual Meeting of the Transportation Research Board*, Washington, DC, January.

2014 Ralph, Kelcie (presenter), "Who will drive me to soccer practice? What declining auto use rates mean for teens," poster presented at the *93rd Annual Meeting of the Transportation Research Board*, Washington, DC, January.

2013 Taylor, Brian, Kelcie Ralph (presenter), Evelyn Blumenberg, and Michael Smart "Who Knows About Kids These Days? Analyzing the Determinants of Youth and Adult Mobility Between 1990 and 2009," presentation at the *92nd Annual Meeting of the Transportation Research Board*, Washington, DC, January.

Conference Activity: Refereed Abstracts

2014 Ralph, Kelcie (presenter), "Stalled on the road to adulthood? The link between recent changes in travel and the gloomy life prospects of young adults," at the *Annual Meeting of the Association of Collegiate Schools of Planning*, Philadelphia, Pennsylvania, November.

2014 Taylor, Brian D., Evelen Blumenberg, Kelcie Ralph, Anne Brown, Michael Smart, and Carole Turley (presenter). "Who knows about kids these days? Analyzing the location choices and travel behaviors of teens and young adults in the U.S.," at the *Annual Meeting of the Association of Collegiate Schools of Planning*, Philadelphia, Pennsylvania, November.

2014 "Who will drive me to soccer practice? What declining auto use rates mean for teens," poster presentation at the *University of California Transportation Center Student Research Conference*, Pomona, California, April.

2014 Taylor, Brian D., Kelcie Ralph (presenter), and Michael Smart. "What explains the gender gap in schlepping? Testing various explanations for gender differences in household-serving travel," at the *University of California Transportation Center Student Research Conference*, Pomona, California, April.

2013 Ralph, Kelcie (presenter), Evelyn Blumenberg, Brian D. Taylor, and Michael Smart. "A License to Walk, Bike, and Ride Transit? Examining The Effects of Drivers Licensing Requirements on Teen and Young Adult Travel Behavior," at the *University of California Transportation Center Student Research Conference*, Los Angeles, California, March.

2012 Ralph, Kelcie (presenter), Evelyn Blumenberg, Brian D. Taylor, and Michael Smart. "A License to walk, bike, and ride transit? Examining the effects of drivers licensing requirements on teen and young adult travel behavior," at the *Annual Meeting of the Association of Collegiate Schools of Planning*, Cincinnati, Ohio, November.

2012 "Who Uses Public Bicycle Systems? Evidence From the London Cycle Hire Scheme," at the *University of California Transportation Center Student Research Conference*, Davis, California, April.

CHAPTER 1: INTRODUCTION

For decades per-capita miles of travel increased steadily in the United States, but in 2004 miles driven stagnated and then declined. Scholars were puzzled. Sure, vehicle travel had declined in previous recessions, but the dip in mileage began before the crash and persisted years after the Great Recession officially ended (Baxandall 2013).

Young people appeared to be leading the trend. Average mobility (miles by any mode) fell 17 percent (7.2 miles) between 1995 and 2009 for young people age 16 to 36. Moreover, young people owned fewer cars and waited longer to get their driver's licenses than they had in prior decades (Sivak and Schoettle 2012).

These trends set off a flurry of speculation. Perhaps, some suggested, American's love affair with the car was over and a new era of walking, biking, and transit use was underway (Dutzik and Baxandall 2013). Others wondered if the Internet reduced the need for trips (Sivak and Schoettle 2011). Still others pointed to economic hardships from the dot-com bust, the housing crisis, and the Great Recession. What did the evidence say?

To find out, I joined a research team at the University of California, Los Angeles in 2011 to investigate the issue (Blumenberg, Taylor et al. 2012). We used data from the U.S. national travel surveys in 1990, 2001, and 2009 to compare the travel patterns of teens (ages 15 to 18) and young adults (ages 19 to 26) to those of adults (ages 27 to 61). We found that the factors that explain travel behavior for adults—employment status, household income, vehicle access, and population density—had similar effects on young adults and teens. Moreover there was no evidence that using the Internet decreased travel (trips or miles of travel) for respondents of any age. Ultimately, we concluded that macro-economic factors were the root cause of the decline in driving.

Yet that research left many unanswered questions. In particular, the travel variables we analyzed (number of trips, miles of travel, and travel mode) revealed little about whether the individuals who were driving less were in turn using transit or walking more. Moreover, by focusing on a single survey day, this research could not inform nascent discussions about multimodality—using a variety of modes over the course of the week (Kuhnimhof, Buehler et al. 2012, Buehler and Hamre 2014).

This work builds on my colleagues' and my previous research and on a host of other studies of youth travel in the United States and abroad. This work is innovative in that it analyzes a multifaceted measure of travel, one that includes mobility, but also incorporates accessibility and mode choice, while also accounting for day-to-day variation in travel. Developing and describing this multifaceted measure of travel is the focus of Part I. In Part II I use the traveler types as a dependent variable to assess the validity of several hypotheses regarding the potential causes of the decline in vehicle travel.

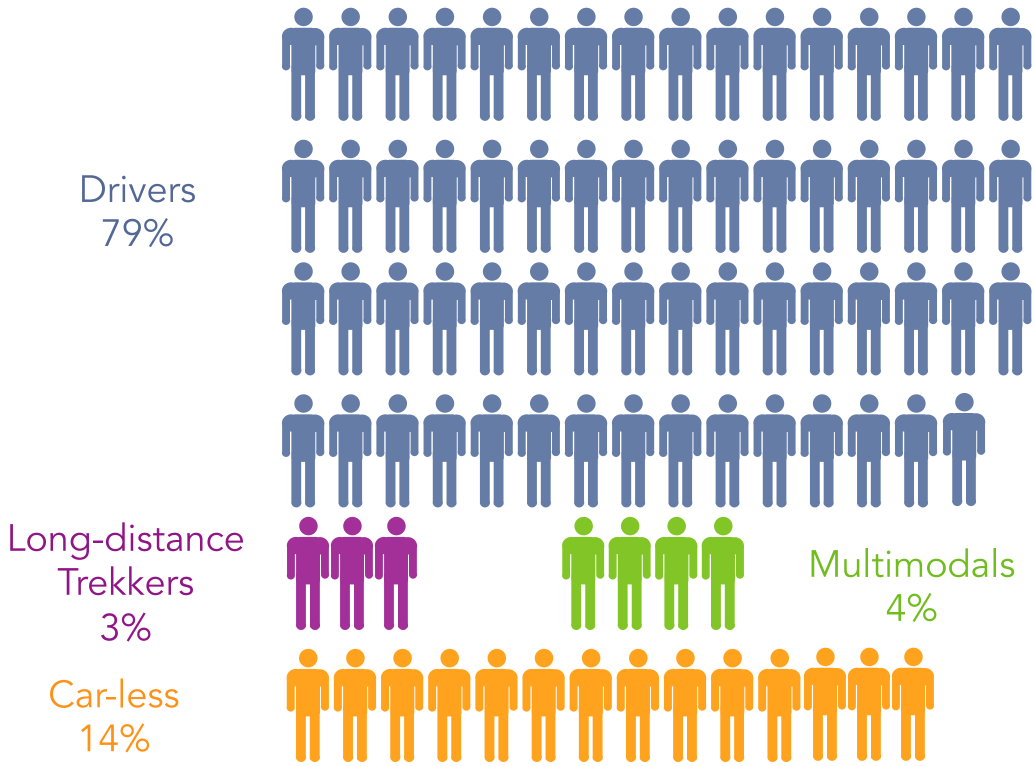
The data for Parts I and II come from the United States national travel surveys in 1995, 2001, and 2009.The analysis focuses on young adults ages 16 to 36 because this age range experienced the most dramatic changes in travel over time and were the most susceptible to the recession.

WHAT DID I FIND?

Part I: The four traveler types

Using latent profile analysis of seven travel variables I identify four traveler types: Drivers, Long-distance Trekkers, Multimodals, and Car-less (see Figure 1). Within each type young people share similar travel patterns.

Figure 1 Traveler types of young adults in the United States in 2009 (Age 16 to 36)



Note: Population estimates based on the weighted values from the NHTS. Source: 2009 NHTS, weighted values.

The vast majority of young people travel almost exclusively by automobile (as Drivers or Trekkers) in all of the time periods studied. The primary difference between these two auto-centric types is that Trekkers drove 50,000 miles a year on average, compared to just 9,000 miles for Drivers.

The next type, the Multimodals, personify many transportation planners' ideal traveler. Multimodals used a mix of modes (half of their trips were in an automobile) and traveled fewer miles each day than Drivers (or Trekkers), but enjoyed greater access to opportunities (i.e. made more trips) than any other traveler type.

Young people in the last type (the Car-less) had very limited mobility; they traveled just two miles a day on average. Limited mobility is not, in itself, a problem if it is paired with adequate access, yet the typical Car-less young person also made staggeringly few trips each day—just two on average—the lowest by far of any traveler type. Worse still, most Car-less young people lived in areas with few transit options and, without a car, they almost certainly suffered from transportation-related social exclusion.

Change over time

The Drivers and Trekkers became less common between 1995 and 2009, while Multimodals and Car-less became more prevalent. In addition, young people in each traveler type also traveled fewer miles (by any mode) and made fewer trips in the later period.

Part II: Explaining the changes

What explains these changes? To answer that question I developed a conceptual framework that explains traveler type as a function of economic Resources, adult Roles, Residential location, and Race/ethnicity (the four R's). This conceptual framework allows me to test a number of hypotheses about the cause of the decline in driving.

Specifically, does the decline in driving reflect:

- A fundamental shift in attitudes and preferences? (Ch. 5: Resources)
- Financial constraints? (Ch. 5: Resources)
- The delayed onset of adult roles? (Ch. 6: Roles)
- A back-to-the-city movement? (Ch. 7: Residential location)
- Increased availability and relative utility of alternative modes in metropolitan areas?
- Increased racial and ethnic diversity of young Americans? (Ch. 8: Race/ethnicity)

Two analytical approaches allow me to test these hypotheses. First, I analyze the change in the prevalence of each traveler type over time for distinct subgroups (i.e. employed or Hispanic). Second, I estimate a series of multivariate regression models with traveler type as the dependent variable. The analytical chapters in Part II correspond to each of the R's in the conceptual model.

In Chapter 5 (Resources) I assess the relative contribution of preferences and economic constraints. In other words, did young people change their travel patterns because they prefer walking, biking, and riding transit, or would young people prefer to drive but cannot afford a car due to a decade of stagnating incomes and widespread unemployment? I find support for both views, but the preponderance of evidence aligns with the view that economic factors were the root cause of the decline in driving. For instance, nearly all of the growth in Car-less-ness occurred among people with low incomes and limited educational attainment, while people with extensive resources, by contrast, did not become more likely to be Car-less over time. Moreover, the independent relationship between resources and traveler type strengthened over time—widening the gap between the haves and the have-nots.

Chapter 6 (Roles) connects the sociological literature on young adulthood with the literature on travel. Young people in the 2000s took longer to attain traditional adult roles (living independently, getting married, and having children) due in part to poor economic conditions (Settersten, Furstenberg et al. 2006). Does the delay in roles contribute to the decline in driving? I find that when young people take on adult roles (and their associated responsibilities) they are more likely to be Drivers or Trekkers and less likely to be Multimodals or Car-less. The deferment of adult roles contributed roughly 30 percent to the aggregate change in the prevalence of these types.

Consistent with previous literature, Chapter 7 (Residential location) establishes a close link between population density and traveler type (particularly for Drivers and Car-less). I find little evidence, however, that a back-to-the-city movement or improvements in the relative utility of non-automobile modes contributed to the decline in vehicle travel. Rather, over time, young people became much more likely to be Car-less outside of metropolitan areas and at low densities where transit service is limited and destinations are far apart. In fact, in 2009, very few Car-less young people lived at high densities in neighborhoods where young people can live a full, engaged life with little or no automobile access. As I discuss in Chapter 9, Car-less young people outside of the densest areas almost certainly suffer from transportation disadvantage and social exclusion (Lyons 2003).

Finally, Chapter 8 (Race/ethnicity) explores the relationship between race/ethnicity and travel—a topic that is more important than ever before because young adults are the most diverse generation in American history (Pew Research Center 2014). There are stark racial and ethnic differences in traveler type; white young adults are much less likely to be Drivers than minority youth (9% v. 24%). The Black-white gap in traveler types persisted when controlling for other factors (but not for Hispanic or Asian young adults), but it declined in size over time. I estimate that changes in the racial composition of the population accounted for roughly 20 percent of the total decline in Drivers and increase in Car-less young adults.

Part III: Making sense of the findings

Individuals with severe transportation constraints are said to suffer from transportation disadvantage because they may find it difficult or impossible to access employment opportunities, reach affordable shopping areas, or to socialize with friends and family. In this way transportation disadvantage can lead to social exclusion. In Part III of this dissertation I contextualize the findings from Parts I and II within the literature on transportation disadvantage and social exclusion. The chapter concludes with suggestions for policymakers and calls for explicit consideration of Car-less young people and others suffering from transportation disadvantage when developing, implementing, and evaluating transportation policy.

PART I: THE TRAVELER TYPES

CHAPTER 2: IDENTIFYING TRAVELER TYPES

WHO COUNTS AS A YOUNG ADULT?

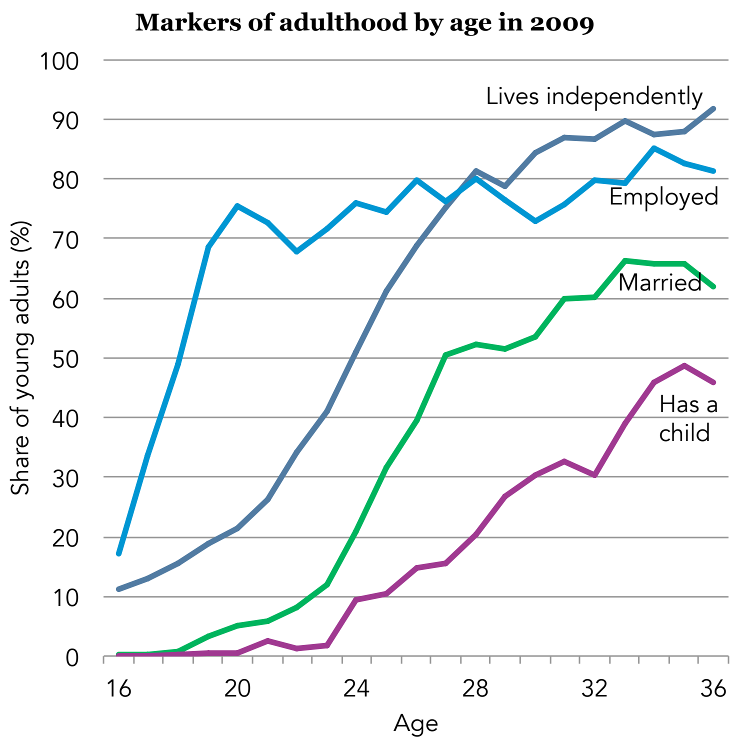
There is no shared definition of a "young adult" and many authors utilize slightly different age groups depending on data availability and the specific research question at hand. There are two distinct approaches to identifying an age range for young adults: one focuses on the transitional nature of the life course and the other identifies distinct, generational cohorts based on year of birth. I describe the two approaches below and introduce my method of delineating young adulthood.

A transitional period

Psychologists conceptualize the life course as a series of culturally constructed phases. At one point there were just two phases: childhood and adulthood, with little to no transition between them (Arnett 2004). This framework matched the reality on the ground; there was little transition between children and adults. People began working and started a family of their own at a young age. Over time, however, as nations industrialized and young people no longer needed to work in factories, a new period—adolescence—arrived. Adolescence is thought to extend from the early teens to age 18, when young people undergo the physical and psychological changes of puberty, attend middle or high school, and typically live with their parents.

With time, the transitional period of adolescence was inadequate to characterize the life course. By the middle of the 20th century scholars like Erik Erikson began to take note of a cases of "prolonged adolescence," where the process of forming an identity continued beyond the age of 18 (Arnett 2004). Over time, more and more young people in the United States exhibited these characteristics. Sociologists track when the typical young person assumes adult roles, such as moving out of the parental home, getting married, or having a child. At the turn of the century sociologists noticed that young people were taking longer than before to attain these so-called markers of adulthood (Shanahan 2000, Settersten, Furstenberg et al. 2006, Cohn, Passel et al. 2011). For example, many young people are not married and do not have children until their early thirties (Cohn, Passel et al. 2011). Figure 2 depicts the share of young people that have attained several of the markers of adulthood in 2009.

Figure 2 Markers of adulthood by age in 2009 (Age 16 to 36)



Note: Markers of adulthood by age in 2009. Source: 2009 National household travel survey

Arnett (2004) argues that this transitional period is actually a unique life stage, which he refers to as "emerging adulthood." Like adolescents, emerging adults continue to develop their identities and explore new possibilities. However, this period is distinct from adolescence, Arnett argues, because adolescents are undergoing puberty, while emerging adults are physically and sexually mature. Moreover, while most adolescents have little independence and live broadly similar lives (they attend school and live with their parents), emerging adults use their independence to pursue a wide range of life circumstances. Arnett argues further that emerging adults cannot be described as young *adults*, because, "this tem implies than an early stage of adulthood has been reached, whereas most young people in their twenties have not made the transitions historically associated with adult status—especially marriage and parenthood—and many of them feel they have not yet reached adulthood" (Arnett 2004).

The age ranges of this transitional period are contested. Arnett's emerging adulthood, lasts from age 18 to the late twenties (Arnett 2004), while the MacArthur Research Network on Transitions to Adulthood focuses on a longer period, from age 18 to 34 (Settersten, Furstenberg et al. 2006).

A generational approach: Millennials

An alternative approach for identifying young people is to classify them by their generational cohort, the Millennials. Americans fall into one of many generations defined by their year of birth (see Table 1) and Millennials include all young people born after 1980 (Pew Research Center 2014).[1]

[1] The very youngest members of this group will actually be a new generation, but the cut-off date for the youngest members of the Millennials has not been established yet.

Table 1 Defining generations

	Birth years	Ages in 2014	Key characteristics and events
Millennials	After 1980	33 and younger	Digital natives, 9-11 terrorist attacks
Generation X	1965 to 1980	34 to 49	The In-between Generation, end of the cold war, development of the Internet
Baby Boomers	1946 to 1964	50 to 68	Vietnam war, Woodstock, environmental movement
Silent Generation	1 to1945	69 to 86	Civil rights movement

Source: Pew Research Center (2014) *Millennials in Adulthood*.

Each generation comes with a host of stereotypes and the Millennials are no different. They have been referred to as among other things, "The Cheapest Generation" (Thompson and Weissmann 2012) and "Generation Me Me Me" (Stein 2013).

As I describe in more detail in Chapter 3, I use data from the national travel surveys in 1995, 2001, and 2009. The dataset only includes complete information for people age 16 and over, and as a result, it is nearly impossible to explore changes in travel behavior for Millennials. If I were to use the national surveys to analyze Millennials I would only have data for people between 16 and 29 in 2009 and between 16 and 21 in 2001. I would have no data whatsoever for the travel patterns of Millennials in 1995 because the oldest Millennials were just 15 years old in that year.

My definition
I chose to analyze young people ages 16 to 36. I split the 20-year time frame into three shorter periods: the teen years (ages 16 to 19), the college age years (20 to 25), and young adulthood (26 to 36).

These age groups roughly parallel the periods of adolescence, emerging adulthood, and adulthood. In this way my approach for identifying age ranges is more of a "transitional period" approach than a "generational" approach. As I explain in more detail below, I believe that adult roles—and their associated responsibilities—shape travel behavior. As such, I wanted my age ranges to incorporate the full transitional period from adolescence to adulthood.

WHY FOCUS ON YOUNG PEOPLE?
Why not analyze the travel patterns of adults of all ages? First, as I describe in the next section, young people experienced the most dramatic changes in travel during the past 15 years. For instance, while adults of all ages drove fewer miles in 2012 than in 2004, the magnitude of the decline was greatest for young people (Davis and Dutzik 2012). At the same time, young people suffered disproportionately during the Great Recession of the late 2000s and they adapted to the economic climate by living with their parents, delaying marriage, and waiting to start a family (Carnevale, Hanson et al. 2013). To the extent that taking on adult roles and responsibilities shapes travel, the evolution of family structure may help explain the changes in travel. In addition there is suggestive (yet inconclusive) evidence that travel patterns as a child or young adult may shape later travel patterns through socialization (Baslington 2008, Haustein, Klöckner et al. 2009). If

this is the case and young people are indeed driving less because the have developed new preferences, we may expect the era of limited car use to continue.

Given the multiple reasons to focus on young people, many authors have begun to explore the travel of young people, often with an eye toward what to expect in the future (Mans, Interrante et al. 2012).

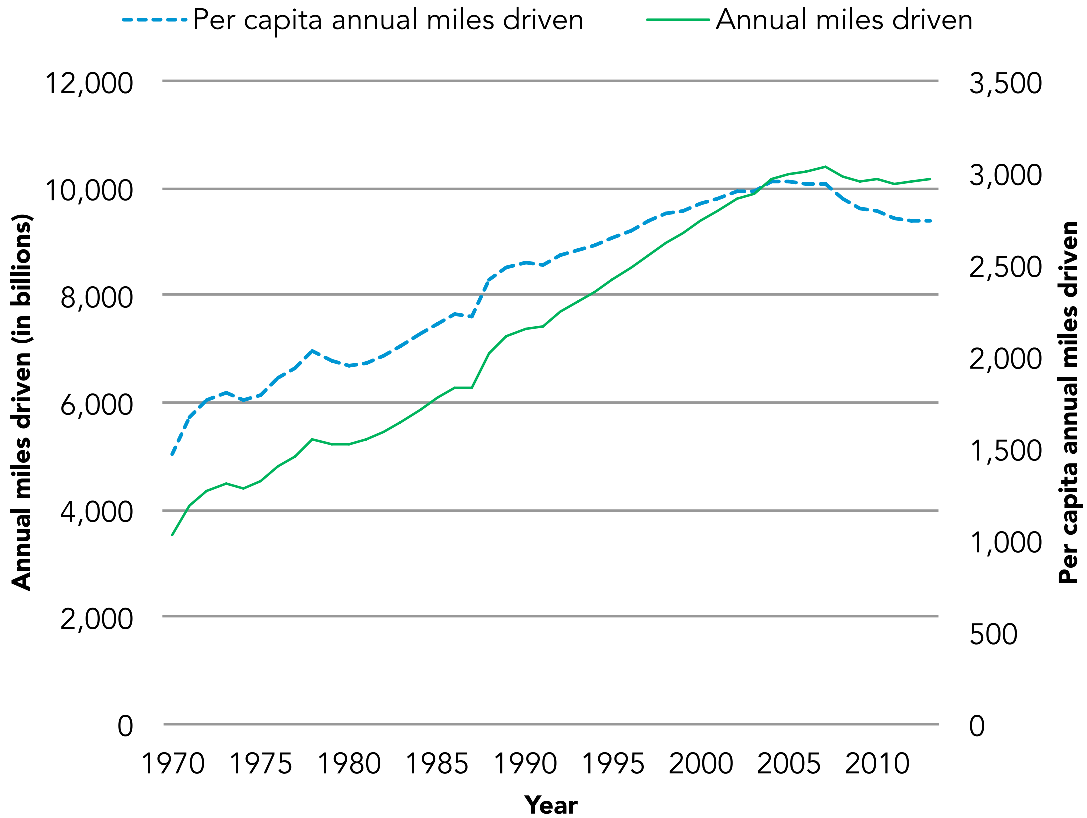
YOUNG PEOPLES' TRAVEL IS CHANGING

In this section I review the literature on evolving travel patterns in the United States and abroad. The evidence suggests that during the 2000s young adults drove fewer miles, were less likely to be licensed drivers, and owned fewer cars than in the 1990s. There is less clarity about whether or not young people began walking, biking, and using transit more frequently during this period. Most importantly, there is surprising little information about the trip making and activity participation of young adults during this period.

Driving fewer miles

For decades on end the average American drove more miles each year than the year before, with few exceptions. Vehicle miles of travel (VMT) per person peaked in 2004 and over the next few years a surprising thing happened—people in the United States drove fewer miles on average. Specifically, miles traveled per person fell 7.4 percent (or roughly 700 miles) between 2004 and 2012 (Dutzik and Baxandall 2013). Young people appeared to be "driving" the decline. Average miles driven fell the most—23 percent—for people ages 18 to 34 (Dutzik and Baxandall 2013).

Figure 3 Vehicle miles of travel in the United States by year



Source: Vehicle miles of travel data is from the Federal Highway Administration's Office of Highway Policy Information (http://www.fhwa.dot.gov/policyinformation/travel_monitoring/historicvmt.cfm)
U.S. population data is from the U.S. Census accessed via http://www.multpl.com/united-states-population/table

Getting licensed later

In addition to driving fewer miles, national data showed that young people were delaying an important travel milestone: obtaining a driver's license. Licensing statistics intensified interest in youth's travel patterns. Using data from the Federal Highway Administration (FHWA), Sivak and Schoettle (2012) found that the share of young people with a driver's license at each age was lower in 2010 than in 1983. Some scholars contend that the FHWA licensing data contains serious flaws, which prompted Tefft, Williams et al. (2013) to use different data (a series of surveys of high school seniors) to assess trends in licensing. They also found widespread delay in licensing: just four in ten young people acquired a license within a year of the minimum age in their state. Further evidence of the delay in licensing came from a different survey of high school seniors, which Shults and Williams (2013) used and found that 85 percent of seniors were licensed to drive in 1996, but only 73 percent were in 2010.

During this period policymakers in every state in the country implemented what is known as graduated driver's licensing (GDL) (Waller 2003). The aim of GDL programs is to improve safety by requiring a period where young people can only drive under the supervision of an adult. The initial period with a learner's permit is followed by an intermediate period with restrictions that generally prohibit driving with passengers and/or driving at night. Finally, after successfully completing the intermediate period, young people gain a full license. By design these programs generally delay the legal age at which young people can become licensed. Yet in analyzing the behaviors and attitudes of 18 to 20-year-olds, Tefft, Williams et al. (2013) conclude there is "little evidence that GLD was itself a major reason or motivator for delaying licensure." Not only did the respondents not point to GDL regulations as their primary reason for delaying licensure, there was no evidence that licensing rates spiked at age 18 when GDL regulations no longer applied.

Do young people plan on getting a license eventually? Most do. In a survey of young people (ages 18 to 39) without a license, the majority (64 percent) of 18 and 19 year olds planned to get a license in the coming year (Schoettle and Sivak 2013); nearly half (47%) of 20 to 29-year-olds expressed similar intentions. However, young people without licenses in their 30s were less likely to say that they planned to get a license. Only 18 percent said they would in the next year and 35 percent report that they never plan to get a driver's license.

Owning fewer cars

Not only did young people during this period drive fewer miles and delay getting a driver's license, they also owned fewer cars (Fry 2013). While 73 percent of young households (headed by someone age 25 or younger) in the United States owned a car in 2007, by 2011, that figure had fallen to 66 percent. Another, indirect measure of car ownership is the proportion of young households who have taken on debt to pay for an automobile. In 2007, 44 percent of young households had vehicle debt. By 2011 that figure declined to 32 percent (Fry 2013).

Embracing other modes?

While car manufacturers fret over the decline in driving (Weissmann 2012, Ross 2014), the trend is music to the ears of transit operators and advocates for walking and biking. These groups hope that as young people drive less, they walk, bike, and ride public transit more often. The popular media championed this view with headlines like "Young people driving less, embrace other transportation" (Copeland 2013) and "The End of Car Culture" (Rosenthal 2013).

It turns out, however, that there was very little evidence of an increase in walking, biking, and using public transit. The most frequently cited evidence of increased use of public transit is the American Public Transit Association (APTA) Ridership Report. According to the APTA, Americans made a record number of transit trips in 2013 (American Public Transportation Association 2014). But as King, Manville et al. (2014) noted in a recent Washington Post op-ed piece, such aggregate statistics are misleading. The population of the United States increased by roughly five percent between 2008 and 2013 and the growth in transit trips in New York City was greater than for the nation as a whole, meaning that outside of NYC, overall transit ridership was down slightly.

Conversely, aggregate figures can also mask important differences by age. Perhaps young people are indeed embracing transit, but their ridership increases are being washed out by steady or declining transit use among older Americans. The Transit Center recently commissioned a nationwide survey of adults to better understand how transit attitudes vary by age, location, and other factors (Transit Center 2014). The authors find that young people under 30 were much more likely than older Americans to ride public transit at least once a week, while older Americans (those age 60 and over) were the least likely to ride transit. These findings are interesting, but they do not shed light on whether young people today are more likely than young people in the past to ride transit.

If the jury is still out on public transit use, what do we know about walking and biking? Unfortunately most of the research on walking and biking does not analyze young people separately. Nevertheless, aggregate data for adults of all ages suggest that walking and biking remains rare. According to an American Community Survey report less than three percent of journeys-to-work are by foot, and less than one percent by bike (McKenzie 2014). The share of Americans who walked to work declined consistently between 1980 and 2000, before leveling off in 2010. Meanwhile rates of biking to work increased by 60 percent between 2000 and 2010, but biking remained extremely rare relative to other modes of travel.

Making fewer trips?

If young people are driving less and they have not significantly increased walking, biking, and riding public transportation, are they simply traveling less by making fewer trips? With few exceptions, people travel to reach a destination in order to participate in some activity—work, school, shop, relax, etc.—while they are there. If young people are making fewer trips, are they participating in fewer activities outside the home?

DOES THE WORLD NEED ANOTHER YOUTH TRAVEL STUDY?

This work builds on the previous literature and addresses some of its most pressing shortcomings. This study fits into the natural evolution of research from aggregate studies that identify trends to disaggregate studies that expand upon and clarify earlier findings. Specifically, I address previous shortcomings by (1) using disaggregate data, (2) employing a multi-faceted measure of travel, (3) conceptualizing vehicle access as a expression of (not a predictor of) travel behavior, and (4) by including a wider share of young adults than has previously ben included in youth travel studies.

Four reasons for another youth travel study

Aggregate data may mask important trends

With few exceptions, most of the early research on the new travel trends of young adults relies on aggregate measures, typically at the nationwide or statewide level. These data clearly indicate that young people drove fewer miles on *average* in recent years but it does little to shed light on the diversity of experiences in the United States. As Goodwin and Van Dender (2013) note, "disaggregation is of great importance as aggregate outcomes are the net result of change in opposing directions, and not of one overriding common factor" (p. 246).

Specifically, aggregate data cannot answer questions about whose travel is changing or where it is changing. As a result, aggregate data are very poorly suited to answering the most pressing questions of all: why is travel changing and what can we expect in the future?

It is possible, for example, that low-income households own more cars today than in decades past and that despite overall declines in driving, the poor may be driving more than before. Evidence from France supports this view. Grimal, Collet et al. (2013) found that low-income households in France owned more vehicles over time, but that automobile ownership in high-income households had reached a saturation point and stabilized. Is the same pattern occurring in the United States? Aggregate data have little to say in that regard.

Previous studies have not captured the multi-faceted nature of travel

In addition to being aggregate in nature, most of the existing studies of young peoples' travel behavior focus on a single variable at a time: licensing (Schoettle and Sivak 2013), vehicle miles of travel (Baxandall 2013), personal miles of travel (Giuliano 2003), trips (Smart, Blumenberg et al. 2013), or mode choice (Bamberg, Ajzen et al. 2003). A limited number of studies consider multiple aspects of transportation in a single study. For example, Ewing and Cervero (2010), Bento, Cropper et al. (2005), Taylor, Ralph et al.

(2013) each analyze multiple dependent variables in turn, synthesizing the results in the discussion. This approach is uncommon and somewhat problematic, as the reader must simultaneously consider multiple model results.

Analyzing specific aspects of travel in isolation leaves many questions unanswered. For example, we know they are driving less, but have young adults maintained access to opportunities—like employment, schooling, socializing, and basic services—by embracing other modes? By focusing on a single facet of travel, most existing studies cannot answer these questions.

To overcome this problem, scholars in diverse fields of study have developed a variety of techniques to identify measures that consolidate multiple aspects of behavior (or some other variable) into a single value. One approach is to develop typologies, where members of each type are similar to one another, but are distinct from members of other types. Authors typically name the types with descriptive monikers that crystalize each types' essence. When Bartko and Eccles (2003) analyzed teen participation in after-school activities they identified six distinct activity profiles—like Highly Involved, Sports, and Uninvolved—using cluster analysis. This approach was far more effective than discussing each of the eleven original activities in isolation. Osgood, Ruth et al. (2005) employed a similar approach, combining information on education, employment, romantic relationships, and parenthood to identify six pathways to adulthood, including the descriptively titled Educated Singles, Slow Starters, and Parents Without Careers.

Typologies can, and do, inform transportation research and policy. For instance, bicycle advocates distinguish between non-cyclists who are "Interested but Concerned" and those who are "No way, no how"(Dill and McNeil 2013), thereby allowing advocates to target their promotional efforts more effectively.

In developing typologies, some travel behavior researchers incorporate rich information on attitudes and beliefs. Based on detailed attitudinal surveys in the United Kingdom, Anable's (2005) typology distinguished, for example, between Diehard Drivers and Malcontented Motorists. Both groups had similar travel patterns, but starkly different underlying preferences. Similarly, a Transit Center report used latent cluster analysis of "attitudes toward transit and urbanism" (p. 36) to identify seven transportation types, including Devoted Drivers, Metro Moms and Dads, and Cosmopolitan Youth (Transit Center 2014). Unfortunately, collecting attitudinal data is expensive, so studies that incorporate preferences are rare and tend to have small and geographically limited samples, limiting their generalizability.

Fortunately, typologies based exclusively on observed behaviors can also provide valuable insights. For example, Vij (2013) identified three modality styles based on number of trips, travel time, and mode used from a six-week travel survey along with information on transportation investments: automobile ownership and possession of a transit pass. Vij used the modality styles to improve travel demand models.

This is the first study that I know of that employs typologies or cluster analysis to specifically address the travel patterns of young people.

Vehicle access is also a reflection of travel

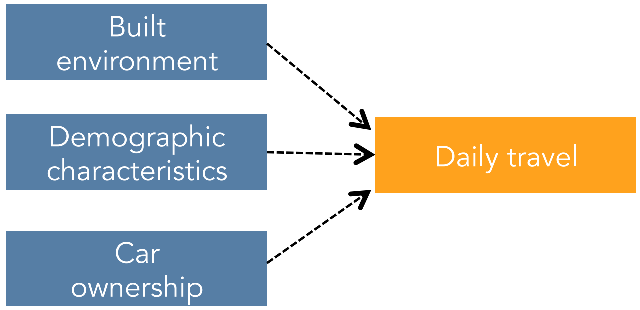
Figure 4 depicts three alternative conceptual frameworks for understanding daily travel, such as number of trips or travel mode. The first panel depicts the typical approach: a variety of factors, including automobile ownership (or access) explain daily travel (Blumenberg, Taylor et al. 2012, Buehler and Hamre 2014). In this approach the explanatory variables do not affect one another and causation flows in one direction.

This approach is problematic because the built environment and demographic characteristics influence car ownership (and vice-versa). Moreover, intermediate decisions—in this case car ownership—shape daily travel patterns (Ben-Akiva and Atherton 1977). To address these limitations, some scholars have used structural equation modeling—an advanced statistical approach—to treat car ownership as a mediating (or intermediate) variable (Bagley and Mokhtarian 2002, Van Acker and Witlox 2010).

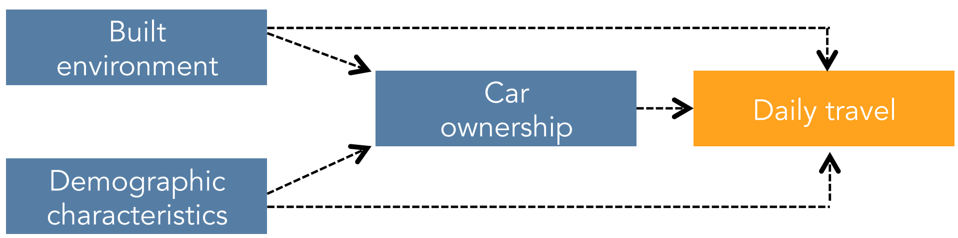
A third approach, employed here, is to incorporate car ownership (and other travel variables) into a single dependent variable, in this case using latent profile analysis. This approach treats long-term decisions—like purchasing a car or obtaining a driver's license—as meaningful expressions of travel behavior. A shortcoming relative to the structural equation approach is that one can no longer distinguish between the effects on car ownership distinct from the other travel variables. Moreover, I cannot estimate the relationship between car ownership and daily travel. Fortunately, a number of studies already address those specific questions (Bagley and Mokhtarian 2002, Van Acker and Witlox 2010, Smart, Blumenberg et al. 2013).

Figure 4 Comparing modeling approaches

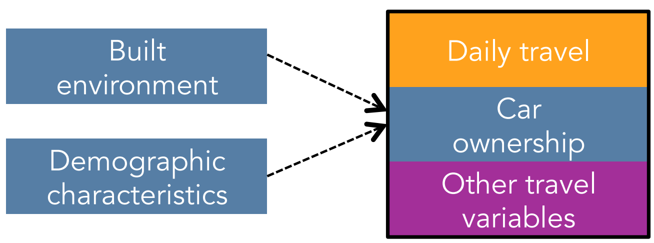
Typical modeling approach



Structural equation modeling approach



Typology approach



Note: Standard measures of daily travel include number of trips, miles of travel, travel mode, etc. The typical and structural equation modeling approaches were adapted from Van Acker and Wilox (2010).

Many studies only include metropolitan young adults

To my knowledge, there is only one disaggregate youth travel behavior study in the United States, but it focused on young people in metropolitan areas only (Blumenberg, Taylor et al. 2012). Yet, nearly one in five young adults in the United States lived outside a metropolitan region in 2009 (see Chapter 7 for more details). Moreover, there are few alternatives to driving outside of metropolitan areas and if young people there drive less, they may be cut off from society to a greater degree than their urban peers (Nutley 1996, Kamruzzaman and Hine 2011). What is more, economic conditions tend to be worse outside of metropolitan areas. Rural poverty rates are relatively high and the post-recession recovery was weaker outside of metropolitan areas (U.S. Department of Agriculture 2013). Due to economic constraints, many young people in those areas may find car ownership increasingly out of reach and with few alternatives. For these reasons, this study expands on earlier work by including young adults outside of metropolitan areas.

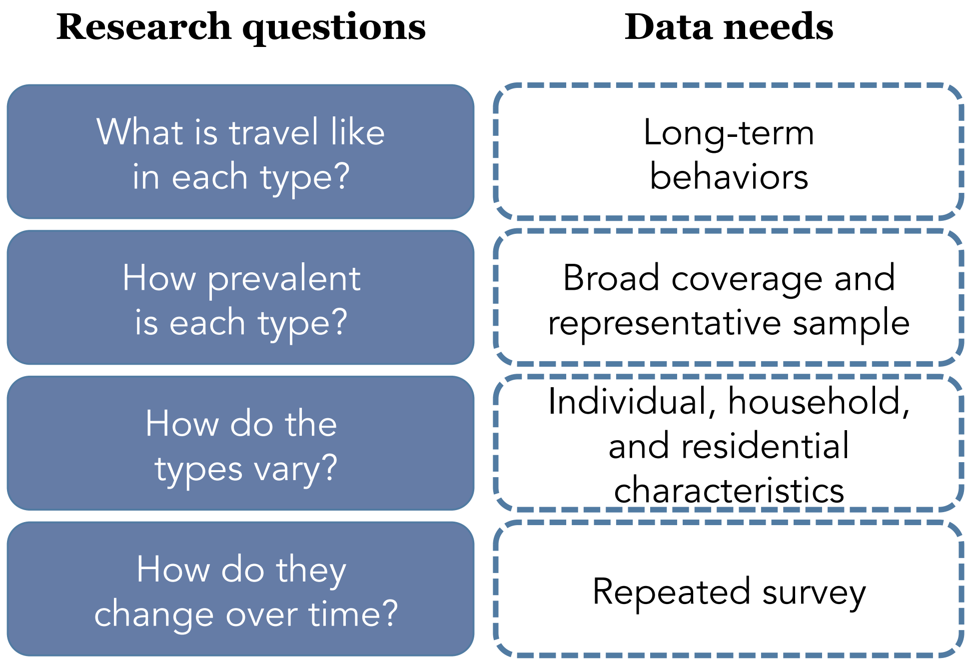
IDENTIFYING TRAVELER TYPES

Data

Identifying data needs and selecting data

Data for this analysis were selected after careful consideration of the research questions and the associated data needs. Figure 5 outlines the research questions and data needs for Parts I and II of this analysis. In the following sections I discuss each of these data needs in more detail, followed by a description of the national travel surveys used in this analysis.

Figure 5 Research questions and data needs



Needs: Long-term travel behavior

If one's aim were to estimate the number of walk trips in the United States, a travel survey from a single travel day would suffice. With a sufficiently large sample, data from the travel day would accurately reflect aggregate travel patterns, even if the survey day was atypical for some respondents.

For years, that was precisely what many travel behavior researchers did. Recently, however, scholars like Kuhnimhof, Buehler et al. (2012) and Buehler and Hamre (2014)have become interested in a slightly different aspect of travel: multimodality. These scholars want to know about the mix of modes over a week. A key motivation for this work is to identify means of encouraging drivers to make some of their trips by non-automobile modes (Buehler and Hamre 2014). Early findings from Germany are auspicious: young adults became more multimodal over time (Kuhnimhof, Buehler et al. 2012).

Surveys of a single travel day cannot adequately determine whether the growth in multimodality also applies to young adults in the United States because the data provide a single snapshot of behavior and reveal nothing about the day-to-day variations in travel that characterize multimodal lifestyles. For that reason, the data for this analysis needed to include information on travel over an extended period. There are two options for collecting information on long-term travel patterns: extended surveys and the recall method, each of which comes with limitations. In extended surveys respondents complete travel diaries for multiple days. Some, like the German MOBIDRIVE survey, extend for weeks at a time (Vij 2013). The longer the survey, the more difficult it is to recruit participants. Respondents are far more likely (1.6 times more) to agree to complete a 24-hour travel diary than a 48-hour diary Goldenberg (1998). Moreover, even when they agree to complete an extended diary, respondents show signs of survey fatigue; they report significantly fewer trips on the second day (Goldenberg 1998). This evidence, along with their expense, calls into question the validity of long-term travel diaries.

Alternatively, researchers may solicit long-term information by asking respondents about travel patterns in the recent past, often a week or month. This so-called recall method poses its own limitations as respondents may, for example, misremember how often they rode public transit last month. Despite these limitations, the recall method is often the most practical choice in travel surveys given budgetary constraints.

Needs: Representative sample with broad geographic coverage

A second key aim of this research is to determine the prevalence of each traveler type. To make this a meaningful measure, the survey sample should be representative of the target population rather than a convenience sample. Many metropolitan areas conduct periodic travel surveys that are representative and I considered identifying traveler types in one or more of those regions. However, metropolitan data are less generalizable and would (by definition) exclude rural young adults, a population group excluded from previous research on youth travel. My preference, therefore, was for national level data.

Needs: Personal characteristics

Early research on the decline in driving relied on aggregate data, often from state or national averages (Sivak and Schoettle 2011, Baxandall 2013, Garceau, Atkinson-Palombo et al. 2015). In their early efforts to identify the cause of the new travel patterns, authors correlated travel trends with aggregate economic variables like statewide unemployment (Baxandall 2013) or statewide Gross Domestic Product (GDP) (Garceau, Atkinson-Palombo et al. 2015). This initial research approach offers some insights, but is problematic in two fundamental ways.

First, GDP provides little information about the distribution of earnings, and as such, often provides misleading information about the well-being of low-income individuals (Stiglitz, Sen et al. 2009). As a result, many economists now caution against the widespread reliance on GDP as the primary (or often only) measure of economic conditions. Instead, some prominent economists now recommend using median income as a more appropriate measure of economic well-being (Stiglitz, Sen et al. 2009).

The second problem requires differentiating between averages and individual behavior. Consider a 2013 study by Baxandall (2013) who compared two statewide measures: average miles driven and the rate of unemployment, found no correlation between the two, and, based on this state-by-state analysis, concluded that "the recession does not appear to be the prime cause of the fall off in driving" (p. 2). How can one reconcile Baxandall's (2013) findings with other research that indicates a strong, positive link between employment and travel (Blumenberg, Taylor et al. 2012)? States do not travel, individuals do. Without analyzing the travel of employed and unemployed *individuals*, it is difficult to discern how unemployment—and by extension, the recession—affects travel. Perhaps employed adults drove more, offsetting declines among unemployed adults.[2] On net, it would appear that unemployment does not predict travel, but the true effects would be masked.

To address these two shortcomings, disaggregate data with individuals (or households), as the unit of analysis was needed. Moreover, data with detailed information about residential location and demographic characteristics of the individuals was preferable, as it would enable me to analyze how the traveler types varied across the population.

[2] This may occur if, for example, roads were less congested because unemployed people stayed home.

Needs: Data over time

The final research question created the most stringent data requirements. To evaluate changes over time, the data needed to be collected in a consistent manner over an extended period. Longitudinal studies, where the same individuals complete a survey in multiple periods, would have been ideal, but unfortunately no such data exist. A second-best solution is repeated cross-sectional data, where a survey is repeated periodically with new respondents, but broadly consistent questions.

The national travel surveys

Fortunately the United States national household travel surveys (NHTS) meet each of these requirements. The surveys are commissioned periodically by the Federal Highway Administration and the central feature is a detailed travel diary over a 24-hour period (U.S. Department of Transportation 2009).[3] Respondents record information about each trip they make, including the purpose of the trip as well as travel mode, duration and distance. For more information about the national travel survey, see Appendix A (p. 249).

Meeting the data needs

In addition to travel from a single day, the NHTS also includes questions about a limited number of longer-term travel behaviors, such as frequency of public transit use and annual miles driven. The NHTS sample includes respondents from all fifty states, enabling analysis of travel patterns in various settings (urban, suburban, and rural) and, as a result, the findings will be more generalizable than an otherwise similar study in a

[3] Surveys were conducted in 1969, 1977, 1983, 1990, 1995, 2001, and 2009. A 2015 survey was underway at the time of this work.

single metropolitan region or state. In addition, the NHTS provides sample weights to match the characteristics of the U.S. population in each survey year (U.S. Department of Transportation 2011). Respondents provided detailed personal information on household income, race, life-cycle characteristics, residential location, and other characteristics. Most importantly, the survey was conducted in a broadly consistent manner in 1995, 2001, and 2009.

The NHTS Sample

The size of the national sample varies, with larger samples in more recent years. In each period, the NHTS included thousands of young people in my age range of interest (16 to 36) (see Table 2). Moving from left to right in Table 2 depicts how the sample size shrinks as respondents are excluded for various reasons. Some were excluded because information was missing about one or more travel variables (particularly annual miles driven) or personal information such as household income or race. Others were excluded if they traveled over 400 miles or who flew in an airplane on the survey day.[4]

Table 2 Sample size

	Age 16-36	with complete travel info	and complete personal info	and traveled <400 miles	and did not fly
1995	28,268	25,174	21,052	20,885	20,135
2001	35,612	26,300	25,080	24,900	23,844
2009	43,541	32,076	30,615	30,427	28,980
Total	107,421	83,550	76,747	76,212	72,959

Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

[4] The focus of this analysis is on typical travel behavior and I explored numerous cutoff points for exclusion. Removing respondents who flew removes an additional 130 cases (51, 43, and 36 in 1995, 2001, and 2009 respectively).

Identifying groups in data

A key aim of this research is to identify distinct traveler types, where individuals in each group share similar travel characteristics. There are many ways to identify groups in data and a critical early step in the project was to select a grouping method.

The most straightforward approach is to manually categorize groups, using an established rule of thumb or by identifying cut-off points in the data (e.g. income quintiles). For example, Buehler and Hamre (2014), classified individuals as multimodals if they walked, biked, or used public transit at any point in the past week.[5]

A variety of more sophisticated statistical techniques are also available. For many years, cluster analysis (either hierarchical or k-means) was the standard statistical tool for identifying groups in data (Eshghi, Haughton et al. 2011). Cluster analysis identifies groups based on the distance between cases, resulting in homogenous and mutually exclusive categories (Schreiber and Pekarik 2014).

There are a number of shortcomings of cluster analysis. Most troublingly, there are few statistical guidelines for determining the appropriate number of clusters (Eshghi, Haughton et al. 2011). The clusters are sensitive to outliers and the same clustering structure cannot be applied to other data (Schreiber and Pekarik 2014). Finally, cluster analysis requires interval level data (k-means clustering) or dichotomous data (hierarchical clustering), and cannot incorporate count or categorical variables. This would pose a problem for identifying traveler types because many of the potential

[5] The authors tested a variety of cut-off points for multimodality; the description in the text is illustrative.

indicator variables are count or categorical (e.g. number of trips on the survey day or frequency of using transit: never/sometimes/once a week or more).

To address the shortcomings of cluster analysis, scholars developed a new approach for identifying groups known as latent class (LC) models. For years LC models required too much computing power to be widely used, but in the 2000s improvements in computing made it possible to employ the new approach more widely. LC models are known by various names in different fields: finite mixture models, Bayesian classification, latent class cluster analysis, latent profile analysis, and others (Magidson and Vermunt 2002, Lanza, Collins et al. 2007, Schreiber and Pekarik 2014). Like cluster analysis, LC models identify homogenous groups in data, but the approach to identifying those groups is different. As Eshghi, Haughton et al. (2011) explains, "[LC models are] a method for analyzing the relationships among manifest data when some variables are unobserved. The unobserved variables are categorical, allowing the original data set to be segmented into a number of exclusive and exhaustive subsets: the latent classes" (p. 274).

There are three key advantages of latent class models over traditional clustering models. First, selecting a model is less subjective than for cluster analysis because the modeler can compare the statistical fit of LC models (Schreiber and Pekarik 2014). Second, rather than assign each case to a group, the LC output produces membership probabilities (Schreiber and Pekarik 2014). This is useful for identifying cases that fit the group structure poorly. Another advantage centers on data. Third, relative to traditional clustering, LC models can work with a wider variety of data types and impose fewer restrictions on the scale and variance of the indicator variables (Magidson and Vermunt 2002). For these reasons, a LC model was used to identify the traveler types

The latent class analysis was conducted using MPlus (version 7.2) and the remainder of the analysis was conducted in Stata (version 13.1).

Which variables to include?

Careful consideration is needed when selecting indicator variables, because the nature of the classes (in this case traveler types) is entirely dependent on the variables used to identify them. Table 3 lists the seven indicator variables used here. Together, the indicators provide data on:

- short-term travel behavior (from the survey day) and medium and long-term information;
- the extent of automobility (Is the respondent legally able to drive? Does the respondent have access to an automobile in his home?)
- the use of alternative modes during the survey day (alt-mode use) and over a longer duration (public transit use in the past month)
- mobility measured over a single day and over the course of a year (annual miles driven);
- access to opportunities.

Measuring the travel variables

Table 3 provides information on the measurement of each travel variable. The following sections provide additional information about each variable.

Table 3 Measuring the travel indicator variables

Variable	Concept	Measurement
	From the survey day	
Mobility	Miles of travel on the survey day by any mode	Continuous, range: 0 to 399
Trips	Number of trips on the survey day	Continuous, range: 0 to 34
Alt-mode use	Share of total miles (PMT) by any non-automobile mode on the survey day.	Percent, range: 0 to 100
	Medium- and long-term travel	
Driver status	Driver status of the respondent	Dichotomous: yes/no
Annual miles driven	Self-reported number of miles driven, capped by NHTS at 200,000	Continuous, range: 0 to 200,000
Automobile access	Automobiles per adult in the household	Ratio, range: 0 to 1
Public transit use	Number of times used public transit in the past month(s).	Categorical: Never, sometimes, or weekly

Mobility

Mobility, is measured here as miles of travel on the survey day. Values for this variable ranged from zero to 4,000 miles. The focus of this analysis was typical travel; as a result, young people with very high mobility were excluded from the analysis. Several candidates for "very high mobility" were explored: 95th percentile (132 miles); 99th percentile (300 miles); 99.5th percentile (400 miles). I selected 400 miles as the cut-off point to maximize the survey size and avoid artificially reducing the size of the Long-distance Trekker group (which has very high mobility on the survey day).

Trips

The number of trips on the survey day serves as a proxy for a respondent's access to opportunities. An ideal measure of access would include the number of activities (employment, stores, or some other activity) that could be reached in a given time period by each travel mode. David Levinson and colleagues at the Accessibility Observatory have made great strides in making precisely that type of calculation. At this time, however, accessibility data are not available for the entire United States and trip making is the best available proxy for the ability to avail oneself of opportunities.

Alt-mode use

This variable ranges from zero (all travel was in an automobile) to 100 (all travel was by non-automobile modes). Respondent who did not make a trip on the survey day have a missing value for this variable, but are still included in the analysis.[6]

Driver status

Driver status for each household member is determined during the initial screening interview with the household head. The NHTS guidelines do not specify a definition of driver and household respondents may interpret the survey questions slightly differently ("Are you a driver?" and "Is [each other member] a driver?"). Throughout the text I refer to a respondents' driver's status as "licensed to drive" to avoid confusion with one of the traveler types (Driver).

---

[6] In earlier iterations of the work I coded the variable such that people who made no trips on the survey day had zero percent of their miles by automobile. As a result, some would-be Drivers were categorized as being Stuck-in-place (in the five-class solution). When I switched to coding the variable as missing and re-estimated the latent class model, 76 percent of the respondents who made no trips were subsequently re-categorized as Drivers and the remaining 24 percent remained Stuck-in-place.

Annual miles driven

The NHTS collects information on annual miles driven using the following question: “About how many miles did you personally drive during the past 12 months in **all** motorized vehicles?” (emphasis original). This variable (YEARMILE) is superior to the variables about each vehicle’s mileage; it includes miles driven even if the household does not own a vehicle.

There are two key shortcomings of using annual miles driven. First, it only accounts for miles *driven* by the respondent; it does not include miles traveled in a private vehicle as a passenger. A young person without a driver’s license would report zero miles driven annually even if she was driven everywhere by her parents. This variable tends to underestimate the true automobility of young adults, particularly those without licenses.

Second, there is widespread evidence that clients underreport their annual miles driven to insurance companies (McNeil 2006). The promise of lower premiums is strong motivation to underreport miles to insurance companies, but NHTS respondents do not share that motivation. Even without that motivation, however, people tend to underestimate travel distances. For example, teens tended to under-estimate how many miles they drove over two weeks by 20 to 30 percent (Leaf, Simons-Morton et al. 2008). To address these concerns about the validity of self-reports, the NHTS includes two follow-up questions to verify the estimate.[7] Note that these variables differ from data collected on miles traveled by each household vehicle.

Despite these shortcomings, the annual miles driven variable provides the only long-term indicator of personal mobility in the national travel surveys.

Automobile access

I also calculated the ratio of automobiles per driver and automobiles per person. The ratios are highly correlated, particularly between vehicles per adult and vehicles per driver (pairwise correlation coefficient of 0.869 with $p<0.001$). I report automobiles per adult rather than automobiles per driver. Some young people may delay becoming a driver if they know that an automobile would not be available to them because of financial or legal constraints. Using automobiles per driver would understate the scarcity of an automobile in those households.

Public transit use

Public transit use is based on the variable *ptused*. Coding for this variable changed slightly between survey years. In 1995 the survey asked "How often is public transit used" and respondents selected from one of six options: Two or more days/week, about once a week, once or twice a month, less than once a month, never, or not available. In 2001, the categories were consistent, but the question included a specific time frame: "How often is public transit used *in the past two months*?" In 2009, the time frame changed again (to one month) and the variable was continuous rather than categorical.

[7] Then the interviewer verifies that the number she has written is correct (VERYMIL). Finally, the interviewer asks for a range of miles (YEARMIL2).

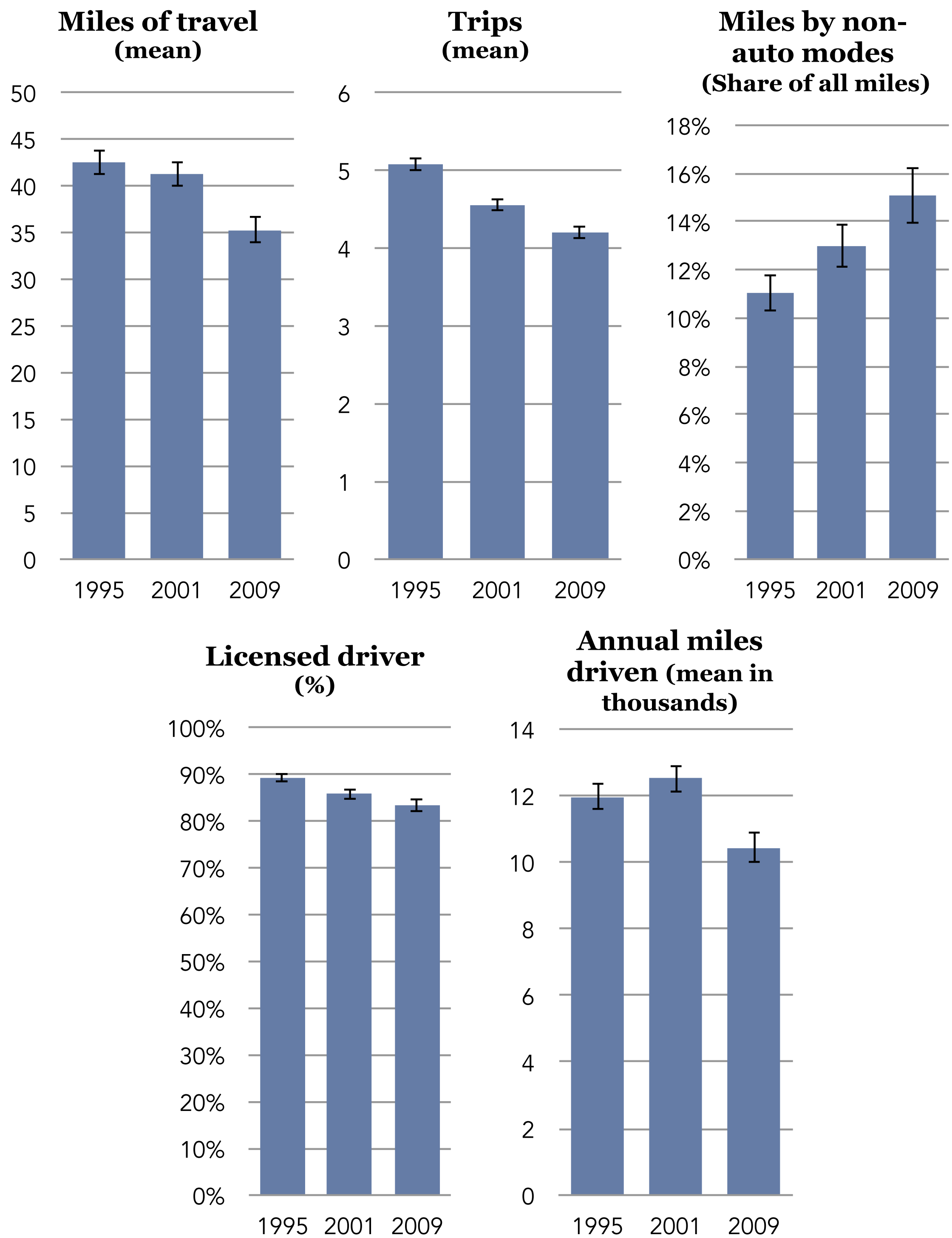
Many NHTS respondents were missing information for *ptused*; 32.1 percent of respondents' transit use was "not ascertained" and an additional 12.4 percent were coded as "appropriate skip". The pattern of missing information varied by geography. Fully 82 percent of respondents with missing information (from either type) lived at densities of 4,000 people per square mile or lower. These are places where public transit is likely unavailable, or if it is available, provides very limited service. If I dropped young people with missing transit data from the analysis, I would underestimate the number of young people with little to no transit service. For this reason, I recoded the transit data so that all respondents who were originally missing transit data (but who had a complete data for the other travel variables) are now coded as "never" using transit.

Travel variables by year

Figure 6 describes travel over a single survey day in 1995, 2001, and 2009. Over time, mobility and trip making declined and young people used non-automobile modes more frequently. Specifically, between 1995 and 2009 the average young person traveled a remarkable 7.2 [5.4, 9.0][8] fewer miles on the survey day (a 17 percent decline), while making 0.86 [0.76, 0.97] fewer trips (also a 17 percent decline). The share of miles by walking, biking, and riding transit increased by 4.0 [2.7, 5.4] percentage points during this period. These trends are similar to reports of increasing multimodality about young adults in Germany (Kuhnimhof, Buehler et al. 2012).

[8] Values in bracket reflect the 95% confidence interval

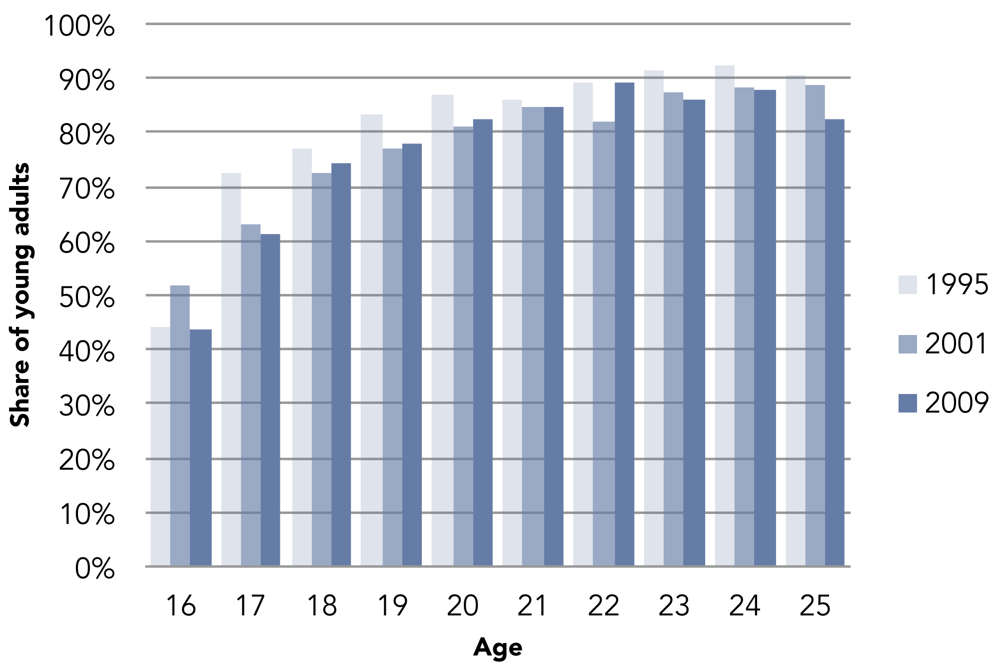
Figure 6 Travel variables by year



Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

The figure also shows that fewer young adults were licensed drivers over time. This aligns with an extensive literature documenting a decline in licensing in the United States (Sivak and Schoettle 2012, Tefft, Williams et al. 2013) and abroad (Noble 2005, Delbosc and Currie 2013). Of course, licensing varies by age. In fact, due to the introduction of stringent restrictions on licensing (Waller 2003, Williams and Shults 2010), some of the youngest members of the sample were not legally eligible to be drivers in the later survey periods. Figure 7 provides a more complete picture of licensing. Among the youngest respondents, a larger share of young adults was licensed to drive in 1995 than in 2001 or 2009. By contrast, licensing rates were similar between years among young people in their late twenties and thirties.

Figure 7 Driver's licensing by age and year in the United States (Age 16 to 36)

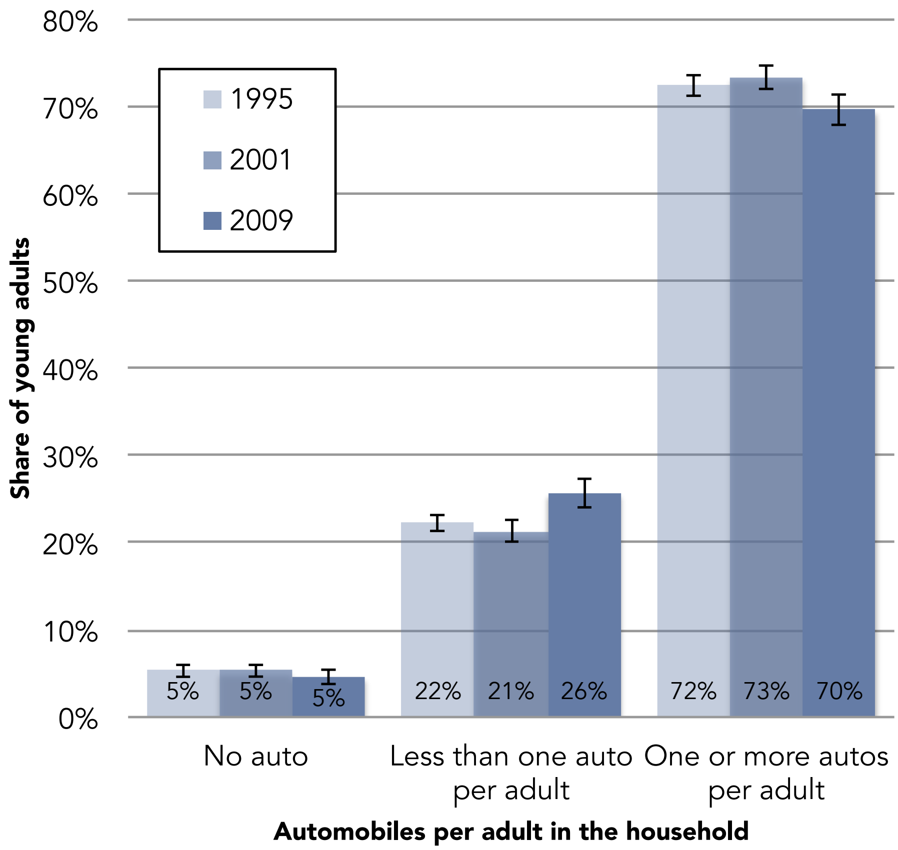


Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Annual miles driven increased between 1995 and 2001 and then declined by two thousand miles on average by 2009. This reflects a reduction in annual miles driven of 16 percent relative to the year 2001. This estimate of the decline in miles driving is slightly lower than the value reported by Dutzik and Baxandall (2013), who also used the national travel survey data and found that Millennials (age 18 to 34) drove 23 percent fewer miles in 2009 than in 2001.

Figure 8 presents information on automobile ownership for young adults. According to the NHTS, in any given year roughly five percent of young people lived in a household with no automobiles. Meanwhile, roughly seven in ten young people lived in a household with at least one automobile per adult. Another twenty percent of young people lived in a household between these extremes, in households where adults outnumber vehicles. In these cases a single adult may have sole use of an automobile or members of the household may share the vehicle. As Figure 8 shows, young people became more likely over time to live in homes where sharing a vehicle was necessary. This aligns with other work that suggests that young people responded to the Great Recession by shedding automobile debt and reducing the number of cars they own (Fry 2013).

Figure 8 Automobiles per adult in the household by year (Age 16 to 36)

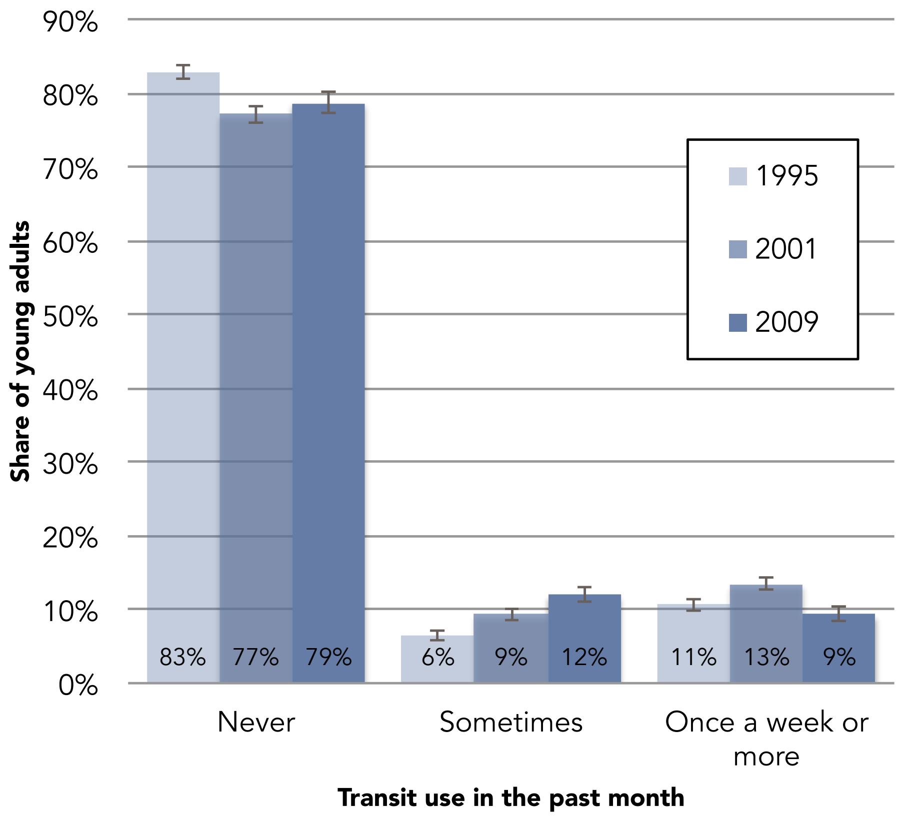


Note: Automobiles per adult (age 18 or over). Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 9 provides information on the frequency of public transit use in the United States by year. During the survey period the vast majority of young people never used public transit. Over time, however, the share that never used transit declined somewhat. A slightly higher share of young people used public transit infrequently, while just over one in ten used public transit at least once a week.

These figures are in line with a recent report on transit ridership and attitudes commissioned by the Transit Center (Transit Center 2014). The authors find that 20 to 30 percent of young people (less than 30) report using transit once a week or more (exact percentages varied by region). The Transit Center values are slightly higher than the NHTS data, which likely reflects differences in sampling. The NHTS data used here includes young people who live outside of metropolitan areas, while the Transit Center report only includes metropolitan residents, where transit service is more widely available.

Figure 9 Transit use in the past month, by year (Age 16 to 36)



Note: Never includes respondents who said transit was "not available". Source: 1995 NPTS, and 2001 and 2009 NHTS

How many traveler types?

Latent profile analysis does not automatically determine the optimal number of classes or types, but there are a number of guidelines to aid model selection (see Table 4). Columns 1 and 2 list the Akaike Information Criterion [AIC] and the Bayesian

Information Criterion [BIC]), which provide a test of the optimal number of classes. Lower AIC and BIC values are preferred (Lanza, Collins et al. 2007) and by this measure, a five-class model is best.

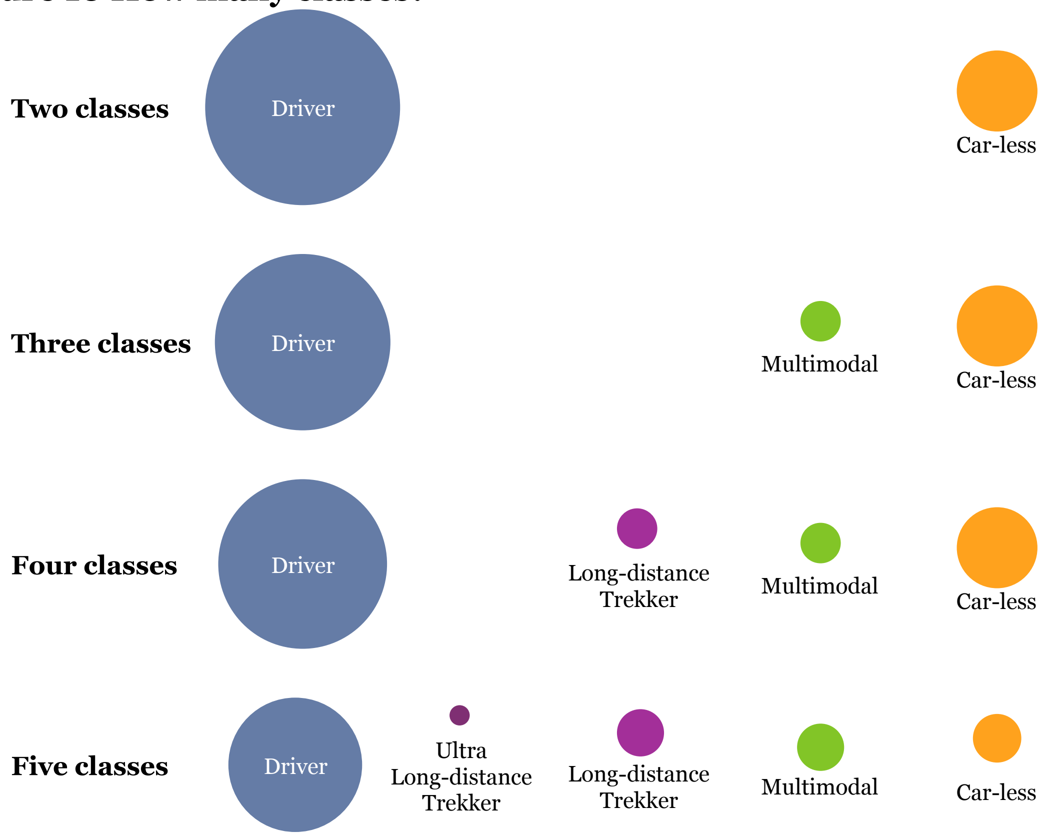
Rather than assign each case to a particular class, LC models calculate the probability of being a member of each class, with values ranging from 0 to 100. Ideally, each case aligns closely with one class—with predicted probabilities close to 100 for that class and close to zero for the other class(es). The entropy score, listed in column 3, combines the predicted probability data into a single measure where a higher value is preferred. Base on the entropy score alone, a model with three classes is preferred, although all of the models have a satisfactorily high entropy value.

Table 4 Latent class model selection

Number of classes	(1) AIC	(2) BIC	(3) Entropy
2	2543404.854	2543662.989	0.978
3	2459350.514	2459719.279	0.985
4	2387887.858	2388367.253	0.982
5	2373012.086	2373602.110	0.970

In addition to statistical criteria, researchers must make subjective decisions based on model interpretability. Figure 10 illustrates the breakdown of classes as the number of classes increases from two to five. For more details about travel behavior in each class, see Table 18 on p. 252 in Appendix A. Regardless of the number of classes in the model, each of the traveler types met Lanza's (2007) definition of interpretable: they are relatively homogenous and, "it is possible to assign a meaningful label to each [one]" (p. 5). Each traveler type in Figure 10 was interpretable and I have assigned a label to each type.

Figure 10 How many classes?



Lanza's final requirement is that, "no class should be trivial in size" (p. 5). While increasing the number of classes makes each group more homogenous, too many classes can be cumbersome to interpret and, most importantly, small sample sizes within one or more classes can limit the statistical power of subsequent analysis. The Ultra-Long-distance Trekkers in the five-class solution represent just one percent of all young adults. Including such a small class would constrain the regression analysis in Part II. For that reason, a four-class solution was selected for further analysis.

With just four types, travel behavior does vary somewhat within each type. For example, Car-less young people at high densities make many more trips than Car-less young people at low densities, which likely reflect stark differences in the availability of public transit (see Chapter 7 for more details).

Emphasizing long-term travel

The results above actually reflect the second latent class model developed for the project. Initially, each indicator variable was given equal weight and a five-class solution minimized the AIC and BIC. The five classes were named to reflect the dominant travel characteristic of each type: Drivers, Long-distance Trekkers, Multimodals, Urbanistas, and Car-less. This five-class solution was problematic because it overemphasized travel on the survey day and underemphasized travel patterns over longer periods. For instance, the Long-distance Trekkers had very high mobility on the survey day (150 miles), but traveled only ten percent more miles than Drivers over the course of the year. Similarly, young people were categorized as Multimodals if they used transit on the survey day, even if they never used transit over the past month and drove several thousand miles annually. In both cases, young adults were being categorized by their atypical behavior on the survey day rather than by their long-term travel patterns.

To rectify this problem I double-weighted two long-term travel variables (annual miles driven and frequency of public transit use) vis-à-vis the survey day variables. The resulting four-class solution was similar in many respects—it still contained the Driver, Long-distance Trekker, Multimodal, and Car-less types. With more emphasis on long-term behavior, young adults were no longer categorized by their atypical behavior on the survey day. For example, in the new solution Long-Distance Trekkers not only drove more than Drivers on the survey day, they also drove more than five times as many miles annually. Similarly, respondents who used transit on the survey day, but who normally did not use transit and drove thousands of miles over the year were categorized as a Driver.

CONCLUSION

This chapter provided detailed information about the process of identifying traveler types. Specifically, it presented data on seven travel variables, which form the inputs of the traveler types. Next, several methods for identifying groups in data were explored and one was selected (latent profile analysis). Finally, the process of selecting the optimal number of groups was described. The next chapter builds on this one by describing travel patterns in each traveler type, describing the prevalence of each type, exploring how the prevalence of each type changed over time, and how travel patterns within each type changed over time.

CHAPTER 3: DESCRIBING THE TRAVELER TYPES

Young adults in the United States can be classified into one of four mutually exclusive traveler types, which I have named: Drivers, Long-distance Trekkers, Multimodals, and Car-less. Each of these types is characterized by distinct travel patterns. Drivers, the most common traveler type, make essentially all of their trips by automobile. Trekkers are similar to Drivers, but travel many more miles each day to complete the same number of trips. Multimodals make half of their trips by walking, biking, or riding transit, but are able to engage in more activities outside the home than Drivers because they make more trips. Finally, Car-less young adults, travel exclusively by non-automobile modes and have very limited mobility and trip making.

The following section characterizes the members of each type in terms of their travel behavior, with special emphasis on the seven indicator variables that were used to identify the traveler types:

- Miles of travel on the survey day by any mode (median)
- Number of trips on the survey day (median)
- Share of miles by an automobile in the survey day (median)
- Driver status (%)
- Annual miles driven (median)
- Automobiles per adult in the household: one or more, less than one, none (%)
- Public transit use in the past month: never, sometimes, at least once a week (%)

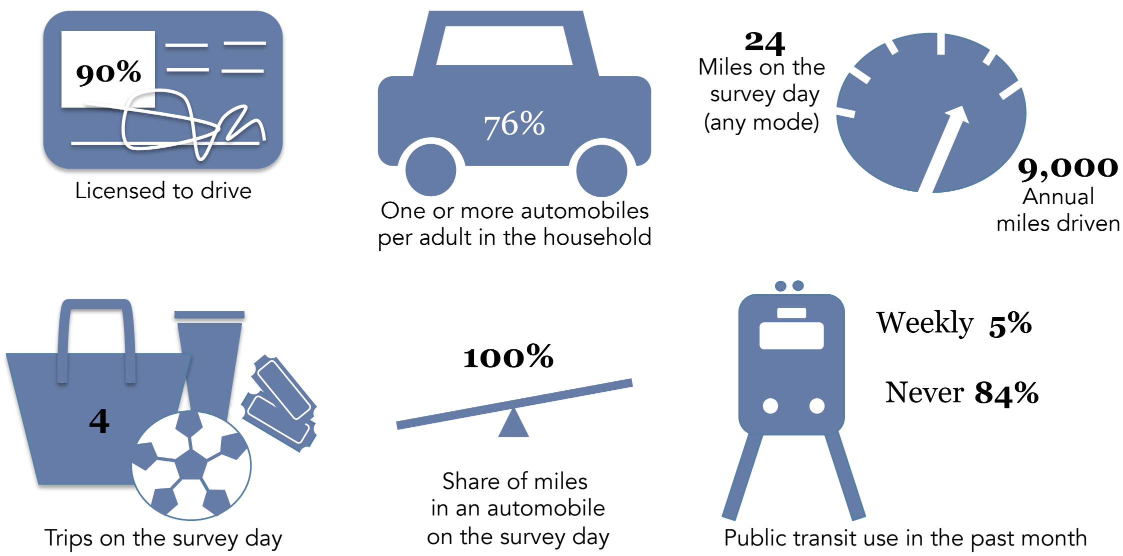
In addition to the summary overview I present here, more information about each of the traveler types can be found in Appendix B (see Table 19 on p. 254).

THE FOUR TRAVELER TYPES

Drivers

Figure 11 characterizes the travel behavior of a typical Driver in 2009.

Figure 11 Travel patterns of Drivers in 2009 (Age 16 to 36)



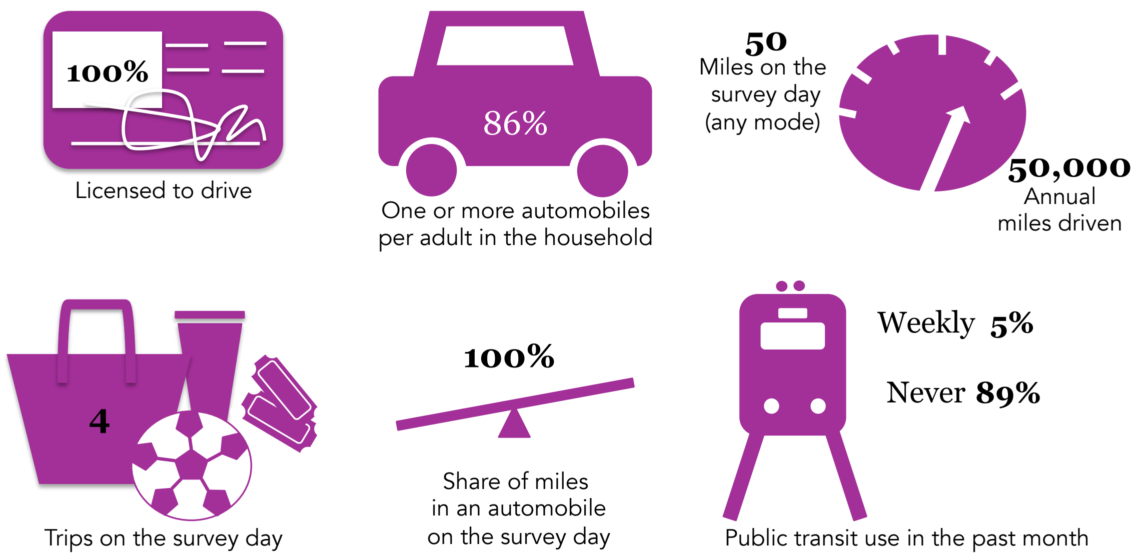
Note: Estimates are based on the NHTS survey weights and are therefore nationally representative. Miles of travel and trip making are reported as median values. All other values are percentages and reflect the share of all young adults ages 16 to 36. Full details available in Appendix B (see Table 19 on p. 254). Source: 2009 NHTS, weighted values.

Automobiles feature very prominently in the lives of Drivers. For example, the typical Driver traveled exclusively by automobile on the survey day. Fully nine in ten Drivers were licensed to drive and those who were not still made all of their trips in an automobile as passengers. Drivers have ready access to automobiles; three quarters of them have at least one motor vehicle per adult in their household. Access to automobiles enabled extensive mobility—the typical Driver traveled 24 miles on the survey day and made four trips on the survey day. Drivers rarely traveled by other modes; the vast majority of Drivers report that they never use public transportation and the typical Driver made just two walk trips over the past week.

Long-distance Trekkers

The Trekkers get their name from their extensive travel over the survey day (see Figure 12).

Figure 12 Travel patterns of Long-distance Trekkers (Age 16 to 36)



Note: Estimates are based on the NHTS survey weights and are therefore nationally representative. Miles of travel and trip making are reported as median values. All other values are percentages and reflect the share of all young adults ages 16 to 36. Full details available in Appendix B (see Table 19 on p. 254). Source: 2009 NHTS, weighted values.

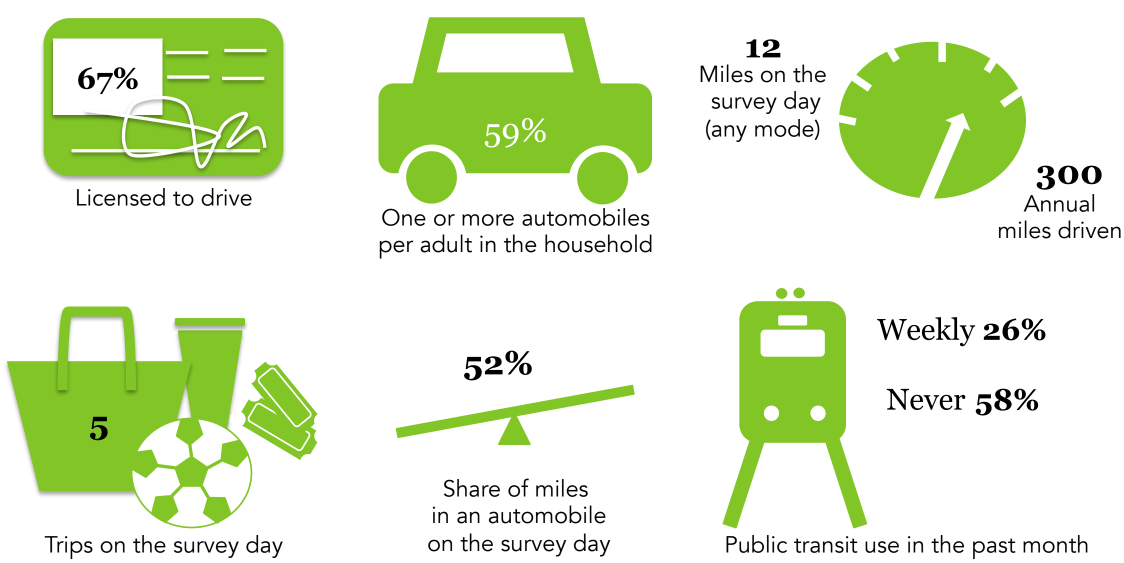
The typical Trekker traveled 50 miles—twice as many as Drivers—but averaged the same four trips per day as Drivers. In other words, Trekkers have higher mobility than Drivers because their average trip length is high, not because they are making more trips and engaging in more activities outside the home. The typical Trekker not only traveled a great distance on the survey day, they also drove vast distances over the course of a year—50,000 miles. Given their extensive travel, Trekkers contribute disproportionately to carbon emissions (Brand and Boardman 2008), congestion, and crashes.

Long-distance Trekkers were similar to the Drivers in the sense that virtually all of their travel was by automobile, all of them were licensed to drive, and automobiles were widely accessible in their homes. Finally, nearly nine in ten Trekkers never use public transit.

Multimodals

The Multimodals differ from the Drivers and Trekkers in that they used a mix of modes on the survey day (see Figure 13), when nearly half of their miles traveled (and 64% of their trips) were by walking, biking, or using public transit.

Figure 13 Travel patterns of Multimodals (Age 16 to 36)



Note: Estimates are based on the NHTS survey weights and are therefore nationally representative. Miles of travel and trip making are reported as median values. All other values are percentages and reflect the share of all young adults ages 16 to 36. Full details available in Appendix B (see Table 19 on p. 254). Source: 2009 NHTS, weighted values.

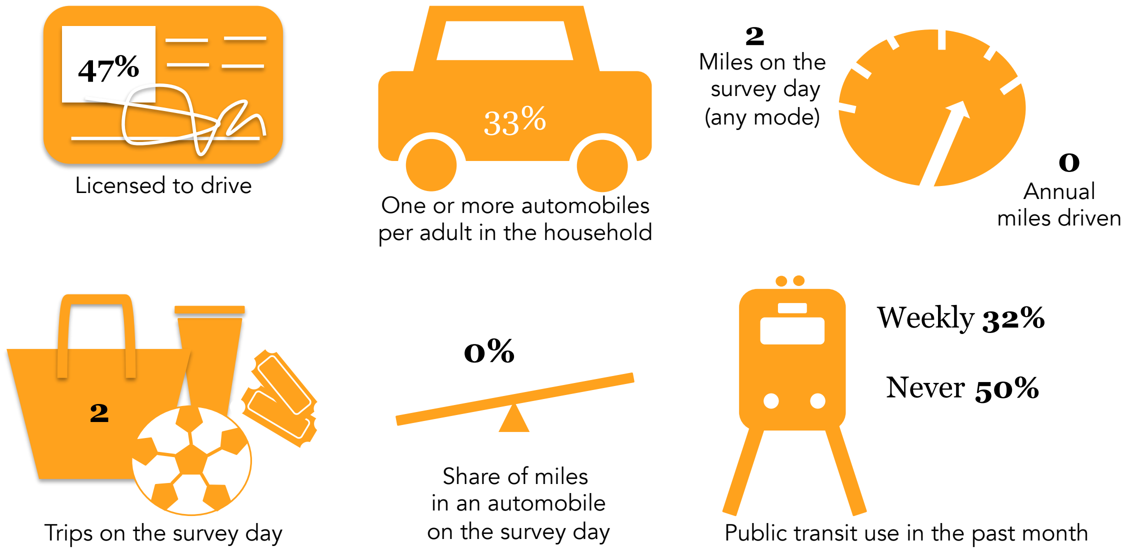
Relative to the Drivers, Multimodals were less likely to have a driver's license and had more limited access to an automobile in their household, and because automobiles enable faster travel and longer trips, Multimodals traveled half as many miles of Drivers on a typical day. Their limited mobility did not, however, appear to limit their activity participation. The typical Multimodal made five trips a day, one more than Drivers. Finally, a quarter of Multimodals used transit at least once a week, but the majority never used public transit.

Car-less

Car-Less young people made all of their trips on the survey day by non-automobile modes. Walking, biking, and using transit are typically slower than traveling by automobile, so it is no surprise that Car-Less young people had lower mobility than the other travel types. The typical Car-Less young adult traveled just two miles on the survey day. The typical Driver traveled twelve times as far as the typical Car-Less young adult.

Of course, limited mobility is not in and of itself a problem, as long as young adults also have adequate access to opportunities, which I approximate here using number of trips on the survey day. The typical Car-Less young person made just two trips on average, or about half or less as many as the other traveler types. This almost certainly means that Car-Less young adults participated in fewer activities outside the home than other young people.

Figure 14 Travel patterns of Car-less young adults (Age 16 to 36)



Note: Estimates are based on the NHTS survey weights and are therefore nationally representative. Miles of travel and trip making are reported as median values. All other values are percentages and reflect the share of all young adults ages 16 to 36. Full details available in Appendix B (see Table 19 on p. 254). Source: 2009 NHTS, weighted values.

Young people in this traveler type had fewer mobility options than the other types. A lower share of Car-less young people had a license, a quarter of them lived in households without any automobiles, and another 43 percent lived in households where adults outnumber automobiles.

A CLOSER LOOK AT TRAVEL MODE

In characterizing the travel patterns of each type, the preceding section focused exclusively on the seven indicator variables used to identify each type. The next section, by contrast, enriches the description with data that were not used to identify the types.

Travel mode on the survey day

Table 5 provides information about the travel mode of each traveler type. Drivers and Trekkers made 88 percent of their trips by an automobile in 2009, predominantly as the driver of the vehicle. Recall that the typical Driver made 100 percent of their *miles* by automobile on the survey day, indicating that their trips by other modes were very short on average. Roughly five percent of Drivers' and Trekkers' trips were by walking.

Table 5 Share of trips by travel mode on the survey day in 2009, by traveler type (Age 16 to 36)

	Driver	Trekker	Multimodal	Car-less
Driver	71%	80%	20%	4%
Passenger	17	8	16	5
Transit	0	1	12	25
Walk	6	4	27	55
Bike	0	1	2	5
Other	5	6	23	7
Total	100%	100%	100%	100%

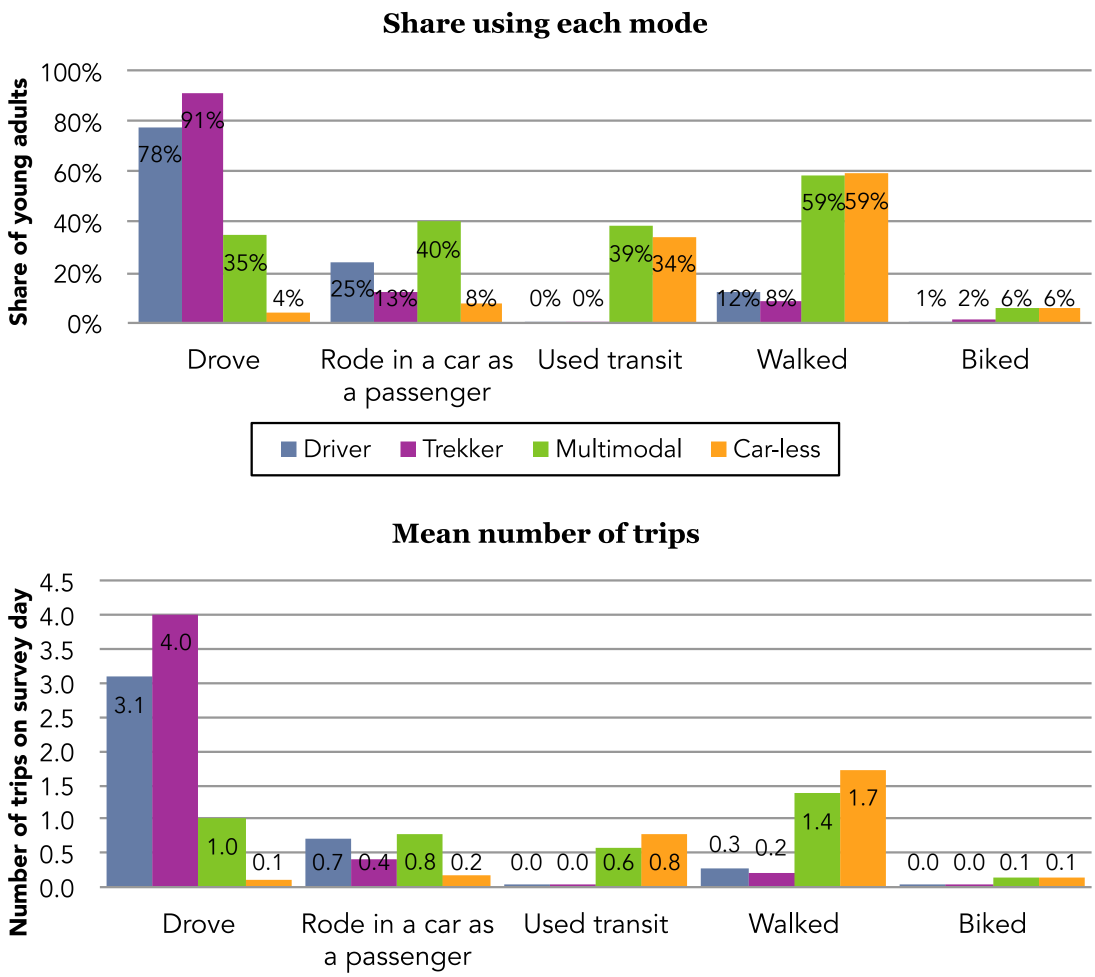
Note: Average share of trips by each mode on the survey day. Other modes include motorcycle, golf cart, taxi, and ferry. Source: 2009 NHTS, weighted values.

Multimodals display a more even distribution of the modes. The average Multimodal young adult made a 36 percent of their trips in a private vehicle: 20 percent as the driver of the vehicle and 16 percent as a passenger. Just over a quarter of the trips made by Multimodals were by walking and a surprisingly large number of their trips were by "Other" modes, which includes motorcycles and taxis.

Among Car-less young adults, the most common mode of travel was walking—they walked for more than half of their trips in 2009. Public transit accounted for another quarter of their trips. Finally, automobiles accounted for just one in ten trips by Car-less young adults, and those were split evenly between trips as passengers and trips as a driver.

Figure 15 presents a different view of travel mode on the survey day. The top of the chart presents the share of young adults that used each mode and the bottom of the chart depicts the mean number of trips by mode.

Figure 15 Travel mode on the survey day in 2009, by traveler type (Age 16 to 36)



Source: 2009 NHTS, weighted values.

This figure cements the importance of automobility in the lives of Drivers and Trekkers. The vast majority of these types drove an automobile on the survey day and riding in an automobile as a passenger was the second most common travel mode. In fact, Drivers and Trekkers almost never used other modes. In particular, less than one percent of young adults in these types used public transit on the survey day. Roughly one in ten Drivers or Trekkers walked on the survey day.

By contrast, a majority of Multimodals walked at some point during the day and averaged 1.4 walk trips. Multimodals were less likely than Drivers or Trekkers to drive an automobile, but they were the most likely of all of the traveler types to ride in a car as a passenger and to use public transit.

Finally, the figure illustrates the remarkably limited travel of the typical Car-less person. Only a third of Car-less people used public transit on the survey day, despite the fact that very few members of this type used an automobile as a driver or as a passenger. Not only did the majority of Car-less young adults walk on the survey day, the mean number of trips was much higher for walking than any other mode, which together suggest that the majority of Car-less young adults rely on walking to meet their needs.

Walking and biking over the past week

As the preceding figure suggests, biking on the survey day was very rare among young adults of all four traveler types. Are young people likely to do at least some biking over the course of a week? Fortunately, in addition to the long-term travel information about transit use, the NHTS also collects information on walking and biking during the past week. Unfortunately, that information was not collected in 1995, so it could not be used to identify the traveler types. Nevertheless, I compared the proportion of young adults in each type who biked (or walked), as well as the mean number of bike (or walk) trips by young people in each type (see Table 6).

Table 6 Walking and biking in the past week by traveler type in 2009, (Age 16 to 36)

	Share of young adults who walked in the past week (%)			Walk trips last week by young adults that walked (mean)		
	Point estimate	*95% confidence interval*		Point estimate	*95% confidence interval*	
		Lower	*Upper*		*Lower*	*Upper*
Drivers	67.8	*66.2*	*69.4*	5.7	*5.4*	*5.9*
Trekkers	63.1	*54.2*	*71.3*	7.1	*6.2*	*8.0*
Multimodals	86.8	*82.1*	*90.4*	7.9	*6.7*	*9.1*
Car-less	83.0	*79.5*	*86.0*	8.8	*8.1*	*9.5*

	Share of young adults who biked in the past week (%)			Bike trips last week by young adults that biked (mean)		
	Point estimate	*95% confidence interval*		Point estimate	*95% confidence interval*	
		Lower	*Upper*		*Lower*	*Upper*
Drivers	8.7	*7.8*	*9.6*	2.5	*2.3*	*2.7*
Trekkers	7.9	*4.8*	*12.6*	2.7	*2.1*	*3.3*
Multimodals	19.2	*13.2*	*26.9*	3.3	*2.7*	*4.0*
Car-less	14.6	*11.9*	*17.9*	6.1	*3.8*	*8.4*

Note: Walking and biking information was not used to identify the traveler types. Source: 2009 NHTS, weighted values.

I find that very few young adults rode a bicycle in the week prior to the survey, but Multimodals (19%) and Car-less (15%) young adults were roughly twice as likely to have biked last week than Drivers (9%).

The majority of young adults, regardless of traveler type, made at least one walk trip in the past week. This finding accords with Buehler and Hamre's (2014) findings on multimodality using the same data. Trekkers were the least likely to walk and Multimodals were the most likely to do so. Restricting the analysis to only people who walked, Car-less and Multimodal young adults made more walk trips on average than Drivers, indicating that they relied on walking for a wider variety of trip purposes than Drivers.

THE PREVALENCE OF EACH TRAVELER TYPE

Figure 16 reports the prevalence of each of the traveler types for the entire United States in 2009. The values in the figure are population estimates derived from a sample, using the provided sample weights. To account for the inevitable uncertainty of making population estimates, Table 20 (on p. 256 in Appendix A) reports a point estimate of each population value along with a 95 percent confidence interval.

Figure 16 Prevalence of the traveler types in 2009, United States (Age 16 to 36)

Note: Population estimates based on the weighted values from the NHTS. Source: 2009 NHTS, weighted values.

In 2009 the vast majority of young adults were Drivers. Along with the Long-distance Trekkers, over 80 percent of young adults used an automobile for essentially every trip. Young adults who used a variety of modes—the Multimodals—were relatively rare; they comprised just four percent of the population. The final group, the Car-less, was the second largest travel type, representing fourteen percent of the population.

Trekkers may have made up a relatively small share of the population in 2009, but because they drive so much over the course of a year, the Trekkers made a disproportionately large contribution to aggregate total miles driven. Whereas in 2009 Trekkers comprised just three percent of the young adult population, they drove roughly 18 percent of all miles driven by young adults (See Table 7). Small reductions in the prevalence of Trekkers can lead to large reductions in travel, and attendant declines in emissions, collisions, and congestion.

Table 7 Trekkers contribute disproportionately to aggregate miles driven

	Share of young adults (1)	Median miles driven per year (2)	(1)*(2)	Share of total (2)/(3)
Drivers	79%	9000	7149	82%
Trekkers	3%	50000	1586	18%
Multimodals	4%	300	11	0%
Car-less	14%	0	0	0%
Total			**(3)** 8746	

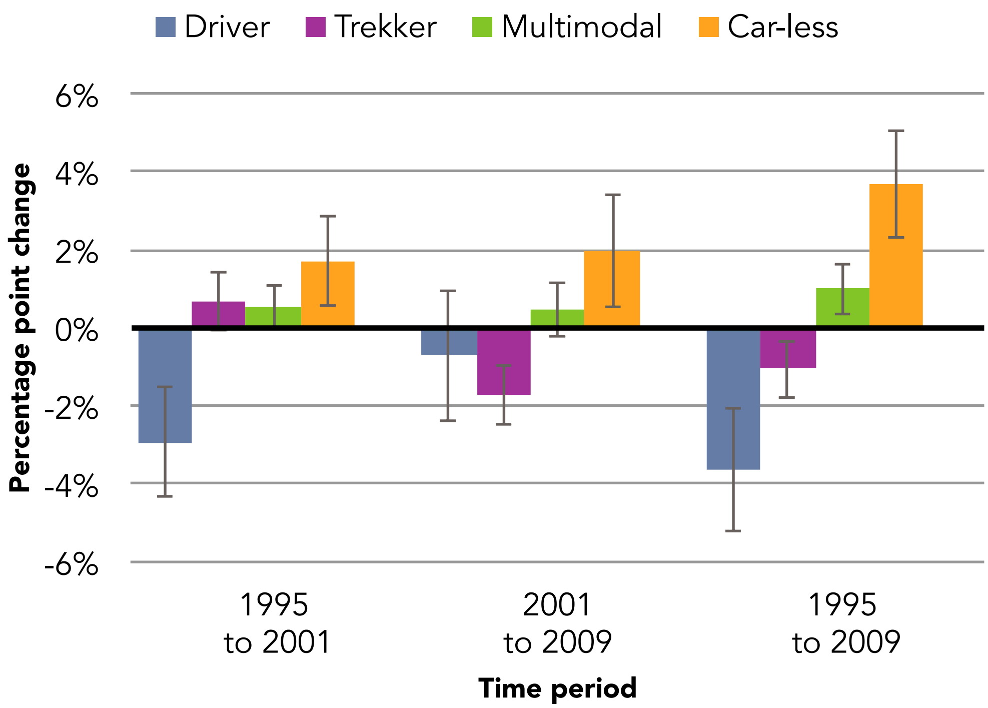
Note: Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Prevalence: Change over time

Aggregate travel behavior can change in two ways: the proportion of young people in each traveler type may change and/or travel within the traveler types may change. Both types of changes occurred for young adults during the survey period. Over time, Drivers and Trekkers made up a smaller share of young adults and Multimodals and Car-less made up a larger share. Meanwhile, miles of travel also declined within each traveler type. While both forces contributed, the aggregate decline in mobility was primarily the result of young adults making fewer trips over time.

Figure 17 depicts the change in the prevalence of each traveler type between 1995 and 2001 and again between 2001 and 2009.

Figure 17 Prevalence of the traveler types over time (Age 16 to 36)



Note: Solid bars reflect the best estimate of the percentage point change in the prevalence of each traveler type between the indicated survey years: 1995 to 2001, 2001 to 2009, or 1995 to 2009. Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Fewer Drivers and Trekkers

For policymakers interested in ameliorating the harms from emissions, collisions, and congestion, fewer Drivers and especially fewer Trekkers, is good news indeed. Fewer young adults were Drivers or Trekkers in 2009 than in 1995. Drivers declined in both periods, but the bulk of the decline occurred between 1995 and 2001. The Trekkers actually increased between 1995 and 2001, but then declined between 2001 and 2009.

More Multimodals

Increasing the use of transit, walking, and biking has long been a goal of transportation planning officials and, as a result, the small but steady increase in the prevalence of Multimodal young adults should be encouraging news for policymakers and advocates.

More Car-less

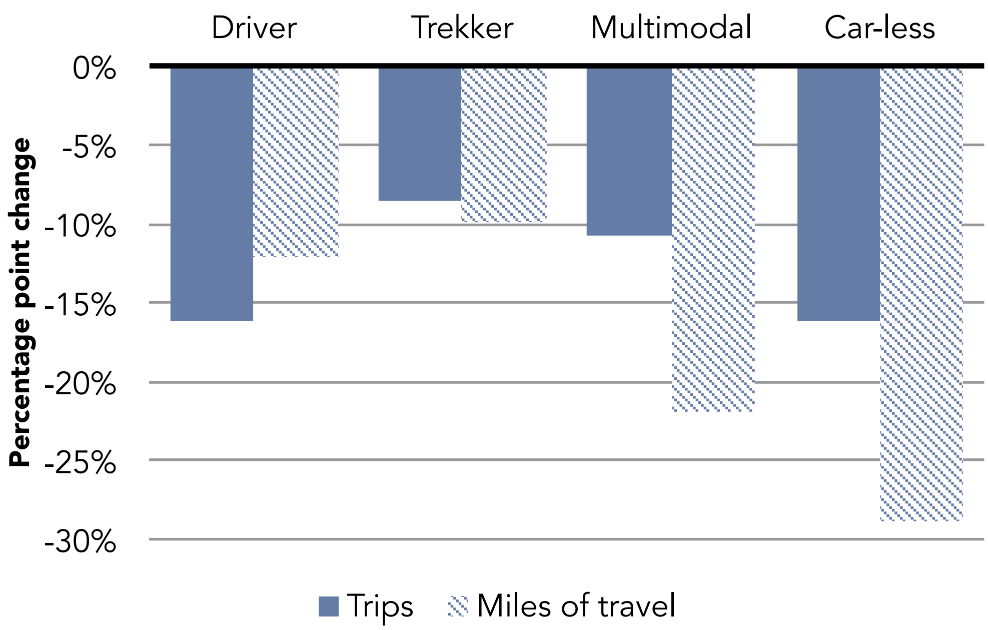
Perhaps the most striking trend in Figure 17 is the steady increase in the share of young adults that were Car-less. The increase in young people relying primarily, if not exclusively, on non-automobile modes is not necessarily troubling. Recall, however, that Car-less young people had very low mobility and made very few trips, indicating that they participated in fewer activities outside the home than other young adults.

Interpreting this trend requires more information about who is becoming Car-less and why. As I find in Chapter 5, some young people with extensive resources (high incomes and advanced degrees) became more likely to be Car-less over time. However, the bulk of the increase in this type was among young people with very limited resources, many of whom reside at very low densities (see Chapter 7).

CHANGES WITHIN EACH TRAVELER TYPE

Figure 18 depicts changes in travel between 1995 and 2009 *within* each traveler type. Young adults of all traveler types traveled fewer miles in 2009 than in 1995.

Figure 18 Declining trips and miles of travel between 1995 and 2009 (Age 16 to 36)



Note: Number of trips and miles traveled are mean values. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

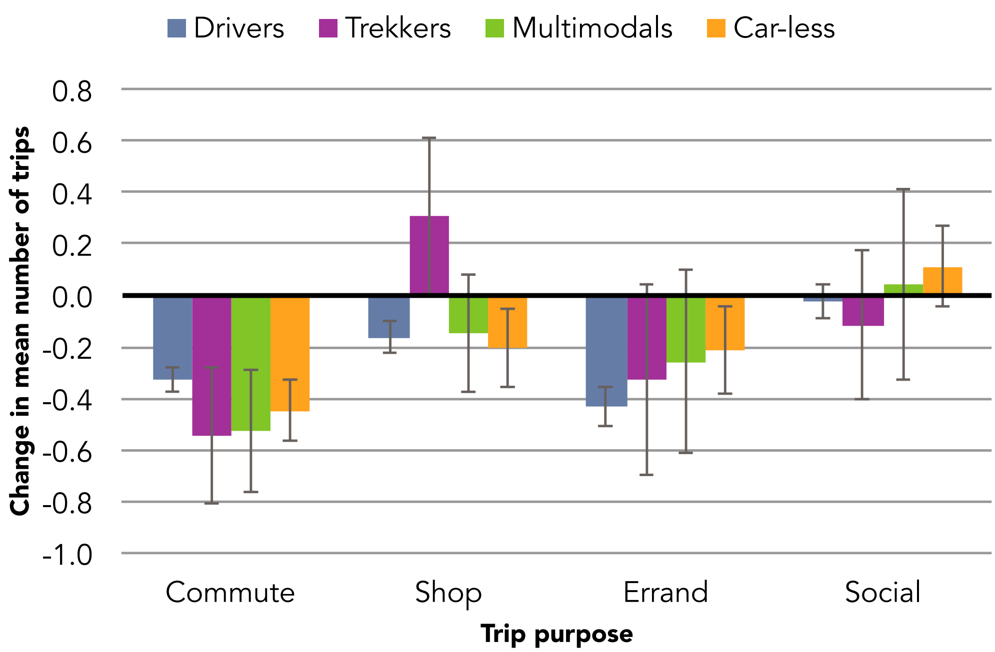
Miles of travel could decline in two ways: young people made shorter trips and/or fewer trips. Of the two, shorter trip distances would be preferable in the minds of transportation policymakers because it would suggest that young people were still able to participate in activities outside the home (approximated by number of trips) and that those activities were closer to home. On the other hand, if young people traveled fewer miles because they were making fewer trips, policy-makers should be concerned about the ability of young people to access opportunities.

As Figure 18 clearly shows, the decline in mobility for Drivers was entirely the result of fewer trips. In fact, trip distances for Drivers actually increased slightly during this period. Like Drivers, miles of travel declined for Trekkers, primarily because they made fewer trips in 2009 than in 1995. By contrast, the two pathways contributed more equally to the decline in mobility for Multimodals and Car-less. The typical Multimodal and Car-less young person made fewer, shorter trips in 2009 than in 1995.

The decline in trip making by trip purpose

Figure 19 provides information about the decline in trips over time by trip purpose. Between 1995 and 2009 young adults in all four traveler types made fewer commute trips. During this same period the share of young adults (of any age) who were employed declined from 79 percent to 69 percent. Moreover, all four traveler types, and particularly Drivers, made fewer trips for errands. There was no change in the number of social trips for any of the traveler types.

Figure 19 Fewer trips between 1995 and 2009, by trip purpose and traveler type (Age 16 to 36)



Note: Solid bars reflect the weighted estimate of the change in mean number of trips for young adults (age 16 to 36) within each traveler type. Error bars reflect the 95 percent confidence interval around the point estimate. Source: 1995 NPTS and 2009 NHTS, weighted values.

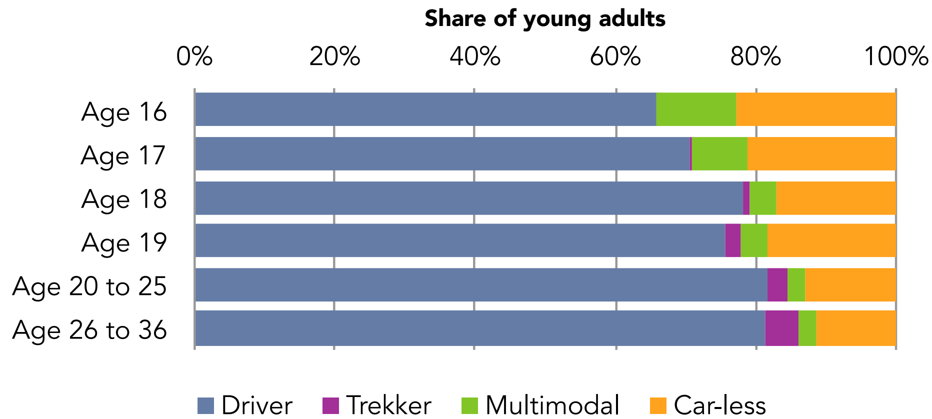
These findings differ from research by Farber and Páez (2011), who explored activity participation and trip duration using a time-geographic approach. They hypothesized that over time, as activities dispersed and congestion worsened, trips would take longer and that this would reduce activity participation. Empirical evidence from Canada from 1992 and 2005 supports this hypothesis. In contrast to my findings, Farber and Páez (2011) find that Canadians reduced discretionary trip making, particularly social trips. The current analysis is somewhat different because it focuses on the number of trips rather than the duration. It is very possible that the *duration* of commute trips in the sample increased, while the average number of work trips decreased.

TRAVELER TYPES DURING THE LIFE COURSE

The age range analyzed here is wide—age 16 to 36—and travel behavior may vary substantially by age, particularly as young people age out of licensing regulations. Ideally I would be able to observe the evolution of travel patterns over time for each individual, for example as an 18-year-old in 1995, as a 23-year-old in 2001, and again as a 32-year-old in 2009. Unfortunately, such longitudinal data are extremely rare in travel behavior surveys and the data used here are a repeated cross-section instead.

Figure 20 depicts the prevalence of each travel type by age in 2009. Even at the youngest age—16 years old—the majority of young people were Drivers. The share of Drivers increased at higher ages, stabilizing by age 20, when eight in ten young adults were Drivers. Not surprisingly, very few teenagers were Long-Distance Trekkers, and the share of Trekkers was higher for young adults in their twenties and thirties.

Figure 20 Prevalence of the traveler types by age in 2009 (Age 16 to 36)



Note: Solid bars reflect the weighted estimate of the prevalence of each traveler type. Error bars reflect the 95 percent confidence interval around the point estimate. Source: 2009 NHTS, weighted values.

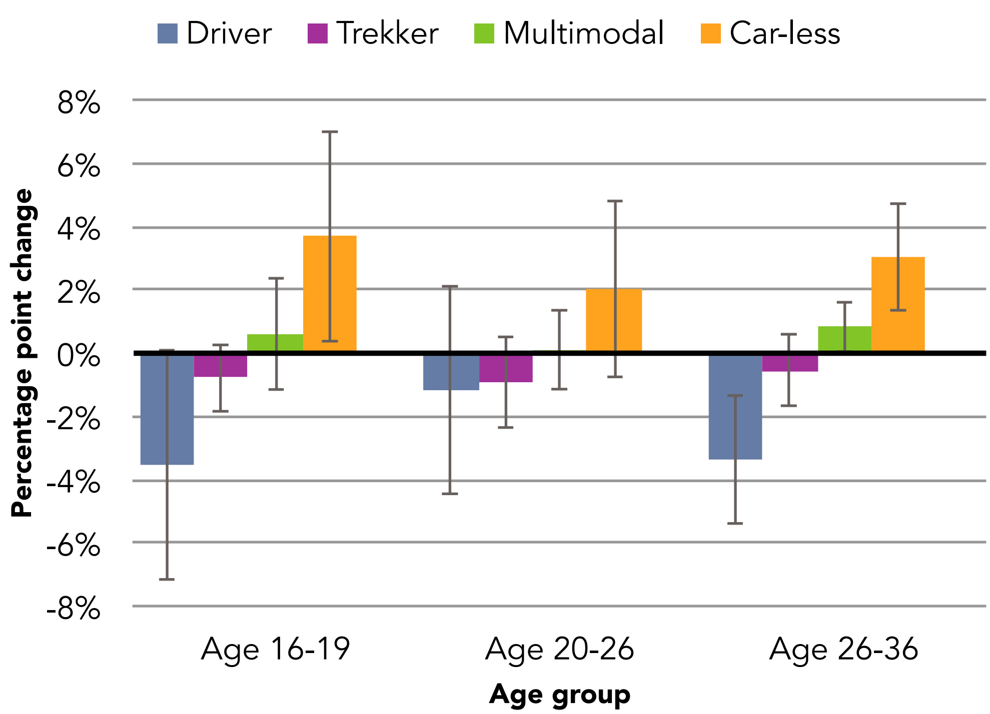
Teenagers were more likely than young adults in their twenties and thirties to be Multimodals or Car-less. Because the data are cross-sectional, it does not necessarily indicate that young people transition away from those traveler types as they age. Nevertheless, the data square with Clifton's (2003) observation that as soon as driving becomes an option, most young adults cease using other modes.

Change over time by age

Were the changes in travel concentrated in any particular age group? Perhaps teenagers experienced the most dramatic declines in Driving because they were subject to increasingly stringent driver's licensing restrictions during this period (Williams and Mayhew 2008). Or perhaps young people in their early twenties experienced the most dramatic changes because record numbers of them enrolled in college, many of which have expensive parking and policies to encourage walking, biking, and using transit (Van Heeke, Sullivan et al. 2014). Moreover, young people in their twenties experienced the most dramatic delays in attaining adult roles (Arnett 2004). For example, while 66 percent of young people ages 20 to 25 lived independently in 1995, only 36 percent of them did in 2009. As I explore in more detail in Chapter 6, the delayed onset of adult roles may reduce the need for young adults to embrace driving.

Figure 21 characterizes the nature of the change in the traveler types for three age groups: 16 to 19, 20 to 25, and 26 to 36. Young people in all three age groups became less likely to be Drivers and more likely to be Car-less. Notably, the magnitude of the changes was smaller and statistically insignificant for young adults ages 20 to 25.

Figure 21 Change in the prevalence of the traveler types between 1995 and 2009, by age



Note: Solid bars reflect the weighted estimate of the change in the prevalence of each traveler type between 1995 and 2009. Error bars reflect the 95 percent confidence interval around the point estimate. Source: 1995 NPTS and 2009 NHTS, weighted values.

I analyzed the nature of the change over time for teenagers by age. Consistent with the hypothesis that licensing regulations altered travel behavior, 17-year-olds experienced the most dramatic reductions in driving; the share of 17-year-olds that were Drivers declined by nine percentage points between 1995 and 2009. This group experienced similar size increases in the share that were Car-less. None of the other differences (age 16, 18, or 19 of any traveler type) were statistically significant (see Figure 80 on p. 257 in Appendix A).

CHAPTER CONCLUSION

Travel patterns vary as much as people do. While it's difficult to characterize anyone's travel choices based social, spatial, or economic characteristics, I find that it is possible to classify young travelers in the U.S. into one of four distinct groups based on their generalized travel patterns: Drivers, Long-Distance Trekkers, Multimodals, and Car-Less. Members of each of these groups travel similarly to one another in ways that are distinct from the other types. In all three periods, the vast majority of young adults relied exclusively on their automobiles for travel. Very few young adults used a mix of modes—just four percent were Multimodals in 2009. Finally, a surprising large number (14%) of young adults primarily relied on non-automobile modes for essentially all of their travel. These Car-less young people had very limited mobility (two miles per day) and made half as many trips as Drivers, just two trips per day.

The data on trip making suggest that Car-less young people participated in relatively few activities outside the home. Transportation constraints may make it more difficult for them to secure employment (Baum 2009), participate in after-school activities (Ralph 2014), socialize with friends (Delbosc and Currie 2012), or access services. Policymakers should take note.

One motivation of this work was to understand what caused decline in driving in the United States. Young adults contributed to this trend in two ways: by shifting to less-auto-centric traveler types (fewer Drivers and Trekkers and more Multimodals and Car-less) and by making fewer trips. I discuss each in turn.

Shifting composition of the traveler types

In 1995, 83 percent of young adults were Drivers, but the share fell by four percentage points to 79 percent in 2009. Contrary to expectations, the bulk of the decline in Drivers occurred between 1995 and 2001. While the decline in the prevalence of Trekkers was smaller in magnitude, the effect was large because Trekkers drive so many miles. One less Trekker on the roads contributes as much to the aggregate decline in driving as four fewer Drivers.

Some of the young adults who stopped being Drivers and Trekkers became Multimodals; the share of Multimodal young adults increased from 2.5 percent in 1995 to 3.5 percent in 2009. This is a promising trend, as Multimodals use automobiles less intensively than Drivers and Trekkers, but make more trips than Drivers and are able to participate in many activities outside the home.

On the other hand, the majority of young people who stopped being Drivers and Trekkers became Car-less. This is troubling news indeed because the typical Car-less young person made so few trips. Moreover, surprisingly few Car-less young adults use public transit; half of them never used transit in the past month. These results suggest that young adults who were Drivers or Trekkers and became Car-less likely changed their travel, not by embracing other modes, but instead by making fewer trips.

Fewer trips

In addition to compositional shifts in the magnitude of each traveler type, travel patterns evolved over time within each traveler type. In particular, young adults in each traveler type made fewer trips, specifically fewer commute trips and errands. Trip making and activity participation go hand in hand (Wachs and Kumagai 1973, Levinson and Krizek 2005, Levine, Grengs et al. 2012) and policymakers should continue to monitor the trip making of young travelers to make sure that they are still able to access activities outside the home.

Finally, this work demonstrates the importance of assessing travel trends holistically. Declines in mobility on their own are not necessarily harmful, but these changes occurred mostly because young people made fewer trips and participated in fewer activities outside the home. This poses a challenge for transportation planners: how can we reduce the many pernicious externalities of auto-dependence, while maintaining and even increasing access to opportunities? I explore this question further in Part III, but before that, we need more information on the causes of the decline in driving. That is the focus on Part II.

Part II: EXPLAINING THE TRAVELER TYPES

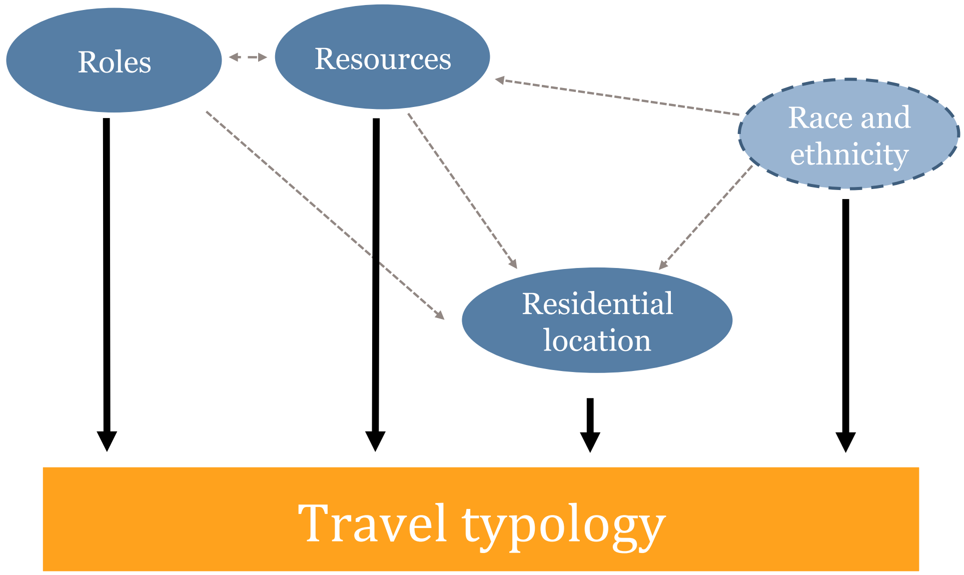
Chapter 4: THE FOUR R's

In Part I I developed a typology to characterize the multi-faceted travel patterns of young adults in the United States. The purpose of Part II is to use these traveler types to examine the causes and consequences of the new travel trends. Did young people cut back on driving because they prefer walking, biking, and riding transit? Or can they no longer afford to drive because of widespread unemployment and stagnating incomes? Young people now wait longer than before to get married and have children. How do those trends contribute to travel patterns? Are young people driving less everywhere or are young people in some areas driving more while others are driving much less? What about racial/ethnic differences in travel? Finally, have the relationships between these factors—resources, roles, residential location, and race—changed over time? Part II answers these questions. The following sections introduce the conceptual model and describe the explanatory variables used in the multivariate analysis.

EXPLAINING TRAVELER TYPE

I drew on the travel behavior literature to create a conceptual model for the traveler types (Figure 22). The dependent variable (travel type) is depicted in yellow, explanatory variables are depicted as blue ovals, and the relationship between variables are depicted with directional arrows. According to the model, travel behavior is largely a function of four factors: Resource, Roles, Residential location, and Race/ethnicity. Each of the Rs is the subject of a later chapter.

Figure 22 Conceptual framework



According to my conceptual framework, travel is a function of available resources. Young people with limited financial resources are often unable to afford to own, insure, maintain, and operate a private automobile. Young adults in some areas may find that they can use car-sharing services (like Car2Go or ZipCar) or transportation network companies (like Lyft or Uber) instead of owning a vehicle. Those services, however, were not yet widely available during the survey period and are typically restricted to people with a credit card. Financial resources also indirectly affect travel through activity participation. People with more resources tend to participate in more activities outside the home and people must travel to participate in those activities.

Travel behavior is also a function of an individual's roles (as a parent, student, employee, spouse, etc.). Each role entails responsibilities and many of those responsibilities involve travel. Parents, for example, must care for children and make a variety of trips to meet their children's needs. Employees must work and, for most employees, this requires a commute to and from work each day.

Resources and Roles are related and are connected by a light gray line in Figure 22. Most obviously, people who work tend to have higher incomes than people who don't. In fact employment is so important to both Resources and Roles that I discuss employment in both of the corresponding chapters. Resources and Roles are also linked in less obvious ways. For example, many young people delay marriage until they are financially stable (Edin and Kefalas 2005), so married couples tend to have greater financial resources on average than singles or unmarried partners.

Resources and Roles influence Residential location. For example, couples seeking good school districts for their children, often select homes in suburban locations. Financial resources enable some and constrain others from locating in desirable locations. In turn, residential location shapes travel patterns by determining the number of nearby destinations and influencing the relative utility or usefulness of each mode of travel (Crane 2000, Chatman 2009, Transportation Research Board 2009, Ewing and Cervero 2010).

Finally, there is not a well-developed theory for the relationship between race/ethnicity and travel, though there is a robust empirical literature on the topic (Chu, Polzin et al. 2000, Giuliano 2003). Racial and ethnic disparities in financial resources and employment, segregated patterns of residential location, and possible differences in cultural norms about roles all contribute indirectly to racial/ethnic differences in travel behavior. Nevertheless, even when controlling for those other factors, racial/ethnic differences in travel persist (Giuliano 2003, Thakuriah, Menchu et al. 2010, Tefft, Williams et al. 2013). As a result, I include race and ethnicity as an explanatory factor in light blue to indicate the absence of a strong theory linking race/ethnicity and travel.

MEASURING THE FOUR R's

As in Part I, I use the national travel surveys in 1995, 2001, and 2009 in Part II. In the following sections I describe how resources, roles, residential location, and race/ethnicity were measured in the surveys.

Resources

I employ three measures of resources: employment status, household income quintile, and educational attainment (for ages 26 to 36 only). Because of the similarity between employment and the other roles, I relegate my discussion of measuring employment to the roles section.

Household income

Measuring household income in a consistent and readily interpretable way presented a number of challenges. First, during the transitional period of young adulthood, many young people move out and establish their own households. How should I compare the household income of someone who lives with his parents with the income of a young woman living independently? One possibility is to add an interaction term between household income and a dummy variable for whether the young person lived independently. However, this approach would not account for the number of people in the household; due to economies of scale in household expenditures, the marginal cost of adding a second or third (and so on) member to a household diminishes with each additional household member (OECD Organisation for Economic Co-operation and Development). I followed the example of the Pew Research Center (2014) and used the following formula:

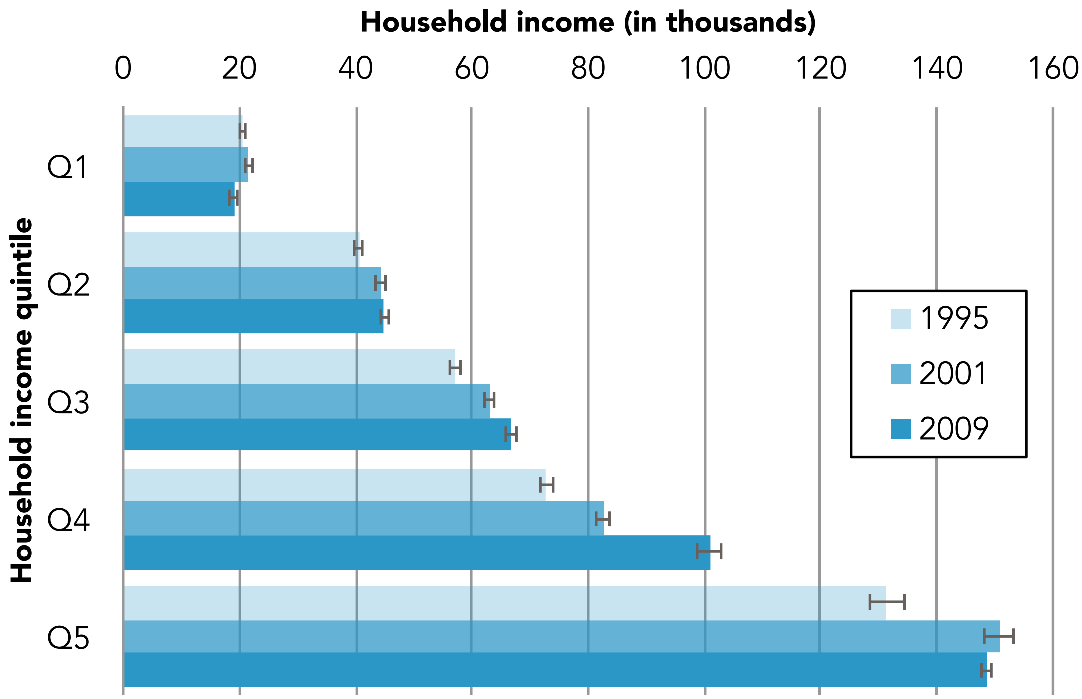
$$Adjusted\ income = \frac{Household\ income}{\sqrt{Household\ size}}$$

Households with very high incomes posed another challenge. The travel surveys included information on household income using categorical (not continuous) values, and the category values for the highest incomes were not consistent from year to year. After adjusting income for the number of people in the household, I determined income quintiles for the full sample (all ages) in each year.[9]

Figure 23 depicts the median household income, adjusted for inflation, of each quintile in each year. Young adults in the fourth and fifth income quintiles had higher real incomes over time, but those in the lowest two quintiles experienced stagnating or declining incomes.

[9] The income quintiles include respondents of all ages to capture the relative economic position of young adults. Individual earnings tend to peak at age fifty or sixty; young people, by contrast, tend to have much lower incomes than late middle-aged adults. Income quintiles were identified separately in each year to account for differences in the top-coding of the income categories from year to year.

Figure 23 Household income (mean) by income quintile and year (Age 16 to 36)



Note: All values are adjusted for inflation and household size and are reported in 2009 dollars.
Source: 1995 NPTS and 2001 and 2009 NHTS, weighted values.

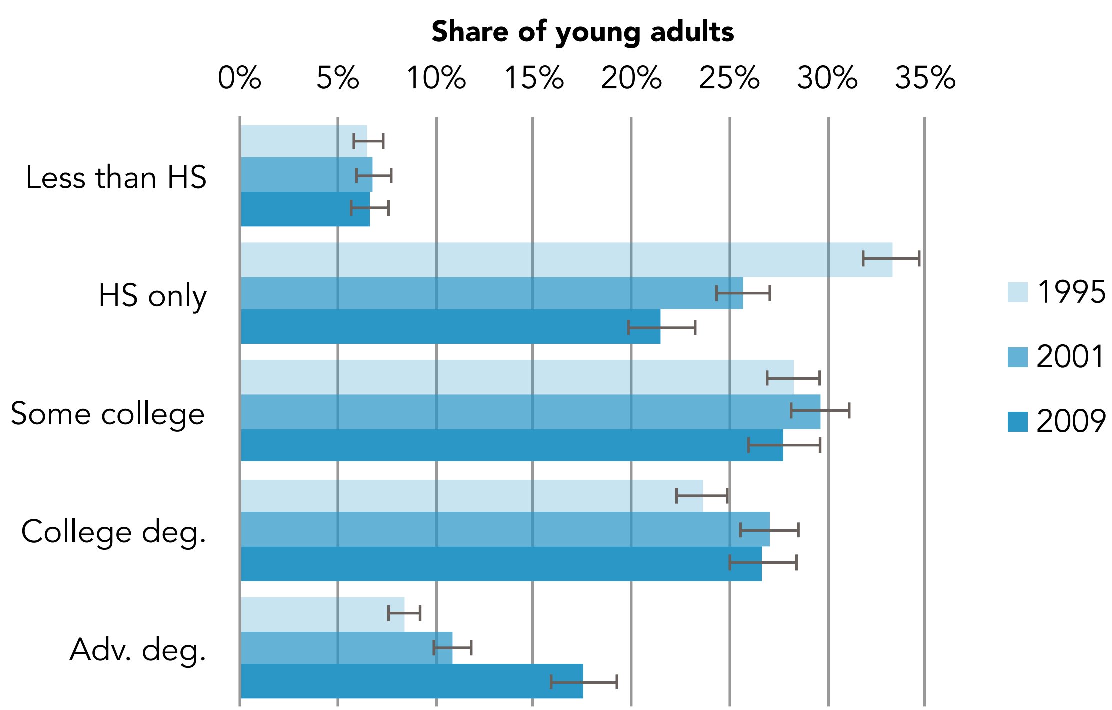
Educational attainment

Potential earnings are closely related to educational attainment (Pew Research Center 2014) so I include educational attainment as a measure of resources. Determining the highest grade completed for young adults also presents important challenges. It is not possible to distinguish, for example, between a twenty-year-old who will only complete some college and a twenty-year-old who will go on to earn a bachelor's or advanced degree. Given these complications, the analysis of educational attainment is restricted to young people ages 26 to 36.[10]

[10] This approach rests on the assumption that educational attainment stabilizes by age26. This age cut-off will miss-categorize some young people, who (like the author) go on to achieve an advanced degree after the age of 26.

Figure 24 depicts the educational attainment of young people ages 26 to 36 in 1995, 2001, and 2009. In 2009 only 44 percent of young adults in that age group had earned a college degree or more. This figure is in accord with nationwide educational statistics. While 70 percent of American youth enroll in further education after high school, less than two thirds graduate (Harvard Graduate School of Education 2011). Graduation rates are lower still at community colleges, where just over half of enrolled students can expect to earn a degree.

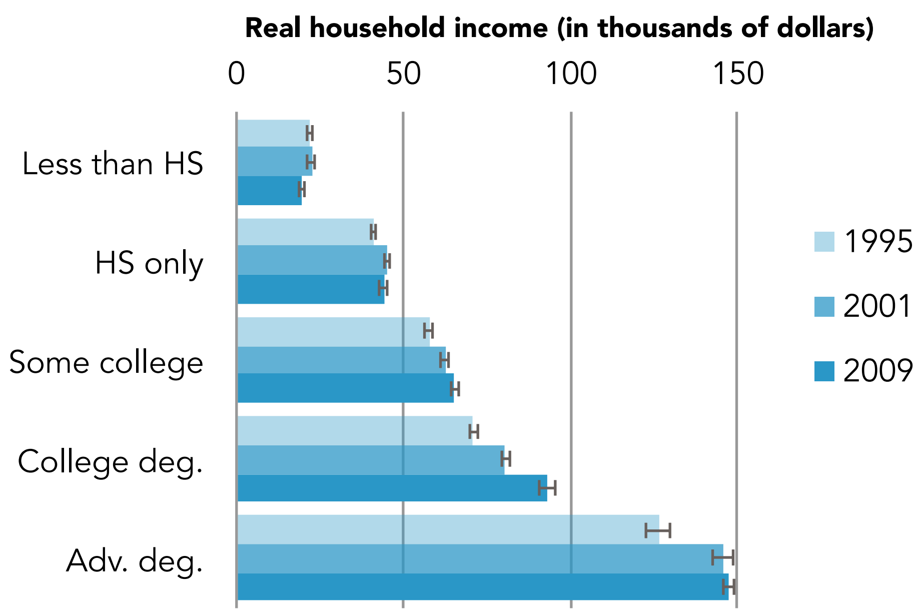
Figure 24 Educational attainment by year (Age 26 to 36)



Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 25 depicts the close relationship between educational attainment and earnings potential. The figure draws on data from the NHTS and is consistent with data from the National Center for Education Statistics on median earnings (National Center for Education Statistics 2013). The gap in earnings by educational attainment widened over time. In an analysis of the Current Population Survey, Carnevale, Hanson et al. (2013) found that earnings fell for they typical young adult (age 21 to 30) between 2000 and 2010 and fell most for those with limited educations. Specifically, college graduates' earnings fell nine percent during the decade, but wages fell by more than twice as much for workers without a high school degree.

Figure 25 Household income by educaitonal attainment and year



Note: All values are adjusted for inflation and reported in 2009 values. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Roles

Sociologists generally recognize five key adult roles, which they refer to as markers of adulthood: (1) live independently, (2) complete education, (3) secure employment, (4) marry a partner, and (5) become a parent (Osgood, Ruth et al. 2005).Variables corresponding with these roles are often included in travel behavior research, but few authors refer to them as roles, referring instead to household characteristics and stage of life. By conceptualizing these variables as roles with attendant responsibilities, interpreting these variables becomes more meaningful. When a young person takes on an adult role, she tends to alter her travel behavior. Mothers, for example, make different types of trips than women without children (Lanzendorf 2010, Ralph, Taylor et al. 2014). This approach dovetails with the mobility biography literature, which explicitly considers travel patterns over the life course (Scheiner 2007, Lanzendorf 2010, Döring, Albrecht et al. 2014).

Information on each role was available in the NHTS (see Table 8). Education and employment are both roles and measures of economic resources and are predominantly discussed in the resources section of this analysis.

Table 8 Measuring adult roles in the national travel surveys

Variable	Concept
Employed	Indicates whether the respondent was employed at the time of the survey. It does not differentiate by full- or part-time status, nor does it differentiate between people who are unemployed (looking for work) and not employed (not looking for work).
Live independently	Indicates whether the respondent lives with his/her parents. A young person who does not live with his/her parents is said to live independently.
Married	Marriage status, young people living with an unmarried partner are considered single.
Have a child	Indicates whether the respondent is a parent; includes children who reside with the respondent.

Note: All variables are measured dichotomously: yes/no.

Employment
Young people have "secured employment" if they are employed in a full- or part-time job. Unfortunately, the travel surveys do not include information about whether a respondent is looking for work. For that reason people coded as "not employed" may be unemployed (looking for work) or may be out of the labor force by circumstance or by choice. Table 9 presents employment and labor force participation data from the Bureau of Labor Statistics. The table reveals that the majority of young people who are not employed are not in the labor force. Nevertheless, the unemployment rate for young people age 20 to 34 is far higher than for older adults.

Table 9 Employment and labor force participation by age in 2013

	Employed	Not employed	**Of those "Not employed" __% are…"** Unemployed	Not in labor force
16 to 19	28%	72%	7%	93%
20 to 24	62%	38%	18%	82%
25 to 29	76%	24%	21%	79%
30 to 34	77%	23%	19%	81%
All 16+	59%	41%	8%	92%

Notes: Calculated from the Bureau of Labor Statistics, Table A-13 "Employment status of civilian non-institutional population by age, sex, and race" December 2014.

Living independently
The other adult roles are based on a variable (*r_relat*) that indicates the relationship between the respondent and the household head. Identifying young people who lived independently was relatively straightforward. I began by identifying all young adults who lived with their parents. In some cases the young adult was the household head and someone else in the household was listed as a "parent." In other cases, a parent was the household head and the young adult was listed as her "child." A young adult is considered to live independently if he does not live with his parents. This slightly

overestimates the share of young people who live independently (and underestimates the share that live with their family) because some young adults likely live with aunts, uncles, grandparents, or other relatives.

Comparing data from the NHTS and the Census suggests that the extent of over-estimating is small. Using census data, the Pew Research Center found that the share of young adults (age 25 to 34) who live with their parents or other relatives increased between 2000 and 2010, from 15.8 percent to 21.6 percent (Parker 2012). [11] Using the same age categories with the travel surveys, I find the share of young people who lived with their parents to be 10.2 [9.2, 11.4] percent in 2001 and 18.2 [16.6, 19.9] percent in 2009.

Married

Next I identified married respondents. The primary dilemma was whether to include non-married partners in a "partnered" variable. On the one hand, I expect couples, regardless of marriage status, to display similar travel patterns. This suggests that I should use a combined "partnered" variable. On the other hand, Settersten, Furstenberg et al. (2006) argue that co-residing with an unmarried partner differs in important respects from marriage, particularly because unmarried partnerships tend to be more fluid. Relative to young people in unmarried partnerships, married young people in the NHTS sample were older, had higher incomes, were more likely to be non-Hispanic White, and had more education (see Table 10). Moreover, unmarried

[11] This statistic includes all young adults in multi-generational households, which the Pew defines as having two or more generations of adults age 25 or over.

partnerships were still relatively rare during the survey period. Of the respondents who were not married, just 2,841 of them (7%) lived with an unmarried partner. In total, only four percent of young adults live with an unmarried partner.

Ultimately my decision to focus on married young adults came down the research question: did the deferment of adult roles contribute to the decline in driving? In the 2000s young people delayed marriage and instead formed less-stable unmarried partnerships. Including unmarried partners in my definition of couples would obscure the effect that delaying marriage has had on travel.

Table 10 Comparing married and unmarried young adults in 2009

	Married	**Unmarried partner**
Household income	\$76,000 (74,000 to 79,000)	\$47,000 (40,000 to 54,000)
Adjusted household income	\$43,000 (41,000 to 44,000)	\$29,000 (24,000 to 34,000)
Age	31 (30.7 to 31.2)	29 (27.7 to 29.9)
College degree or more	47% (43 to 51)	28% (15 to 48)
NH White	70% (67 to 72)	62% (48 to 74)

Note: Ranges reflect the 95 percent confidence interval around the population estimate. Adjusted household income is household income divided by the square root of household size. All values are for 2009. Source: 2009 NHTS, weighted values.

Has a child

Identifying young adults with children was the most difficult role for me to identify in the data. I labeled respondents as parents if they were (1) the household head and (2) indicated that they lived with their own child. If the household head was a parent, I also categorized the head's spouse as a parent. While the spouse may not be the biological parent of the child, he or she likely helps to care for any child in the household. Unfortunately, my method for identifying parents can only identify parents who reside with their children.

The task of identifying parents was even more complicated when the respondent lived with his or her own parents. Unfortunately, *r_relat* does not include a category for grandchild. If a respondent lived with his or her own parent and also had a child of his or her own, the child would be listed in the survey as an "other relative." I designated respondents as parents if they lived with their own parents and with an "other relative" who was at least 15 years younger than the respondent. This approach slightly overestimates the number of parents because some young "other relatives" are not the respondent's child and are instead nieces, nephews or some other relation.

Finally, while gender[12] is not explicitly part of my conceptual framework, parenting roles, on average, differ decidedly for men and women (Bianchi, Milkie et al. 2000, Bittman, England et al. 2003, Sayer 2005, Cunningham 2007, Offer and Schneider 2011). For this reason, I included gender in the regression models (described below) as an interaction term with "has a child."

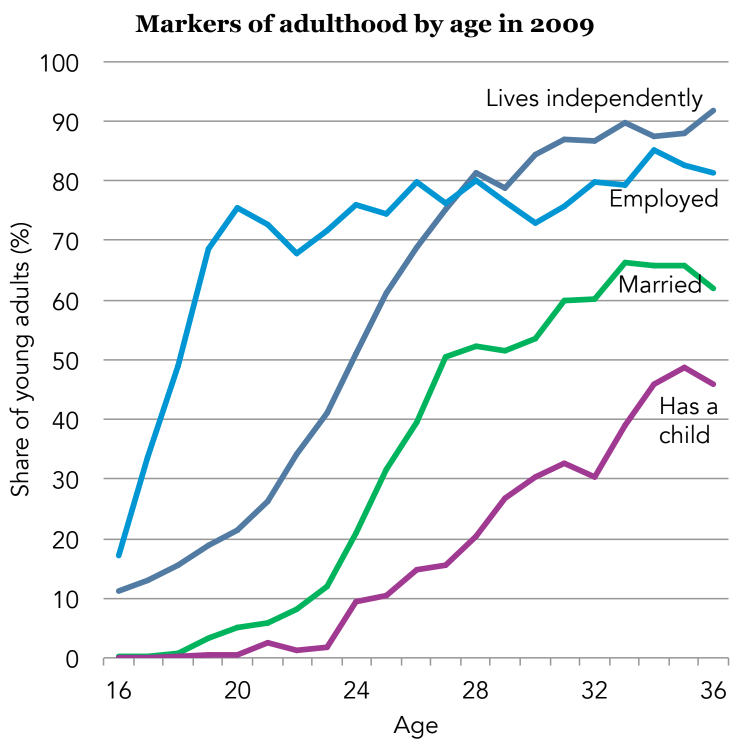
Delayed adulthood?

Figure 26 depicts the share of young adults that have taken on each of the adult roles (except education), by age. As the figure illustrates, the average teenager has taken on

[12] I use the term gender instead of sex purposefully. The NHTS solicits information on the sex of each respondent, but the question is self-reported and most people likely report their gender identity rather than their biological sex.

very few adult roles. The first role attained is typically employment, likely in the form of a part-time job. Very few teenagers live independently, are married, or have children, but the share of older young people that have taken on these roles is higher.

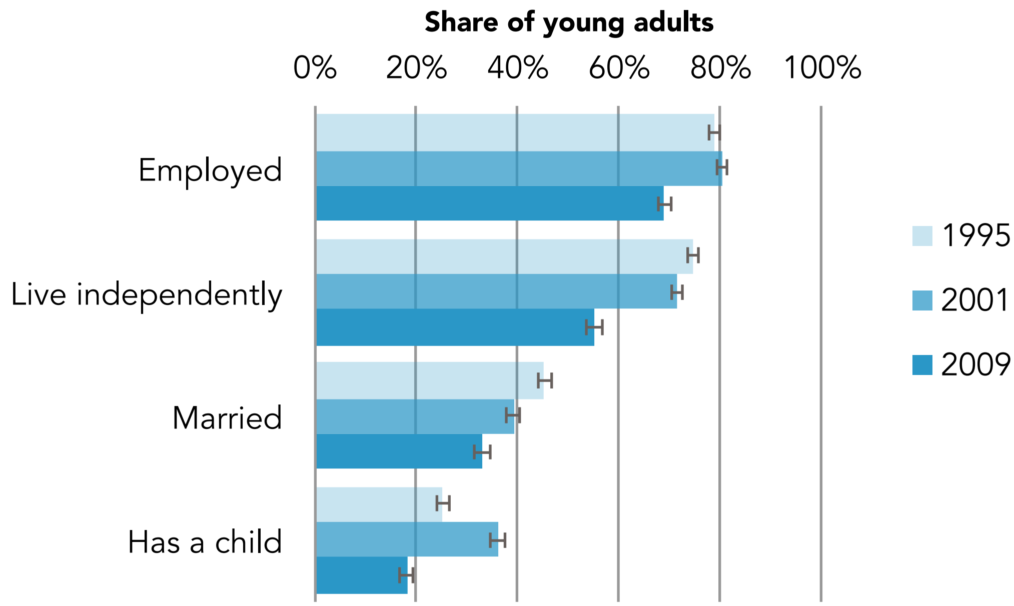
Figure 26 Adult roles by age in 2009



Source: 2009 NHTS, weighted values.

Sociologists who study young adults have documented widespread delays in attaining adult roles (Shanahan 2000, Settersten, Furstenberg et al. 2006, Settersten and Ray 2010). As Figure 27 illustrates, a substantially smaller share of young adults had taken on each role in 2009 than in the previous years.

Figure 27 Share of young adults (Age 16 to 36) that have attained each adult role, by year



Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Residential location

Of the many possible measures of residential location, this analysis includes three: population density, size of the metropolitan statistical area, and region of the country.[13]

Residential density

The NHTS provides information on residential density measured as people per square mile in the census block group. The NHTS reports density using a categorical variable with eight categories, but because there was very little variation in travel behavior at the lowest densities (50, 300, 750, and 1,500 people per square mile), those categories

[13] Many studies on travel and the built environment incorporate more detailed measures such as land-use mix, jobs-housing balance, intersection density, distance to transit, or measures of accessibility. This study does not include those measures, primarily because it is difficult to collect such data for a national sample. By omitting those variables, I am relying on population density, size of the metropolitan statistical area, and region of the country to serve as a proxy for those other variables.

were combined (less than 2,000) (see Table 11). Figure 28 depicts neighborhoods in Los Angeles and Chicago with each population density.

Table 11 Population density categories (people per square mile)

Label	Range
<2,000	0-1,999
3,000	2,000-3,999
7,000	4,000-9,999
17,000	10,000-24,999
>25,000	25,000-999,999

Figure 28 Visualizing population density in Los Angeles and Chicago

Visualizing population density in Los Angeles and Chicago

Los Angeles, California | **Chicago, Illinois**

(A) Less than 2,000 people per square mile

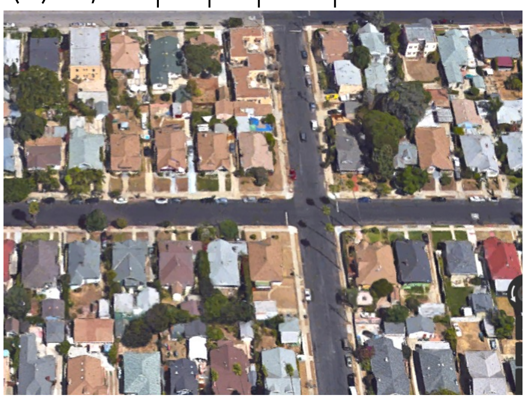
(B) 3,000 people per square mile

Continued on the next page

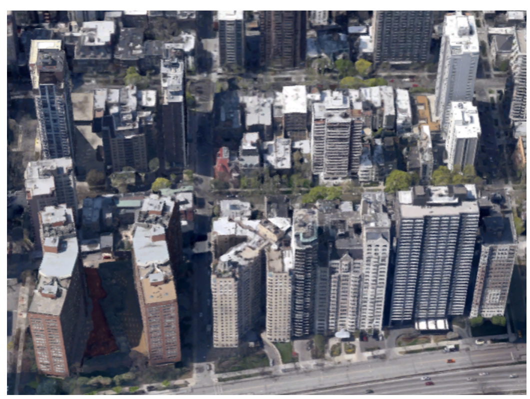
Los Angeles, California **Chicago, Illinois**

(C) 7,000 people per square mile

(D) 17,000 people per square mile



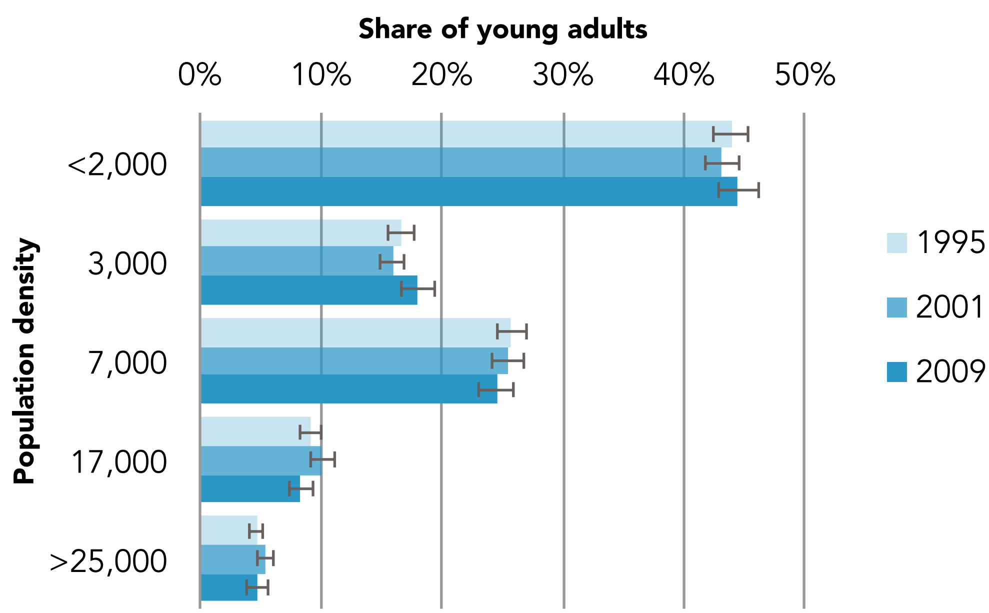
(E) 25,000 or more people per square mile



Note: Maps from Google, population density data from the American Fact Finder of the US Census. Los Angeles tract numbers: (A) 2623, (B) 6704.16, (C) 7025.01, (D) 2373, and (E) 2653.04. Chicago tract numbers: (A) 8299.02, (B) 8233.04, (C) 4911, (D) 2431, and (E) 801.

Figure 29 provides information on the share of young adults that live at each population density. The majority of young people in the United States lived at densities of less than 4,000 people per square mile and fully 44 percent of them lived at densities below 2,000 people per square mile.

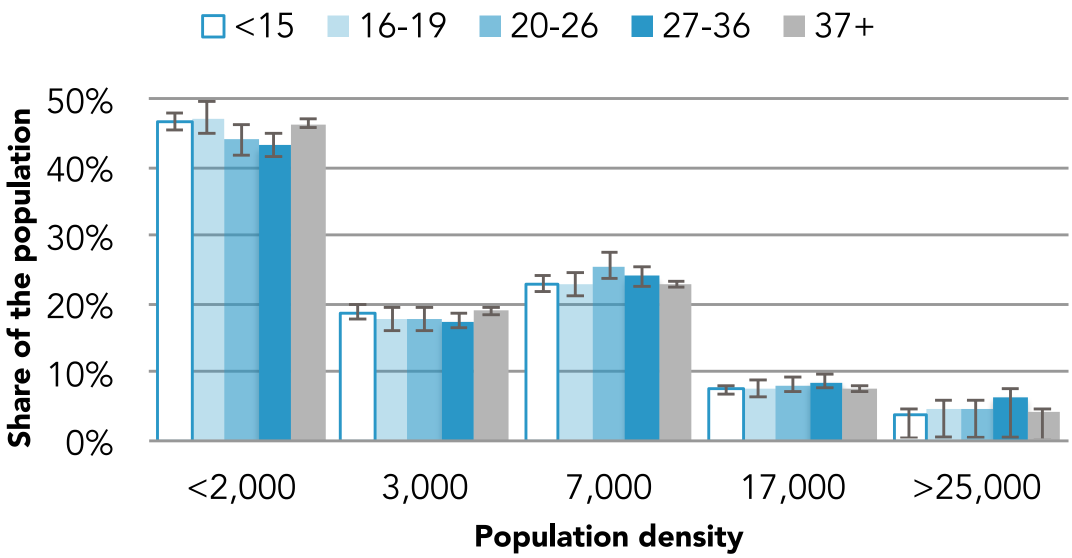
Figure 29 Share of young adults (Age 16 to 36) by population density and year



Note: Error bars reflect the 95 percent confidence interval around the population estimate.
Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 30 compares the population density of Americans by age group. In general, Americans of all ages live at relatively low densities, but some differences materialize by age. While the oldest (37 and older) and youngest (15 and under) respondents live in similar locations, young adults, particularly those age 20 and older, differ slightly. A smaller share live at the lowest densities and a larger share live at moderate (7,000) and high (>25,000) densities. Notice that this figure is from a single year (2009) and provides no evidence about change over time.

Figure 30 Residential location (population density) in 2009 by age

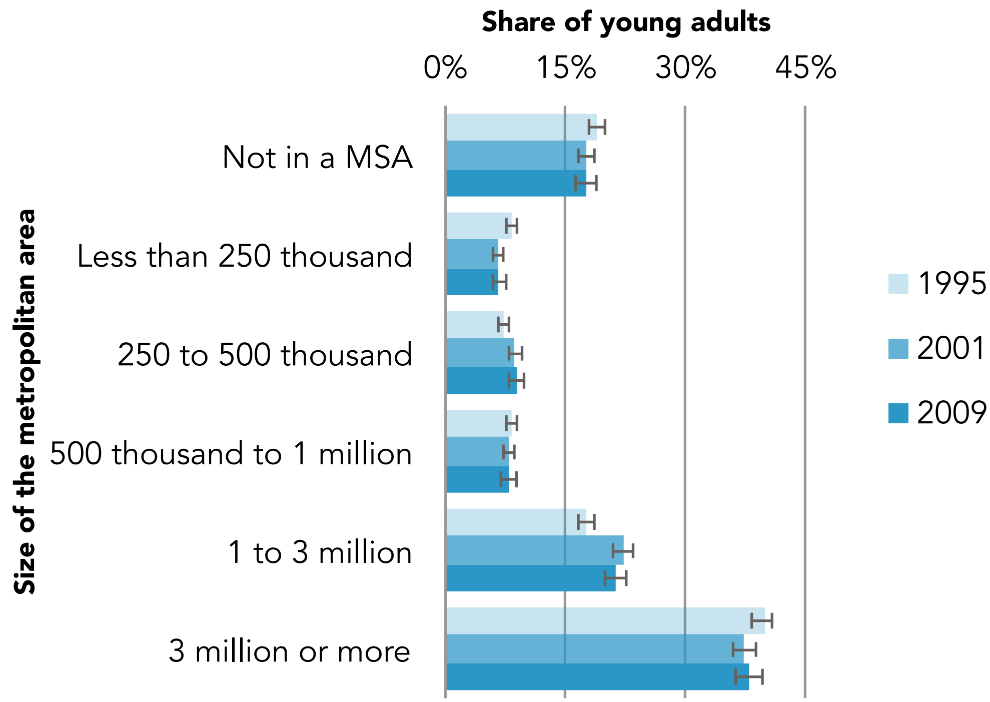


Note: Error bars reflect the 95 percent confidence interval around the population estimate.
Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Size of the metropolitan area

The NHTS includes information on the size of the metropolitan statistical area (MSA) of each household. Figure 31 indicates that the most common metropolitan size among young adults was three million or more. Despite living in large cities, nearly a quarter of young people in the largest MSAs lived in areas with fewer than 2,000 people per square mile.

Figure 31 Share of young adults (Age 16 to 36) by size of the metropolitan area and year

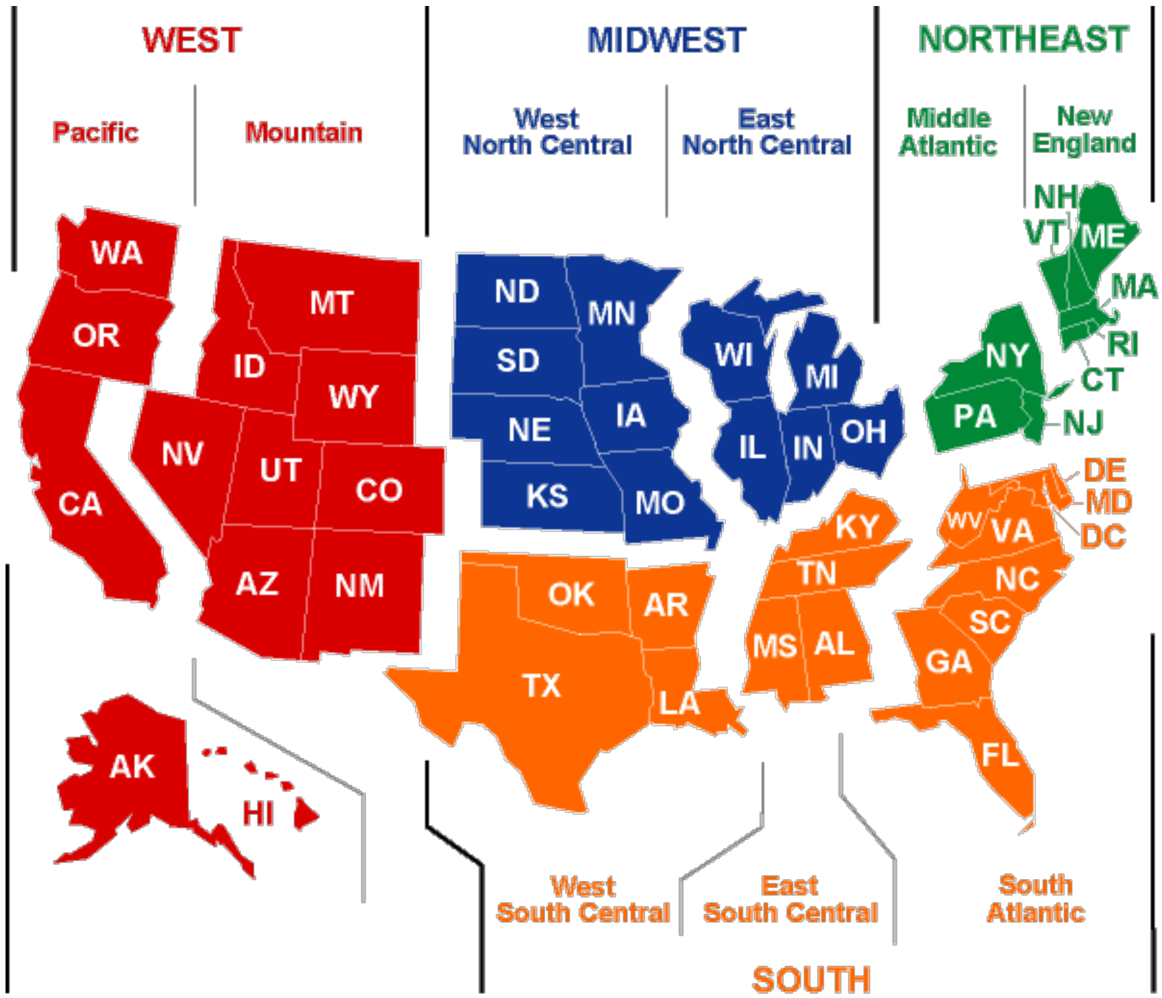


Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Region

The NHTS includes two variables to describe a respondent's region: Census Region (Northeast, Midwest, South, and West) and the more detailed Census Divisions (see Figure 32).

Figure 32 Census regions and divisions



Source: http://www.eia.gov/consumption/commercial/census-maps.cfm

Table 12 summarizes the residential location of young adults in 2009 by census region and division. A larger share of young adults lived in the South and West than in the Northeast and Midwest. Relative to the general population (all ages), young adults were slightly more likely to live in the Mountain or Middle Atlantic divisions and were slightly less likely to live in the South Atlantic division.

Table 12 Where do young adults live? Census region and division of young adults (age 16 to 36) in the United States in 2009

Census region		Census division	
Northeast	19%	New England	5%
		Middle Atlantic	14%
Midwest	21%	East North Central	15%
		West North Central	6%
South	36%	South Atlantic	18%
		East South Central	6%
		West South Central	12%
West	24%	Mountain	8%
		Pacific	17%
	100%		100%

Source: 2009 NHTS, weighted values.

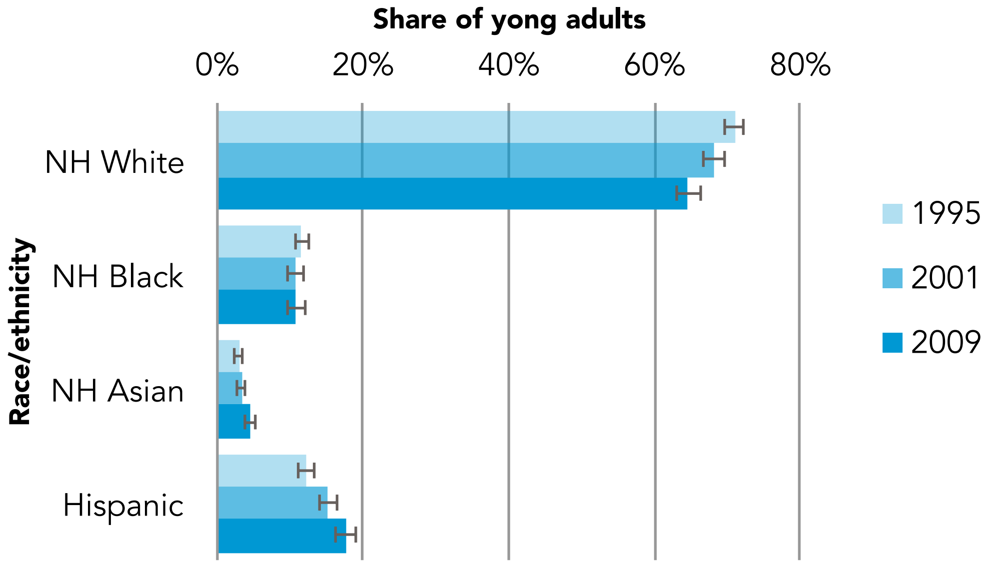
Race/ethnicity

The NHTS includes data on race and ethnicity, but during the survey period, the data were only collected for the household head. This is problematic, particularly because many young people today have mixed ancestry. For example, in 2010, fully 15 percent of newly married couples were multiracial (Lofquist, Lugaila et al. 2012, Frey 2014). I combined the two race and ethnicity variables from the household head into a single variable with five categories: non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, Hispanic, and Non-Hispanic other, henceforth referred to as white, Black, Asian, Hispanic, and other.[14] Figure 33 presents data on the racial and ethnic composition of young people in the United States using the imperfect NHTS data.

---

[14] I follow the example of Touré (2011). Who's Afraid of Post-Blackness?: What it Means to be Black Now. New York City, Free Press.and capitalize Black, but use lowercase for white. As Touré explains in the author's note to his book Who's afraid of Post-Racial Blackness: "I have chosen to

Figure 33 Race and ethnicity of young adults (Age 16 to 36) by year



Note: NH is non-Hispanic. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Immigrant status

Immigrants tend to display unique travel patterns when they arrive in the United States, but they quickly adopt many of the travel patterns of their new country. Some differences persist, however, even after twenty years in the United States (Blumenberg and Smart 2011). The NHTS includes a variable *Born in US*, but that variable is only available in 2001 and 2009 and for this reason it is not included in the regression models described later in the chapter. Roughly 14 percent of young adults in the NHTS sample were immigrants (in 2001 and 2009).

---

capitalize the word "Black" and lowercase "white" throughout this book. I believe "Black" constitutes a group, an ethnicity equivalent to African-American, Negro, or, in terms of a sense of ethnic cohesion, Irish, Polish, or Chinese. I don't believe that whiteness merits the same treatment. Most American whites think of themselves as Italian-American or Jewish or otherwise relating to other past connections that Blacks cannot make because of the familial and national disruptions of slavery. So to me, because Black speaks to an unknown familial/national past it deserves capitalization."

ANSWERING RESEARCH QUESTIONS USING THE FOUR R's

The conceptual framework allows me to test a number of hypotheses about the cause of the decline in driving. Specifically, does the decline in driving reflect:

- A fundamental shift in attitudes and preferences? (Ch. 5: Resources)
- Financial constraints? (Ch. 5: Resources)
- The delayed onset of adult roles? (Ch. 6: Roles)
- A back-to-the-city movement? (Ch. 7: Residential location)
- Increased availability and relative utility of alternative modes in metropolitan areas?
- Increasing racial and ethnic diversity of young Americans? (Ch. 8: Race/ethnicity)

To answer these questions I employed two analytical approaches: analyzing change over time for distinct subgroups and estimating multivariate regression models. The following sections detail each approach.

Change over time for distinct sub-groups

The previous chapter revealed that there were fewer Drivers and Trekkers and more Multimodals and Car-less young adults in 2009 than in 1995. Analyzing variations in the direction and magnitude of changes over time for distinct population groups provides indirect evidence for many of the questions outline above. In the next chapter, for example, I compare the change in the prevalence of each type by income quintile and find that the changes for low-income young adults differed markedly from changes for high-income young adults (see p. 123). In later chapters I explore change over time for young people who have and have not taken on each adult role (Chapter 6), by residential location (Chapter 7), and by race/ethnicity (Chapter 8). In each case I present the magnitude of the change over time with 95 percent confidence intervals. This approach is preferable to simply comparing the proportion in each year (Cumming 2014).

Multivariate analysis

The preceding analytical approach is descriptive and does not include statistical controls for other changes that may confound the results. The second approach—multivariate analysis—allows me to identify the independent relationship between the traveler types and young peoples' roles, resources, residential location, and race/ethnicity. The models are multinomial logistic regressions with Driver as the base or reference category.[15] The main model does not include the educational attainment variables because there was no reliable education data for respondents age 25 and younger and because of multicollinearity with household income. Finally, the NHTS-provided survey weights are used throughout the analysis so that the estimates are representative of the population of the United States.

To facilitate model interpretation, I used the *margins* command of Stata to estimate the predicted proportion of young adults in each traveler type (Mitchell 2012). Fortunately, this also produces a lower and upper bound for the estimate that reflects a 95 percent confidence interval. I follow the advice of Cumming (2014) and eschew traditional null hypothesis significance tests and instead report point estimates with

[15] Driver was the most common traveler type.

confidence intervals and employ "estimation thinking".[16] Most often the confidence intervals take the form of error bars in figures. The error bars can be used to do traditional null hypothesis testing; if the error bar crosses the axis, the effect is not statistically significant.

Finally, a central aim of this research was to determine whether the relationship between the four R's and traveler type changed over time. To answer this question I re-estimated the model twelve times (once for each explanatory variable) and each time I added an interaction term between the variable of interest and year (1995, 2001, and 2009). The model results with interaction terms are presented in the Appendix of each chapter.

RESULTS

In the following sections I briefly introduce the results of the multivariate analysis. This discussion is cursory; each of the following four chapters provides more comprehensive interpretation. Table 13 presents fit statistics for each multinomial logistic regression models with an interaction term (survey year). These Pseudo R^2 values are in line with similar studies of travel behavior[17].

---

[16] A growing number of social scientists have advanced compelling arguments to call into question the "cult of statistical significance." Far from disparaging all forms of quantitative analysis, these scholars endorse "new statistics," a quantitative approach that employs "estimation thinking". While traditional hypothesis testing addresses a dichotomous question—"Is there an effect?"—new statistics asks, "How large is the effect?" These scholars recommend using point estimates and confidence intervals to convey the magnitude of effects (effect sizes) and the degree of certainty (length of error bars). For more information see Ziliak and McCloskey (2008) and Cumming (2014).

[17] For example, in a multinomial logistic regression model predicting multimodality using data from the national travel surveys, Buehler and Hamre's (2014) model has a McFadden's pseudo-R^2

Table 13 Fit statistics for all multinomial logistic regression models

	χ^2	df	Prob $> \chi^2$	Pseudo R^2	N
Resources					
Household income quintile	12031.69	132	0.000	0.1377	68810
Education (Age 26-36)	6948.93	123	0.000	0.1425	42094
Roles					
Worker	12026.03	114	0.000	0.1376	68810
Live independently	12006.71	114	0.000	0.1374	68810
Married	12006.41	114	0.000	0.1374	68810
Has a child (Female only)	5913.63	99	0.000	0.1537	34835
Has a child (Male only)	5384.46	99	0.000	0.1120	33975
Residential location			0.000		
Population density	12023.57	123	0.000	0.1376	68810
Size of metropolitan area	12025.85	129	0.000	0.1376	68810
Census division	12002.61	147	0.000	0.1373	68810
Race	12059.99	132	0.000	0.1380	68810

Note: Full model results are available in each chapter.

Each of the following four figures presents the results of nine multinomial logistic regression models, each with traveler type as the dependent variable. Each bar reflects the independent relationship between that variable and traveler type (i.e. while controlling for each of the other variables) in 2009. The base categories serve as a point for comparison and they are: have not attained the adult role, middle-income quintile, 7,000 people per square mile, and non-Hispanic white. Bars to the right of the axis indicate that young people with that characteristic were more likely to be a Driver (or Trekker, etc.) relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate.

of 0.058. In a study of travel mode for commute trips and social trips, Blumenberg et al. (2012) had pseudo-R^2 values ranging from 0.11 to 0.27.

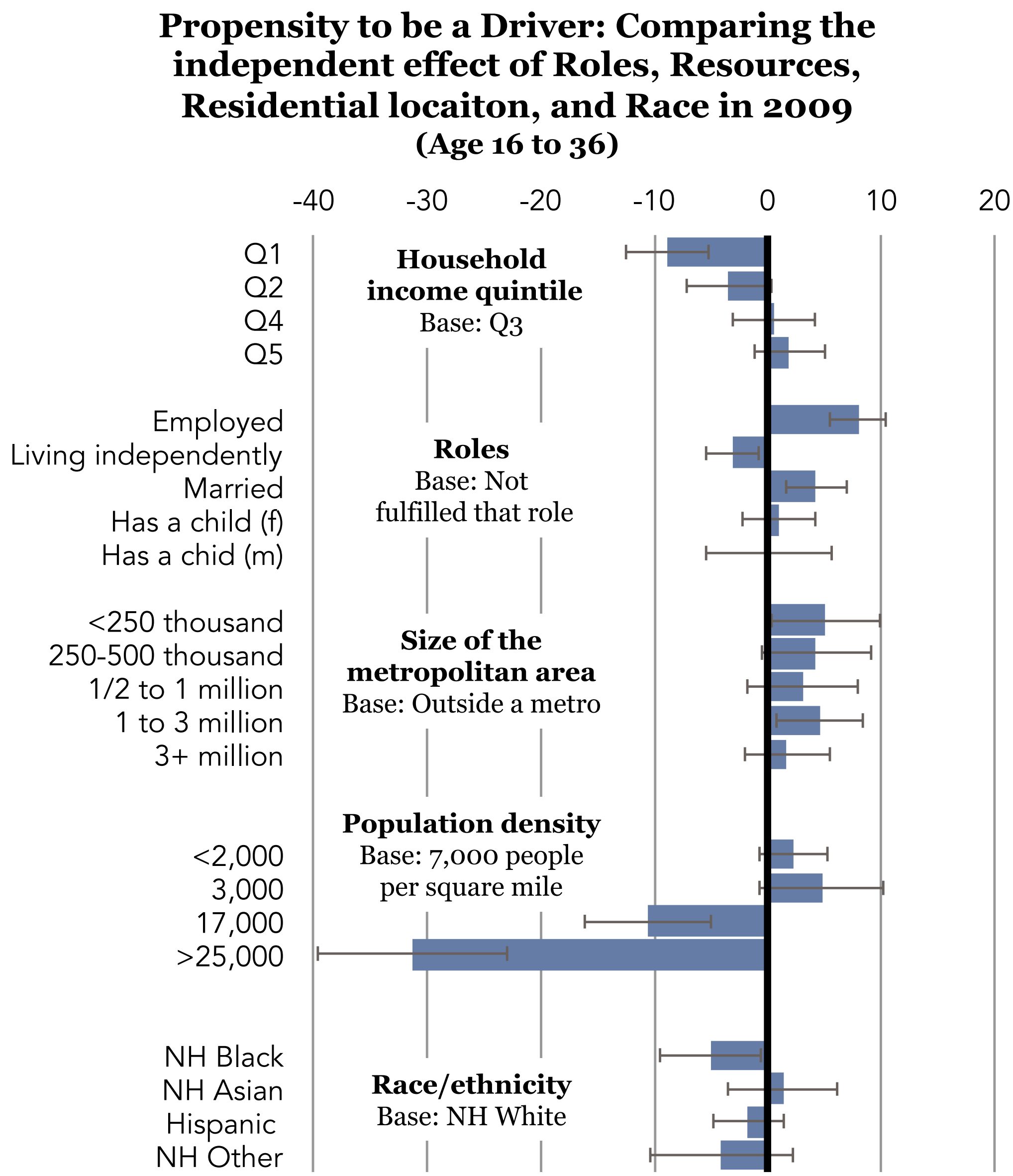
Driver

Controlling for other factors, resources strongly shape the propensity to be a Driver (see Figure 34). Young adults with fewer resources (in the lowest two income quintiles) were less likely than young people in the middle-income quintile to be Drivers. Employment—at once a resource and a role—increased the propensity to be a Driver, as did being married. Young people in metropolitan regions were more likely to be Drivers than young people outside metropolitan areas (with the exception of the largest cities). Population density had the strongest relationship. Everything else equal, the propensity to be a Driver decreased as density increased, particularly at the highest densities. Finally, being Black was the only race/ethnicity category that was significantly related to the propensity to be a Driver after controlling for the other factors.

Car-less

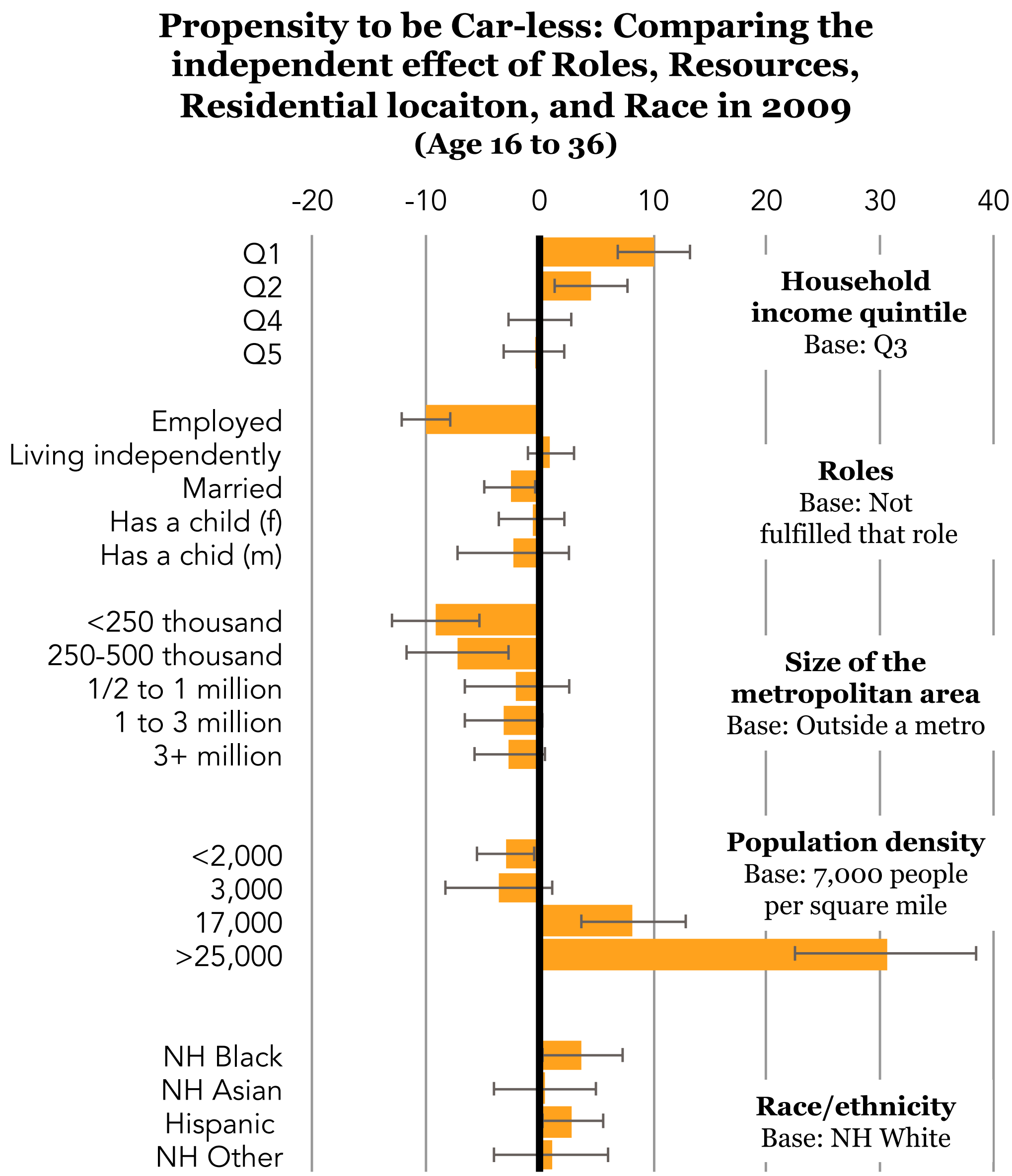
I present the results for the Car-less type next because the results tend to mirror the results for Drivers (see Figure 35). Young adults with low incomes or without jobs were more likely to be Car-less than young people with more resources. Surprisingly young people outside metropolitan areas were more likely to be Car-less than young people in metropolitan areas of any size when controlling for other factors. The results for population density are more intuitive: at high densities young adults were more likely to be Car-less.

Figure 34 Synthesis: Propensity to be a Driver in 2009 (Age 16 to 36)



Note: Result of nine multinomial logistic regression models, each with traveler type as the dependent variable. Each bar is the estimate of the independent effect of the variable (i.e. while controlling for each of the other variables) in 2009. Effect sizes are relative to the base category: not fulfilled the role, middle-income quintile, 7,000 people per square mile, or non-Hispanic white. Bars to the right of the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate. Estimates are weighted to reflect the population of the United States using the provided survey weights. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 35 Synthesis: Propensity to be Car-less in 2009 (Age 16 to 36)



Note: Result of nine multinomial logistic regression models, each with traveler type as the dependent variable. Each bar is the estimate of the independent effect of the variable (i.e. while controlling for each of the other variables) in 2009. Effect sizes are relative to the base category: not fulfilled the role, middle-income quintile, 7,000 people per square mile, or non-Hispanic white. Bars to the right of the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate. Estimates are weighted to reflect the population of the United States using the provided survey weights. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

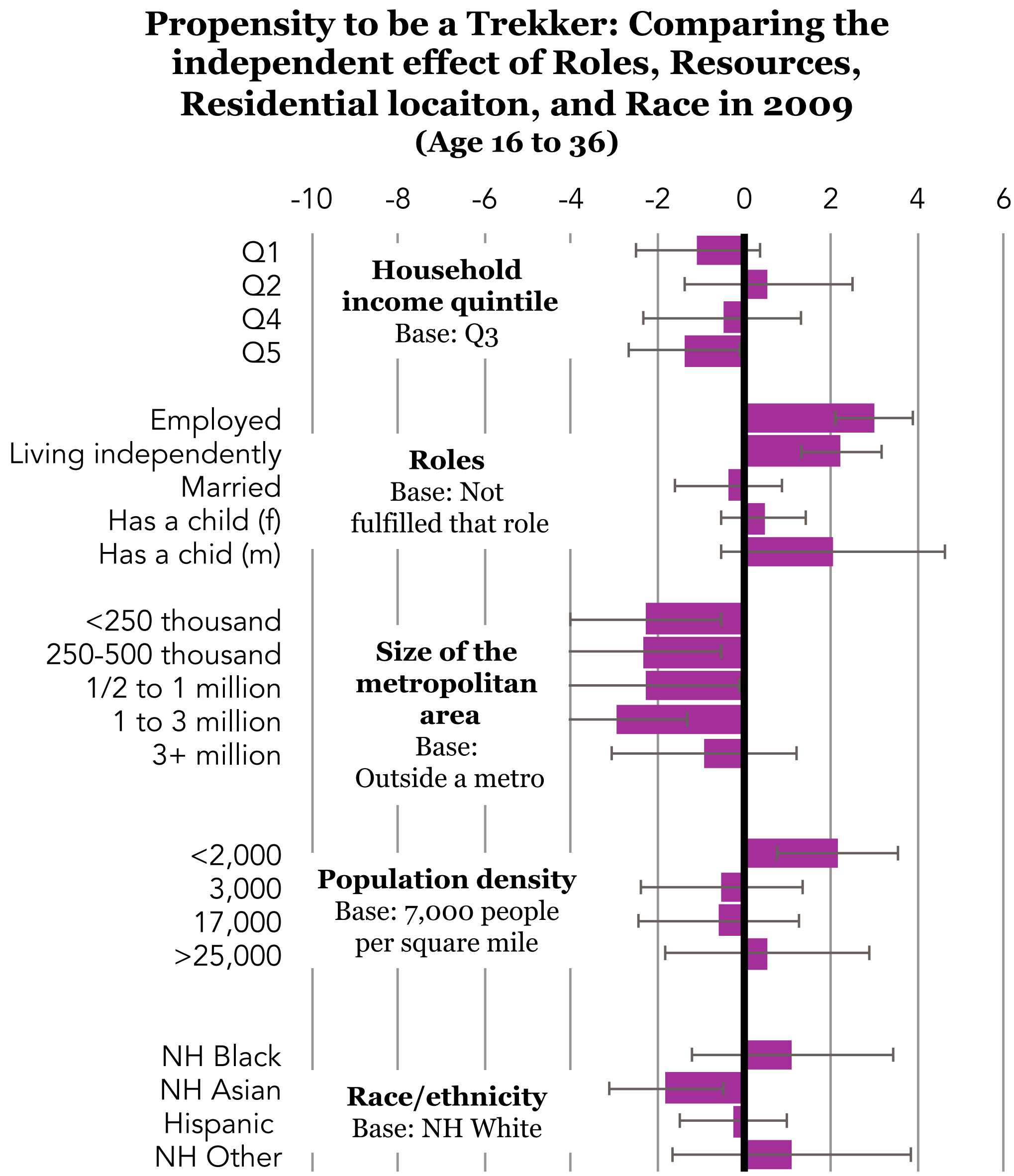
Long-distance Trekker

Because there are so few Trekkers and Multimodals, the magnitude of the independent relationships in Figure 36 and Figure 37 are relatively smaller than for Drivers and Car-less. Nonetheless, the error bars should still be interpreted in the same way. There was a U-shaped relationship between income and the propensity to be a Trekker; young people with very low or very high incomes were less likely than those in the middle-income to be Trekkers. When a young person takes on an adult role like employment, living independently, or having a child (men only), he becomes more likely to be a Trekker. Trekkers were most common, everything else equal, at low densities and outside of metropolitan areas. Finally, Asian young adults were less likely than whites to be Trekkers, but there were no other significant racial differences.

Multimodals

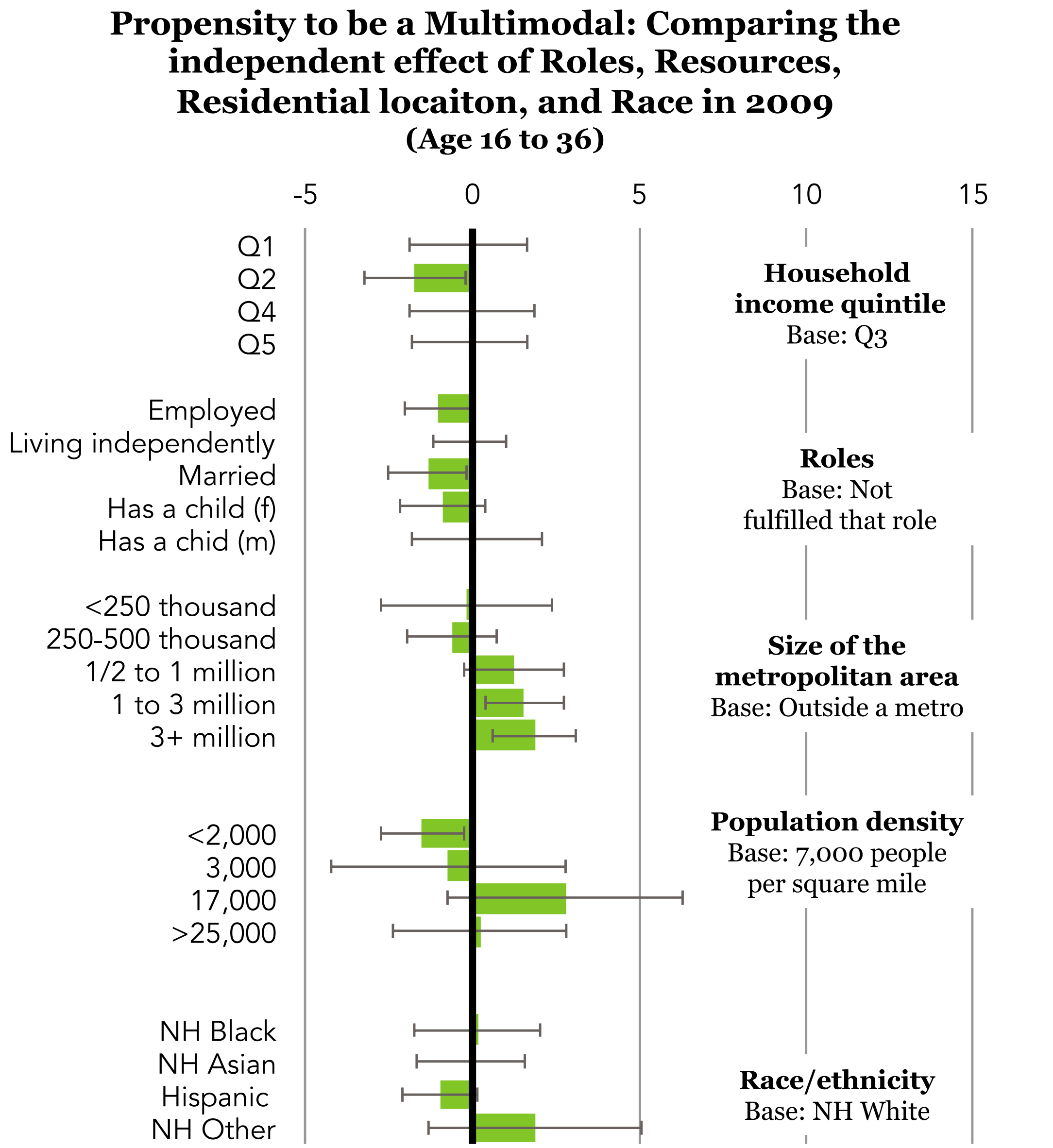
In general there were very few Multimodals, so the estimates were more uncertain (reflected by relatively larger error bars). As a result, there were fewer statistically significant relationships between the four R's and traveler type. When young people took on adult roles they were slightly less likely to be Multimodals. The propensity to be Multimodal increased with the size of the metropolitan area and with population density (except at the highest density, where I suspect that would-be Multimodals were simply more likely to be Car-less). Finally, everything else equal, white young adults were the most likely of the racial/ethnic groups to be Multimodals.

Figure 36 Synthesis: Propensity to be a Long-distance Trekker in 2009 (Age 16 to 36)



Note: Result of nine multinomial logistic regression models, each with traveler type as the dependent variable. Each bar is the estimate of the independent effect of the variable (i.e. while controlling for each of the other variables) in 2009. Effect sizes are relative to the base category: not fulfilled the role, middle-income quintile, 7,000 people per square mile, or non-Hispanic white. Bars to the right of the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate. Estimates are weighted to reflect the population of the United States using the provided survey weights. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 37 Synthesis: Propensity to be a Multimodal in 2009 (Age 16 to 36)



Note: Result of nine multinomial logistic regression models, each with traveler type as the dependent variable. Each bar is the estimate of the independent effect of the variable (i.e. while controlling for each of the other variables) in 2009. Effect sizes are relative to the base category: not fulfilled the role, middle-income quintile, 7,000 people per square mile, or non-Hispanic white. Bars to the right of the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate. Estimates are weighted to reflect the population of the United States using the provided survey weights. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

CHAPTER CONCLUSION

This chapter established the analytical approach for Part II of the dissertation. The traveler types from Part I serve as the dependent variables in two types of analysis: a descriptive change over time for distinct sub-groups and a multivariate analysis. The conceptual framework for this analysis draws on the travel behavior literature and conceives of the traveler types as a function of available economic Resources, whether the respondent has taken on adult Roles, the utility of travel modes based on the Residential location, and finally the Race and ethnicity of the individual. In each of the subsequent chapters I explore the relationship between the traveler types and one of the four R's: resources (Chapter 5), roles (Chapter 6), residential location (Chapter 7), and race/ethnicity (Chapter 8). The final chapter synthesizes the results and contextualizes the findings in terms of the broader literatures on travel behavior and young people.

CHAPTER 5: RESOURCES

SATISFYING PREFERENCES OR RESPONDING TO CONSTRAINTS?

Recently I traveled on consecutive weekends to a small town in Ohio and then to Washington, DC. This trip cast the difference between travel-by-choice and travel-by-constraint into sharp relief. In both places I observed young people going about their daily business on foot, but the context of their walk trips could not have been more different. While the DC pedestrians rushed along crowded sidewalks through streets lined with shops, cafes, offices, and other potential destinations, the small town Ohioans walked along the shoulders of busy four-lane roads, loaded down with grocery bags, far from any store. I observed a young man with a small child in a stroller standing in the median of a four-lane road waiting to cross. And I watched in horror as an elderly woman slowly made her way across the entrance to a freeway on-ramp with cars and large trucks whizzing by.

These starkly contrasting scenes demonstrate the importance of urban form and supportive infrastructure in shaping the walking experience—the focus of chapter 7—but they also reveal how a person's available resources affect the quality and availability of travel choices. Accordingly, this chapter focuses on the resources part of the story, examining in particular travel differences by employment, household income, and educational attainment.

This chapter opens with two competing interpretations of the cause of the decline in driving among young adults. Are young people satisfying new preferences or are they responding to economic constraints? To answer that question, this chapter compares changes in travel between 1995 and 2009 for young people with many resources (employed, high incomes, and with extensive educational attainment) and young people with few resources (not employed, low incomes, and limited educations). This analysis reveals that preferences and constraints are both at work, but there is more substantial support for the economic view. The penultimate section addresses a related question: over time, are economic resources becoming more or less important as explanatory factors for travel behavior? To answer that question I estimate a series of multinomial logistic regression models, which are described in the previous chapter. The conclusion includes a brief discussion of the implications of these findings.

Two views

The dramatic changes in travel have garnered great interest from the popular media, advocacy organizations, and researchers alike. In general, many of the scholars who are intrigued by the trends have proffered a number of reasonable hypotheses and conducted cursory analysis on the topic, but given the limitations of existing analyses many scholars are taking a wait-and-see approach. By contrast, most media pundits and advocacy organizations have staked out positions and many fall into one of two camps: those that see a fundamental shift in preferences for non-automobile travel and those that see adaptations to economic constraints.[18]

[18] An alternative framework, employed by the Netherlands Institute for Transport Policy Analysis, breaks the causes into situational factors and attitudinal factors. Situational factors, according to the authors, include the recession, limited access to a vehicle, increased migration to the city, and nearly ubiquitous social media. Attitudes, by contrast, include evolving views on the prestige or status of the automobile, a tendency to embrace the sharing economy, and increased environmental awareness. I see two primary shortcomings in that conceptualization. First, it seems to me that migration to the city and the growth of social media are more

Preferences

Those in the preferences camp conceive of a new, widespread "desire to drive less" (p. 5), based in part of the rise of ubiquitous communication technology, a heightened environmental consciousness, and the growing allure of urban amenities (Dutzik and Baxandall 2013).

Communication technology

> *"The Internet makes telecommuting possible and allows people to feel more connected without driving to meet friends."*
>
> \- Mimi Sheller in The New York Times
>
> (Rosenthal 2013)

Perhaps the most oft-cited explanation for the decline in driving is the concurrent increase in information communication technologies (ICTs) (Sivak and Schoettle 2012). Young people do not need to drive, the argument goes, because they can text, Skype, or tweet with their friends.

Young people are indeed digital natives—they grew up with the Internet and household electronics (Pew Research Center 2014) and, as a result, young people tend to be early adopters of new technologies. For example, in 2010 the vast majority of teenagers owned a cell phone (80%) and a third owned a smart (web enabled) phone. Moreover, texting is "the dominant daily mode of communication between teens," (p.

---

attitudinal than situational. Second, limited access to a car is, to me, further evidence of the decline in driving, not a cause of the decline in driving. Nevertheless, I agree with the authors' key finding that situational factors, primarily the recession, was the primary (though not only) cause of the recent decline in driving among Dutch young adults. For more information see: Jorritsma, P. and J. Berveling (2014). Not carless, but car-later. Netherlands, KiM Netherlands Institute for Transport Policy Analysis**:** 65.

2) with the average teen sending or receiving 50 texts a day (Lenhart, Ling et al. 2010). In 2011 smart phone ownership was highest for young people in their twenties, who were more likely than teens and more likely than older adults to own a smart phone (Zickhuhr 2012).

ICTs may reduce driving through a number of pathways. First, they may replace some trips. Activities that once required travel, such as visiting the bank, purchasing music, or even working, have been replaced by mobile banking, music streaming, and teleworking (Mokhtarian 2009).

Second, ICTs may make it easier to use non-automobile modes of transportation (Mokhtarian 2002). In particular, mobile phone mapping services and real-time arrival information may reduce the barriers to using public transit (Ferris, Watkins et al. 2010, Watkins, Ferris et al. 2011). Ferris, Watkins et al. (2010) found that bus users were more satisfied with their rider experience. Waiting for the vehicle to arrive is a particularly onerous aspect of riding transit. Real-time bus information reduces actual wait times (Watkins, Ferris et al. 2011) and, by reducing the "frustration and uncertainty of not knowing when a bus is really going to arrive," also reduces *perceived* wait times (Ferris, Watkins et al. 2010) (p. 1811). Current riders report using transit service more often after the introduction of real-time information, particularly for non-work trips (Ferris, Watkins et al. 2010). Evidence from other jurisdictions (Chicago), provides further evidence that real-time information modestly increases ridership (Tang and Thakuriah 2012).

In addition to making it easier to use other modes of transportation, ICTs may make riding transit more enjoyable (Mokhtarian 2009). Many transit agencies have caught on to this idea and are marketing their services as a way to "Drive less, do more" (see Figure 38).

Figure 38 Public transit promotional material

Promotional material for the UTA TRAX in Salt Lake City
http://www.rideuta.com/news/2015/01/drive-less-do-more/

Finally, ICTs may make new travel options available, which may reduce automobile ownership and, in turn, decrease total miles of travel by automobile. Mobile-enabled carsharing service, such as Zipcar and Car2go, offer the ability to rent a vehicle by the hour using a cellphone. People who join carsharing services tend to reduce the number of automobiles that they own, often by shedding older, less fuel efficient vehicles (Martin and Shaheen 2011). Less evidence exists about the effects of Transportation Network Companies (like Uber, Sidecar, and Lyft) that serve as high-tech taxis. Together, these and other services help provide a robust set of travel options, making it less onerous to be a car-light or car-free household and, because car ownership is among the strongest predictors of miles of driving (Bento, Cropper et al. 2005), owning fewer cars likely reduces total miles driven.

Two industry-conducted surveys provide supporting evidence for this hypothesis. In a survey commissioned by the car-share company Zipcar, a quarter of respondents ages 18 to 34 reported that they drive less because of mobile transportation apps (Zipcar 2013). Similarly, nearly two thirds of college students in an international survey commissioned by Cisco (a computer networking company) reported that if they had to choose, they would prefer the Internet over a personal vehicle (Cisco 2011).[19] These results are hardly surprising given that Zipcar and Cisco each have professional interests in the results and the samples are almost certainly not representative of the general population.[20]

Academic scholars do not share the same self-serving motivations of industrial researchers and, as a result, their research design and sampling frame are typically more rigorous, lending more credence to the generalizability of their findings. In the existing academic research on this topic few (if any) respondents report that using ICTs reduce their desire to travel (Delbosc and Currie 2012). For example, while many journalists speculate that teens are less interested in getting a driver's license because

[19] Willingness to forgo a car varied substantially by country. While the majority of Japanese, German, and British college students opted for the Internet (85, 75, and 72 percent respectively), the majority of American college students favored a car (54 percent). The survey findings may speak more to the availability of alternatives to the automobile than to the vital importance of the Internet.

[20] Despite being widely cited, details about the Zipcar survey are scarce. I found no information on the sampling approach of the 2012 survey. According to a press release for the 2014 version of the survey, the data are "weighted by the demographic variable to match the national Census." (See http://www.zipcar.com/press/releases/fourth-annual-millennial-survey)

they can connect with friends online (Alcindor 2012, Rosenthal 2013), yet in rigorously conducted surveys very few (just 17%) of 18- and 19-year olds without a driver's license list ICTs as the primary reason for remaining unlicensed (Delbosc and Currie 2012, Tefft, Williams et al. 2013). By contrast, fully eight in ten unlicensed teens listed other explanations for the delay, the most common of which was that they did not have access to a vehicle (Tefft, Williams et al. 2013).

The most commonly cited evidence about ICTs and behaviors (as opposed to perceptions) is a 2011 study by Sivak and Schoettle. The authors analyzed driver's licensing rates in fifteen countries and found fewer people were licensed in countries where a larger proportion of the population had Internet access. The authors conclude that the data is "consistent with the hypothesis that access to virtual contact reduces the need for actual contact among young people" (p. 13). The study has been criticized on theoretical and methodological grounds by Le Vine, Latinopoulos et al. (2013) and evidence from disaggregate sources that control statistically for potential confounding effects (like income) consistently contradict the finding that ICTs serve as a substitute for travel (Taylor, Ralph et al. 2013, Le Vine, Latinopoulos et al. 2014). Despite these criticisms and evidence to the contrary, the results are widely cited in the popular press.

In a comprehensive review of ICT and travel behavior, Mokhtarian (2002) concludes that, "the empirical evidence for net complementarity is substantial, although not definitive, and the empirical evidence for net substitution appears to be virtually nonexistent" (p. 43). Mokhtarian (2002 and 2009) identifies several pathways by which ICTs could generate more travel. First, digital messages may contain invitations that generate additional trips. Second, ICTs may free up time and resources that can be spent on different activities, which may require travel (Mokhtarian 2009). Third, ICTs also tend to increase the size and geographic scope of social and business networks (Schwanen, Dijst et al. 2008) and wider networks may lead to more travel (Carrasco and Miller 2006), particularly for periodic long-distance trips (Larsen, Axhausen et al. 2006). Indeed, young people tend to report that ICTs lead to more trips, not fewer (Delbosc and Currie 2012). Nearly two thirds of young people (age 17 to 24) in the Netherlands agreed that ICTs made it easier to meet up with a friend (Jorritsma and Berveling 2014).

Heightened environmental consciousness

Others speculate that young people are driving less as a part of a conscious effort to reduce their environmental footprint (Jorritsma and Berveling 2014). Support for this view comes from a widely cited survey commissioned by Zipcar, which found that 44 percent of young people (ages 19 to 34) agree with the statement, "I want to protect the environment, so I drive less" (Zipcar 2013).

The Zipcar findings are probably not generalizable because Zipcar members were likely over sampled. Moreover, Zipcar's findings conflict with other, more rigorous studies on environmental motivations and travel. In a nationally representative survey of 2,000 adults in the Netherlands, just 20 percent of young (age 17 to 24) respondents—half as many as the Zipcar study—reported that they drove less to protect the environment (Jorritsma and Berveling 2014). Delbosc and Currie have conducted a number of smaller scale studies on this topic that align with the Dutch findings. In a survey of low-income households without a vehicle in Melbourne, Australia, Currie and

Delbosc (2009) found that 2 of the 24 respondents (just 8%) agreed with the statement, "I don't have a car because we think cars are bad for the environment/community" (p. 6). By contrast, seven times as many respondents (13 of 24; 58%) reported that they do not drive because they cannot afford a vehicle. In a different study, the same authors conducted an online focus group with young people age 17 to 21 in Australia (Melbourne and Victoria). Of the 28 participants, not a single one mentioned environmental issues as a motivation for his or her travel behavior (Delbosc and Currie 2012). When prompted to consider the topic, the consensus was that taking individual steps to protect the environment (such as riding transit instead of driving) were "unrealistic". Moreover, the authors analyzed the British National Travel Survey and found that one percent of unlicensed young people (age 17 to 29, n=2,820) in the United Kingdom list environmental factors as a cause for their delay, but 30 percent indicated that the high cost of automobility was the reason for their delay. The findings of each of these studies contrast starkly with the findings of the Zipcar study and together cast serious doubt on the hypothesis that environmental preferences explain the decline in driving.

Furthermore, there is no evidence that environmental attitudes are stronger for young people than older adults. For example, in a nationwide survey of British adults (n=2009) Thornton (2009) found that young people (16 to 24) displayed the least environmental consciousness of any generation (Thornton 2009). Similarly, in a nationally representative survey of Dutch adults (n=2000), Jorritsma and Berveling (2014) found that young adults (age 18 to 29) were less likely than older adults to report that they drive less in an effort to improve the environment (Jorritsma and Berveling 2014).

Moreover, analysis of longitudinal data suggests that young people (and older adults) today are no more environmentally conscious than in decades past. In an analysis of nationwide attitude surveys in the US and the United Kingdom Le Vine, Jones et al. (2014) found that environmental attitudes have not strengthened over time. Similarly, in an analysis of the Monitoring the Future survey data Wray-Lake, Flanagan et al. (2010)young people in the United States were no more environmentally conscious in 2005 than they were in 1990.

Finally, even if environmental attitudes were more widespread in this generation (which they are not), those attitudes may not necessarily translate into behavior. In a review of the link between environmental attitudes and travel, Anable, Lane et al. (2006) highlighted the weak link between environmental knowledge and travel. Kahn and Morris (2009) found a similarly small link between environmental attitudes and sustainable travel patterns in the United States.

Coping with economic constraints

A different view suggests that economic constraints are the primary factor in explaining the decline in driving. As a result of the bursting of the Dot Com bubble, the housing crash, and the Great Recession, the 2000s were a difficult time for many families. Median household earnings peaked in the late 1990s and have stagnated or declined since then (DeNavas-Walt and Proctor 2014). The middle class has gotten smaller, the wealth gap has widened, and unemployment remains high (Casselman 2014). The economic climate of the late 2000s was not simply the result of the Great Recession, it was a prolonged decline—a "lost decade" according to the Pew Research Center (Pew Research Center 2012).

National gross domestic product is a poor indicator of the economic well-being of families (Stiglitz, Sen et al. 2009). As a result, as Casselman (2014) explains,

> *"The middle class was struggling in the 2000s despite an economy that was, by conventional measures, strong. The recession turned stagnation into an outright decline, and the recovery has thus far been too weak to claw back much of what was lost" (p. 1).*

Indeed, in the year 2000, more people filed for bankruptcy than graduated from college (Sullivan, Warren et al. 2006).

The Great Recession certainly exacerbated inequality. The U.S. economy added thousands of new jobs in the post-recession years, but the majority of new jobs were in low-wage sectors, while the majority of jobs cut during the recession were mid-wage, (National Employment Law Project 2012). For instance, 300,000 of the new jobs were in food preparation or retail, where the median wage is just $9.04 and $10.97 respectively.

There is a substantial earnings gap by educational attainment and it is widening over time (Pew Research Center 2014). In 2012 when a typical college graduate could expect to earn $45,000 year on average, someone with only a high school diploma can expect to earn just $28,000. Moreover, while record numbers of students enroll in college (Fry and Parker 2012), relatively few students successfully graduate with a college diploma. In the late 2000s, just four in ten 27-year-olds in the United States had completed an associate's degree or higher (Harvard Graduate School of Education 2011). In other words, the majority of young adults do not have a college degree and can expect to earn $30,000 or less each year (Pew Research Center 2014).

Household wealth is distributed even more unequally than earnings. In 1983 the typical high-income households had three times the wealth as a middle-income household; by 2001 the ratio was four to one, and in 2010, in the aftermath of the Great Recession, it was six to one (Pew Research Center 2012).

In terms of employment, young people tend to fare the worst in economic downturns, due to their relative deficits in both human capital and seniority. The most recent recession was no exception (Oreopoulos, von Wachter et al. 2012). Young people face greater un- and under-employment today than young adults in previous generations (Abel, Deitz et al. 2014). The share of young adults in the labor force (that is working or looking for work) was the same in 2012 as it was in 1972 (Carnevale, Hanson et al. 2013).

Young people who graduate during a recession tend to enter lower-level occupations than they would in a more robust labor market. In 2012, for example, 44 percent of recent college graduates were in jobs that did not require a college degree (Abel, Deitz et al. 2014). Then a process known as cyclical downgrading begins. Employment opportunities build on early employment experience and, as a result, taking a low-wage job early on can constrain opportunities for years to come (Kahn 2010, Oreopoulos, von Wachter et al. 2012). Cyclical downgrading reinforces the existing trend toward low-wage service work. In 1980, 15 percent of young workers (ages 18 to 25) worked in food or personal service. By 2010, however, fully 27 percent young people worked in those industries (Carnevale, Hanson et al. 2013).

Young people have adapted to the economic climate in many ways. Some move back in with their parents (or never leave home at all) (Parker 2012). Others delay marriage (Edin and Kefalas 2005) and many try (with varying levels of success) to wait to have children (Livingston 2011, Carnevale, Hanson et al. 2013, Tavernise 2013). As I explore in more detail in the next chapter, these adult roles are associated with responsibilities—like commuting, purchasing groceries, or chauffeuring children—that entail travel. If fewer young people took on those roles, we can expect them to drive less.

The economic climate may also make it difficult to afford a vehicle. In the United States, young people adapted to the Great Recession by shedding automobile debt and owning fewer cars (Fry 2013). Extensive survey research in several countries supports this view. In the Zipcar survey introduced above, 80 percent of Millennials (ages 18 to 34) agreed that “in this economy, it can be difficult to own a car because of the high cost of gas, parking, and maintenance” (Zipcar 2013). Similarly, 23 percent of European respondents (Curry and Hughes) and 40 percent of Dutch young adults (Jorritsma and Berveling 2014) put off buying a car because of the recession.

Employment status also shapes vehicle ownership. Thakuriah, Menchu et al. (2010) find that employed young people are more likely to own a private vehicle than young people without a job and that the gap in automobile ownership "between [the] employed and unemployed have increase with each successive generation" (p. 6).

Vehicle ownership is a strong predictor of vehicle use (Bento, Cropper et al. 2005, Taylor, Ralph et al. 2013) and if young people are less able to afford a vehicle because of the recession, they are also probably less likely to drive.

Evidence regarding driver's licensing supports the view that young people are responding to economic constraints (Tefft, Williams et al. 2013). The majority of teens in high-income households (over $100,000 a year) had a license within 12 months of the minimum age and 79 percent had one before their 18th birthday. Comparatively few teens from low-income households (less than $20,000) were able to drive; only 16 percent had a license within a year of the minimum and just one quarter had one by their 18th birthday. The authors conclude that, "the characteristic most strongly related to delay in licensure was household income" (p. 9).

The costs of owning, operating and insuring a vehicle increased during the survey period. Accounting for inflation, fuel costs increased by 88 cents during the survey period from $1.62 in 1995, to $1.86 in 2001, and $2.50 in 2009 (Office of Energy Efficiency and Renewable Energy 2014).

Additionally, the recession may limit activity participation—and associated travel. Employed young people tend to travel more miles each day than otherwise similar people who are not employed, in part because most workers must commute to and from work (Taylor, Ralph et al. 2013). Many young people are unemployed during the recession, so aggregate travel is likely lower than it would be with full employment.

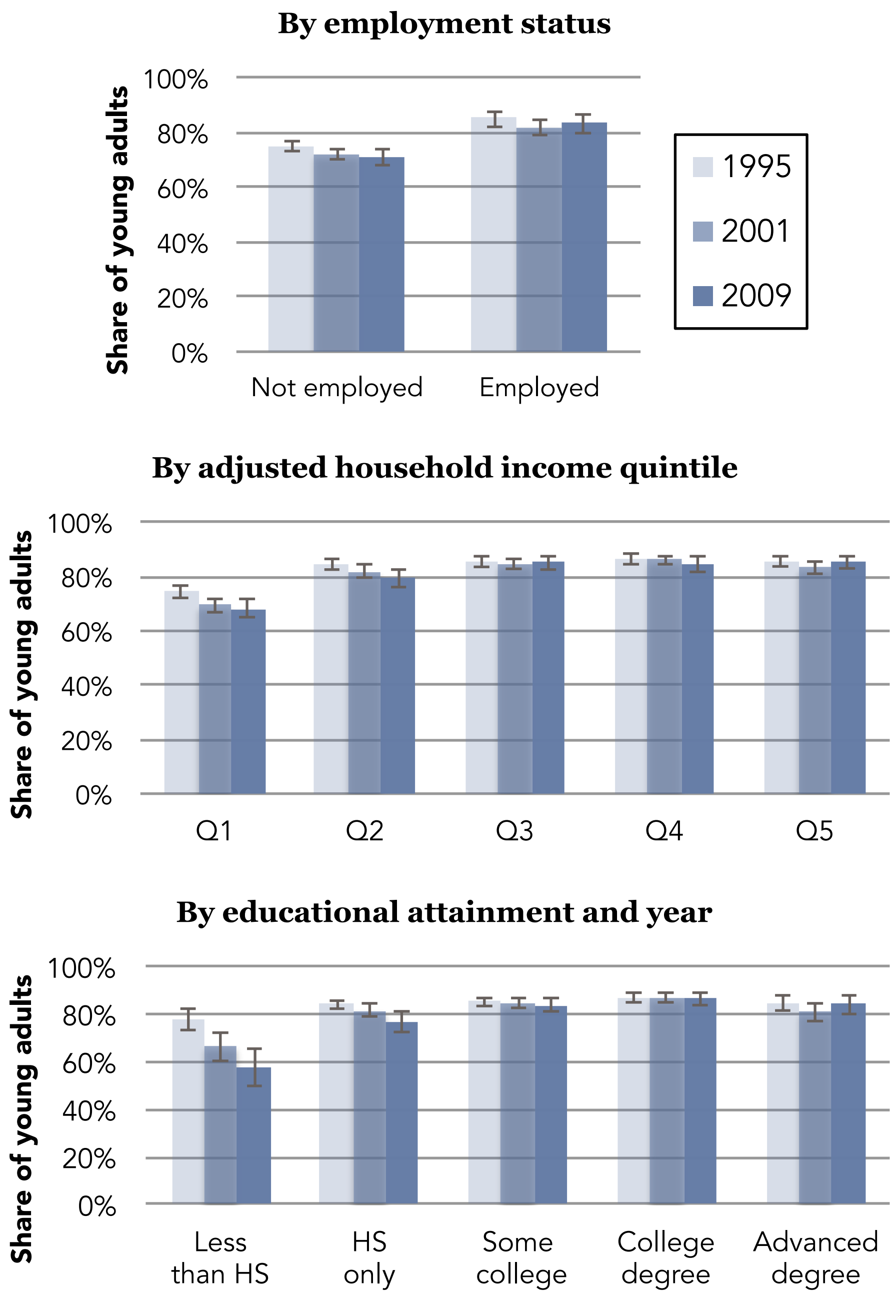
Moreover, in a survey nationwide survey of middle class families, 62 percent reported that they had to reduce spending in the aftermath of the Great Recession (Pew Research Center 2012). These families likely have fewer resources to engage in activities outside the home, like dining at restaurants or going to the cinema, and they may travel less as a result.

Some point out that "per-capita driving had already begun to decline years *before* the recession and continues after" (Baxandall 2013). Yet, as I have shown here, the economic fate of Americans began to deteriorate long before the Great Recession and has failed to improve much since the official end of the Recession.

Descriptive travel patterns by economic resources

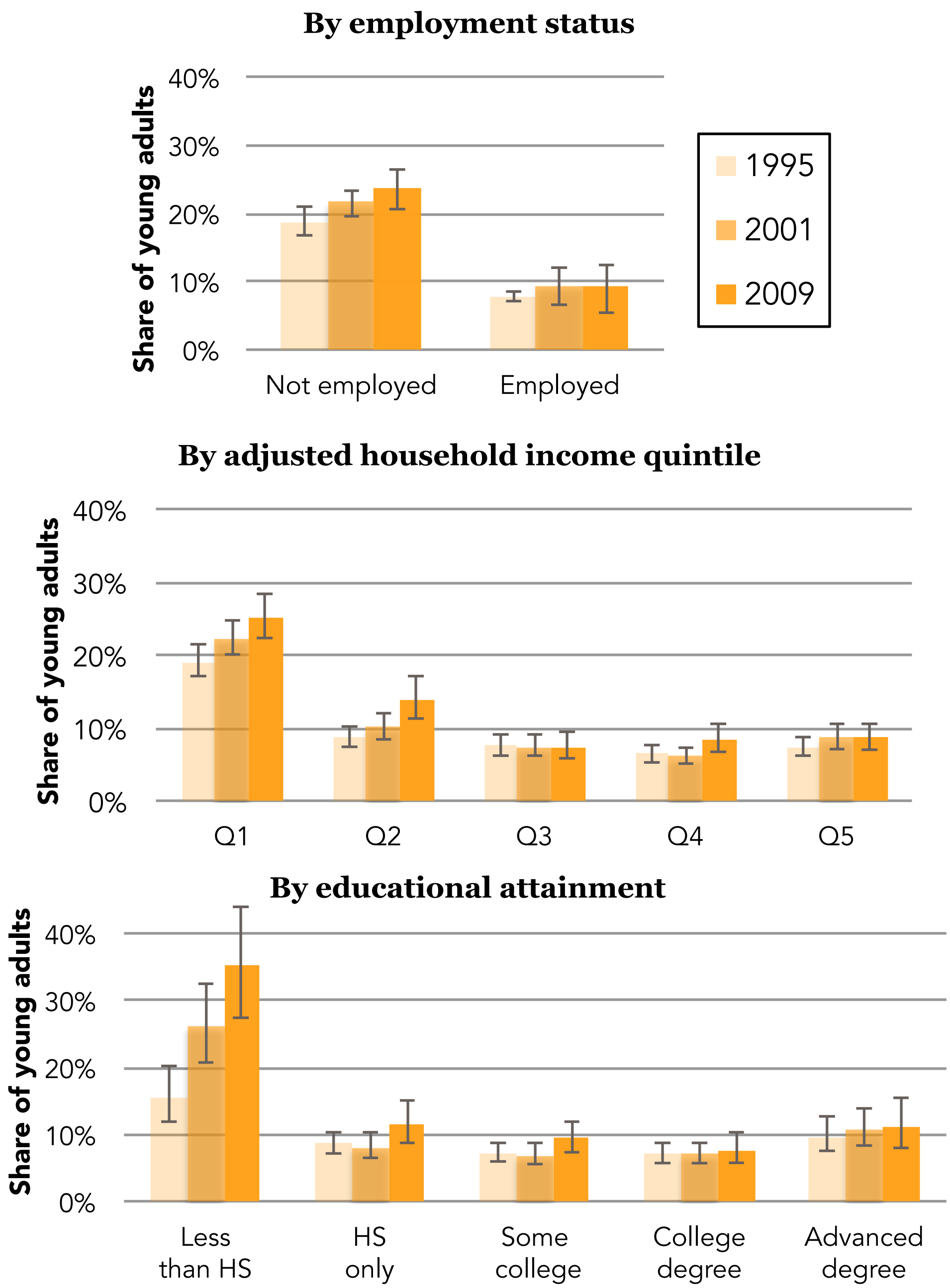
Previous research suggests that private automobiles are the most common mode of transportation, even among those with the fewest resources(Blumenberg 2004). The traveler type results align with that finding. As Figure 39 reveals, the majority of young adults were Drivers during the survey period regardless of their employment status, their household income, or their educational attainment. Nevertheless, there was substantial variation in the share of young adults that were Drivers by the extent of resources. A larger share of young people with adequate resources, that is those who had high incomes, had completed college, or had a job, were Drivers than young people with more limited resources. The share of Drivers was slightly lower among young adults with an advanced degree than among young adults with a college degree only.

Figure 39 Proportion of young adults (Age 16 to 36) that are Drivers by resources and Year



Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Results for employment and household income are for young people ages 16 to 36. Results for educational attainment are for ages 26 to 36 only. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 40 Proportion of young adults (Age 16 to 36) that are Car-less by Resources and Year



Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Results for employment and household income are for young people ages 16 to 36. Results for educational attainment are for ages 26 to 36 only. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

In turn, the share of young adults that were Car-less was highest among young adults without a job, with low incomes, or with less than a high school degree (see Figure 40). Again, young people with advanced degrees appear to differ from young adults with just a college degree. Advanced degree holders were slightly more likely to be Car-less than those with just a Bachelor's degree.

Disentangling preferences and constraints: A test

It can be tempting to frame preferences and constraints as mutually exclusive and opposing explanations for the decline in driving. In such an oppositional framework, the task at hand is to decide which view is correct. But both forces are likely at work simultaneously, albeit to different degrees, and preferences and constraints likely interact in complex ways.

Between 1995 and 2009 Drivers and Trekkers became less prevalent and Multimodals and Car-less became more prevalent. Comparing the magnitude of those changes by young peoples' economic resources provides indirect evidence on the relative contribution of preferences and constraints. Young people with many resources (those who are employed, highly educated, and have high-incomes) are better able than young people with few resources to act on their preferences. If the decline in driving were concentrated among high-income people, this would suggest that aggregate travel changes were the result of preferences. If, on the other hand, the bulk of the decline in driving were concentrated among young people with few resources, then I would conclude that economic constraints predominate.

Evidence that changes reflect adaptations to economic constraints

Figure 41 compares the change in the prevalence of Drivers and Car-less for young people by their economic resources. Bars above the axis indicate that more young adults were Drivers in 2009 than in 1995. Likewise, bars below the axis indicate that fewer young adults were Car-less over the same period. The error bars reflect the 95 percent confidence interval around the estimate of the change. When the error bars cross the axis, the change over time was not statistically significant according to traditional null hypothesis testing.

Fewer young adults were Drivers in 2009 than in 1995, and according to all three measures of resources, young people with the fewest resources experienced the most dramatic declines in the share that was Drivers. Similarly, the increase in Car-less-ness was far larger for young adults with the fewest resources. For example, the share of Car-less young adults increased by over five percentage points between 1995 and 2009; from 19 percent to 25 percent. The changes were even starker for young people with limited education. While just 16 percent of young adults without a high school diploma were Car-less in 1995, the share increased by nearly twenty percentage points to 35 percent in 2009. In other words, more than a third of young people (age 26 to 36) with less than a high school education had severely constrained mobility.

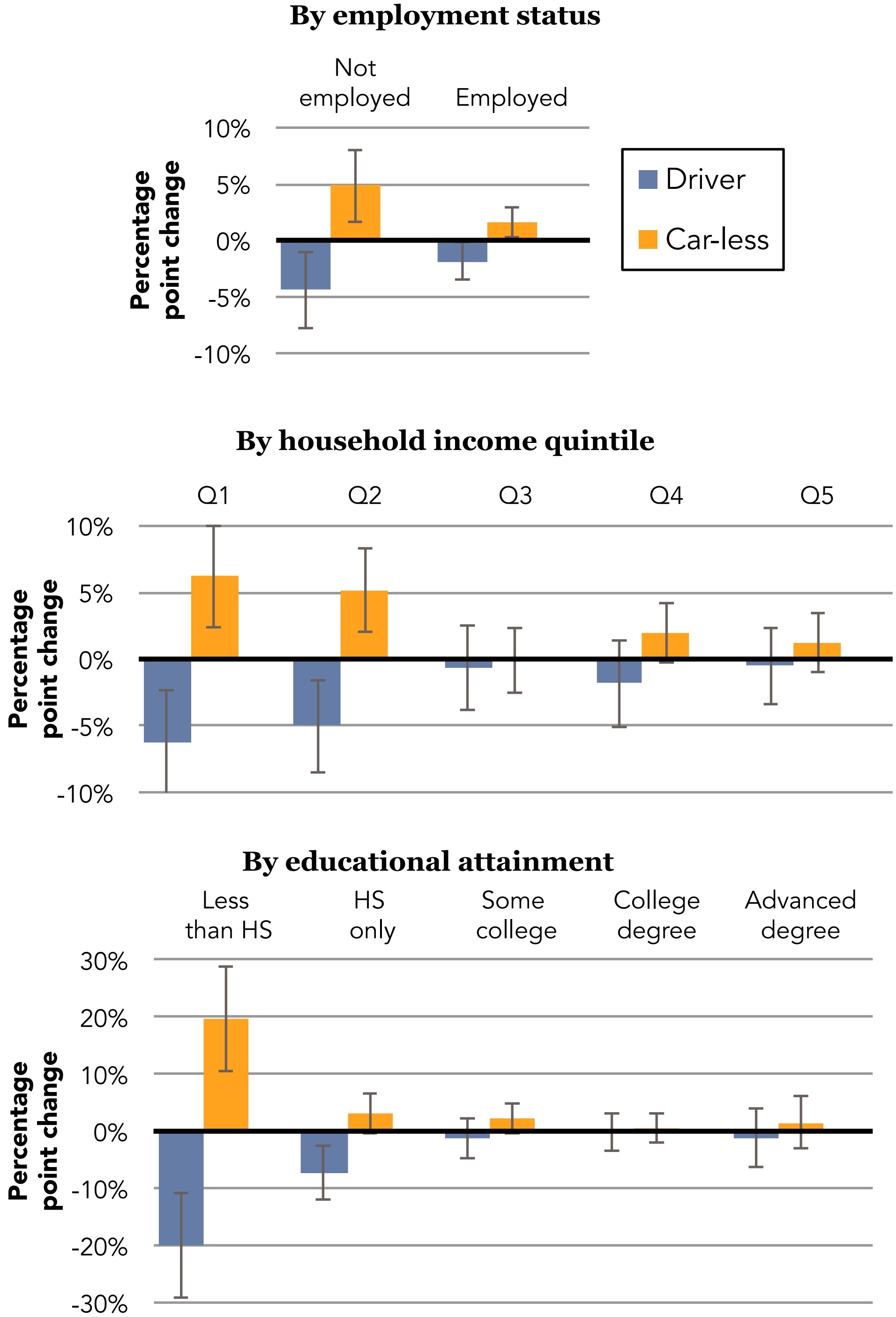
Young people with the most resources, by contrast, experienced few meaningful changes in the share that was Drivers or Car-less. Young people in the third, fourth, and fifth income quintiles did not experience any statistically significant change in the prevalence of Drivers or Car-less. Similarly, college educated young adults were equally likely to be Drivers (or Car-less) in 2009 as they were in 1995.

Evidence that new preferences are at work

Figure 42 depicts the change in the prevalence of Trekkers and Multimodals between 1995 and 2009 by the three measures of economic resources. In contrast to the results for Drivers and Car-less, it was young people with the most resources, not the fewest, who experienced the most dramatic declines in the share of Long-distance Trekkers and the largest increases in the proportion Multimodals. The pattern is particularly clear by household income quintile; low-income young adults (Q1 and Q2) experienced no change in the share of Trekkers or Multimodals, but at higher incomes young adults became increasingly less likely to be Trekkers and increasingly more likely to be Multimodals over time.

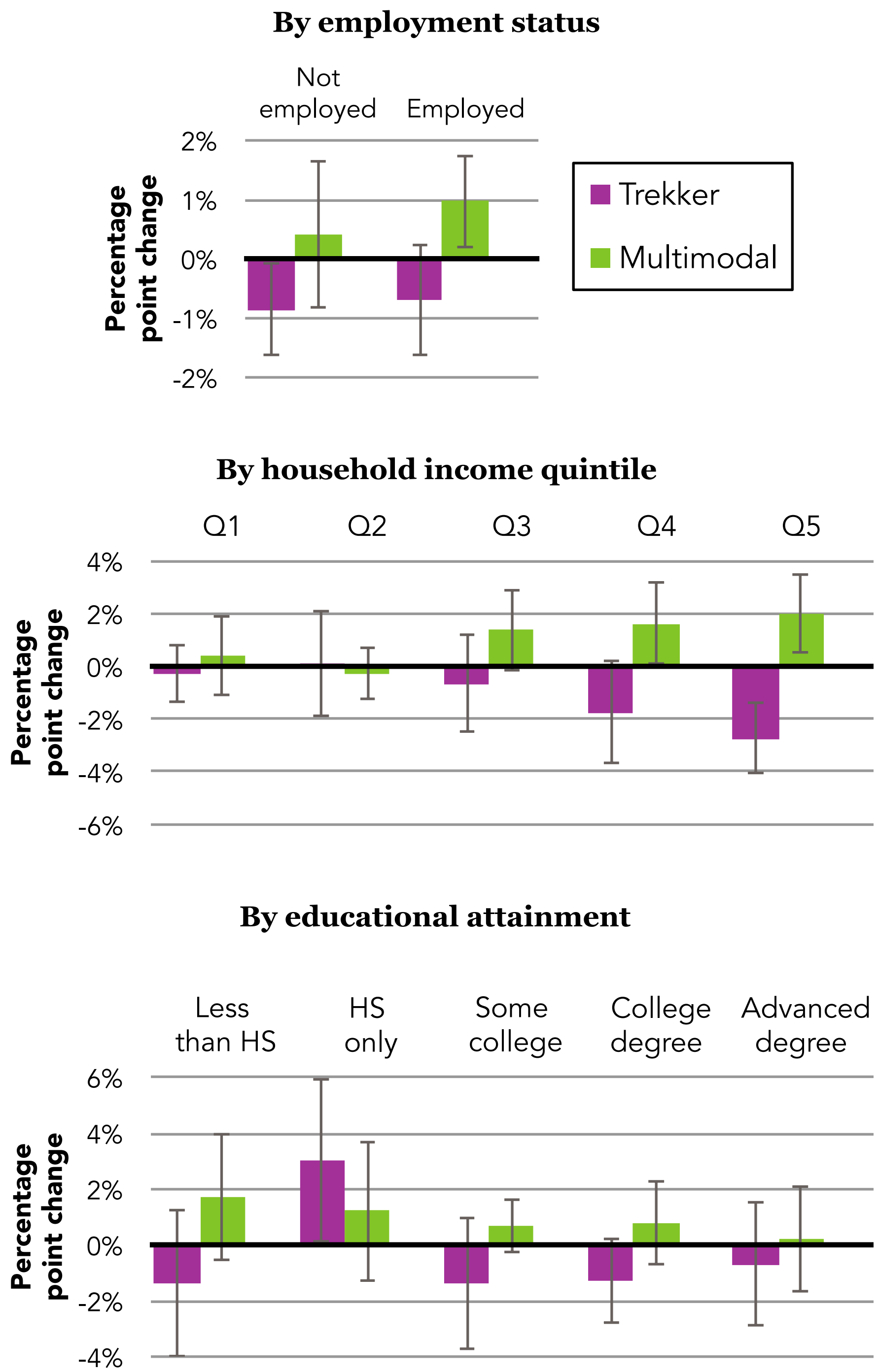
Surprisingly, the results by income quintile did not align with the results by educational attainment. While most young adults (age 26 to 36) were less likely to be Trekkers in the most recent survey period, young adults with only a high school degree were actually more likely to be Trekkers in 2009 than in 1995.

Figure 41 Fewer Drivers and more Car-less by Resources (1995 to 2009)



Note: Includes young adults ages 16 to 36 for employment status and household income and those ages 26 to 36 for educational attainment. The prevalence of each traveler type in 1995 and 2009 are based on NHTS survey weights. Error bars reflect the 95 percent confidence interval around the estimate of the difference between survey years. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 42 Fewer Trekkers and more Multimodals by Resources (1995 to 2009)



Note: Includes young adults ages 16 to 36 for employment status and household income and those ages 26 to 36 for educational attainment. The prevalence of each traveler type in 1995 and 2009 are based on NHTS survey weights. Error bars reflect the 95 percent confidence interval around the estimate of the difference between survey years. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Independent effect of resources

The preceding section reports descriptive results and does not account for the many ways in which young people with extensive resources differ from those with fewer resources. The following analysis—a series of multinomial logistic regression models—does control statistically for differences in roles, residential location, and race/ethnicity. The following figures depict the independent relationship between resources and traveler type and in 1995, 2001, and 2009. Full model results are available in Appendix C. (For the independent effect of household income see Table 21 on p. 258, for the independent effect of employment see Table 22 on p. 260, and for the independent effect of educational attainment see Table 23 on p. 262.)

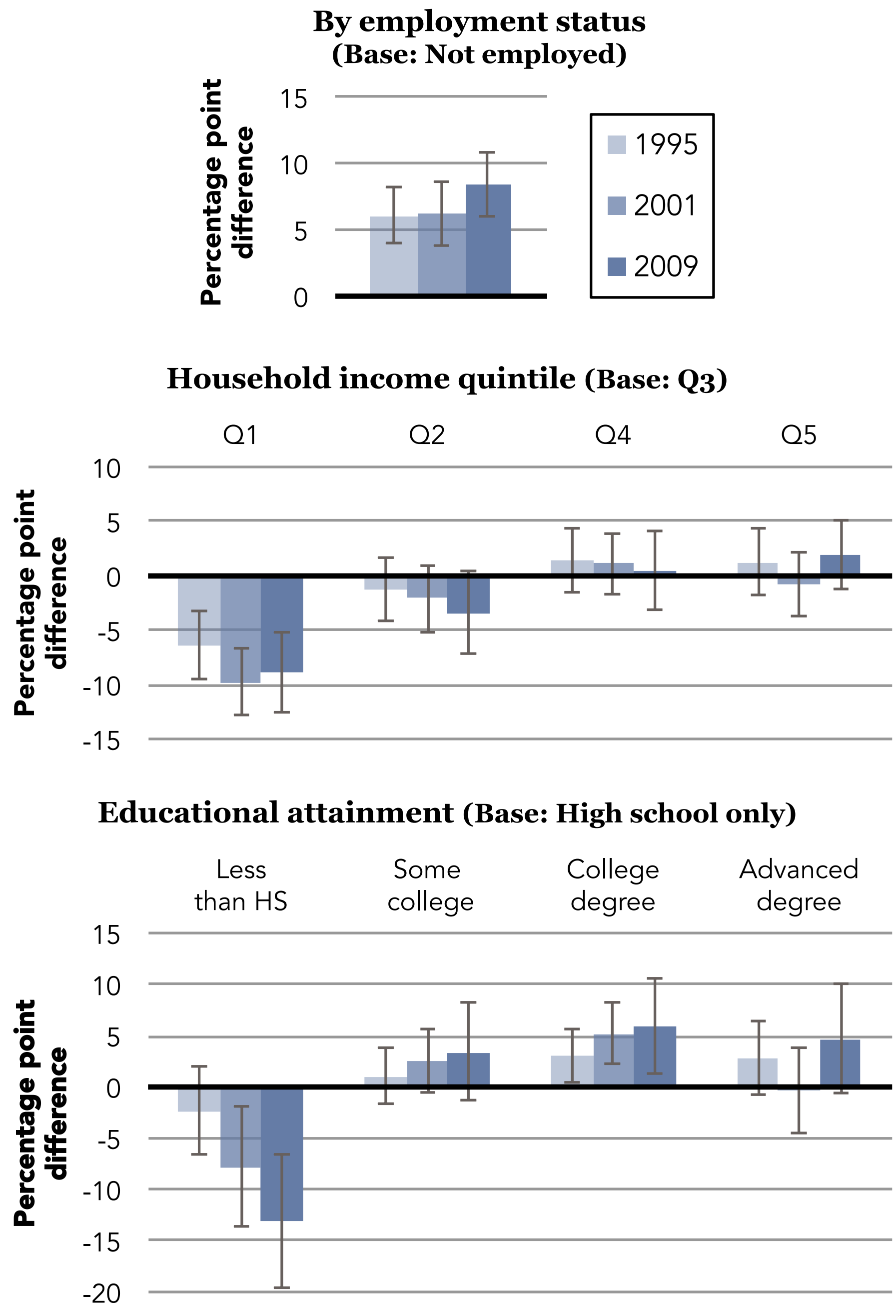
The following graphs (Figure 43 through Figure 46) present the independent relationship between three measures of resources—employment, household income quintile, and educational attainment—and traveler type for Drivers (Figure 43), Car-less (Figure 44), Long-distance Trekkers (Figure 45), and Multimodals (Figure 46). The independent effects of resources are reported relative to a base category: not employed, middle income quintile, or high school only. Bars above the axis indicate that young people with the corresponding level of resources (e.g. employed or the highest income quintile) were more likely to be in that traveler type and bars below the axis were less likely, everything else equal. The error bars reflect the 95 percent confidence interval around the estimate. If the error bar crosses the axis, the value is not statistically significant according to traditional null hypothesis testing (alpha level of 0.05).

To assess whether the independent effect of resources changed over time, each resource model includes an interaction term between resources and year, which enables the effect of resources to vary from year to year. In addition, the interaction term can be employed to formally test whether the effect changed over time (see Table 24, Table 25, and Table 26 in Appendix C for employment, income quintile, and education respectively).

Propensity to be a Driver

Figure 43 presents the independent relationship between resources and the propensity to be a Driver. Being employed increases a young adult's propensity to be a Driver, everything else equal. While the effect increased slightly over time, the magnitude of the change was not statistically significant (see Table 24 on p. 264 in Appendix C). Having a low income reduces a young adult's propensity to be a Driver and the magnitude of this effect strengthened over time for those in the lowest income quintile (see Table 25 on p. 264 in Appendix C). The effect of having a high income (Q4 or Q5) relative to a moderate income (Q3) did not change over time. Finally, young adults with less than a high school degree were much less likely than young people with a high school degree to be a Driver, everything else equal. This gap widened over time (see Table 26 on p. 265). Controlling for other factors, young people with at least some college were more likely to be Drivers than those with only a high school education. The magnitude of this effect did not change in a statistically significant way over time.

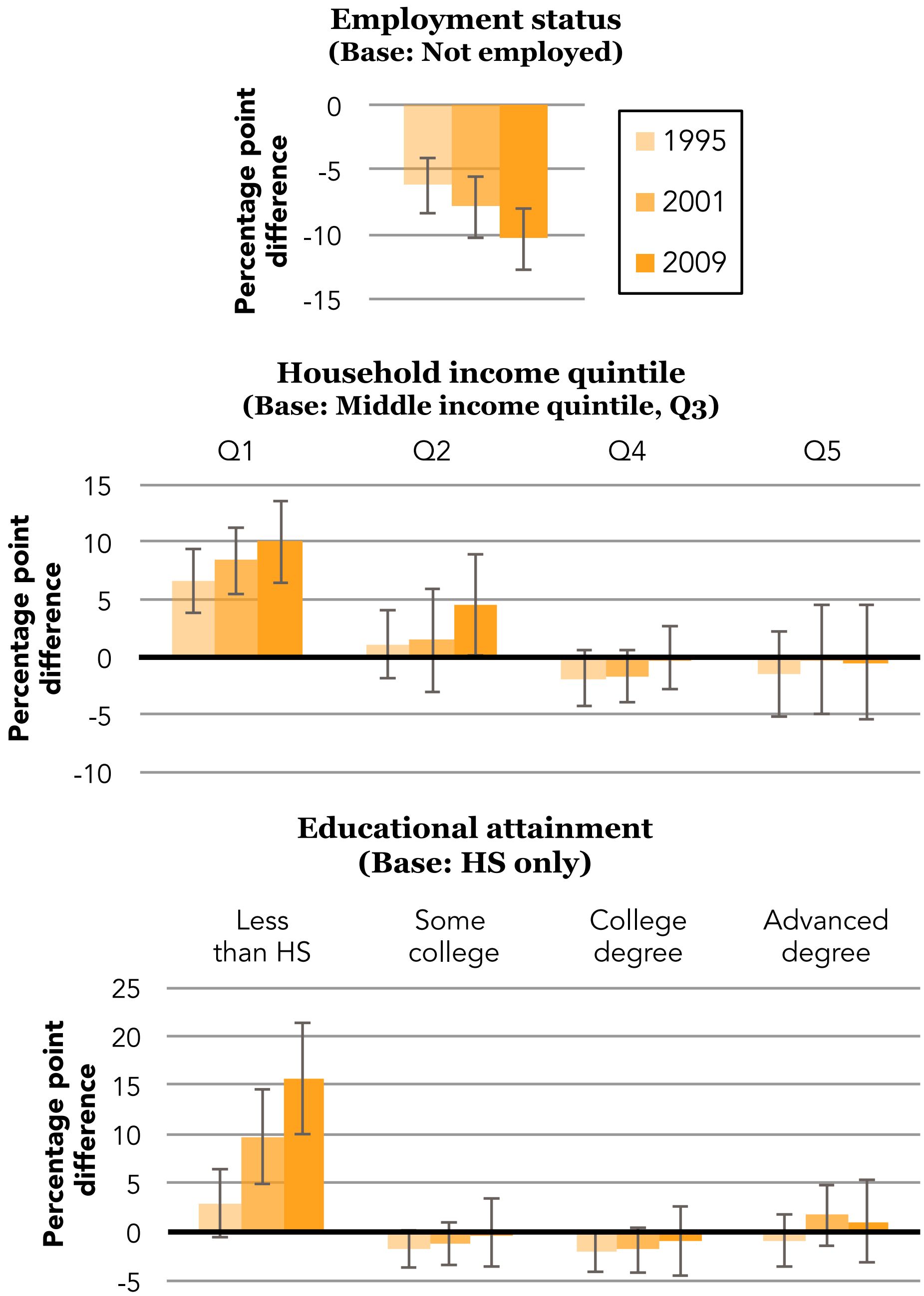
Figure 43 Independent effect of resources: Propensity to be a Driver by year



Note: Result of three multinomial logistic regression models, each with traveler type as the dependent variable and an interaction term with year (1995, 2001, and 2009). Bars above the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Age range: Employment and Household income (16 to 36), Educational attainment (26 to 36). Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 44 paints a similar picture to Figure 43. Being employed decreases a young adult's propensity to be Car-less. While this effect increased over time, the magnitude of the change was not statistically significant. By contrast, the independent effect of having a low income (Q1) or limited education (less than a high school diploma) grew over time. For those with more than the lowest level of resources (income or education), there was no statistically significant difference in the propensity to be Car-less (relative to the base) and the magnitude of the effect did not change over time. The only exception to this rule was members of the second income quintile. While the change over time was not statistically significant, the effect did increase from being essentially zero in 1995 and 2001, to being larger, and statistically significant in 2009. The suggests that the second income quintile split from those in the third or higher quintiles and, in 2009, traveled more like young adults from the lowest income quintile.

Figure 44 Independent effect of resources: Propensity to be Car-less by year



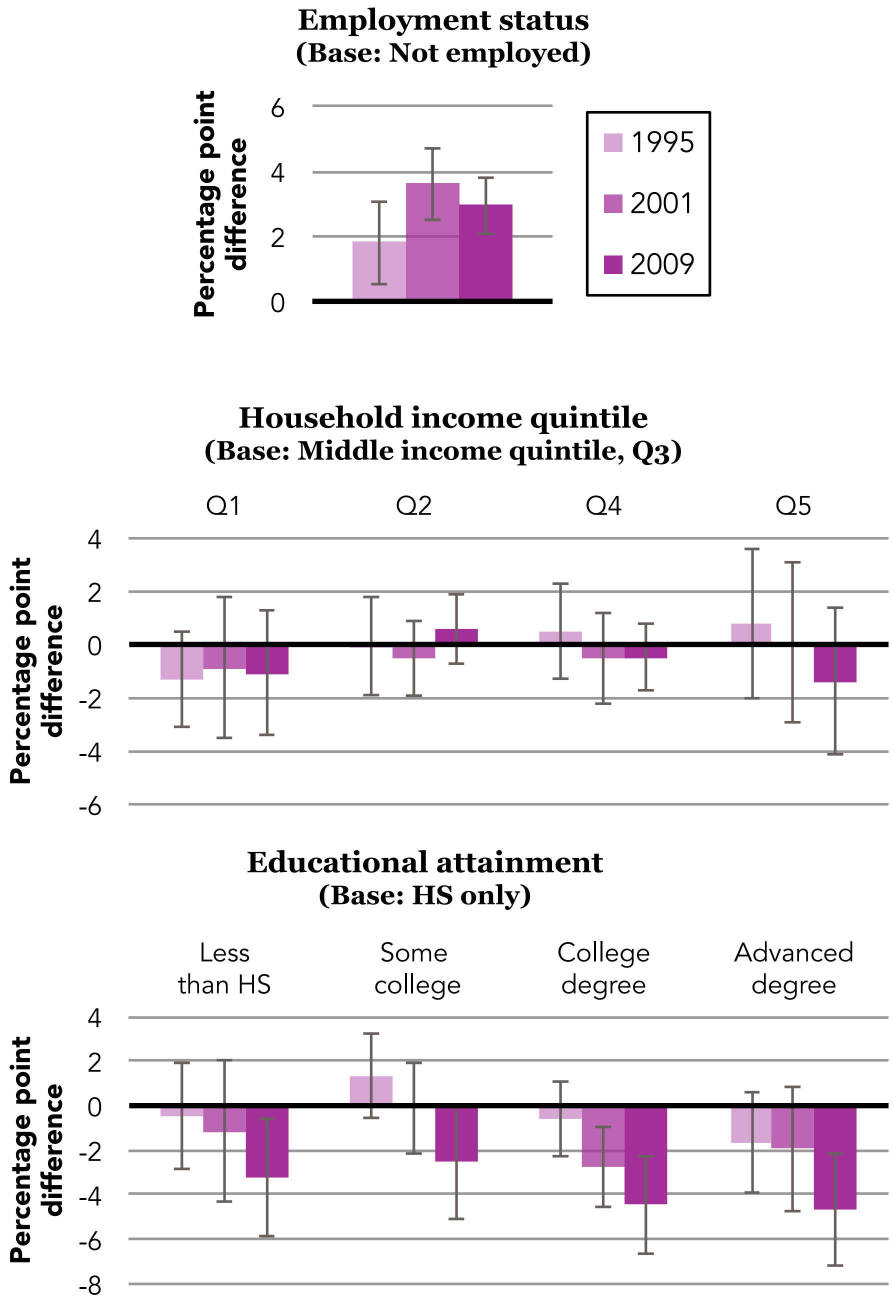
Note: Result of three multinomial logistic regression models, each with traveler type as the dependent variable and an interaction term with year (1995, 2001, and 2009). Bars above the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Age range: Employment and Household income (16 to 36), Educational attainment (26 to 36). Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 45 depicts the independent relationship between resources and the propensity to be a Long-distance Trekker. While the magnitude of the effects was generally smaller than for the Drivers or the Car-less group, being employed did increase the propensity to be a Trekker, everything else equal. Moreover, the magnitude of this effect increased significantly between 1995 and 2009.

There were no differences in the propensity to be a Trekker by household income and no statistically significant change in the magnitude of the income effect over time. However, while the trend over time for young adults in the highest income quintile was not statistically significant, the trend is suggestive. In the earliest period (1995) high-income young people were more likely than otherwise similar moderate-income young people to be Trekkers. Over time, however, high-income young people became much less likely to be Trekkers and by 2009 having a high income reduced the propensity to be a Trekker (albeit not to a statistically significant degree).

Finally, high school graduates with no college were the most likely to be Trekkers (everything else equal) and the gap between them and other young adults widened over time. Recall from Figure 42 that the decline in Trekkers between 1995 and 2009 for college graduates were small (and statistically insignificant). Thus, the widening gap by educational attainment was primarily the result of more high school graduates being Trekkers in the later period.

Figure 45 Independent effect of resources: Propensity to be a Long-distance Trekker by year

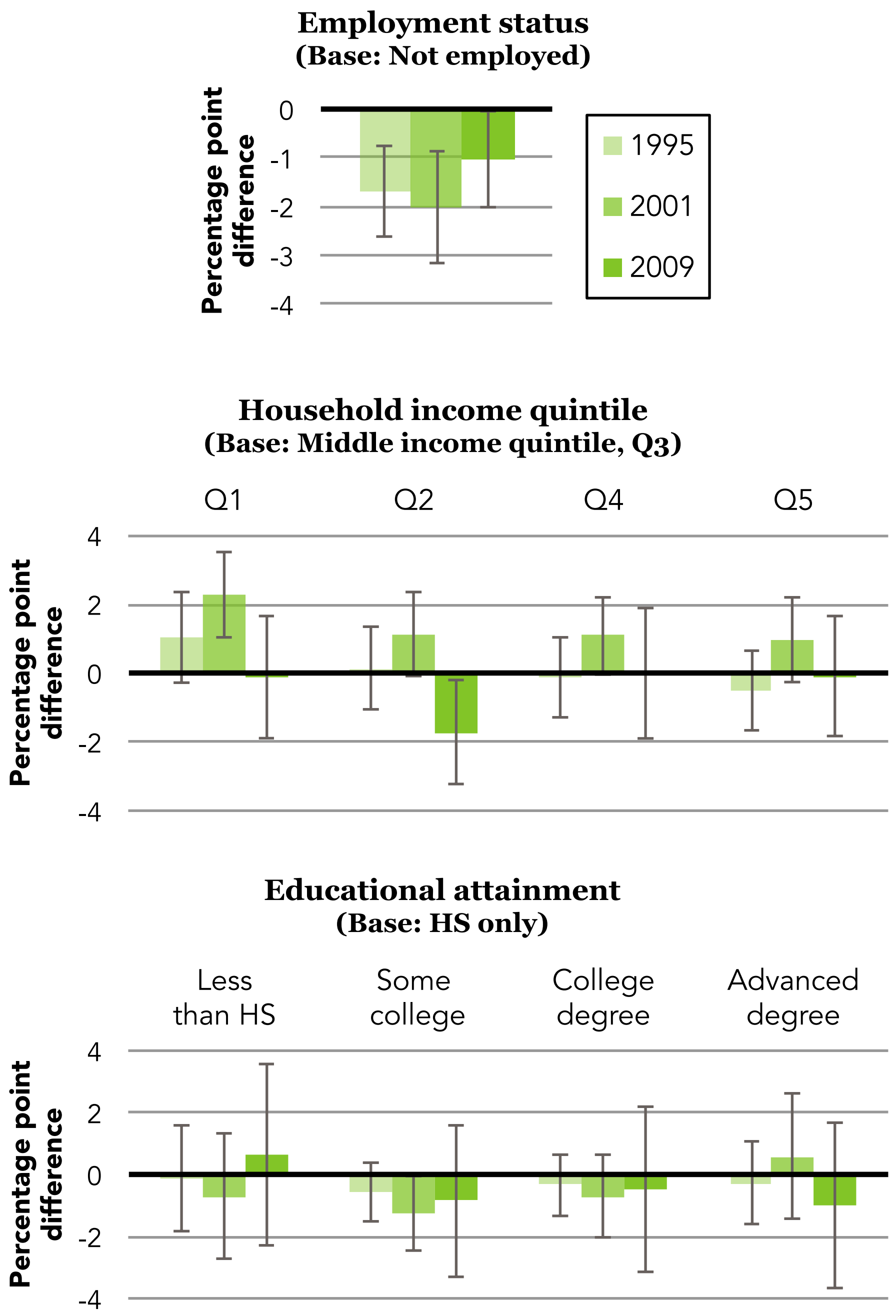


Note: Result of three multinomial logistic regression models, each with traveler type as the dependent variable and an interaction term with year (1995, 2001, and 2009). Bars above the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Age range: Employment and Household income (16 to 36), Educational attainment (26 to 36). Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Finally, Figure 46 presents the independent effect of resources on the propensity to be a Multimodal. Employed young people were less likely to be Multimodal, everything else equal, than similar young people without a job. The magnitude of the employment effect declined slightly (but not statistically significantly) in the most recent period.

There were essentially no differences in the propensity to be a Multimodal by income quintile or educational attainment when controlling for roles, residential location, and race/ethnicity. This is surprising given the attention on college educated young people and their supposed preferences for walkable communities. We saw in Figure 42 that more high-income young people were Multimodal in 2009 than in 1995. Conceivably, high-income young people may have relocated to denser neighborhoods with more options for travel by alternative modes and, when controlling statistically for residential location characteristics, the effect of income on the propensity to be Multimodal diminishes. However, according to the NHTS data, there was no difference in the share of high-income (Q4 or Q5) young adults residing in dense urban areas between 1995 and 2009.

Figure 46 Independent effect of resources: Propensity to be Multimodal by year



Note: Result of three multinomial logistic regression models, each with traveler type as the dependent variable and an interaction term with year (1995, 2001, and 2009). Bars above the axis indicate that young people with that characteristic were more likely to be a Driver relative to the base, everything else equal. The inverse is true for bars to below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Age range: Employment and Household income (16 to 36), Educational attainment (26 to 36). Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

CHAPTER CONCLUSION

This chapter offered an indirect test of two hypotheses about the recent changes in travel behavior of young adults. Both preferences and economic constraints are likely at work, but the bulk of the decline in driving occurred for young people with the fewest resources—those without jobs, with low incomes, and/or with limited educational attainment. This work supports the view that a poor economic climate was the primary contributing factor to the decline in driving. What is more, the results of the multinomial logistic regression analysis reveal that the relationship between resources and the traveler types, particularly Drivers and Car-less, became stronger over time.

At the same time, there was some support for the view that preferences were also at work. In contrast to the trends for Drivers and Car-less, the decline of Trekkers and the rise of Multimodals were concentrated among high-income young people; low-income young people experienced no such changes. While the magnitude of the changes for Trekkers and Multimodals tended to be smaller in percentages (but larger in percent change terms) than for the Drivers and Car-less, this finding nevertheless supports the view that young people with the most resources—those who are best able to act on their preferences—became less likely to be Trekkers and more likely to be Multimodal in the 2000s. Counter-intuitively, this finding was not consistent across the various measures of resources. While everyone else was less likely to be a Trekker in 2009 than in 1995, young people with just a high school education became more likely to be a Trekker during this period.

Finally, despite the media attention on highly educated young people, this group experienced no changes in the prevalence of any of the four traveler types. In other words, advanced degree holders were just as (un)likely to be a Multimodal (or Drivers, Trekkers, or Car-less) in 2009 as they were in 1995.

CHAPTER 6: ROLES

INTRODUCTION

As we saw in Chapter 3, the travel patterns of young adults changed between 1995 and 2009. Young adulthood also transformed during this period (Arnett 2004, Settersten, Furstenberg et al. 2006, Settersten and Ray 2010). Young people in past decades often took a standard path to adulthood by securing a job, moving out of the parental home, getting married, and starting a family of their own (Settersten, Furstenberg et al. 2006). Today the order and timing of the taking on these roles no longer proceed in the traditional manner for many youth (Shanahan 2000, Osgood, Ruth et al. 2005).

This chapter addresses two related research questions. First, how do adult roles shape traveler type? Second, has the widespread delay in adult roles contributed to the decline in driving?

The following section provides more information about adult roles and draws on the literature on transitions to adulthood to explore how and why young adults are delaying taking on adult roles and eschewing the associated responsibilities. I then characterize the literature that links roles to travel behavior. Next, I address each role in turn, characterizing the prevalence of each traveler type by role attainment, highlighting changes in the prevalence over time, and finally, estimating the independent effect of each role.

I find that young adults have taken on fewer roles over time and that the link between travel and roles is strong. Looking forward, these results suggest that many young adults will return to being Drivers if and when the economy recovers and young adults are once again employed, getting married, and having children.

Adult roles

In analyzing the relationship between adult roles and travel, which roles warrant analysis? Sociologists use five markers to identify trends in adulthood: (1) live independently, (2) complete education, (3) secure employment[21], (4) marry a partner, and (5) become a parent (Osgood, Ruth et al. 2005). While sociologists recognize that not all adults will attain each of these roles, these so-called "markers of adulthood" are regularly used to make comparisons over time and across geographies. In addition to serving as markers of adulthood, educational attainment and employment status are also indicators of economic resources and for this reason, employment and education were explored in Chapter 5.

Living independently

When a young person moves out of her parents' home she takes an important step towards becoming an adult. Historically, young adults in the United States typically moved out of their parents' home at an early age and remained independent (Settersten, Furstenberg et al. 2006). More recently, however, many young people live independently for a while and then "boomerang" back home for stints of varying lengths (Parker 2012). Many others never leave the nest at all, leaving many to wonder about their "failure to launch" (Carnevale, Hanson et al. 2013).

---

[21] Completing education and securing employment are often considered markers of adulthood, but they are also indicators of economic resources. For this reason, employment and education are explored in Chapter 5.

Regardless of how one measures living arrangements, young adults became less likely to live independently during the 2000s. The share of young adults that live with their parents increased steadily over the past 40 years and by 2012, 36 percent of young adults in the United States (age 18 to 31) lived with their parents (Fry 2013). Moreover, by the end of the Great Recession, the share of American households with multiple generations under one roof was higher than in the past 60 years (Parker 2012).

While there are many reasons to live with family members, financial constraints are the primary motivation for most young adults. Eight in ten young people who live with their parents agree with the statement, "[I] don't currently have enough money to lead the kind of life [I] want" (Parker 2012). By contrast, just over half of young adults that live independently agree. In addition, unemployed young adults are more likely than their employed peers to live with their parents (Fry 2013). Together, these findings suggest that young people live with family members to ease financial constraints.

The financial climate also indirectly increases the number of young adults living at home by motivating more of them to pursue education and by encouraging (or compelling) them to delay marriage. Record numbers of young adults enrolled at colleges and University across the country during the Great Recession (Fry and Parker 2012). Meanwhile, many young adults put off getting married, anticipating more stability down the road (Edin and Kefalas 2005). Because students and singles are more likely to live with their parents than people who have completed their education or gotten married, the indirect effect of the recession was to increase the share of young adults living in their parents' home. Moreover, young people are less able to live independently when housing prices increase (Yelowitz 2007). As a result, young adults may struggle to afford independent living, particularly in some high-cost urban areas. Finally, controlling for differences in educational attainment and employment, young adults are equally likely to live with their parents regardless of gender or race (Parker 2012).

Marriage

The typical young adult waited longer to get married in the 2000s than in the 1980s and 90s. By 2010, the median age of first marriage in the United States was at an all-time high: 26.5 for women and 28.7 for men (Cohn, Passel et al. 2011). Somewhat counter-intuitively, scholars argue that this trend suggests that young adults put a very high value on marriage; interviews with low-income women (Edin and Kefalas 2005) and working-class women and men (Smock, Manning et al. 2005) reveal that these young adults hope to marry one day, but are waiting for financial security to do so.

Having children

Traditionally, couples waited to have children until they had secured each of the other adult roles, but given the lengthening demands for higher education, limited labor markets, and financial constraints, many couples now have children before completing their educations, securing a job, and living independently (Settersten, Furstenberg et al. 2006).

The longer young adults wait for marriage, the higher the chances that they will have a child out of wedlock. Nearly half (48%) of all first births in the United States in the 2000s were to women who were not married (Hymowitz, Carroll et al. 2013). While many out-of-wedlock births occur in households with low incomes and very limited educations[22], the growth in out-of-wedlock births was primarily driven by "Middle American" women—women with a high school degree only or some college (but no degree) (Hymowitz, Carroll et al. 2013). As the age of first marriage crept up in the 1970s, delays in childbirth failed to keep pace. Fully 58 percent of babies born to women with a high school degree or some college were born out-of-wedlock in 2010 (Hymowitz, Carroll et al. 2013). These moderately-educated women have experienced what Hymowitz, Carroll et al. (2013) term the great crossover; the median age of having a child now precedes the median age of marriage. College-educated women, by contrast, still get married, on average, nearly two years before having a child.

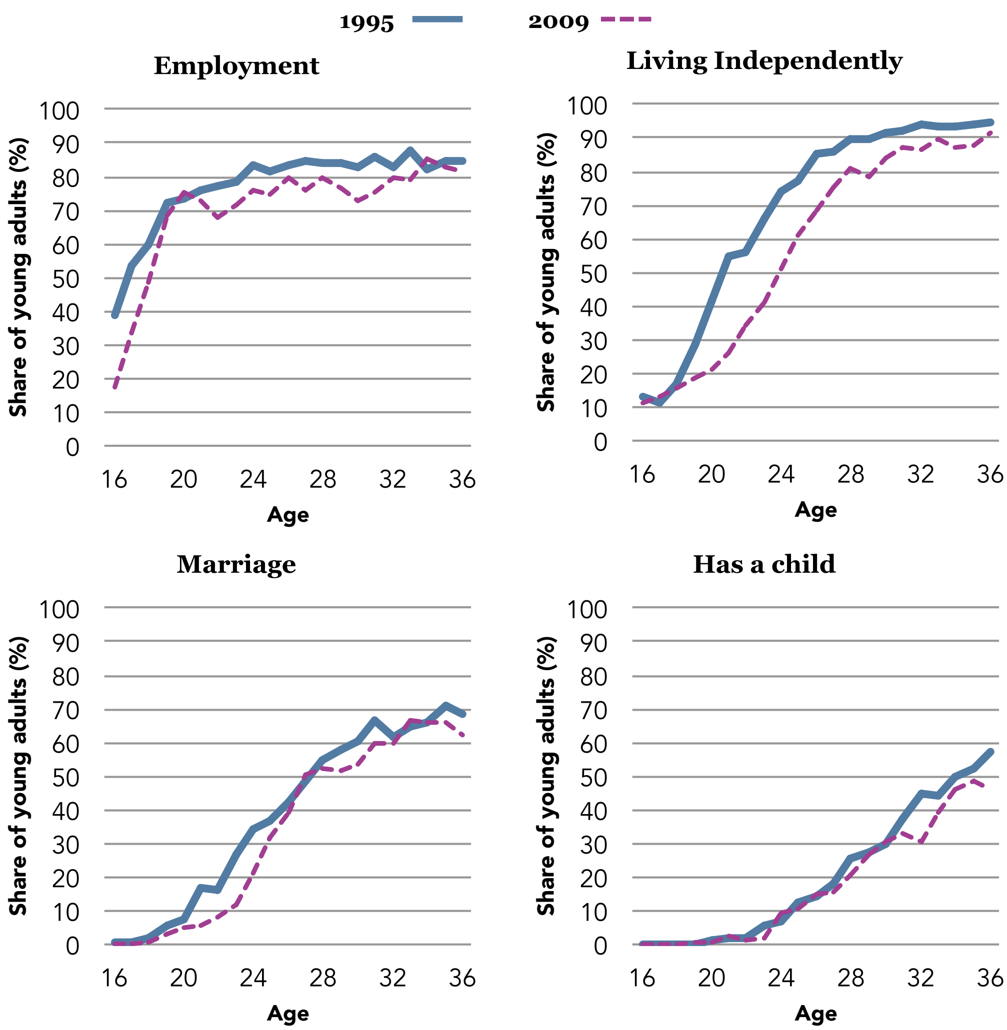
The road to adulthood in 1995 and 2009

Figure 47 provides information about the share of young adults that have taken on each adult role by age in 1995 and 2009 (see Chapter 4 for more details on the measurement of these variables). The shares are lowest in the left-hand side of each chart because few of the youngest adults have attained any of the markers of adulthood. Moving rightward, the share of young adults that have taken on adult roles increases. The trend line for 2009 is nearly always to the right of and below the line for 1995. This indicates that at any given age a smaller share of young adults took on adult roles in 2009 than in 1995. Another way to interpret the graph is to determine the age at which a specific

[22] In the 1970s the average woman with less than a high school degree got married and had her first child by age 19. Over the next forty years the age of first marriage increased (to 25 in 2010), while the age of having a child held steady (Hymowitz, Carrol et al. 2013).

share of young adults achieves each marker of adulthood. For example, in 1995 the median age of living independently was 20 years old. By 2009 the median age was four years older.

Figure 47 Markers of adulthood by age in 1995 and 2009

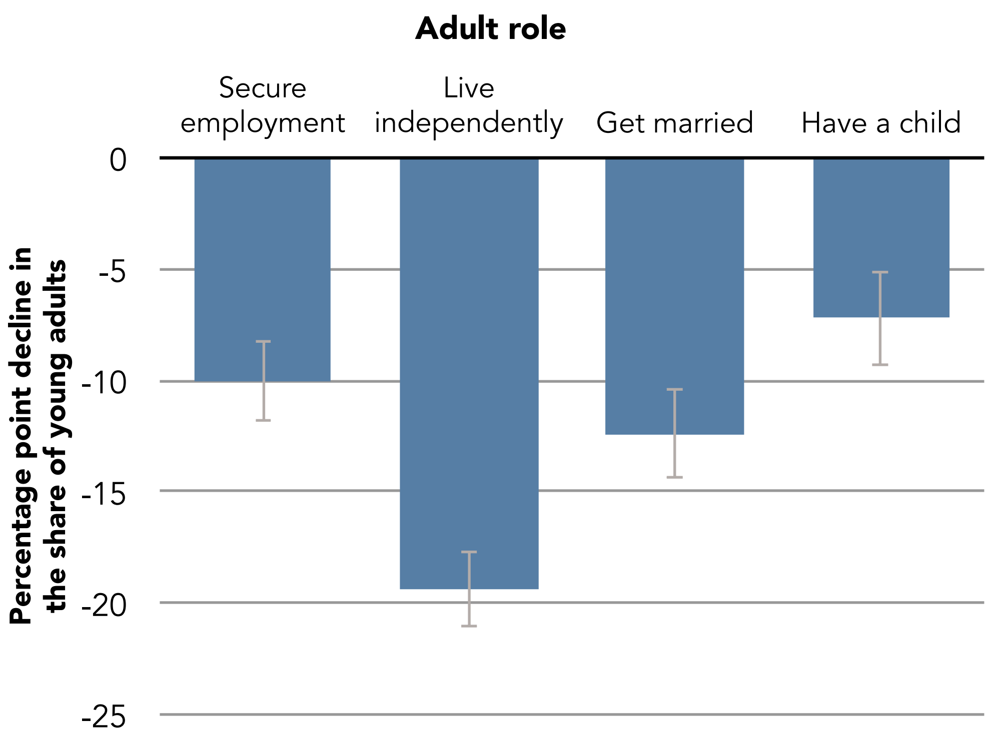


Note: The share of young adults who have attained each marker of adulthood by age in 1995 and 2009. Source: 1995 NPTS and 2009 NHTS, weighted values

It can be tempting, when interpreting a chart like this, to think of adult as something that is achieved once and for all. Instead, as Shanahan (2000) notes, the roles are rather fluid. Young people get jobs and lose jobs. They may move out of their parents' home and then move back in temporarily. Marriage is slightly more stable, although it too can be fluid if young adults get divorced. Having a child is the least fluid of the roles. The fluidity of transitions is difficult to observe without longitudinal data.

Figure 48 further elucidates the postponement of adult roles between 1995 and 2009. Ten percent fewer young adults were employed in 2009 than in 1995. The decline in young people living independently was even larger; 25 percent of young adults in the United States lived with their parents in 1995. By 2009, fully 45 percent did. Finally, fewer young adults were married or had children, but consistent with the literature, reductions in marriage outpaced fertility declines.

Figure 48 Decline in the role attaiment of young adults (Age 16 to 36) between 1995 and 2009



Note: Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS and 2009 NHTS, weighted values

Why the delay?

Structural shifts in the economy and over a decade of economic crises are the likely cause of the widespread delay in adult roles (Settersten and Ray 2010). The nation transitioned away from well-paid manufacturing jobs to lower-paying, and often less-secure, service jobs for low- and moderate-skill workers (Farber 2007, National Employment Law Project 2012). As a result, a college education became more central to success, leading many young people to put traditional adult roles on hold while they pursued higher education. Moreover, young people put marriage plans on hold (Edin and Kefalas 2005) and, somewhat less successfully, waited to start a family (Livingston 2011) until they were economically stable.

Will young people embrace traditional roles again when the economy recovers? Preliminary evidence suggests that the fertility rate has rebounded since the recession (Tavernise 2013). But for the other roles, there are few signs that the economic situation of young adults has improved much since the recession. In 2010 the share of young people who were employed was the lowest it had been in 60 years (Taylor, Parker et al. 2012). Worse still, evidence suggests that graduating during a recession continues to negatively affect young people's employment and earnings for many years, long after the recession is over (Kahn 2010, Oreopoulos, von Wachter et al. 2012). Similarly, there is little evidence that the gradually improving economy is enabling young adults to live independently. The share of young adults living with their parents was higher in 2012 (36%) than it was in 2009 (34%), when the Great Recession officially ended (Fry 2013).

In sum, we know that young adults in the early 2010s face a tough economic climate and for that reason many of them have adapted by moving back in with their parents and putting off marriage while they work to achieve financial independence and stability. Unfortunately that day may never come for some. Many young adults enroll in college, but most drop out long before graduation. They leave saddled with debt but with no diploma that would have promised higher earnings. Worse still, while they were busy investing in their education and waiting for marriage, many young adults become parents long before they gain stability. For these reasons, the MacArthur Foundation characterizes most young people—fully two thirds of them—as simply treading water (Settersten and Ray 2010).

Relationship between roles and travel

The life course perspective, frequently employed in demographic research, conceives of a lifetime as periods of relative stability punctuated by transitional points (Elder, Johnson et al. 2003, Mortimer and Shanahan 2003). This perspective has gained favor recently among travel behavior scholars, who see it as a means of addressing the shortcomings of a near-universal reliance on cross-sectional data (Lanzendorf 2003).[23] The key theoretical innovation of the mobility biography approach is to add a mobility element to the life course perspective. Methodologically, this approach is novel in its use of qualitative, retrospective interviews; participants generally provide an autobiographical account of travel for ten to twenty years (Scheiner 2007). Mobility

[23] According to Lanzendorf (2003), the primary (though not the only) shortcoming of cross-sectional data is that it can only provide evidence on statistical correlation, not causality.

biography scholars hope to understand when and how long-term travel decisions are made and how those decisions relate to other elements of the life course. Early findings from this field suggest that mobility patterns are most likely to change in conjunction with other life changes such as starting a new job, moving to a new home, or having a child (Lanzendorf 2010, Scheiner and Holz-Rau 2013, Döring, Albrecht et al. 2014).

The analysis presented here uses cross-sectional data, not longitudinal, and is therefore not a mobility biography study. Nevertheless, the current study includes many of the same variables of interest (moving out of the parental home, getting married, having a child) as mobility biography studies. Moreover, in considering adult roles and their associated responsibilities, this work employs a similar approach for conceptualizing the link between those variables and travel. Finally, this work and mobility biography research also share a focus on young people; Beige and Axhausen (2012) find that the frequency of many travel-relevant life course events peak in the 30s (or younger), precisely the ages analyzed here.

Employment

Adult roles typically come with responsibilities, many of which entail travel. For example, with limited exceptions, employed young adults must be present at work each day, which requires travel. Previous travel behavior research suggests a strong link between employment and travel, particularly automobile ownership (Thakuriah, Menchu et al. 2010) and miles of travel (Taylor, Ralph et al. 2013).

Living independently

Living independently may increase or decrease travel by automobile. Since most young people who live with their parents do so out of financial necessity, young adults who live with their parents may be less likely to be Drivers and more likely to be Car-less. On the other hand, these young people typically spend less than independent young adults on food and rent[24] and therefore may have more resources available for travel. Moreover, young people may have greater access to an automobile in the parental home than when living independently. For these reasons, young adults who live independently may be less likely to be Drivers than their otherwise similar peers. In a mobility biography study in Zurich, Switzerland, Beige and Axhausen (2012) find that young people are more likely to own a car and more likely to own a transit pass when they move out of the parental home.

Getting married

Thakuriah, Menchu et al. (2010) propose two distinct pathways through which marriage could affect automobile ownership. First, married women could have greater financial stability, which enables car ownership and second, married women may purchase cars in anticipation of the need to care for children. Empirical results (based on three data sets from the National Longitudinal Surveys program) suggest that married young women are more likely to own a car than otherwise similar young women who are not married (Thakuriah, Menchu et al. 2010).

[24] Young adults who live with their parents are less likely than those who live independently to be in poverty (Parker 2012).

Having a child

The new responsibilities associated with becoming a parent typically prompt additional shopping and chauffeuring trips (Lanzendorf 2010, Ralph, Taylor et al. 2014). Mothers generally find the extra trips are far more onerous without a car (Bostock 2001), so having a child often leads to more automobile ownership (Beige and Axhausen 2012). In a review of the mobility biography literature, Scheiner (2007) notes that many of the life-cycle effects—and particularly child-birth—are highly gendered; having a child tends to exert a much larger influence on the life of a new mother than a new father. For this reason, I analyze the effect of having a child separately for men and women.

Finally, turning the causal arrow around, adequate transportation, particularly travel by automobile, can make it easier to attain many of the markers of adulthood. Securing a job, for example, is almost always easier with a fast and flexible mode of transportation (Ong 2002, Blumenberg and Manville 2004) and caring for a family is usually far easier with an automobile than on foot or by transit (Ralph, Taylor et al. 2014).

RESULTS

The following sections depict the relationship between each adult Role (living independently, getting married, and having a child) and traveler type.[25] For each Role I first describe the descriptive data, with a focus on fluctuations in the prevalence of each type over time. Young people who have attained each Role differ in important respects from young people who have not attained each role and, for this reason, I estimate a

[25] The main results for employment were discussed in Chapter 4.

series of multinomial logistic regression models to estimate the independent effect of taking on each adult role. For more information about the model specification, see Chapter 4.

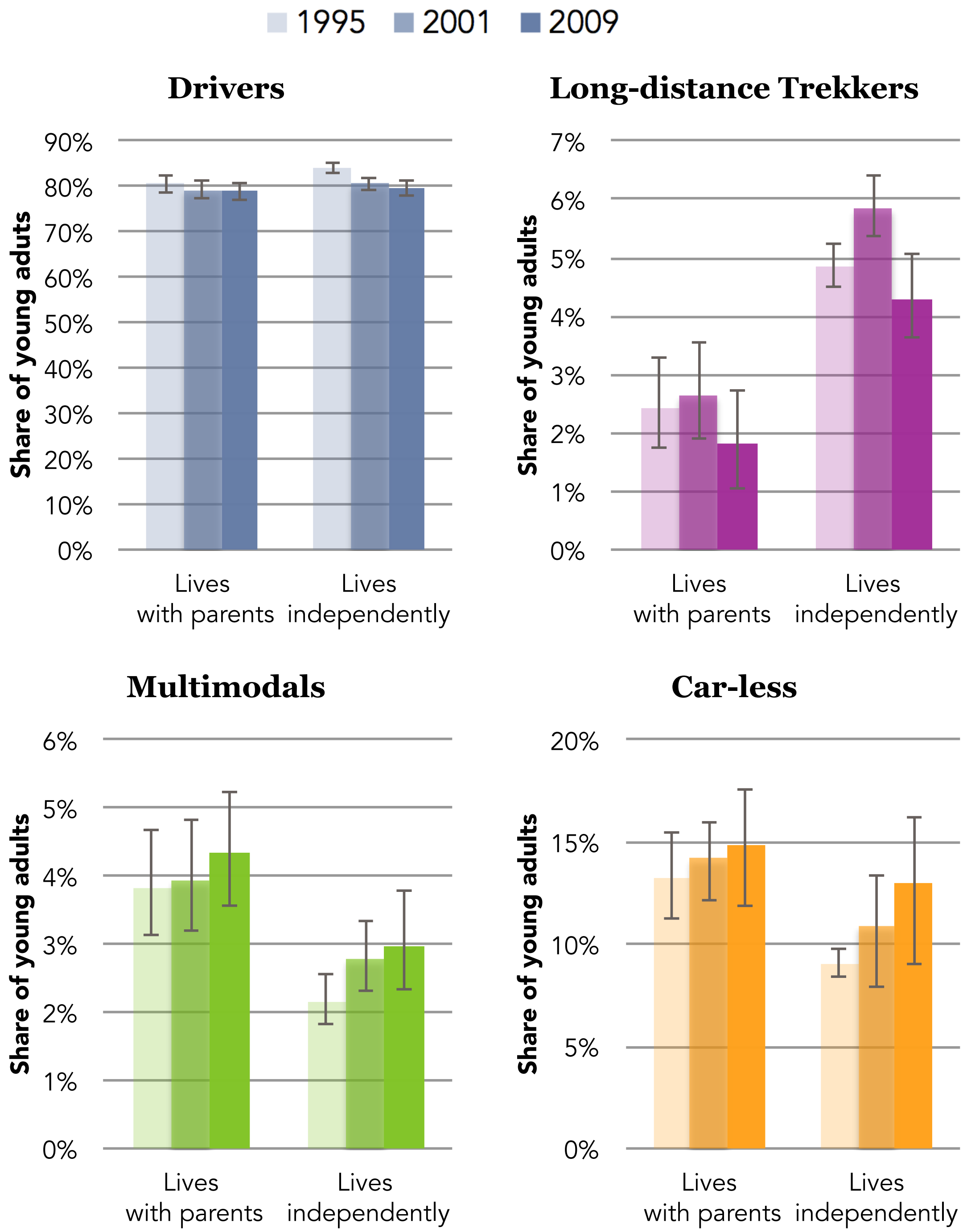
Young people who have taken on adult roles, particularly employment and marriage, are more likely to have auto-oriented travel patterns (as Drivers and Trekkers) and less likely to use alternative modes of travel (as Multimodal or Car-less). Combined with the results of the previous chapter, this analysis suggests that if the economy improves and young adults return to work, move out of on their own, get married, and start families again, then many of them will also return to driving.

Living independently

Descriptive travel patterns

Figure 49 depicts descriptive data on the distribution of the traveler types by living arrangement. Relative to young adults who lived with their parents, a larger share of independent young adults were Drivers and Trekkers and a smaller share were Multimodal or Car-less during the survey period. For both groups, there were fewer Drivers and Trekkers and more Multimodals and Car-less in 2009 than in 1995. While the direction of the effect was the same regardless of living situation, young people who lived independently experienced relatively larger changes in travel over time (see Figure 81 on p. 267 in Appendix D).

Figure 49 Traveler type by living arrangement and year (Age 16 to 36)



Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

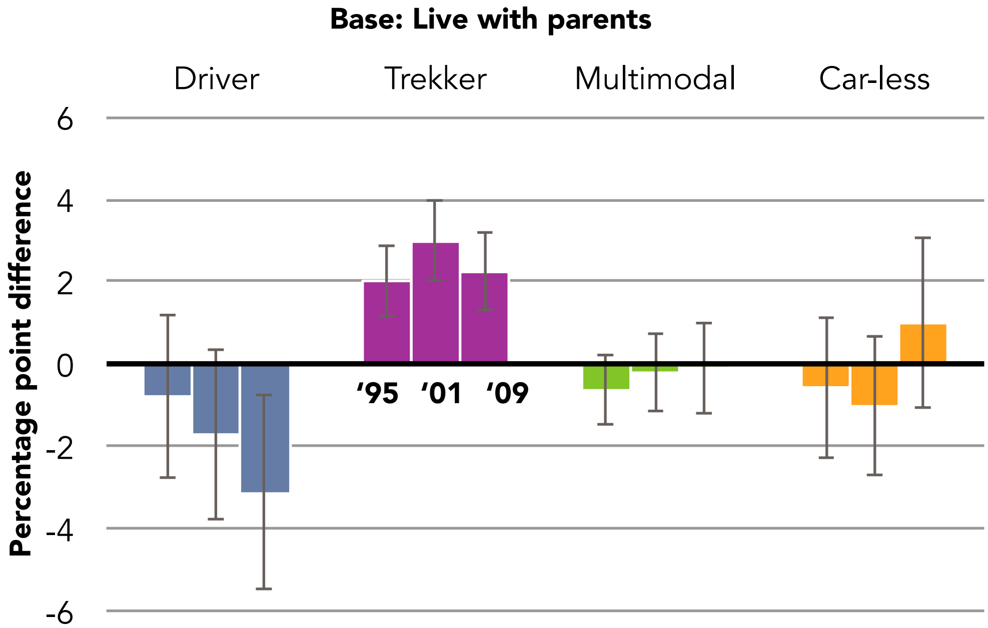
Independent effect of living independently

Young people who have established their own home differ in important respects from people who have yet to leave the parental nest (or who have returned) (see Table 28 on p.268). The average independent young adult was older, more likely to be employed, more likely to be married, and more likely to have a child than young adults who lived with their parents. Employment disparities by living arrangement primarily reflect age differences. Young adults age 26 to 36 were equally likely to be employed regardless of living situation. Independent older young adults were, however, more likely to have children and to be married than young adults of the same age who live with their parents.

Figure 50 presents the independent effect of living independently on traveler type, that is, when controlling for the effect of resources, residential location, and race/ethnicity. For full model results see Table 31 on p. 275 in Appendix D.

Based on the descriptive results, one might expect that young adults who lived independently would be more likely to be Drivers than young adults that lived with parents. Yet Figure 50 indicates that, everything else equal, independent young adults were actually *less* likely to be Drivers than young people who lived with their parents. In turn, independent young adults were much more likely than their otherwise similar peers living with parents to be Trekkers.

Figure 50 Independent effect of living independently on traveler type (Age 16 to 36)



Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. The model includes an interaction term between year (1995, 2001, and 2009) and lives independently, as well as control variables associated with the other roles, resources, residential location, and race/ethnicity. Estimates are weighted to reflect the population of the United States using the provided survey weights. Effect sizes are relative to the base category. Bars above the axis indicate that independent young people were more likely to be that traveler type relative to the base, everything else equal. The inverse is true for bars below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Living in the parental home imposes locational constraints that may explain this finding. A young person who lives with his parents may reside in more automobile-dependent locations than he would have otherwise preferred. Yet there was no statistically significant difference in residential location of young adults by their living arrangement (population density or size of the metropolitan area). This finding may instead reflect greater financial constraints for independent young adults who, unlike those who live with their parents, have fewer options to realize economies of scale in expenses and are less able to share household vehicles.

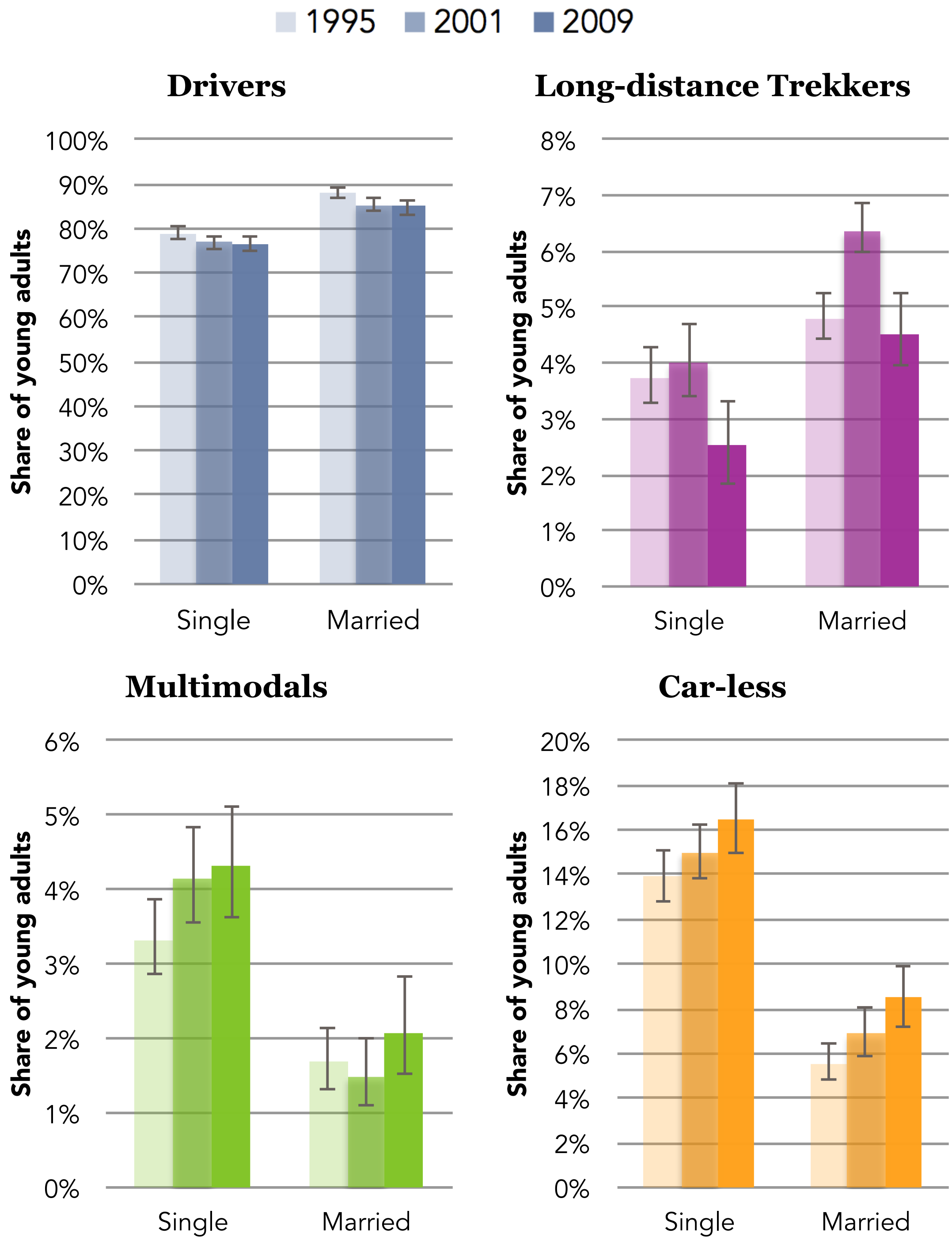
Finally, I am not sure why someone would be more likely to be a Long-distance Trekker if they live on his or her own. This finding held in both the descriptive analysis and the analysis when controlling for other variables.

Travel by marriage status

Descriptive travel patterns

Figure 51 presents traveler type by relationship status (married or single). Relative to single young adults, more married young adults were Drivers and Trekkers and fewer were Multimodals or Car-less. Irrespective of relationship status, young adults became less likely over time to be a Driver or a Trekker and more likely to be Multimodal or Car-less. The magnitude of the change was broadly similar for married and single young adults (see Figure 82 on p. 270 in Appendix D).

Figure 51 Traveler type by relationship status and year (Age 16 to 36)

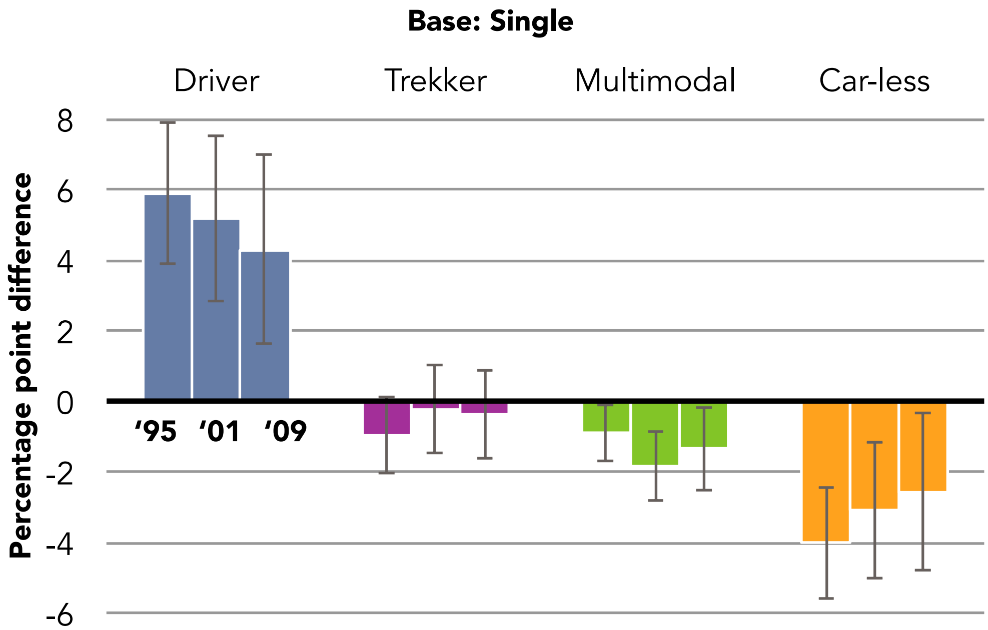


Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Independent effect of marriage

Married young adults were older, had higher incomes, were more likely to live independently, and were less likely to be a racial or ethnic minority than single young adults (see Table 29 on p. 269 in Appendix D). Figure 52 displays the independent effect of being married on traveler type in each year. For full model results see Table 32 on p. 277 in Appendix D.

Figure 52 Independent effect of being married on traveler type (Age 16 to 36)



Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. The model includes an interaction term between year (1995, 2001, and 2009) and marriage status, as well as control variables associated with the other Roles, Resources, Residential location, and Race/ethnicity. Estimates are weighted to reflect the population of the United States using the provided survey weights. Effect sizes are relative to the base category. Bars above the axis indicate that married young people were more likely to be that traveler type relative to the base, everything else equal. The inverse is true for bars below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Married young adults were more likely than their otherwise similar peers to be Drivers and less likely to be Car-les. There was no difference in the propensity to be a

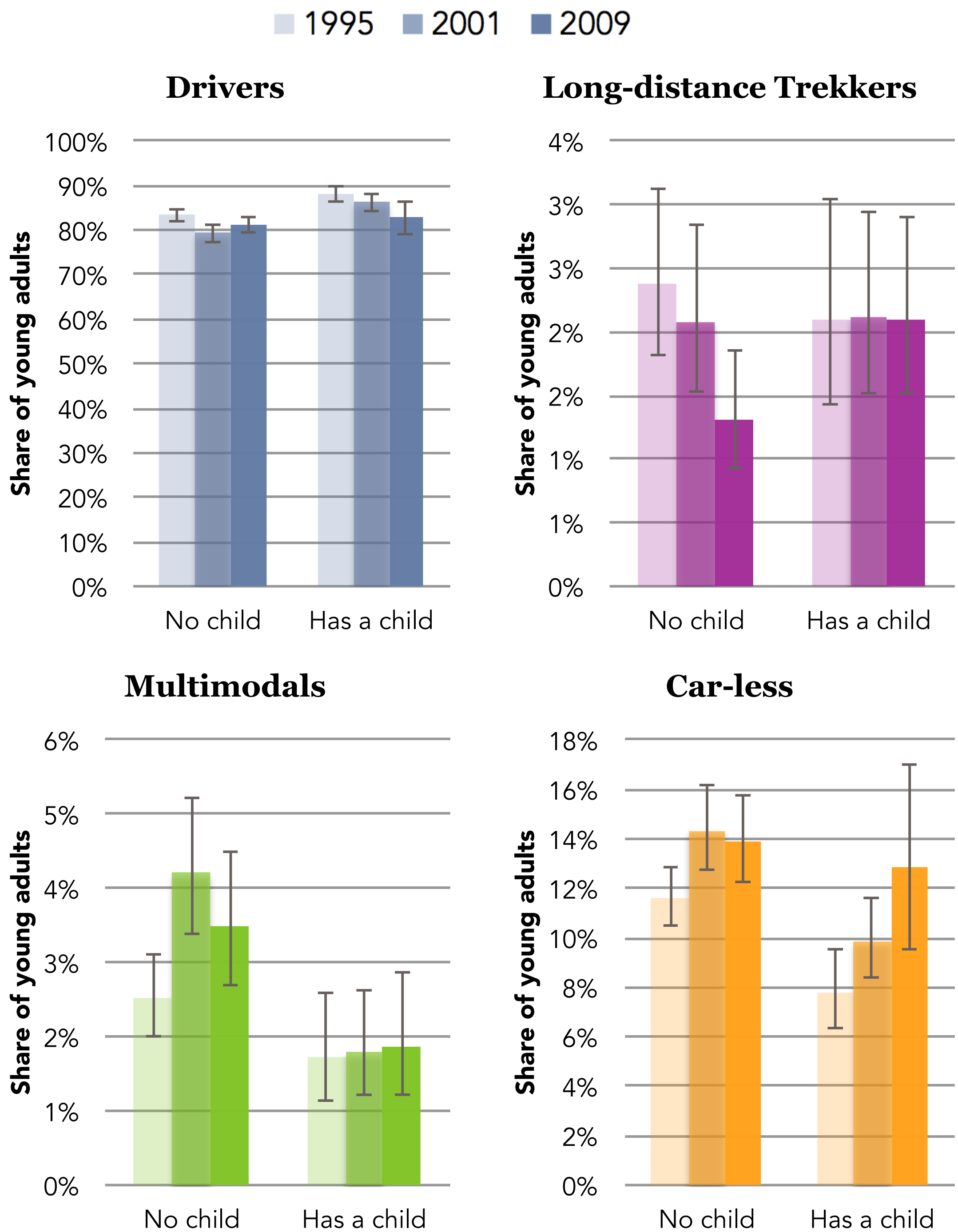
Trekker by marriage status. Finally, married young adults were slightly less likely than their otherwise single peers to be Multimodal. While the magnitude of this effect was small, marriage exerted the largest independent effect of any of the Roles on the propensity to be a Multimodal.

Parenthood

Descriptive travel patterns for women

Figure 53 describes the share of young women in each traveler type by year (Results for men are discussed on p. 161). Relative to women without children, more mothers were Drivers and fewer were Multimodal. In 1995 mothers were less likely than women without children to be Car-less, but by 2009 there was little difference Car-less-ness by parent status. Finally, very few young women were Trekkers, regardless of whether they have children or not.

Figure 53 Traveler type by parent status and year for young women (Age 16 to 36)



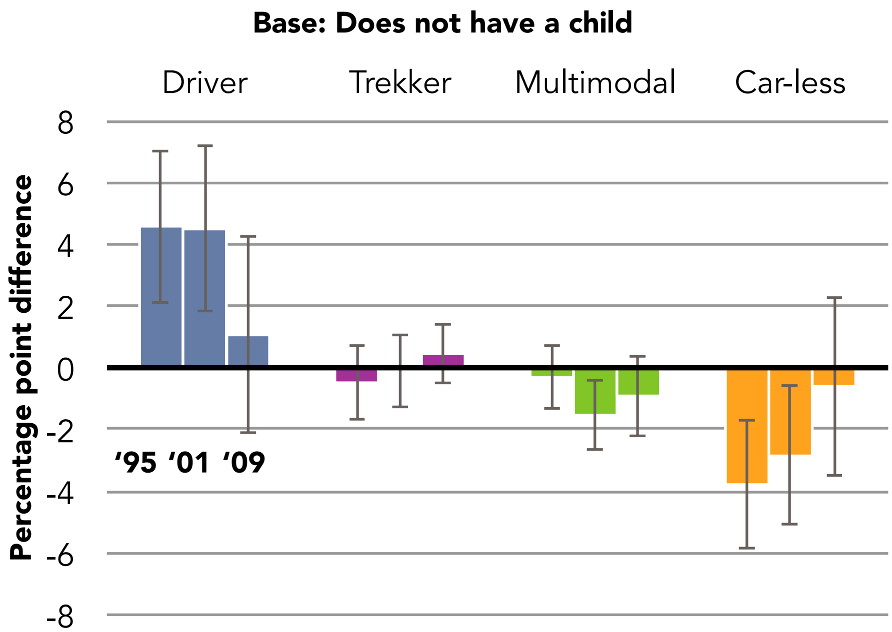
Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Independent effect of motherhood

The majority of mothers in the sample (67%) were married and nine in ten mothers lived independently (see Table 30 on p. 271 in Appendix D). Mothers had less education and lower incomes than women without children and were more likely to live in smaller cities and at lower densities.

Figure 54 indicates that, holding everything else equal, women were more likely to be Drivers and less likely to be Car-less if they had a child in 1995 and 2001. In the most recent period, however, mothers and women without children were equally likely to be Drivers (or Car-less) when controlling for the aforementioned differences in other roles, resources, residential location, and race/ethnicity. There was not a meaningful difference in the propensity to be a Trekker or a Multimodal between mothers and women without children. For full model results see Table 33 on p. 279 in Appendix D.

Figure 54 Independent effect of having a child on traveler type for young women (Age 16 to 36)



Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. The model includes an interaction term between year (1995, 2001, and 2009) and parent status, as well as control variables associated with the other Roles, Resources, Residential location, and Race/ethnicity. Estimates are weighted to reflect the population of the United States using the provided survey weights. Effect sizes are relative to the base category. Bars above the axis indicate that mothers were more likely to be that traveler type relative to the base, everything else equal. The inverse is true for bars below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Becoming a parent (men)

The independent effect of being a parent was broadly similar for men as it was for women. The primary difference was that men, unlike women, were more likely to be Trekkers if they were fathers (controlling for other factors). For full model results see Table 34 on p. 281 in Appendix D.

Variations by age

By pooling the data for young adults of all ages, the preceding analysis effectively assumes that taking on adult roles affects travel patterns in the same way regardless of age. To test this assumption, I estimated a multinomial logistic regression model for 2009 only and added an interaction term between employment status (yes/no) and age category (16 to 19/20 to 25/26 to 36). None of the interaction terms were significant, which indicates that pooling the data for young adults age 16 to 36 was appropriate.

Comparing the magnitude of the effect

To facilitate comparison Figure 55 presents the magnitude of the independent relationship between roles (including employment[26]) and traveler type in 2009. Relative to the other adult roles, employment generally exerted a strong effect on travel. By contrast, becoming a parent had an unexpectedly muted effect, particularly for women. This is surprising given the demands that that the arrival of a child has on a household and the results of previous research on the importance of childbirth for travel (Beige and Axhausen 2012). In most cases getting married had the second largest effect on travel. The marriage effect identified here may actually reflect differences in wealth between married and single young adults, which are not accounted for in the model.

[26] While it was not a focus of this chapter, employment is included in the figure for comparison.

Figure 55 Synthesis: Independent relationship between roles and traveler type in 2009 (Base: Have not attained each role)

Note: Results of a five multinomial logistic regression models, each with traveler type as the dependent variable. Each of the five models includes an interaction term between year (1995, 2001, and 2009) and the variable of interest (employment, living independently, etc.). Each model also includes control variables associated with the other Roles, Resources, Residential location, and Race/ethnicity. Estimates are weighted to reflect the population of the United States using the provided survey weights. Effect sizes are relative to the base category. Bars to the right of the axis indicate that young adults that have attained that role were more likely to be that traveler type relative to the base, everything else equal. The inverse is true for bars to the left of the axis. Error bars reflect the 95 percent confidence interval around the estimate. The base categories are: not employed, lives with parents, single, and does not have a child. F and M refer to women and men, respectively. Source: 2009 NHTS, weighted values.

How much did deferring adult roles contribute to the decline in driving?

In the 2000s young people delayed taking on adult roles and, because taking on roles is associated with an increased propensity to be a Driver or a Trekker and a decreased propensity to be a Multimodal or Car-less, this delay contributed to the aggregate decline in Drivers and Trekkers and the increase in Multimodals and Car-less. Table 14 depicts the estimated share of young people in each traveler type that would have existed if young adults had taken on as many adult roles in 2009 as they had in 1995. For comparison, the table includes the actual prevalence for each type in 1995 and 2009. In every case the estimated value lies between the extremes of the actual 1995 and 2009 values. The final column displays how much role deferment contributed to the overall change in the prevalence of each traveler type. Values were typically lowest for having a child and highest for employment and marriage. Notably, however, the delay in roles does not explain all (or even a majority of) the change in traveler types. For example, even if young people were employed at the same rate in 2009 as they were in 1995, the proportion of Drivers would have fallen by two percentage points and the share Car-less would have increased by the same amount.

Table 14 Prevalence of the traveler types if young people had taken on as many adult roles in 2009 as they had in 1995

	(1) Actual 1995 value	(2) Predicted value	(3) Actual 2009 value	(4) Share of gap explained
Employed				
Driver	83%	81%	79%	34%
Trekker	4%	3%	3%	30%
Multimodal	3%	3%	4%	14%
Car-less	10%	12%	14%	39%
Total/average	100%	100%	100%	29%
Live independently				
Driver	83%	80%	79%	4%
Trekker	4%	4%	3%	45%
Multimodal	3%	3%	4%	26%
Car-less	10%	13%	14%	10%
Total/average	100%	100%	100%	21%
Married				
Driver	83%	80%	79%	28%
Trekker	4%	3%	3%	23%
Multimodal	3%	3%	4%	28%
Car-less	10%	13%	14%	27%
Total/average	100%	100%	100%	26%
Has a child (women only)				
Driver	85%	82%	82%	5%
Trekker	2%	2%	1%	9%
Multimodal	2%	3%	3%	17%
Car-less	10%	14%	14%	3%
Total/average	100%	100%	100%	9%
Has a child (men only)				
Driver	81%	78%	77%	4%
Trekker	6%	5%	5%	19%
Multimodal	3%	4%	4%	9%
Car-less	10%	14%	14%	8%
Total/average	100%	100%	100%	10%

Note: Predicted values are based on the share of young adults that had attained each role in 1995 and the probability of being a Driver (and each subsequent role) given one's role attainment in 2009. The share of the gap explained is: [1-(Column 1-Column 2)/(Column 1-Column 3)]*100.

CHAPTER CONCLUSION

During the Great Recession, economic conditions for a large share of young adults in the United States were poor indeed. Earnings stagnated and record numbers of young, would-be workers struggled to find jobs. In response to these economic constraints young people moved back in with their parents, put off marriage, and delayed having children. As the economy recovers and young people head back to work, move out, and start families of their own, will they once again embrace driving? I find that when young people take on adult roles, they tend to move away from alternative modes of travel (as Multimodals or Car-less) and become more likely to be Drivers and Trekkers. These results suggest that if good jobs return, young people will embrace driving once again.

CHAPTER 7: RESIDENTIAL LOCATION

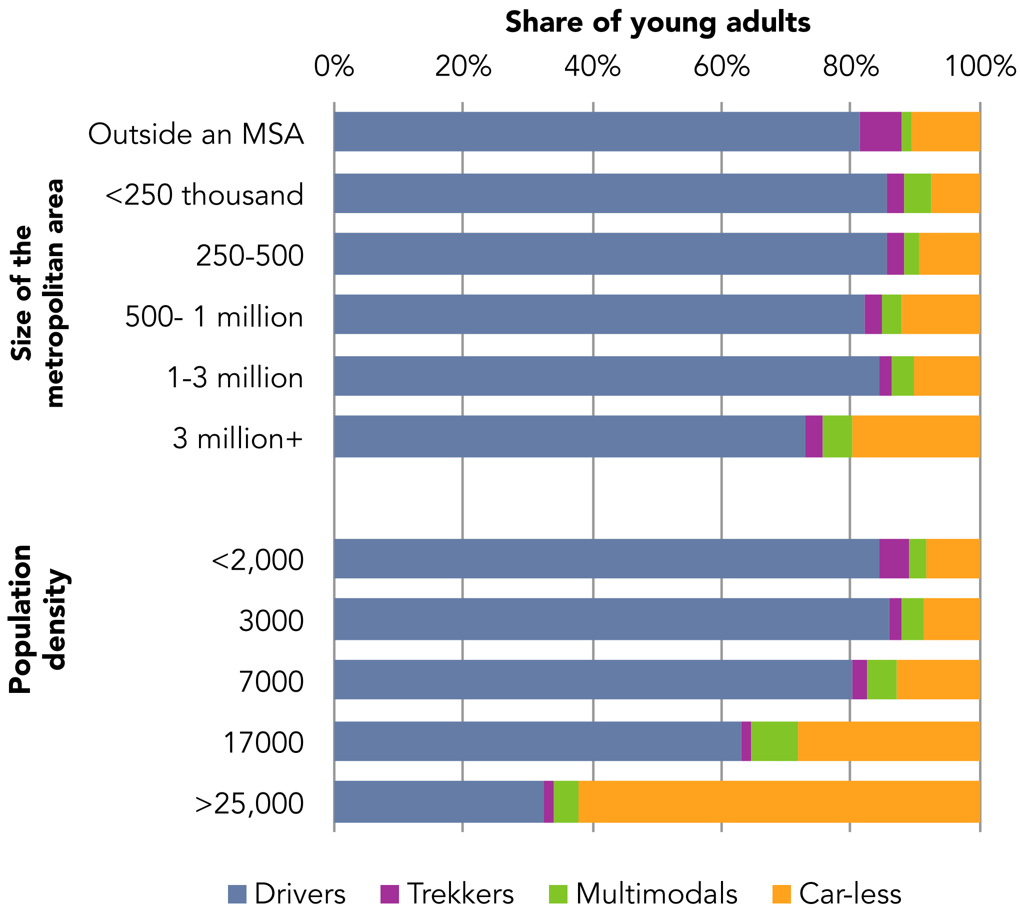
INTRODUCTION

The preceding chapters explored the relationship between the traveler types identified in Part I and a young person's roles and economic resources. This chapter explores the relationship between traveler type and residential location and has four aims. First, it provides additional evidence about the relative contribution of preferences and constraints that was explored in Chapter 5. Second, the chapter explores two more hypotheses about the decline in vehicle travel: a back-to-the-city movement and improvements in alternative transportation options that made being a Multimodal more desirable. Finally, the chapter closes with an analysis of how non-automobile transportation options and access to opportunities vary by population density.

DESCRIPTIVE TRENDS

Figure 56 illustrates the prevalence of each traveler type by size of the metropolitan area and population density in 2009. While the majority of young adults were Drivers regardless of their residential location (with one exception), there were relatively fewer Drivers in the largest cities and, especially, in the densest areas. Trekkers were most common outside of metropolitan areas and at the lowest densities. There were more Multimodal young adults as metropolitan size and density increased. Finally, there were relatively more Car-less young adults as metropolitan size and density increased. In the densest areas there were more Car-less young people than Drivers.

Figure 56 Residential location and traveler type of young adults (Age 16 to 36) in 2009: Size of the metropolitan area and population density



Note: Estimate of the prevalence of the traveler types in the young adult population using the provided survey weights. Source: 2009 NHTS, weighted values.

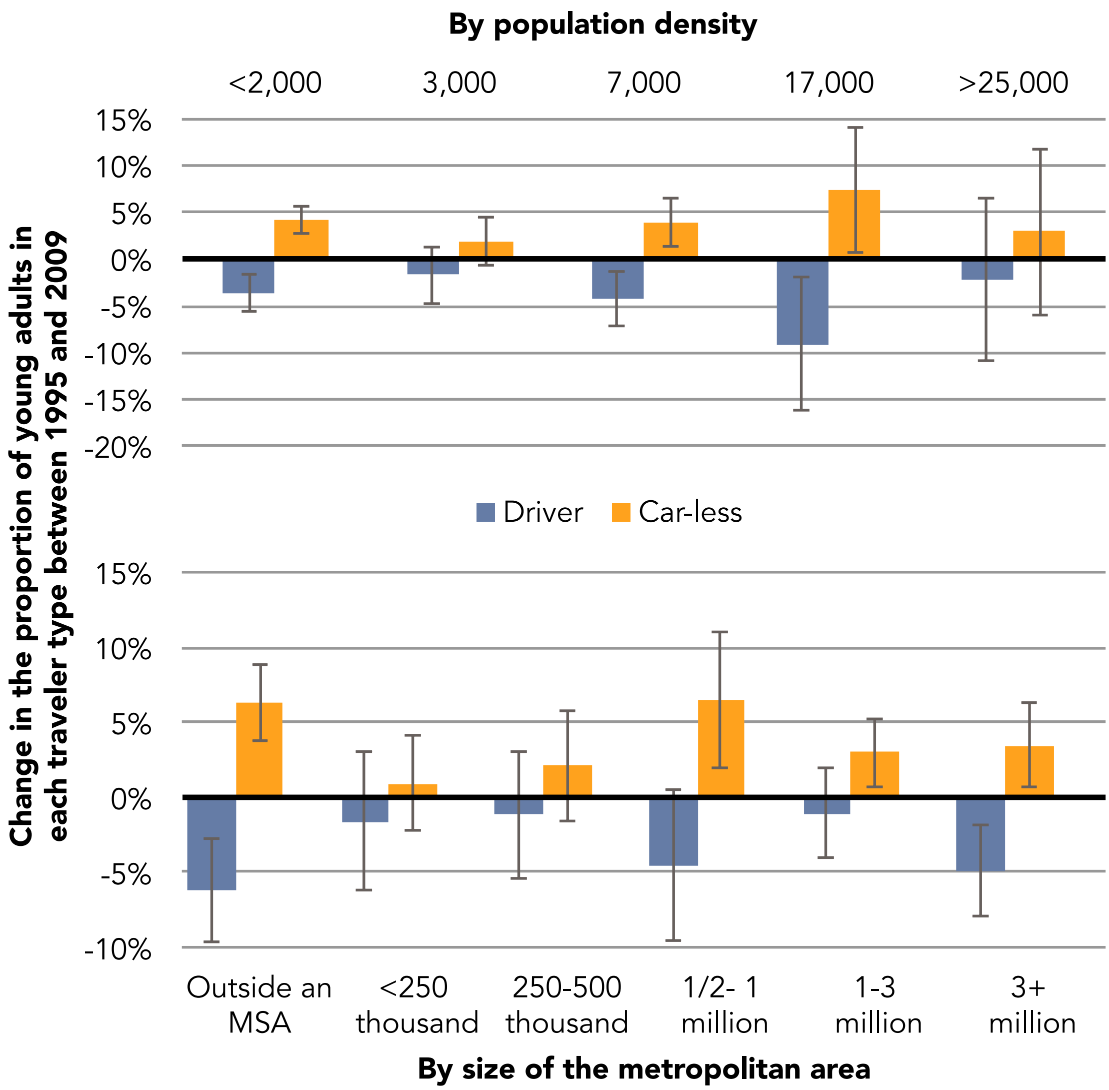
These descriptive trends align with the commonsense expectations about the relative utility (and availability) of various travel modes in various settings. In low-density areas, destinations are far apart and transit service is often extremely limited. As a result, walking, biking, or riding transit in those areas is often unsuitable and most trips must be made by private vehicle. As densities increase, there are more destinations nearby, so walking and biking become more favorable options. Transit service also generally improves with density. Young adults at low densities learn to drive earlier and drive more miles on average than young adults at higher densities (Trowbridge and McDonald 2008, McDonald and Trowbridge 2009).

Change over time: Preferences or constraints

Drivers and Car-less

The following figures depict the change in the prevalence of the Drivers and Car-less (Figure 57) and the Trekkers and Multimodals (Figure 58) between 1995 and 2009. Analyzing changes over time by location offers an indirect test of the relative contribution of preferences and economic constraints that was the focus of Chapter 5. If the reduction in Drivers and increase in Car-less were concentrated in areas with many non-automobile travel options (specifically high densities), then preferences may plausibly—though not necessarily—be at work. On the other hand, if the changes were more dispersed geographically and, in particular, if there were more Car-less young people over time in the most inaccessible places (low densities and outside of metropolitan areas), this finding may indicate that widespread economic constraints were a primary cause. Young people in those areas were almost certainly not acting on their preferences; in those areas travel by automobile is essentially a prerequisite for securing a job, meeting basic needs, and maintaining social ties.

Figure 57 Where were there fewer Drivers and more Car-less young adults (Age 16 to 36) over time?



Note: The prevalence of each traveler type in 1995 and 2009 are based on NHTS survey weights. Error bars reflect the 95 percent confidence interval around the estimate of the difference between survey years. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

The largest reductions in Drivers (and increases in Car-less) occurred in areas well-suited for being Car-less: at high densities (particularly at 17,000 people per square mile) and in moderate to large metropolitan areas (particularly with 500,000 to 1 million residents). This finding is in line with (but does not necessarily support) the view that the decline in vehicle travel reflects preferences. This finding may not reflect preferences if, for example, young people facing economic constraints chose to locate in dense areas to reduce the burden of Car-less-ness.

There were also substantial increases in the share of Car-less young people outside of metropolitan areas and at very low densities. Few young people would willingly forgo automobility in low-density areas outside of metropolitan regions because there are few non-automobile travel options there (see Figure 68 later in this Chapter) and this suggests that economic constraints were the driving force of changes in those areas. As I discuss in more detail in Chapter 9, Car-less young people in these areas likely suffer from transportation disadvantage and social exclusion (Social Exclusion Unit 2003, Delbosc and Currie 2012).

Trekkers and Multimodals

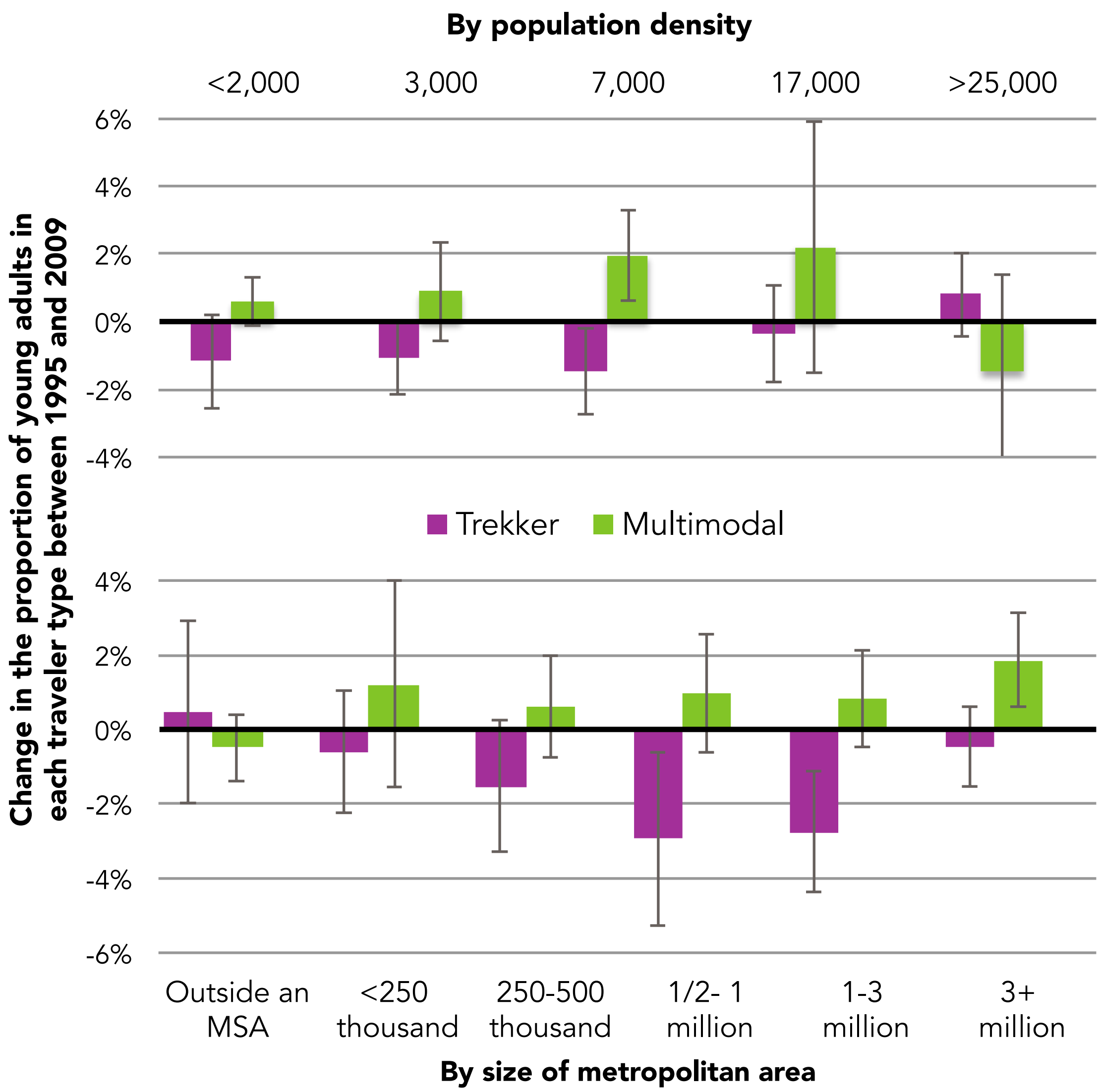
Figure 58 depicts the change in the prevalence of Trekkers and Multimodals between 1995 and 2009 by residential location. The biggest increases in Multimodals occurred at moderately high densities (7,000 and 17,000 people per square mile) and in the largest cities (3+ million). The largest decline in Trekkers occurred at low densities (where the majority of Trekkers resided in 1995).

The trend was reversed at the highest densities (over 25,000 people per square mile) and outside Metropolitan areas, where there were more Trekkers and fewer Multimodals over time.[27]

---

[27] However, the change over time was not statistically significant.

Figure 58 Where were there fewer Long-distance Trekkers and more Multimodal young adults (Age 16 to 36)vover time?



Note: The prevalence of each traveler type in 1995 and 2009 are based on NHTS survey weights. Error bars reflect the 95 percent confidence interval around the estimate of the difference between survey years. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Region of the United States

In addition to the analysis of population density and size of the metropolitan area, I conducted a parallel analysis for region of the country (see Appendix E).

INDEPENDENT RELATIONSHIP

The previous analysis relied on descriptive data, yet young adults differ substantially by their residential location (see Table 35 and Table 36 on pp. 286 and 287 in Appendix E) and those other factors may mask the independent relationship between travel and residential location. The following section highlights differences in personal characteristics by residential location and the next section reports the results of the multinomial logistic regression models (for more details see Chapter 4).

Personal characteristics by residential location

Population density

Relative to young people living at low densities, those at high densities were more likely to have very low incomes and very limited educational attainment. Meanwhile, the share of young people with advanced degrees was highest at high densities, perhaps to maximize access to high-skilled employment opportunities. Finally, during the survey period the racial composition of the United States varied greatly by density. While white young adults made up the majority at lower densities, they comprised just one quarter of young adults at higher densities. Racial and ethnic variations in living situation and travel are the focus of Chapter 8.

Metropolitan area

During the study periods the vast majority of young adults in the United States lived in metropolitan areas of various sizes; only 18 percent lived outside metropolitan areas. Young people who resided outside of cities differed from their urban peers in many ways (see Table 36 on p. 287 in Appendix E). For instance, young people outside metropolitan areas were much more likely than urban young people to have very low incomes. While both groups were equally likely to have graduated from high school, urban young people were much more likely to have graduated from college or to have earned an advanced degree. Relative to their urban peers, young people outside metropolitan areas were more family oriented; they were slightly more likely to be married and to have a child. Finally, while metropolitan areas, particularly large metropolitan areas, were very diverse places in terms of race and ethnicity, there was much less diversity outside of metropolitan areas in 2009. In that year fully 81 percent of young adults outside of metro areas were non-Hispanic white, a share that declines steadily as metro area size increases.

Self-selection

In attempting to identify the independent relationship between residential location and traveler type, this project confronts a common methodological challenge: residential self-selection makes establishing causality from cross-sectional data difficult. People who prefer to walk and ride transit may move to locations with more nearby destinations and good transit service and failing to account for the influence of preference may lead to biased estimates of the relationship between the built environment and travel. To reduce potential bias from self-selection, this study employs multivariate statistical analysis to control for other factors related to travel behavior. This approach is widely used (Ewing and Cervero 2010) because, as Naess (2014) argues, self-selection is "unlikely to represent any great source of error… as long as 'traditional' demographic and socioeconomic variables have already been accounted for" (p. 57).

The issue of self-selection remains hotly contested. Naess (2014) argues that the preoccupation with self-selection is unnecessary, noting that the causal mechanisms linking travel and the built environment are well-established; that precise estimates of the relationship are not only impossible, but also unnecessary; and that controlling statistically for demographic factors is sufficient to achieve an estimate of the relationship with a reasonable level of confidence. Levine (2005), for example, argues that transit-oriented and walkable neighborhoods are in such short supply that even if all of travel difference between neighborhoods were the result of self-selection, building more such neighborhoods should lead to changes in travel behavior. Perhaps most importantly for policymakers, the self-selection debate is often beyond the point because, as Chatman (2014) argues, "controlling for residential self-select is not necessarily relevant to the predictive questions that controlled estimates are meant to inform" (p. 47).

Model results

The following figures present the independent relationship between traveler type and residential location. Full model results are available in Appendix E: for population density see Table 37 on p. 288; for size of the metropolitan area see Table 38 on p. 290; and for census region see Table 41 on p.294.

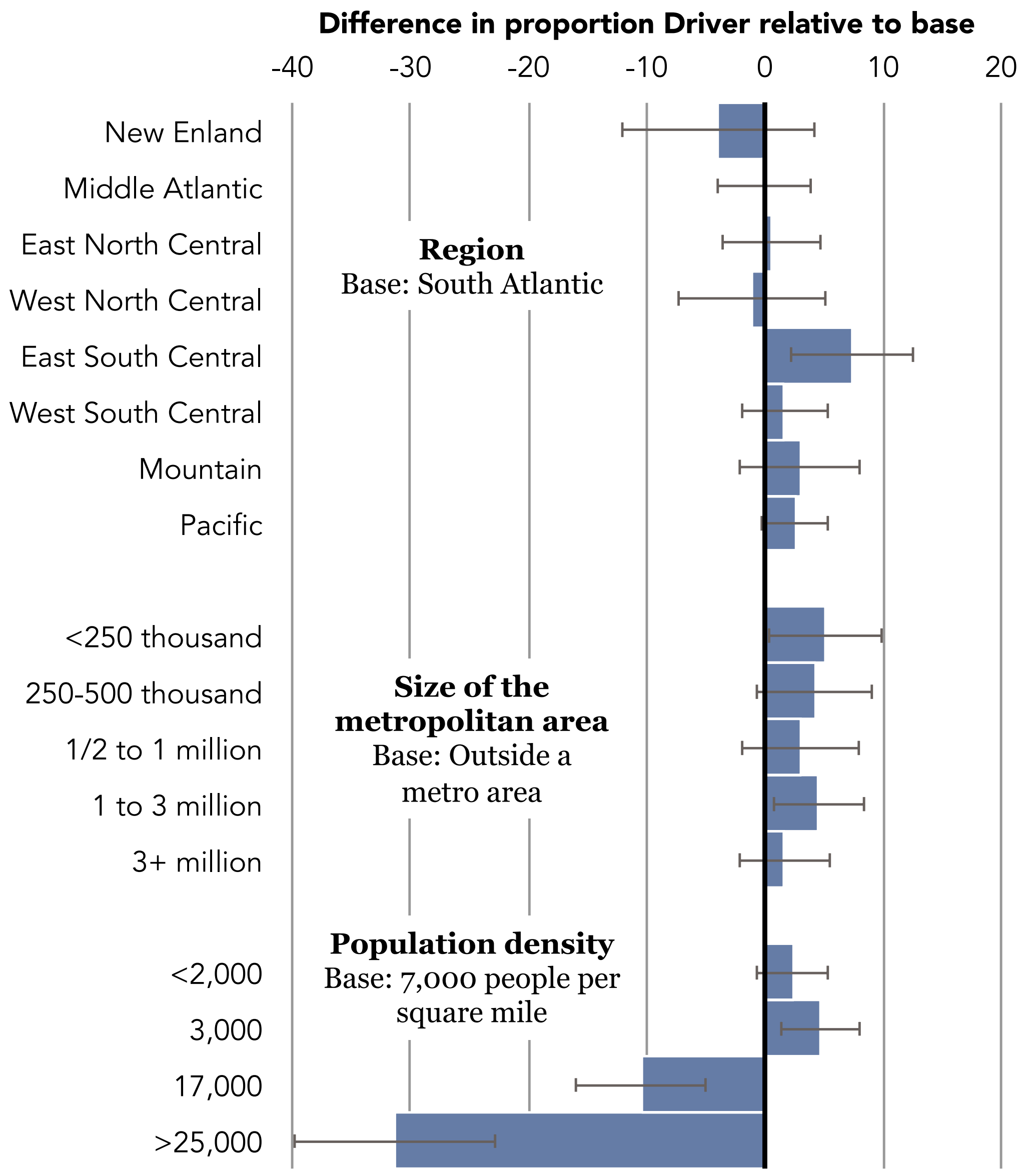
Drivers

Figure 59 depicts the results for Drivers. Of the three residential location variables, Density had the strongest relationship with the propensity to be a Driver. Everything else equal, young adults at low densities were most likely to be Drivers and those at high densities were least likely. Surprisingly, young people in metropolitan areas were more likely to be Drivers than young people outside metropolitan areas. With one exception, the regional variables were not statistically significant. Young adults in the East South Central region were more likely to be Drivers than otherwise similar young adults in other regions.

Car-less

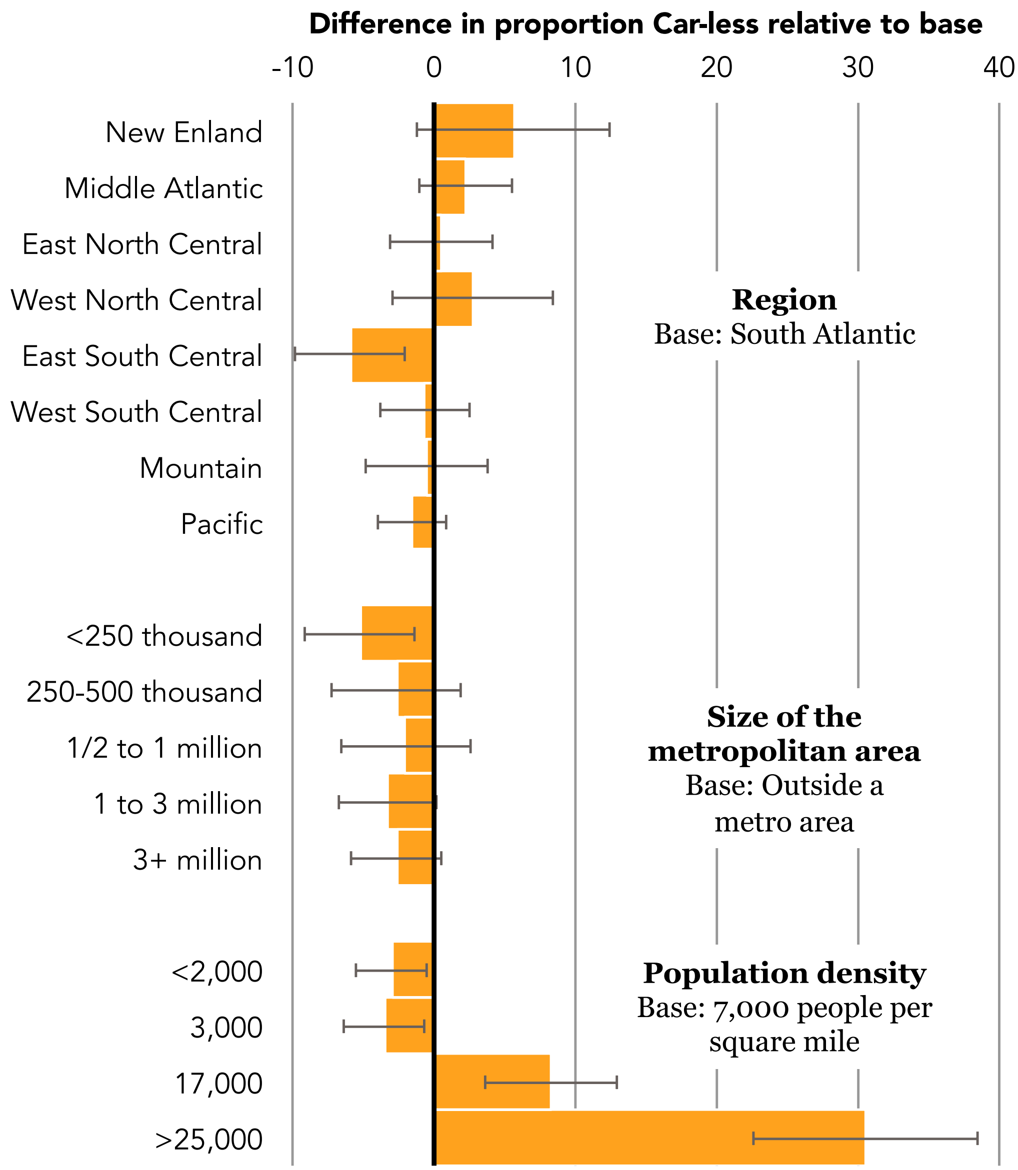
As Figure 60 indicates, the relationship between residential location and the propensity to be a Driver were generally mirrored for Car-less. Relative to young adults at moderate densities, young adults were less likely to be Car-less at lower densities and more likely to be Car-less at higher densities. Controlling for other factors (including population density), young adults who lived in metropolitan areas were less likely to be Car-less than those outside of metropolitan areas. Finally, young adults were least likely to be Car-less, everything else equal, if they lived in the East South Central region (KY, TN, MS, and AL) and most likely to be Car-less if they lived in New England (ME, NH, VT, MA, RI, and CT).

Figure 59 Residential location synthesis: Propensity to be a Driver in 2009



Note: Comparing the results of three separate multinomial logistic regression models with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 60 Residential location synthesis: Propensity to be Car-less in 2009

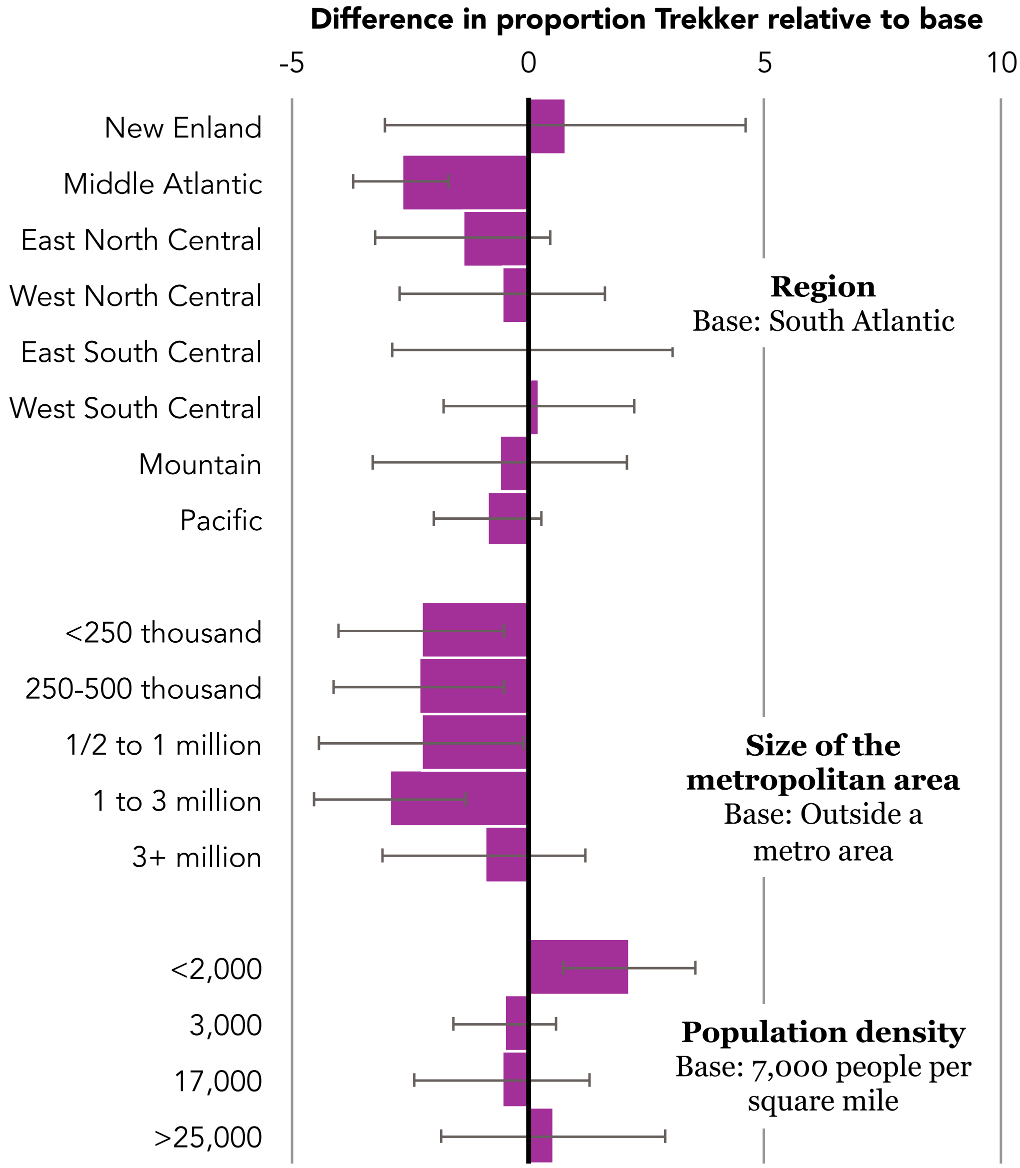


Note: Comparing the results of three separate multinomial logistic regression models with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 61 presents the regression results for Long-distance Trekkers. As expected, young adults were most likely to be Trekkers, everything else equal, if they lived at low densities and if they lived outside of metropolitan areas. Once again there was only one statistically significant regional effect: young people were more likely to be Trekkers, everything else equal, if they lived in the in the Middle Atlantic region (NY, PA, and NJ).

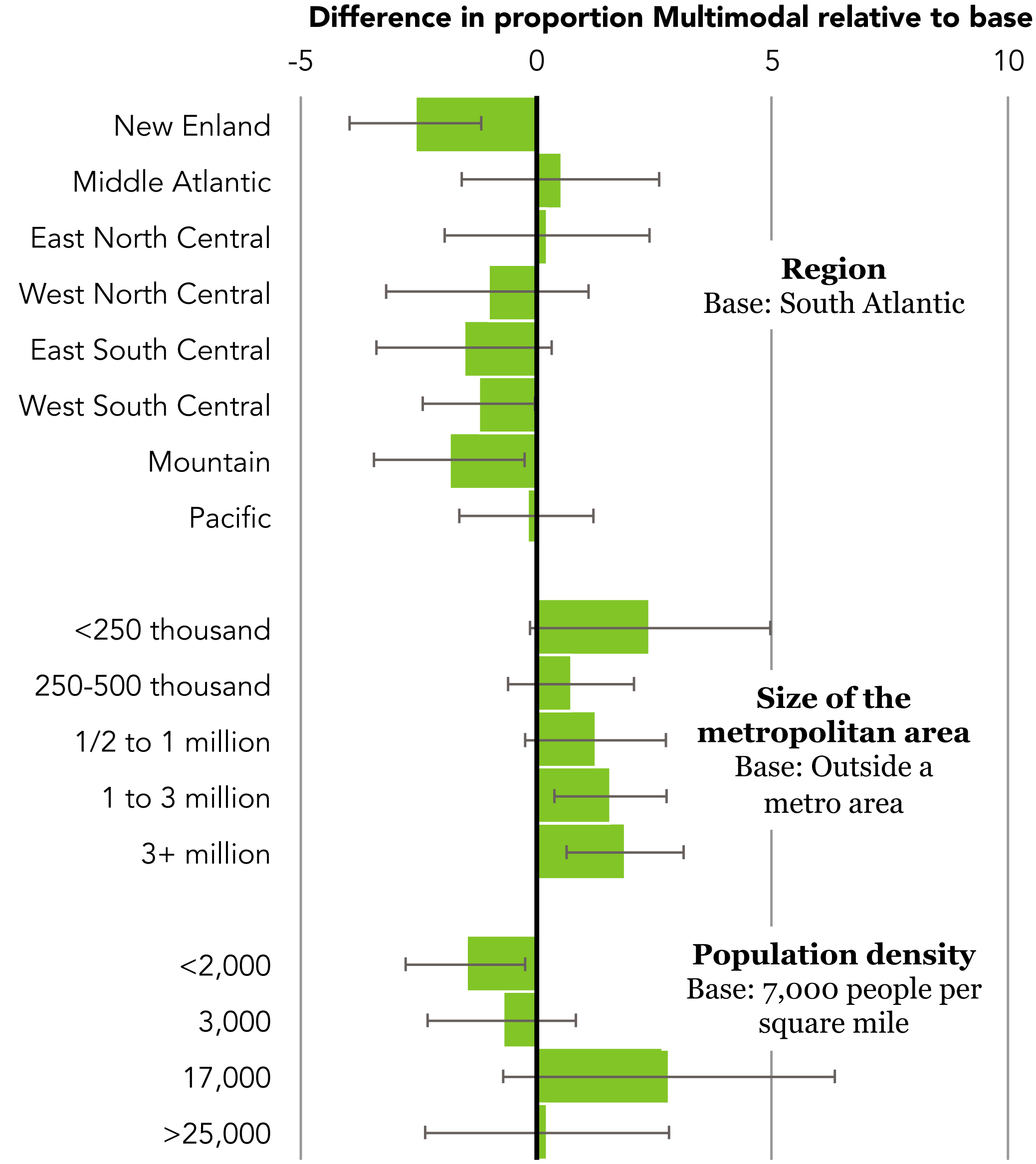
Finally, Figure 62 presents the model results for Multimodals. The propensity to be a Multimodal was lowest at low densities and increased steadily with density, that is, until the densest regions, where young adults were no more likely to be Multimodal than their otherwise similar peers at moderate densities. This likely reflects the fact that in the densest areas, young people are more likely to be Car-less than a Multimodal. Young adults were less likely to be Multimodals, everything else equal, if they lived in the New England or Mountain region.

Figure 61 Residential location synthesis: Propensity to be a Long-distance Trekker in 2009



Note: Comparing the results of three separate multinomial logistic regression models with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Figure 62 Residential location synthesis: Propensity to be Multimodal in 2009



Note: Comparing the results of three separate multinomial logistic regression models with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

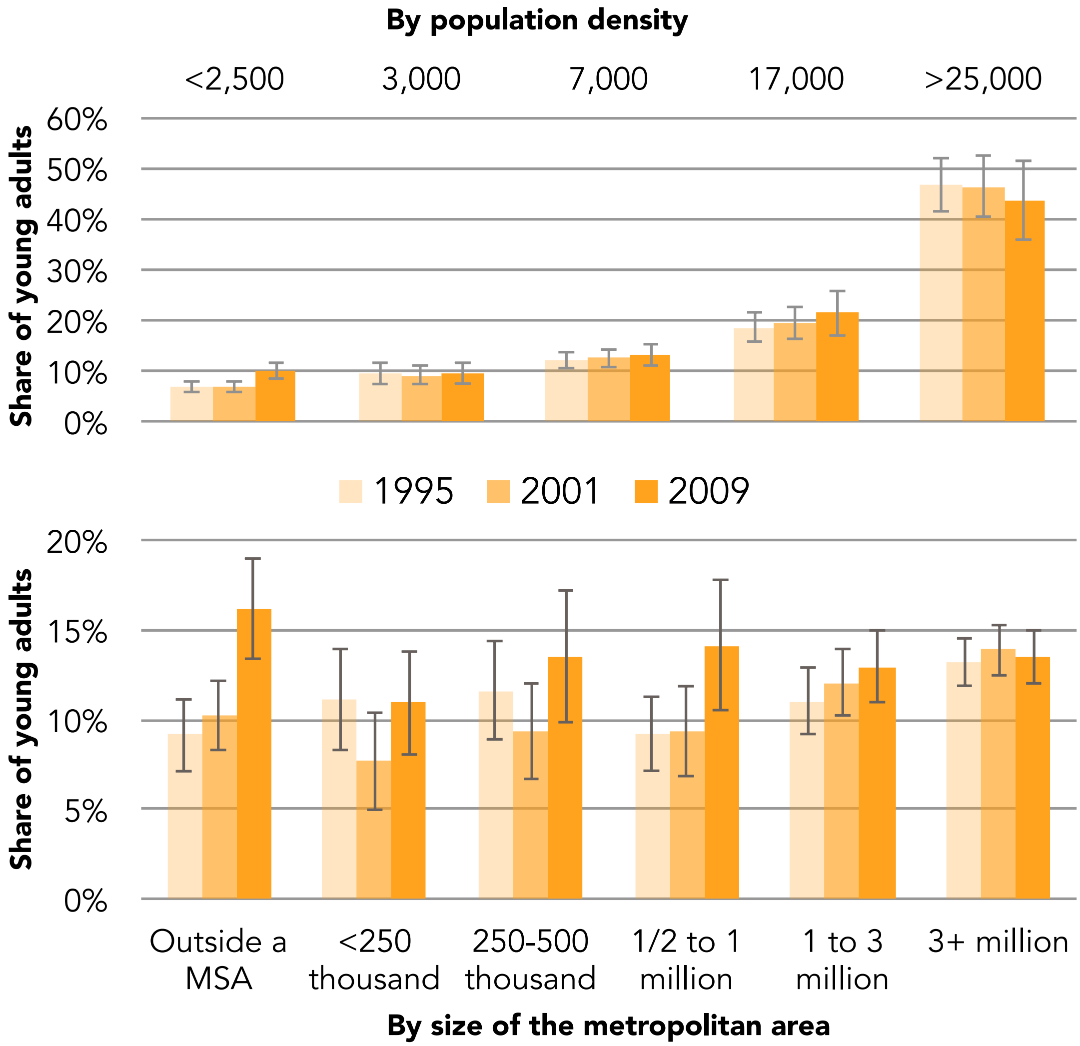
TESTING HYPOTHESES

Improved utility of alternative modes

The preceding results focused on the relationship between the residential location variables and the traveler types in 2009. This section builds on that analysis to test a hypothesis: did improvements in the availability and relative utility of non-automobile modes of travel contribute to the decline in driving? While this analysis does not directly evaluate the availability or utility of alternative modes, it indirectly addresses the hypothesis by testing whether the relationship between residential location and traveler type changed over time. If, for example, young people at moderate densities (17,000 people per square mile) were much more likely (everything else equal) to be Multimodals in 2009 than in 1995, this would suggest that characteristics of the built environment in those areas changed sufficiently to alter travel behavior. For this test I added an interaction term to each model between residential location and survey year (1995, 2001, and 2009). Full tables of the significance tests for the interaction terms are available in Appendix E on pp. 292 and 293.

The propensity to be Car-less at low densities and outside of metropolitan areas changed significantly over time. Figure 63 depicts the share of young adults that we could expect to be Car-less in each year by population density, controlling for other factors. Everything else equal, young people in the lowest densities and outside of metropolitan areas were more likely to be Car-less in 2009 than in 1995 or 2001.

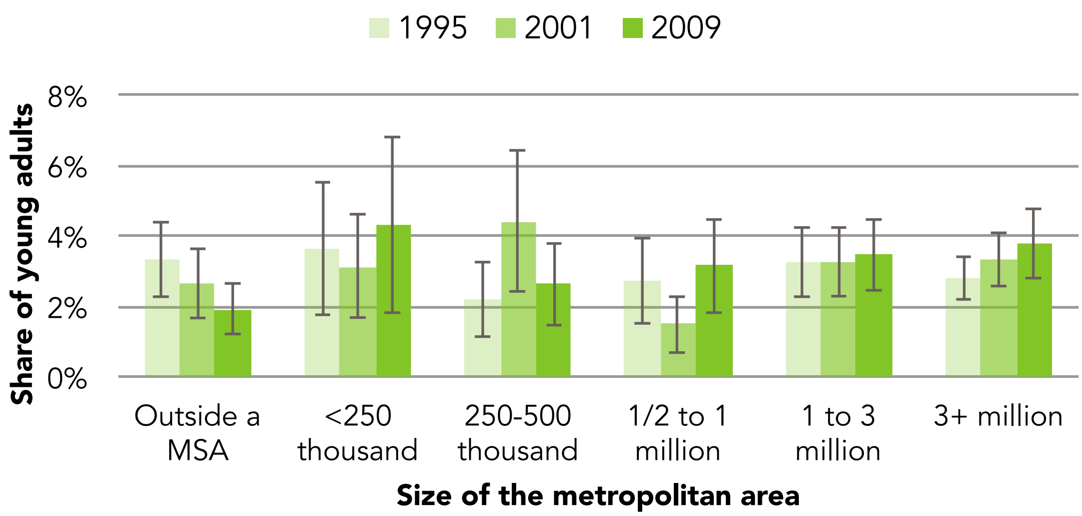
Figure 63 Predicted proportion of young adults (Age 16 to 36) that were Car-less by residential location and year



Note: Results of a multinomial logistic regression model with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

The propensity to be Multimodal also changed over time by size of the metropolitan area. As Figure 64 depicts, the share of young adults that were Multimodal decreased steadily outside of metropolitan areas, changed sporadically in medium-sized metropolitan areas, and increased slightly in the largest metropolitan areas.

Figure 64 Predicted proportion of young adults (Age 16 to 36) that were Multimodal by size of the metropolitan area and year



Note: Results of a multinomial logistic regression model with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

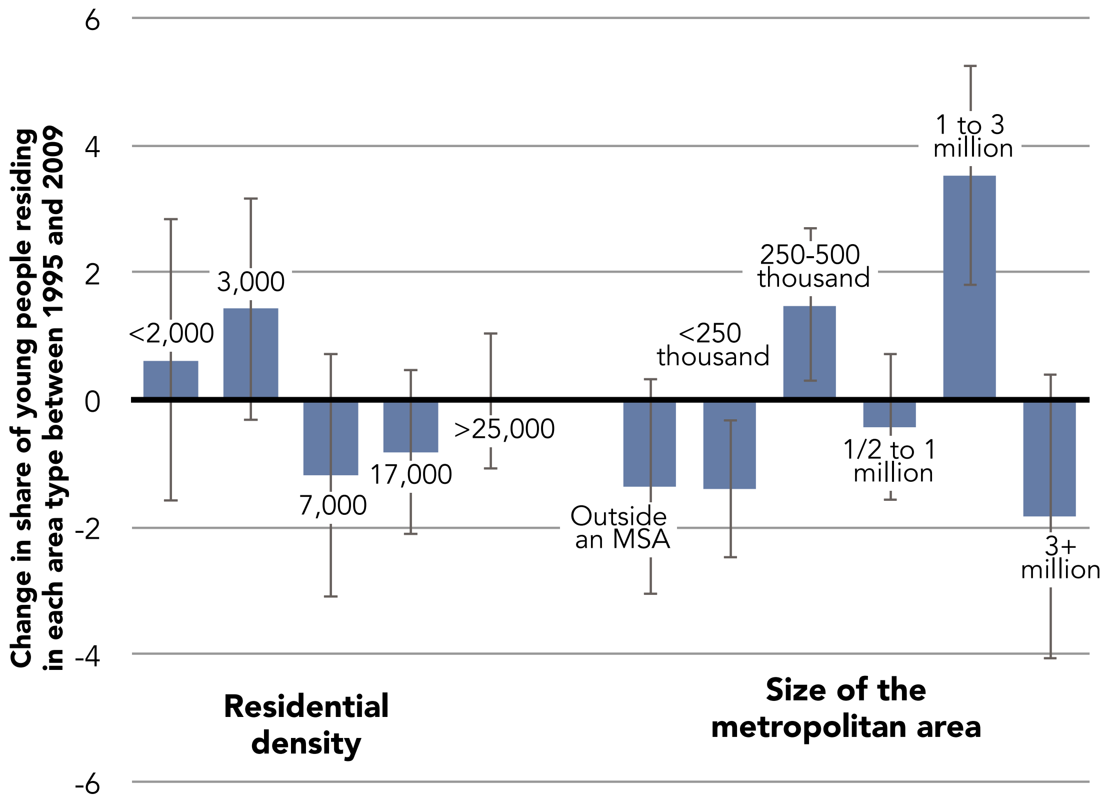
Back-to-the-city movement

Residential location could contribute to the decline in driving if young adults moved away from low-density localities to denser neighborhoods in metropolitan areas with better transit service, more destinations nearby, more congestion, and more limited (and more expensive) parking. For this reason, many journalists point to a back-to-the-city movement as a key explanatory factor in the aggregate decline in driving (Rosenthal 2013). For a back-to-the-city movement to contribute to the decline in driving, two conditions must hold: residential location must be related to traveler type (it is) and relatively more young people must live in dense areas (or otherwise Multimodal friendly areas) in 2009 than in 1995. The second condition is the subject of this section.

There are many reasons for young people to return to cities: superior consumption opportunities (Glaeser and Gottlieb 2006), more employment opportunities, even a better marriage market (Costa and Kahn 1999), and there is some evidence that a back-to-the-city movement is indeed underway. Between 2000 and 2010, the share of college-educated young adults (25 to 34) increased much faster—twice as much—in "close-in" neighborhoods of metropolitan areas compared with metropolitan areas more than three miles away from the central business district (Cortright 2011). Yet focusing on people with college degrees leaves many people out of the picture. In 2008, just 40 percent of 27-year-olds had earned an associate's degree or higher (Harvard Graduate School of Education 2011). Young people with college degrees are more likely to move across state lines than young people with more limited education. By focusing on college educated young people—the minority of young adults—we may unintentionally overplay the extent of migration.

While the NHTS data does not include information on moves, it can provide some evidence on the validity of the back-to-the-city claims. In the NHTS data there is no evidence of an urban renaissance (see Figure 65). On average, there were actually slightly more young people in low-density areas (and fewer in high-density areas) in 2009 than in 1995. There were also fewer young people in towns, small cities, and the largest cities in 2009 than in 1995. Meanwhile, medium-sized cities had relatively more young adults in the later period.

Figure 65 Change in the residential location of young adults (Age 16 to 36) between 1995 and 2009: Density and size of the metropolitan area



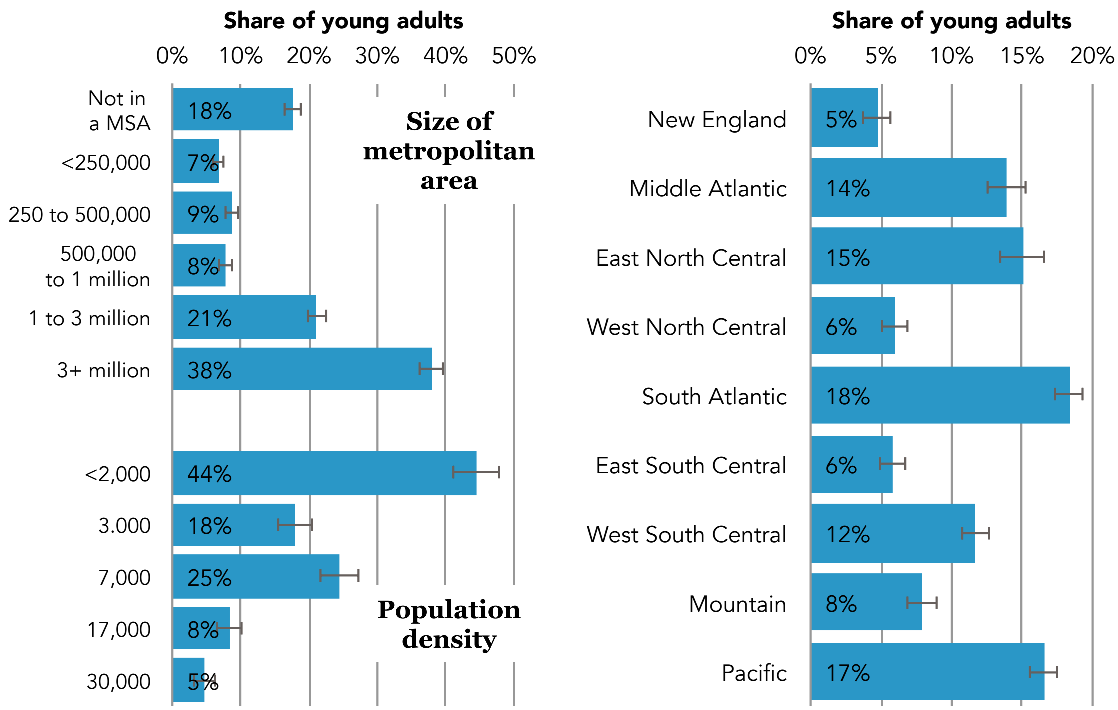
Reported estimates are for the population of young adults using the provided survey weights. Bars above the axis indicate that a larger share of young adults lived in that type of location in 2009 than in 1995. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

The increased share of young adults at lower density areas is at odds with the aggregate trend toward less driving. The relative decline in non-metropolitan areas, by contrast, supports the aggregate trend toward less driving because young people outside metropolitan areas were so much more likely than otherwise similar young people to be Drivers and Trekkers.

THE RESIDENTIAL LOCATION OF YOUNG ADULTS

Figure 66 contextualizes the previous findings by providing information about the residential location of young adults in the United States in 2009. A majority of young adults lived in a city with at least one million residents. Nonetheless, very few of them lived at high densities. Instead, the most common living situation of young adults in the United States was to live at very low densities (less than 2,000 people per square mile).

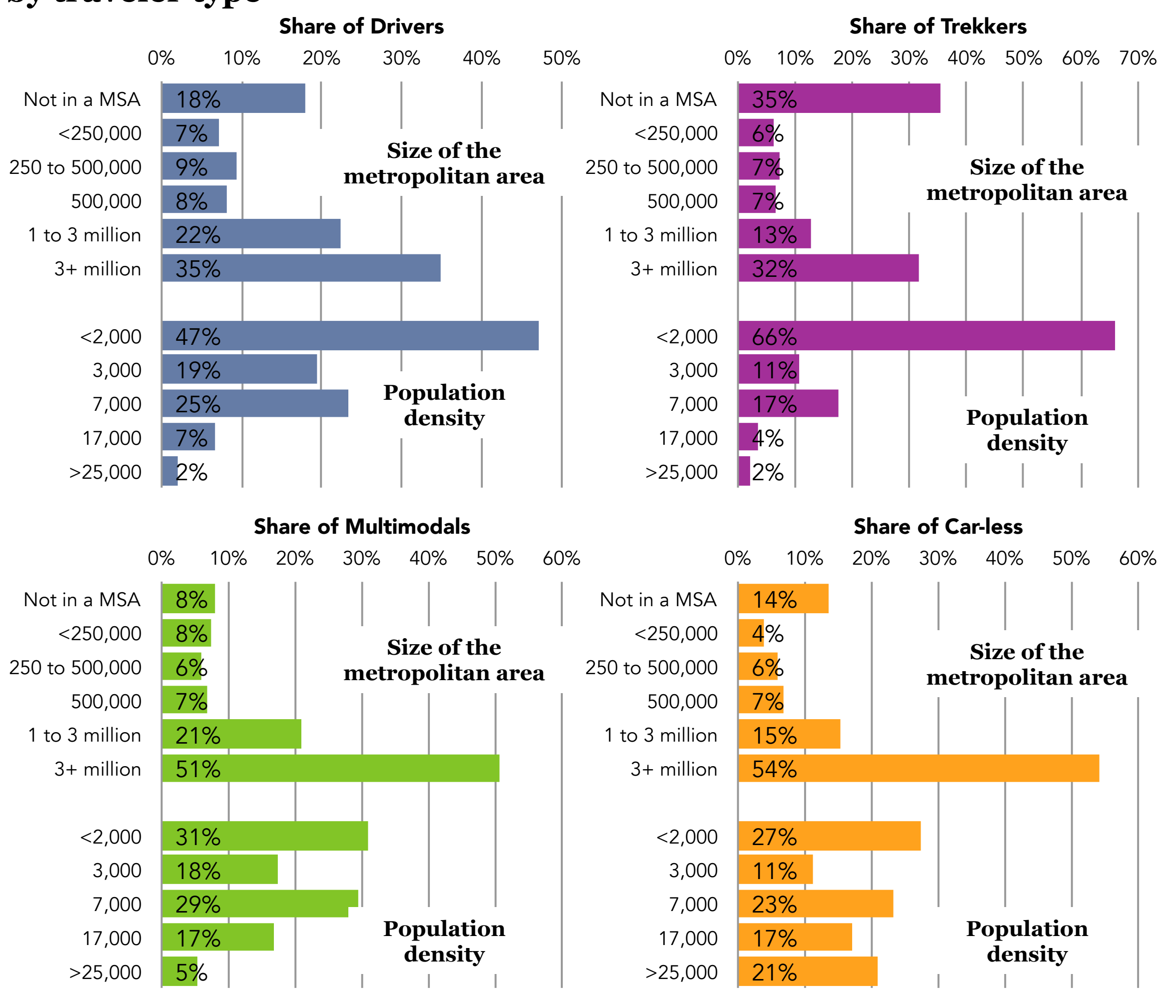
Figure 66 Residential location of young adults (Age 16 to 36) in 2009



Note: Values for size of the metropolitan area and population density each sum to 100 percent. Values are weighted to reflect the U.S. population. Source: 2009 NHTS, weighted values.

Figure 67 provides information on the residential location of young adults by their traveler type. Because most young people are Drivers, the distribution for Drivers in Figure 67 was very similar to the distribution of all young adults in Figure 66. The pattern for Trekkers differed; most Trekkers lived at very low densities either outside of metropolitan areas or in the largest metropolitan areas. Similarly, most Multimodals lived in large cities and were over-represented at moderate densities (7,000 or 17,000 people per square mile). Finally, recall that a majority of young people in the densest areas was Car-less. Yet, as Figure 66 indicates, relatively few young adults in the United States lived at such high densities in 2009. For this reason, the most common population density for a Car-less young person was a very low density.

Figure 67 Residential location of young adults (Age 16 to 36) in 2009 by traveler type



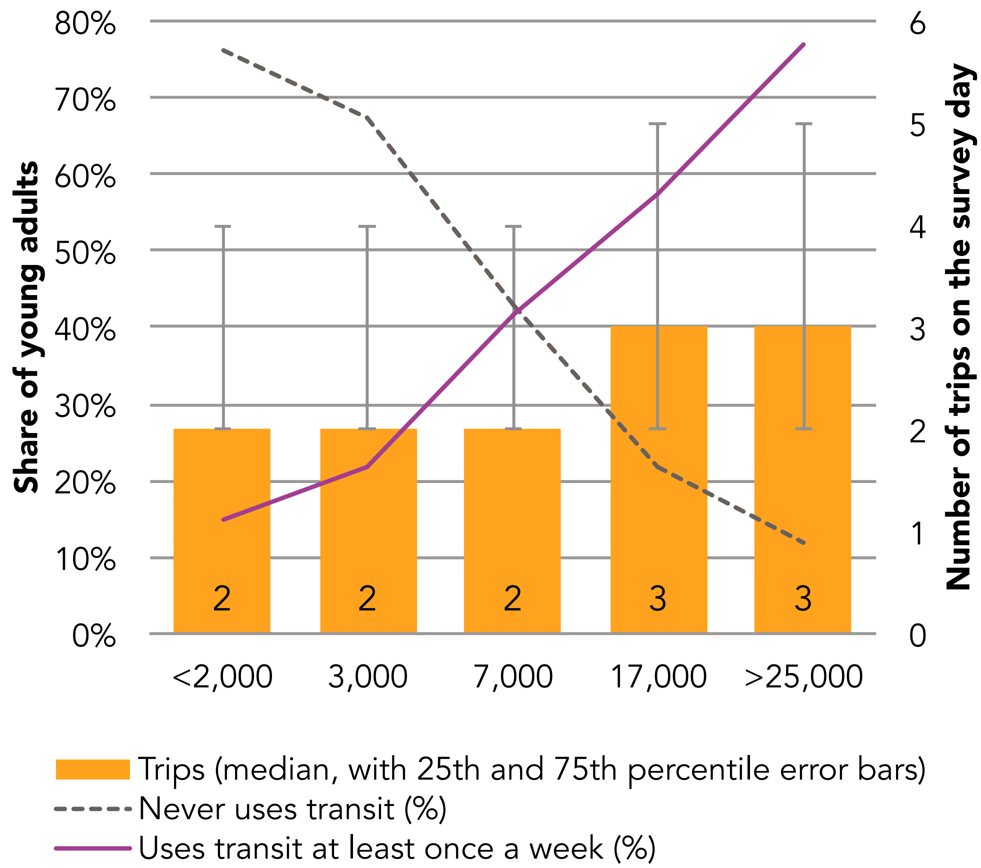
Note: Values for size of the metropolitan area and population density each sum to 100 percent. Values are weighted to reflect the U.S. population. Source: 2009 NHTS, weighted values.

Coping with Car-less-ness: variations by density

Figure 68 presents data on the trip making and transit use of Car-less young people by density in 2009. In that year, the vast majority of Car-less young people who lived at low densities never used public transit, likely because it was unavailable or unreliable in their area. Due in part to the limited availability of public transit, the typical Car-less person in those outlying locations made just two trips a day on average, which suggests that they participated in very few activities outside the home. At higher densities, by contrast, a majority of Car-less young people used public transit at least once a week. These young people made three trips per day on average, one more (50%) than their Car-less peers at lower densities, but still fewer than the typical Driver, who made four trips per day in 2009.

Clearly the experience of being Car-less varies by location. This finding exemplifies a tension in identifying groups in data. On the one hand, the groups should ideally be as homogenous as possible and this is achieved primarily by increasing the number of classes. With enough unique traveler types, for example, the Car-less group would likely split in two, one type with very low mobility and the other with relatively higher mobility (but still lower than the Drivers). The latter group would almost certainly live in high-density areas. While seeking homogeneity, the researcher also needs each group to have a large enough sample size for subsequent analysis. For this reason, I could not increase the number of classes and the Car-less young adults were all in a single traveler type.

Figure 68 Travel patterns of Car-less young adults (Age 16 to 36) by population density in 2009



Note: At densities of 7,000 people per square mile and the median young adult and the 25th percentile young adult made the same number of trips. Source: 2009 NHTS, weighted values

CHAPTER CONCLUSION

This chapter analyzed the relationship between residential location (population density, size of the metropolitan area, and Census division) and the traveler types. Of the residential location variables, population density had the strongest relationship with traveler type. Everything else equal, young people were much less likely to be Drivers (or Trekkers) and much more likely to be Car-less as density increased. Similarly, young people who live outside of metropolitan areas were more likely to be Drivers and Trekkers and less likely to be Car-less than young people in metropolitan areas.

Over time the relationship between traveler type and residential location changed somewhat. Young people residing outside of metropolitan areas or at low densities became more likely over time to be Car-less, everything else equal.

Few young people who live at low densities were Car-less (10%). Yet, because so many young adults live at low densities, many Car-less young people (27%) live at low densities, where there are few non-automobile transportation options. For this reason, many Car-less young people make very few trips indeed.

Together these facts paint a troubling picture. Many Car-less young people may prefer to move to more accessible locations, but likely find that suitable locations are in short supply. Levine (2005) estimates that housing in walkable, transit-friendly areas is woefully underprovided. What is more, the limited supply of such housing means that houses in walkable communities are more expensive—sometimes much more—than similar houses in more car-reliant areas (Cortright 2009). As a result, young people who cannot afford an automobile are now also increasingly priced out of communities that could soften the blow of being Car-less.

Finally, aside from the increased propensity to be Car-less at low densities and outside of metropolitan areas, there was no evidence that residential location contributed to the decline in driving. Rather than a back-to-the-city movement, the NHTS data indicate that a smaller share of young adults lived at high densities in 2009 than in 1995.

CHAPTER 8: RACE/ETHNICTY

INTRODUCTION

If you board a typical bus in the United States, you can expect that the majority of your fellow riders will not be white. In Los Angeles, for example, just under half of all commuters in the city are Hispanic, but fully 71 percent of those commuting by bus are Hispanic (rholeywell 2013).

Do Black and Hispanic households have distinct cultural values, preferences, or attitudes towards carpooling and public transit? Do racial/ethnic differences actually reflect disparities in employment, income, wealth, or housing? What is the relationship between race/ethnicity and travel when those factors are accounted for statistically and how should we interpret these so-called independent effects? Finally, if race/ethnicity does indeed directly influence travel behavior, how strong is the relationship and is it strengthening or weakening over time? These questions are the focus of this chapter.

Before addressing these questions I describe the increasingly diverse racial and ethnic backgrounds of young adults in the United States. Next, I highlight stark disparities that differentiate the lives of young people by their race and ethnicity. In doing so I draw on data from the national travel surveys and other sources, emphasizing factors from the conceptual model: roles, resources, and residential location. The subsequent section introduces the existing literature on racial differences in automobile ownership, driving, and transit use. The result section follows, where I describe racial differences in the traveler types and the declining independent effect of race on travel.

Throughout the chapter I analyze five racial/ethnic categories: non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, Hispanic, and Non-Hispanic other, henceforth referred to as white, Black, Asian, Hispanic, and other. As I explained in Chapter 4 (footnote 14), I follow the example of Touré (2011) and capitalize Black, but use lowercase for white. Finally, in general I do not report on the travel patterns of the other category because, as Giuliano (2003) reasoned, "non-Hispanic other is a composite of many different ethnic groups, [and] there is no reason to expect any unique behavior to categorize this group" (Giuliano 2003). I do, however, include the other category in the regression analysis for completeness.

Young adults in America: increasingly diverse

Young people today are the most racially and ethnically diverse generation in American history; more than four in ten young adults is not white (Pew Research Center 2014). Moreover, the Hispanic population is younger on average and Hispanic families tend to have slightly more children (Martin, Hamilton et al. 2013) and as a result, the trend of increasing diversity is predicted to continue. In 2012, for the first time ever, there were fewer white babies than non-white babies born in the United States (Passel, Livingston et al. 2012). By 2050, the Pew Research Center projects that whites will make up a minority of the population (Passel, Livingston et al. 2012).

As we saw in Figure 33 on p. 94, the majority of young adults in the United States were white in all three years, but over time the share of young adults who were white declined, while the share Hispanic increased steadily.

The racial composition of the sample in the national travel survey differs somewhat from U.S. Census data. The U.S. census data suggests that 57 percent of young people ages 18 to 34 were non-Hispanic white in 2009, lower than in 1990 (73%) and 2000 (63%) (U.S. Census Bureau 2015). The figures for the NHTS in 2001 and 2009 were 68 and 65 percent respectively—five to eight percentage points higher than the Census values. This suggests that the NHTS sampling and weighting procedure slightly overestimates the share of white young adults in the United States. Nevertheless, both datasets reveal the same trend toward increasing diversity.

Racial differences in travel from the literature

Until the turn of the century, many travel behavior studies did not explicitly consider race and ethnicity (Chu, Polzin et al. 2000). As a result, Giuliano (2003) argues, "our understanding of travel behavior is largely an understanding of the white majority population" (p. 351). In a context of increasing racial and ethnic diversity in the United States, failing to account for racial differences in travel is increasingly problematic (Contrino and McGuckin 2009).

When race and ethnicity are considered, they are most commonly used as a tool for descriptive comparisons or as a control variable in a statistical model, where the analytical focus is on one or more other variables (Taylor, Ralph et al. 2013, Tefft, Williams et al. 2013, Buehler and Hamre 2014). In other cases, however, race/ethnicity is a primary variable of interest (Chu, Polzin et al. 2000, Giuliano 2003), particularly in the so-called spatial mismatch literature, which explores how the suburbanization of jobs far from urban centers leaves low-income, minority people at a disadvantage in securing employment (Ellwood 1986, Ihlanfeldt and Sjoquist 1998, Gobillon, Selod et al. 2007). The following sections describe the prevailing findings of the travel behavior literature with respect to race and ethnicity. I differentiate between analyses that make simple descriptive comparisons and analyses that aim to estimate the independent effect of race/ethnicity by controlling statistically for the effect of other factors.

Descriptive comparisons by race/ethnicity

The most straightforward way to incorporate race and ethnicity intro travel behavior studies is to compare the experiences of distinct racial/ethnic groups (Chu, Polzin et al. 2000, Contrino and McGuckin 2009). For example, a number of studies identify stark differences in automobile ownership by race. Berube, Deakin et al. (2006) used Public Use Micro-data to study racial differences in automobile ownership in the United States. Less than five percent of white households in the United States did not own a car in the year 2000, but four times as many Black households and more than three times as many Hispanic households did not own a vehicle. Using different data (the 1995 Nationwide Personal Transportation Survey), Raphael and Stoll (2001) found similar racial disparities in vehicle ownership. Raphael and Stoll (2001) attribute the stark differences in automobile access to differences in household income and wealth, access to capital markets, price discrimination in automobile sales, and higher cost of insurance in communities of color.

The gap in vehicle ownership also occurred for other racial and ethnic groups. In 1970 white households were the least likely to not own a car (7%), compared to eleven percent of Asian households, 21 percent of Hispanic households, and 43 percent of

Black households (American Association of State Highway and Transportation Officials 2013).

The racial gap in vehicle ownership varies by employment status (Thakuriah, Menchu et al. 2010) and household income. For example, low-income Black household are less likely than low-income white households to own a vehicle (Berube, Deakin et al. 2006). This may reflect difference in residential location of low-income households. According to the national travel survey data, the majority of low-income white young adults lived at low densities (less than 1,500 people per square mile). By contrast, low-income Black and Hispanic youth were far less likely to live at low densities—just 30 and 25 percent respectively.

In addition to disparities in vehicle ownership, a number of studies find large racial and ethnic differences in rates of driver's licensing. For example, Tefft, Williams et al. (2013) found substantial variation in the age at which young people obtain a licensure. Whereas more than half of white young people had a license within twelve months of the minimum age of licensure, less than a quarter of Black or Hispanic young people had one. By age 18, when licensing regulations lapse, 67 percent of white young people had a license, but only 37 percent of Black young people and 29 percent of Hispanic young people did.

The *Commuting in America* 2013 report provides further evidence of distinct travel patterns by race and ethnicity. Racial-ethnic minorities[28] were less likely than white adults (over 16) to drive alone to work and were relatively more likely to commute

[28] Except American Indians.

by car-pooling, riding transit, or walking (American Association of State Highway and Transportation Officials 2013). Similarly, Giuliano (2003) finds that in 1995 white adults made the most trips and traveled the most miles on average of any of the racial/ethnic groups. Black adults made the fewest trips and traveled the fewest miles.

Evidence suggests that the racial/ethnic differences in travel are waning over time. The racial/ethnic gap in households with no vehicles narrowed considerably between 1970 and the late 2000s as Black and Hispanic families made great strides toward vehicle ownership (Thakuriah, Menchu et al. 2010, American Association of State Highway and Transportation Officials 2013). Nevertheless, the racial and ethnic gap in vehicle ownership remained large; in the late 2000s the share of car-free households was higher for Black (20%) and Hispanic (13%) households than for white households (7%) (American Association of State Highway and Transportation Officials 2013). Commuting patterns are also converging. Hispanic and Black adults (of any age) became more likely over time (2000 to 2010) to drive alone to work and used other modes less frequently (Pisarski 2006, American Association of State Highway and Transportation Officials 2013).

The independent effect of race/ethnicity on travel

These travel differences by race and ethnicity are, in the words of Raphael and Stoll (2001), "glaring" (p. 101). Yet, there are substantial variations in household resources and residential location by race and ethnicity in the United States. "The key question," Giuliano (2003) explains, is, "whether such differences exist even when other factors are taken into account" (p. 355).

When confronted with multiple potential causes, a quantitative analyst's first instinct is to use statistical models (such as logistic regression) to attempt to isolate the independent effect of race/ethnicity on travel. Most studies that control for other factors continue to find racial and ethnic differences in travel, though as Chu, Polzin et al. (2000) explains, those differences are often, "far less than one would anticipate from reviewing aggregate… differences across groups" (p. 162). For example, racial disparities in licensing rates were attenuated slightly, but remained sizeable, when controlling for differences in household income (Tefft, Williams et al. 2013). Moreover, Giuliano (2003) found that the abovementioned racial/ethnic gap in daily miles traveled was not entirely explained by differences in resources and residential location; Black and Hispanic adults still traveled fewer miles in 1995 than otherwise similar white or Asian adults (Giuliano 2003).

The aforementioned studies paint a picture of racially distinct travel patterns—specifically licensing (Chu, Polzin et al. 2000, Contrino and McGuckin 2009, Tefft, Williams et al. 2013), automobile ownership (Berube, Deakin et al. 2006), travel mode (Chu, Polzin et al. 2000, American Association of State Highway and Transportation Officials 2013), and miles traveled (Giuliano 2003)—and that these racial differences persist when controlling for other factors known to influence travel behavior. Each of these studies focused on a specific aspect of travel. How does race and ethnicity affect a more holistic measure of travel—the traveler types?

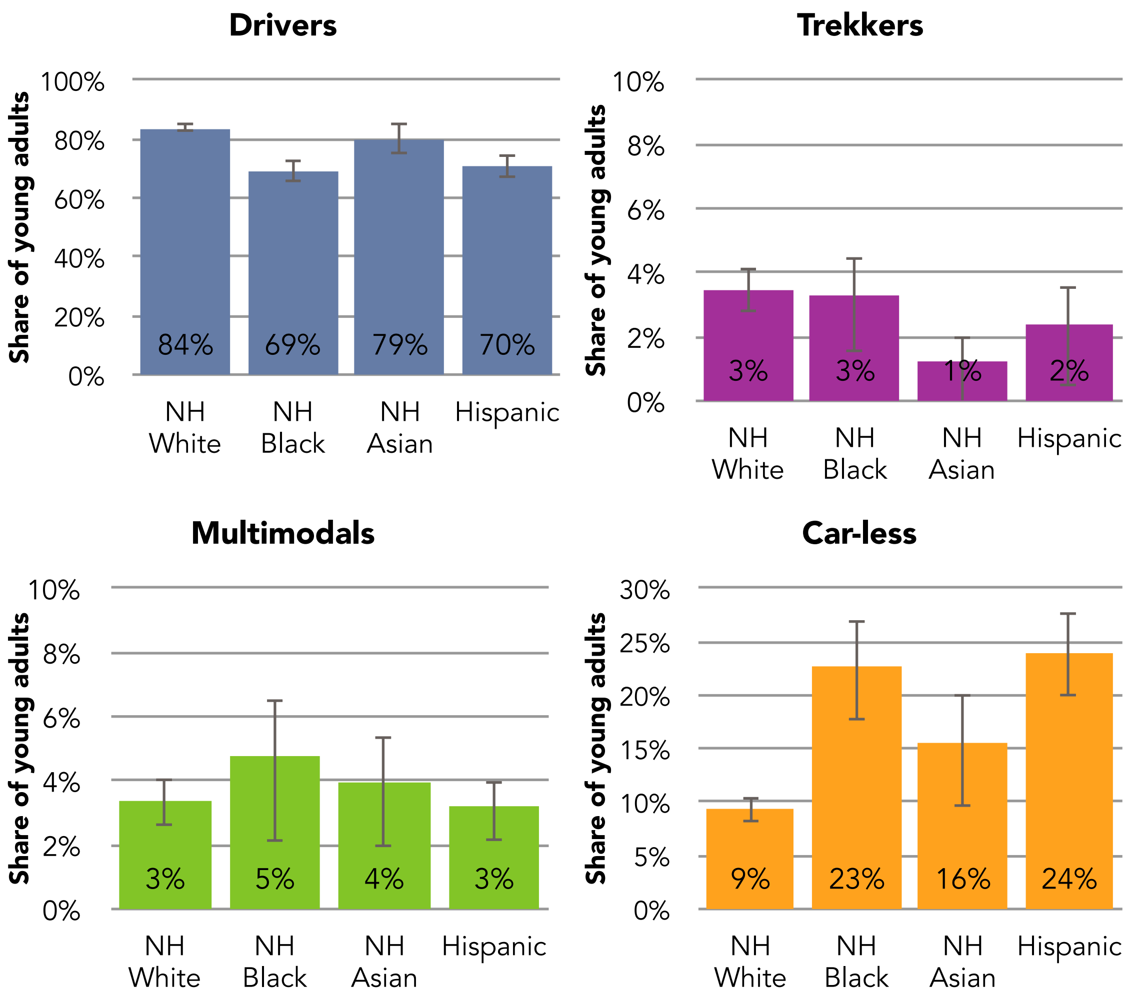
RESULTS

Descriptive analysis

Figure 69 presents the prevalence of each traveler type in 2009 by race/ethnicity. These results do not include statistical controls for any differences between the groups, but they are weighted to reflect the population of young adults in the United States. Regardless of race/ethnicity, the vast majority of young adults were Drivers and the second most prevalent group was the Car-less. Relatively few young people were Long-distance Trekkers or Multimodals, irrespective of race. Above and beyond those general trends, however, there was substantial variation by race and ethnicity.

Of the racial/ethnic groups, white young adults were the most likely to be Drivers and by far the least likely to be Car-less. Black and Hispanic young adults, by contrast, were much less likely to be Drivers and much more likely to be Car-less. Asian young adults typically landed between the two extremes. Relative to the other groups fewer Asian young adults were Trekkers, but otherwise there were few differences in the share of young adults that were Trekkers or Multimodals by race/ethnicity.

Figure 69 Prevalence of the traveler types of young adults (Age 16 to 36) by race and ethnicity in 2009

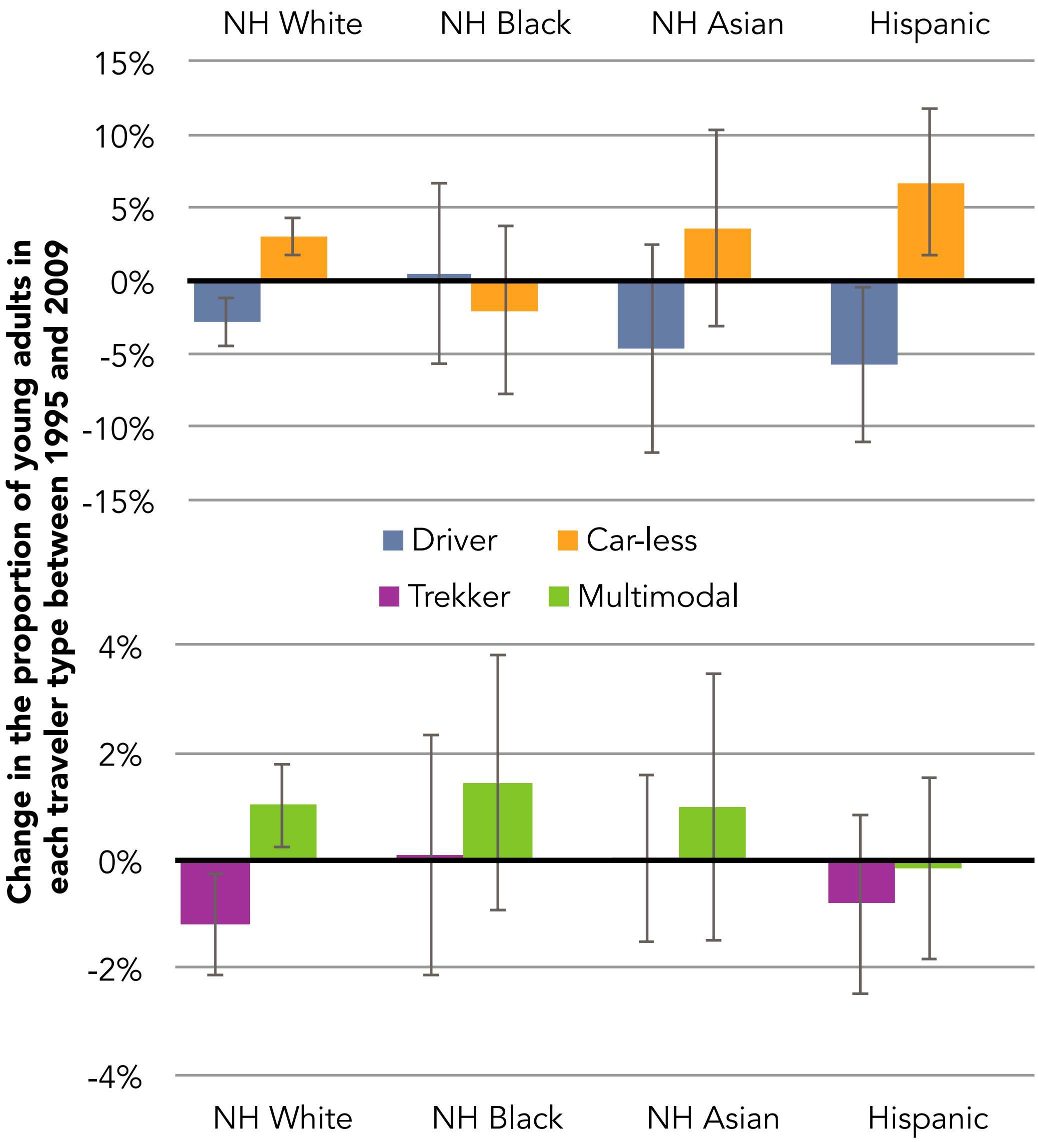


Note: Chart is based on descriptive data only. Error bars reflect the 95 percent confidence interval around the population estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Change over time

Figure 70 provides information on how the prevalence of the traveler types changed between 1995 and 2009 by race/ethnicity. In general, there were fewer Drivers and more Car-less young adults in 2009 than in 1995 and these changes tended to mirror each other. For example, while the share of Drivers among white young adults fell by three percentage points, the share Car-less increased by the same amount.

Figure 70 Change in the prevalence of the traveler types between 1995 and 2009 by race and ethnicity



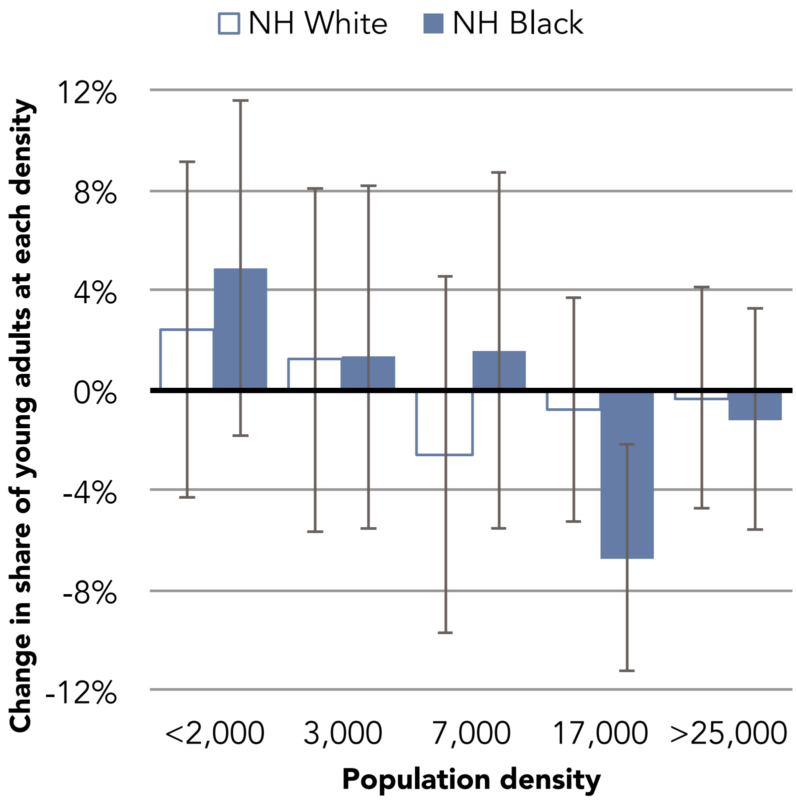
Note: The error bars depict the 95 percent confidence interval around the estimate of the difference over time. These error bars depict plausible values. When the error bars extend across the axis both positive and negative values are plausible. In other words, I cannot say with confidence whether the prevalence of that traveler type increased or decreased. Source: 1995 and 2009 NHTS, weighted values.

Drivers and Car-less

Hispanic young adults experienced the most dramatic reductions in the Drivers and increase in Car-less over time, followed by white young adults. The estimated change in Drivers and Car-less was relatively large for Asian young adults, but there was substantial uncertainty about the estimate. The error bars include both negative and positive values, so I cannot confidently state whether the share of Asian young adults that were Drivers increased or decreased.

The pattern of change over time differed for Black young adults. While the other groups became less likely to be Drivers and more likely to be Car-less, Black young adults experienced no such changes. This aligns with data on the increasing car ownership among Black households (Thakuriah, Menchu et al. 2010, American Association of State Highway and Transportation Officials 2013). Moreover, the stability of the traveler types over time for Black young adults may also be due to Black suburbanization during this period (Frey 2011). Figure 71 provides information from the NHTS about changes in the residential location of Black young adults between 1995 and 2009, with values for white young adults for comparison. While these data do not track moves between locations, they do reveal that there were relatively more Black young adults at low densities and relatively fewer at high densities in 2009 than in 1995.

Figure 71 Change in the residential location of young adults (Age 16 to 36) between 1995 and 2009 by race and etnicity



Note: Each density category reflects a range. See Chapter 4 for more details. Source: 1995 and 2009 NHTS, weighted values.

Trekkers and Multimodals

The changes over time for Trekkers and Multimodals were smaller and more uncertain due to limited sample sizes (see Table 42 on p. 296 in Appendix F). The decline in the prevalence of Trekkers appeared to be limited to white and Hispanic young adults. Meanwhile, white, Black, and Asian—but not Hispanic—young adults, became more likely over time to be Multimodal.

Independent relationship

The preceding results relied on descriptive data, but as I demonstrate in the next section, there were marked disparities in the life circumstances of young adults by race and ethnicity. Without multivariate modeling it is impossible to attribute apparent differences in travel to race and ethnicity alone.

Racial/ethnic disparities in life circumstances

The life circumstances of young adults in the United States varied rather substantially by race and ethnicity in 1995, 2001, and 2009. Perhaps most glaring are the vast differences in economic resources by race/ethnicity. What is more, differences in familial resources as a child, adolescent, and young adult are often reproduced in the next generation (McLanahan and Percheski 2008, Bradbury 2011). The following sections employ weighted data from the national travel surveys to explore racial variations in young adults' roles, resources, and residential location. Wherever possible, the NHTS data is cross-validated with other sources.

Roles

In 2009, the timing of adult roles varied substantially by race and ethnicity (see Table 15). The following sections describe each adult role in turn.

Table 15 Role attainment by race/ethnicity and age in 2009

	NH White	NH Black	NH Asian	Hispanic
Employed				
Age 16 to 19	**47%**	37%	<u>17%</u>	37%
Age 20 to 25	**75%**	<u>64%</u>	<u>64%</u>	74%
Age 26 to 36	**83%**	76%	78%	<u>72%</u>
Live independently				
Age 16 to 19	<u>12%</u>	**24%**	18%	15%
Age 20 to 25	<u>34%</u>	**42%**	40%	40%
Age 26 to 36	**86%**	<u>79%</u>	84%	85%
Married				
Age 16 to 19	*1%*	*2%*	*1%*	*1%*
Age 20 to 25	14%	<u>4%</u>	**15%**	13%
Age 26 to 36	**65%**	<u>33%</u>	**65%**	54%
Has a child				
Age 16 to 19	*0%*	*0%*	*1%*	*0%*
Age 20 to 25	3%	**7%**	<u>2%</u>	6%
Age 26 to 36	34%	33%	<u>15%</u>	**42%**

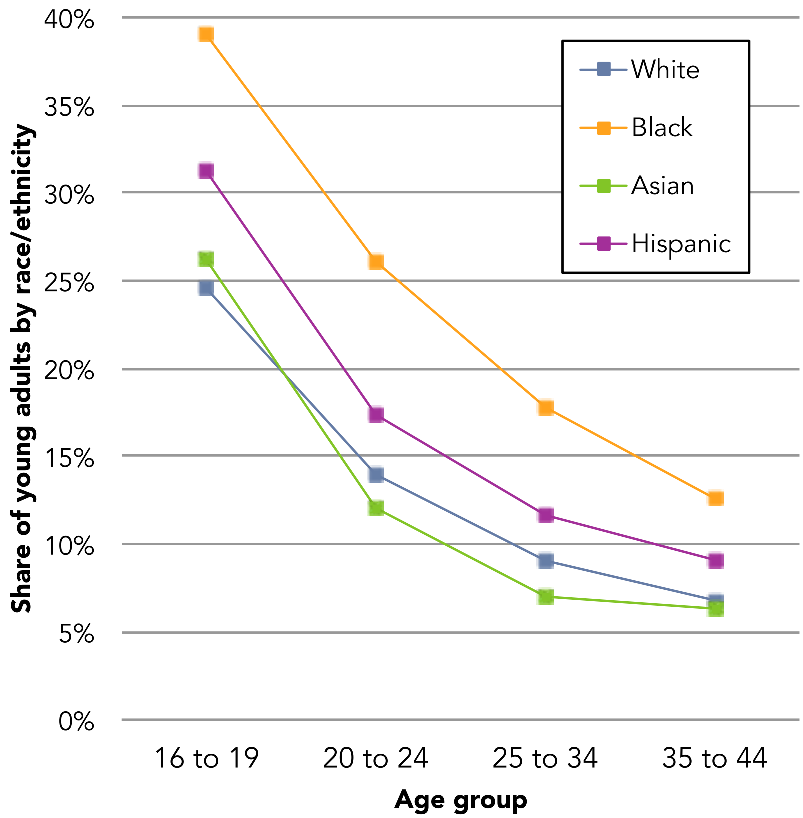
Note: The highest row percentage is in bold, and the lowest is underlined. All differences by race/ethnicity were statistically significant, except for those noted in italics. Source: 2009 NHTS, weighted values.

Employment

In 2009 white young adults of every age were more likely than young adults of other races to be employed. For Asian young adults, the employment gap was very pronounced among teenagers; Asian teens were by far the least likely to be employed. Beyond the teenage years, Asian young adults were nearly as likely as white young adults to work for pay. The employment gap for Black teenagers relative to whites was relatively smaller than it was for Asian teens and the Black-white employment gap also declined with age. By contrast, the gap in employment between whites and Hispanics held steady at roughly ten percentage points at each age.

For comparison, Figure 72 presents information from the Bureau of Labor Statistics (BLS) on the unemployment rate by race/ethnicity and age in 2010. Black young adults of all ages experience much higher unemployment than other groups. Unemployment tends to decline with age and, like the national travel survey data, the BLS data points to a smaller employment gap at higher ages.

Figure 72 Unemployment rate by race and ethnicity and age in 2010



Source: (Bureau of Labor Statistics 2012)

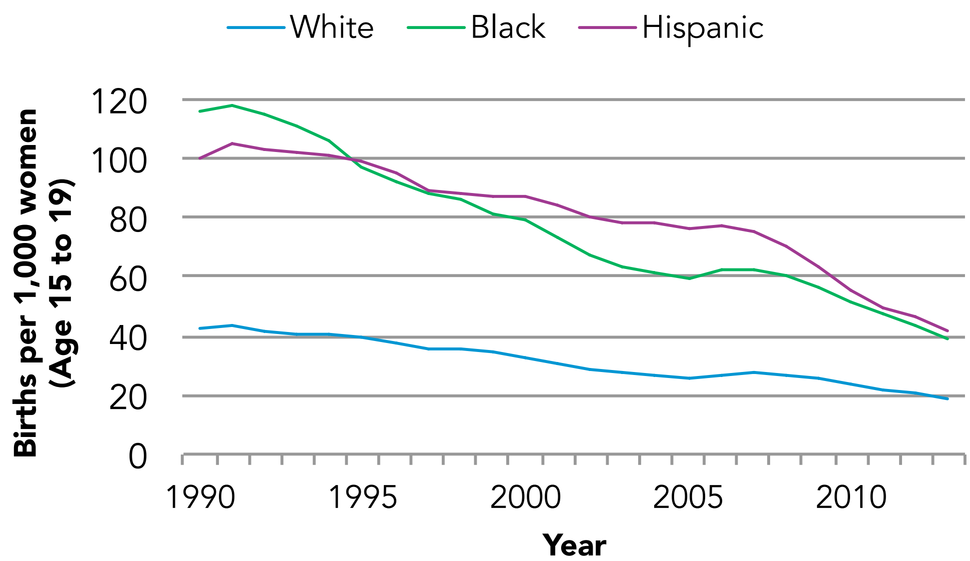
Living independently

Racial disparities in living independently were less pronounced than they were for employment. Regardless of race or ethnicity, the vast majority of teenagers lived in their parental home. Nevertheless, a small share of teens lived independently (alone, with roommates, or with extended family). In 2009 white teens were the least likely of the groups to live independently and Black teens were the most likely to do so. As they age, a larger share of young people lived independently, regardless of race. Among the oldest group (ages 26 to 36) a majority of young people lived independently; white young adults of that age were the most likely and Black young adults were the least likely to live independently. The data on living independently in the national travel surveys differs somewhat from other sources. The Pew Research Center conducted a nationally representative telephone survey in 2011 and found no racial/ethnic differences in the prevalence of young people (age 25 to 34) that moved back in with parents (Parker 2012).

Marriage and child-birth

In 2009, very few teenagers in my sample were married or had children, irrespective of race. As a result, there were no racial differences in the attainment of these roles among teenagers. This differs from other sources on teen parents, which finds Black and Hispanic women are more likely than whites to become teen mothers. Figure 73 depicts the teen birth rate (births per 1,000 women) by race and ethnicity over time. Despite declines in teen births since the 1990s, there were more teen mothers in the United States in 2009 than the national travel surveys suggest. Because teen mothers are more likely to have low incomes (Edin and Kefalas 2005), the lower than expected share of teen mothers in the sample likely leads me to underestimate the proportion of Car-less young adults in the United States.

Figure 73 Teen birth rate by race/ethnicity and year (1990 to 2013)



Note: Births per 1,000 women ages 15 to 19. Source: "Trends in Teen Pregnancy and Childbearing" (2015) U.S. Department of Health and Human Services. http://www.hhs.gov/ash/oah/adolescent-health-topics/reproductive-health/teen-pregnancy/trends.html#_ftn1

By the early twenties racial and ethnic disparities in marriage rates materialize. Relative to other young adults, fewer Black young adults were married by their early twenties and they continued to lag behind in their thirties. While 65 percent of white and Asian young adults ages 26 to 36 were married, just a third of Black young adults were. This aligns with data on the steep decline in marriage among black adults (Banks 2011, Schneider 2011). For example, among adults (18 and over), 64 percent of Hispanics and 76 percent of whites were married in 2010, while just over half of black adults were (Cohn, Passel et al. 2011).

The trends for childbearing differed from marriage somewhat. Hispanic and Black young adults in their early twenties were twice as likely to have a child as white young adults of the same age. By their late twenties and thirties white and Black young adults were equally likely to have children, but Hispanic young adults were relatively more likely to have children. Finally, relative to the other racial/ethnic groups, Asian young adults were very unlikely to have children, even among the oldest age range analyzed here.

The data from the national travel surveys on childbirth align with other sources. Data from the U.S. Department of Health and Human Services, for example, indicates that the average age of first birth for Asian women was 29.3, later than for white women (25.9 years) or Black (23.6 years) or Hispanic women (23.8 years) (Martin, Hamilton et al. 2013). The observed differences in the share of young adults with a child reflect not just the timing of having children, but also the total number of children a woman is expected to have. In 2012, the total fertility rate—the expected number of children per woman in a lifetime—was higher for Hispanic women (2.4) and Black women (2.1) than it was for white or Asian women (1.8) (Passel, Livingston et al. 2012). Racial differences in childbirth also reflect differences in educational attainment; the more educated a woman is, on average, the longer she waits to get married and have children (Passel, Livingston et al. 2012). The long delay in childbirth for Asian women, in particular, reflects their very high educational attainment, on average, which is discussed in more detail in the next section.

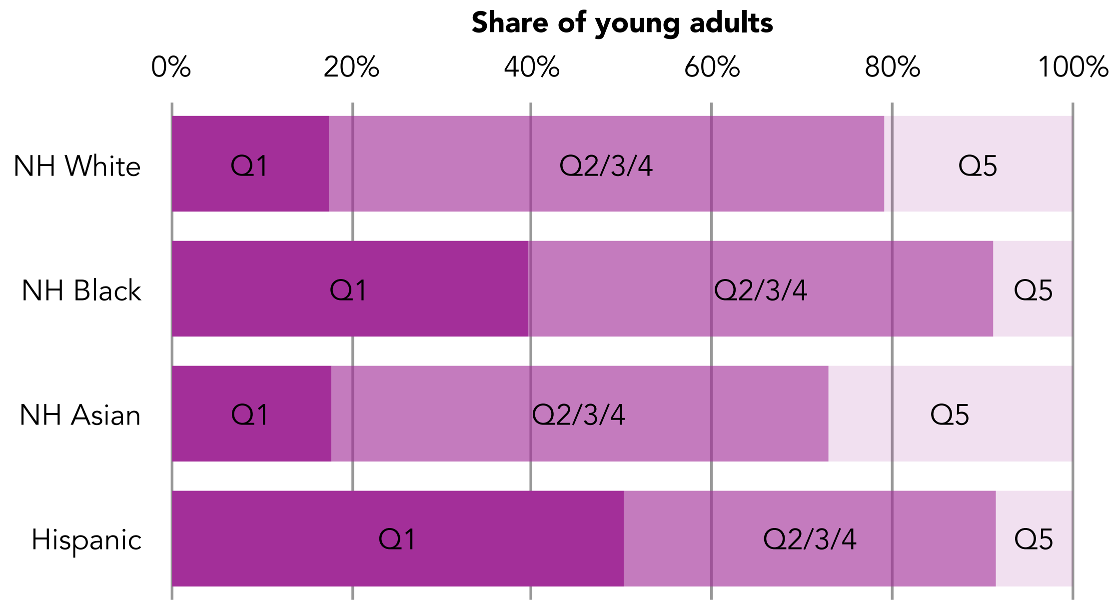
We have seen in previous chapters that taking on adult roles, particularly employment and marriage, increases young adults' propensity to be a Driver and decreases their propensity to be Car-less. Black and Hispanic young adults have taken on fewer adult roles on average than white young adults (particularly employment), which likely contributes to aggregate disparities in traveler type.

Resources

Educational attainment varied substantial by race/ethnicity in 2009. Asian young adults were much more likely than young adults of other races to engage in post-secondary education. Fully eight in ten Asian young adults (age 26 to 36) had a college degree or more in 2009. By comparison only half of white young adults had achieved a similar level of education. Meanwhile, Hispanic and Black young adults were the least likely to complete college (25 and 35 percent respectively). Moreover, nearly one quarter of Hispanic young adults (age 26 to 36) did not complete a high school degree.

These discrepancies in education contribute to substantial differences in household income and wealth (Pew Research Center 2014). Figure 74 depicts the household income quintile of young adults in the United States by race and ethnicity in 2009 according to the NHTS.

Figure 74 Household income quintile of young adults (Age 16 to 36) in 2009 by race and ethnicity



Note: Household income is adjusted for household size, by dividing household income by the square root of the number of people in the household (OECD Organisation for Economic Co-operation and Development , Kochhar and Cohn 2011). Source: 2009 NHTS, weighted values.

Since the majority of the U.S. population is white, I expected the income quintiles for white young adults to closely approximate the overall distribution of the quintiles: 20 percent in the lowest quintile, 60 percent in the middle, and another 20 percent in the highest quintile. The NHTS data align with that expectation. Black and Hispanic young adults were disproportionately more likely to live in households with limited income and disproportionately less likely to have high household incomes. By contrast, Asian young adults, with their higher than average educational attainment, were the most likely of any group to be in the highest income quintile.

Over time, an increasingly larger share of Black and Hispanic young adults was in the lowest income quintile (particularly in 2001) and an increasingly larger share of white and Asian young adults was in the highest income quintile (see Table 44 on p. 300 in Appendix F). Data from the Federal Reserve paints a picture of a steady—not increasing—income gap between 2001 and 2010, although the Federal Reserve data compare non-Hispanic white adults with non-white/Hispanic adults. Including high-earning Asian households may distort diverging earnings trends.

In the United States, household wealth is distributed even more unevenly by race than earnings. Wealth data were not collected in the travel surveys, but data from other sources depict truly staggering disparities. According to the Federal Reserve Board's analysis of the Survey of Consumer Finances, the average net worth of a non-Hispanic white household in 2010 was $130,600 (in 2010 dollars). By contrast, the average non-white/Hispanic household had just $20,400 of wealth (Bricker, Kennickell et al. 2012). According to the Federal Reserve, the wealth gap narrowed between 2001 and 2010. The Pew Research Center, by contrast, concludes that the gap in economic resources widened between 2001 and 2011. Using data from the Current Population Survey to explore the experience of households during the 2000s, the Pew Research Center characterized the average white household as an economic winner and the average Black or Hispanic household as a loser (Pew Research Center 2012). Having limited economic resources constrains a household's ability to own a vehicle and, as a result, racial disparities in economic resources likely contribute to higher rates of Car-less-ness among Black and Hispanic young adults.

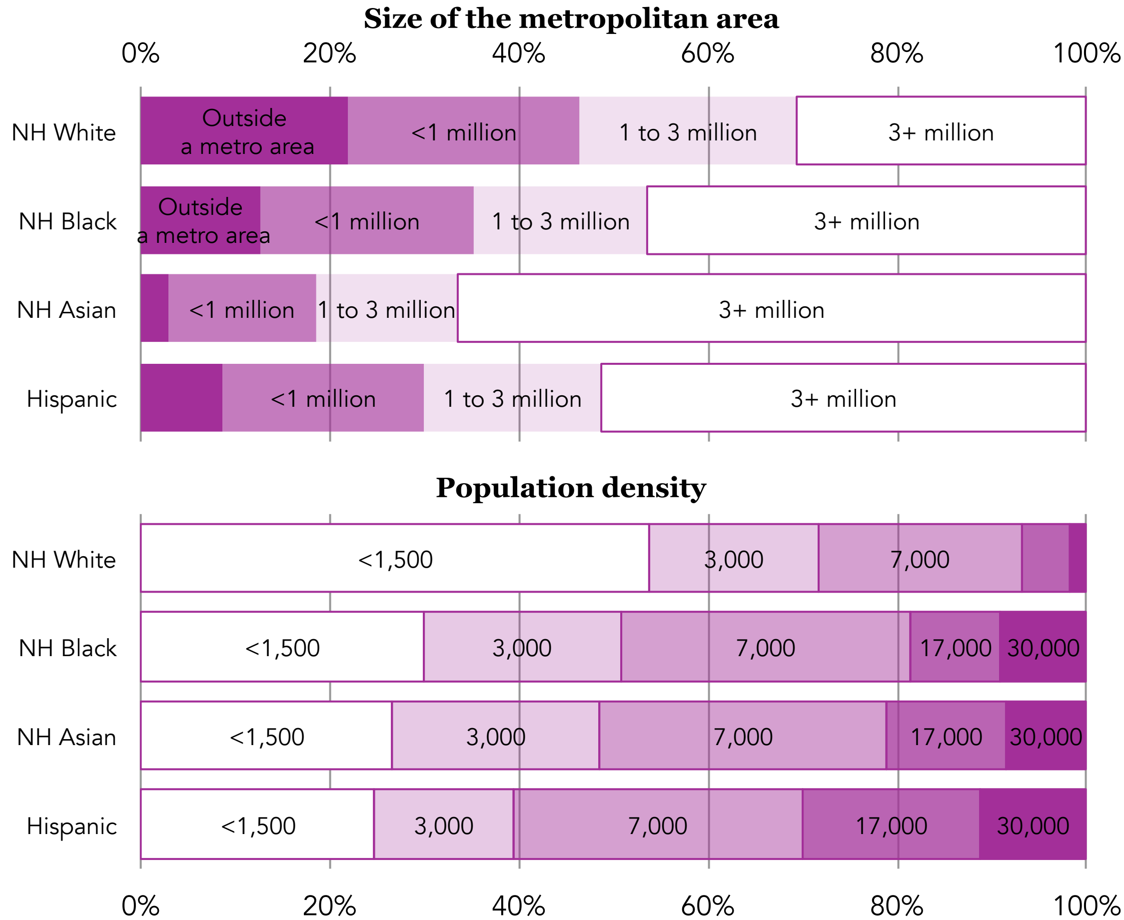
Residential location

Figure 75 presents information on the residential location of young adults by race/ethnicity in 2009. The majority of young adults lived in metropolitan areas, irrespective of race. White young adults were the most likely of any racial/ethnic group to live outside a metropolitan area and Asian young adults were the least likely to do so. Racial-ethnic minority young adults were far more likely than their white peers to live in very large cities (more than three million people). While three in ten white young adults lived in very large cities, nearly five in ten Blacks and Hispanics did and nearly seven in ten Asians did.

As Figure 75 indicates, the majority (54%) of white young adults lived at very low densities (less than 1,500 people per square mile) in 2009. Relatively fewer young adults of other racial backgrounds lived at such low densities. Racial minorities were more likely than their white peers to live at high densities, but even among racial minorities, living at very high densities was rare.

We saw in Chapter 7 the close relationship between residential location and the traveler types. Young people living outside metropolitan areas and/or at low densities were more likely to be Trekkers and because white young adults were more likely to live in those areas, I expected that a relatively larger share of white young adults were Trekkers or Drivers than young adults of other races/ethnicities. Similarly, young people were more likely to be Car-less if they lived at high densities or in the largest cities—areas where non-white young adults live. For this reason I expected more non-white young people to be Car-less than white young adults.

Figure 75 Residential location of young adults (Age 16 to 36) in 2009 by race and ethnicity

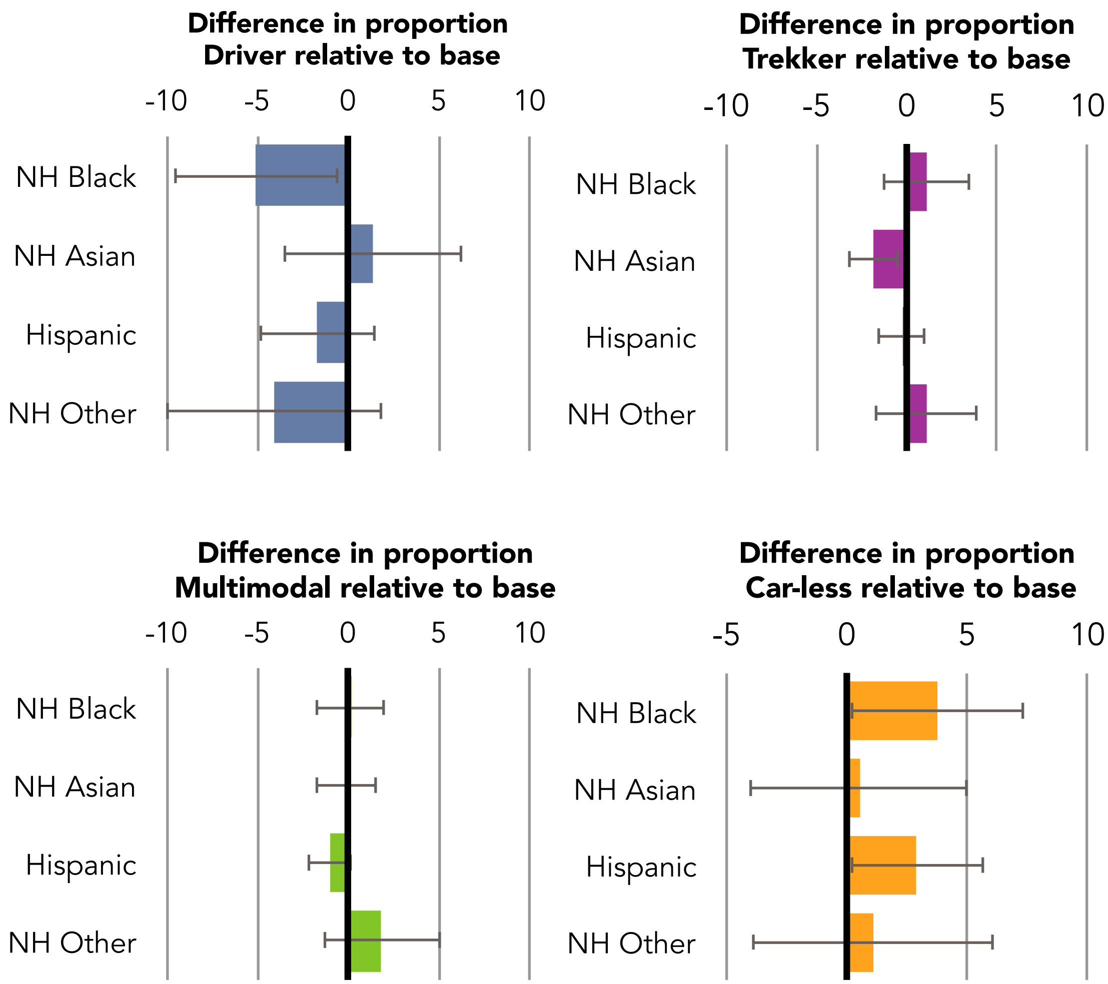


Source: 2009 NHTS, weighted values.

Model results: Independent relationship

Figure 76 presents the independent effect of being Black (or Hispanic or Asian) on the propensity to be each traveler type relative to otherwise similar white young adults. The results are based on multinomial logistic regression models with traveler type as the dependent variable. These models control statistically for differences in resources, roles, and residential location (see Chapter 4 for more details).

Figure 76 Independent relationship between traveler type and race/ethncity for young adults (Age 16 to 36) in 2009



Note: Results of a multinomial logistic regression model with traveler type as the dependent variable. Models control for resources, roles, residential location, and race (see Chapter 4). Error bars reflect the 95 percent confidence interval around the estimate of the population proportion. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

In general there was no independent relationship between race/ethnicity and traveler type for Trekkers or Multimodals in part because the sample sizes for non-white young adults of these types are rather small, limiting the precision of the estimates (see Table 42 on p. 296 of Appendix F). The lone exception is that Asian young adults were less likely than otherwise similar white young adults to be Trekkers.

The meaningful independent effects of race/ethnicity were associated with the propensity to be a Driver or Car-less. In particular, Black young adults were less likely to be Drivers and more likely to be Car-less than white young adults, even when controlling for differences in resources, roles, and residential location. Why would such differences persist? It could be that the measures of resources and residential location were not specific or comprehensive enough. The model does not, for instance, control for racial disparities in wealth. Differences in the traveler types may also reflect racial differences in the cost of owning an operating an automobile. Minority young adults may face higher prices for purchasing or insuring a vehicle, due in part to price discrimination (Ayres and Siegelman 1995, Raphael and Stoll 2001, Ong and Stoll 2007).

Independent relationship: Change over time

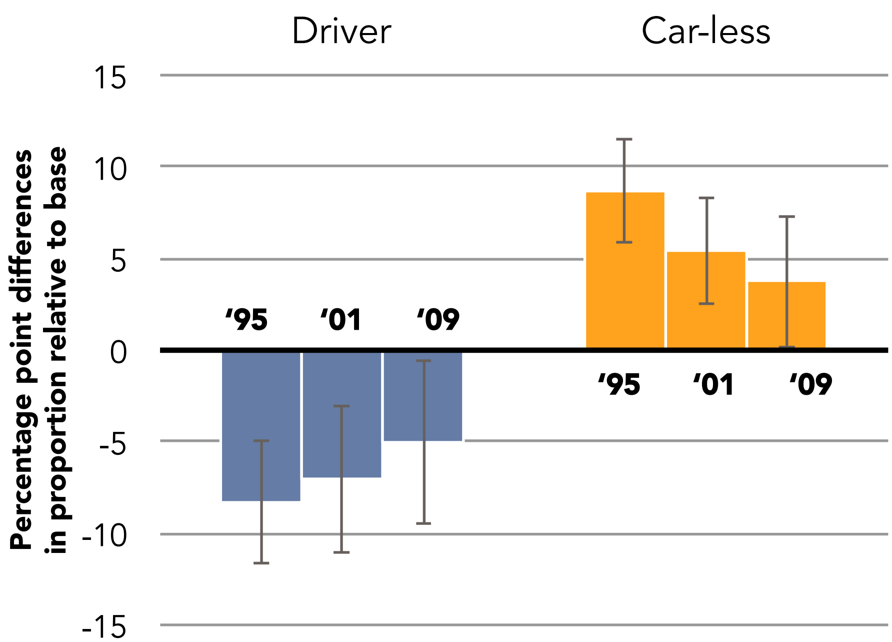
As I discussed above, many studies suggest that racial differences in travel are waning over time. Is the same true for the racial gap in the traveler types? By adding an interaction term between year and race/ethnicity, I can test whether the relationship changed over time. I find that the relationship between race and traveler types was typically consistent from year to year (see Table 46 on p. 303 in Appendix F).[29] The key finding, depicted in Figure 77, was that the Black-white gap in the propensity to be a Driver or Car-less declined steadily over time.[30] This finding aligns with other research

[29] The relationship between being Asian and being Car-less changed over time: the effect was stronger in 1995 and 2009 and not significant in 2001.

[30] Driver was the base category for the regression models, so the interaction terms for Driver could not be tested directly. Throughout the analysis the relationships for Drivers and Car-less

that finds a steady increase in driving by Black adults in the United States (Pisarski 2006). For a depiction of the other race/ethnicity variables over time, see Figure 91 on p. 304 in Appendix F.

Figure 77 The declining independent effect of being non-Hispanic Black on traveler type



Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

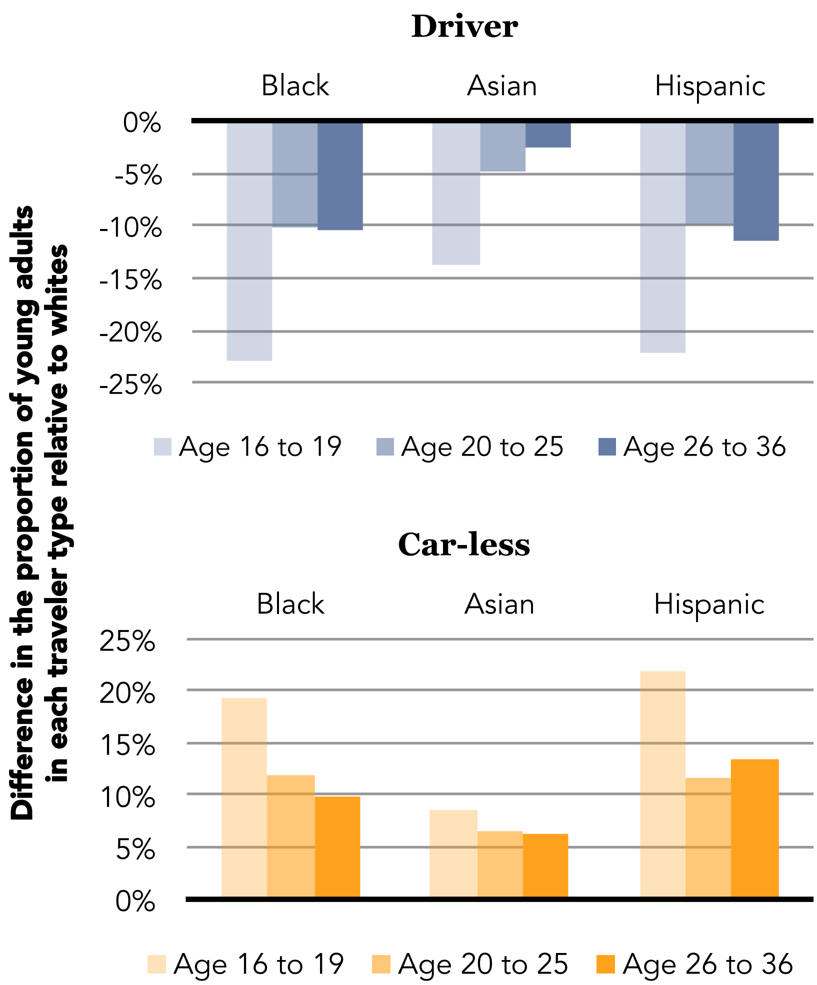
Independent relationship: Variation by age

The age range analyzed here is wide—twenty years in total. Perhaps the effect of race/ethnicity on travel varies in a meaningful way by age. Young people may travel similarly as children and teens and then their travel patterns may diverge as adults. Alternatively, children and teens may display disparate patterns than tend to converge in later years.

have been mirror images. As a result, I present the estimated proportions of Drivers and Car-less.

Figure 78 provides descriptive statistics on the share of young adults that was a Driver or Car-less in 2009 by age. At all ages non-white young adults were less likely to be Drivers and more likely to be Car-less, but the gap was widest among teenagers and smallest among young people ages 26 to 36.

Figure 78 Racial/ethnic gap in the prevalence of the traveler types by age in 2009, descriptive results



Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

To test whether these differences persisted when controlling for other factors, I estimated another multinomial logistic regression model with an interaction term between race/ethnicity and age category. The interaction terms were generally not statistically significant, indicating that there was no difference in the independent effect of race/ethnicity by age. In other words, all of the apparent racial differences by age in Figure 78 are actually due to racial differences in resources, roles, and residential location that vary by age. In particular, as I described above, the racial gap in (un)employment declined steadily with age.

How much did increasing diversity contribute to the decline in driving?

In the 2000s young people were more racially and ethnically diverse than young adults were in 1995 and, because being Hispanic or Black is associated with a decreased propensity to be a Driver or a Trekker and an increased propensity to be a Multimodal or Car-less, the racial/ethnic compositional changes contributed to the aggregate decline in Drivers and Trekkers and the increase in Multimodals and Car-less. Table 16 depicts the estimated share of young people in each traveler type that would have existed if young adults had the same racial/ethnic makeup in 2009 as they had in 1995. For comparison, the table includes the actual prevalence for each type in 1995 and 2009. With one exception, the estimated value lies between the extremes of the actual 1995 and 2009 values. The final column displays how much racial/ethnic compositional changes contributed to the overall change in the prevalence of each traveler type. Racial/ethnic changes contributed the most—roughly one fifth of the total—to changes in the prevalence of Drivers and Car-less and did not contribute to the increase in Multimodals. Notably, however, the compositional changes do not explain all (or even a majority of) the change in traveler types.

Table 16 Prevalence of the traveler types if young people had the same racial/ethnic composition in 2009 as they had in 1995

	(1) Actual 1995 value	(2) Predicted value	(3) Actual 2009 value	(4) Share of gap explained
Driver	83%	80%	79%	19%
Long-distance Trekker	4%	3%	3%	9%
Multimodal	3%	4%	4%	-1%
Car-less	10%	13%	14%	21%
Total/Average	100%	100%	100%	12%

Note: Predicted values are based on the share of young adults in each racial/ethnic group in 1995 and the probability of being a Driver (and each subsequent role) given one's race/ethnicity in 2009. The share of the gap explained is: [1-(Column 1-Column 2)/(Column 1-Column 3)]*100.

CHAPTER CONCLUSION

There are well known racial and ethnic differences in aggregate travel patterns and researchers study these disparities to help ameliorate racial inequality and to make travel forecasts more accurate. This work expanded on previous studies of racial and ethnic differences in travel by using a multifaceted measure of travel and by explicitly analyzing how racial/ethnic differences varied over time and by age. I find that observed racial differences in travel between white and Hispanic or Asian young adults reflect differences in resources, roles, and residential location. For Black young adults, by contrast, a race effect persists even when controlling for other factors. Like other studies (Thakuriah, Menchu et al. 2010), I find that this Black-white gap declined over time.

This work also analyzed racial differences in travel patterns by age. I find that teenagers experienced the starkest differences in travel type by race in 2009 and that those differences declined with age. Despite these aggregate trends, however, there was no difference in the independent relationship between race/ethnicity and traveler type by age when controlling for other factors.

Together these results indicate that the staggering racial/ethnic disparities in travel behavior actually reflect perhaps equally staggering disparities in resources, roles, and residential location by race/ethnicity. All of these factors are highly correlated with race and ethnicity, which makes interpreting the results more difficult, particularly for policymakers (Carter 2009). On the one hand, the diminishing independent effect of being Black and the lack of an independent effect for being Hispanic or Asian suggests that policymakers interested in reducing racial gaps in travel should simply focus on reducing inequality more generally.

On the other hand, controlling for residential location may lead scholars to understate racial/ethnic disparities in travel. Black and Hispanic households may strategically locate in denser areas than white households because their economic situation may be more precarious or because they may face housing discrimination. If their residential location decisions are constrained and those residential locations shape travel then the actual effect of race may be stronger than originally thought.

Finally, this analysis suggests that the increasing racial and ethnic diversity of young people in the United States contributed to the decline in vehicle travel; roughly twenty percent of the change in the share of Drivers and Car-less was explained by compositional shifts in the population.

PART III

CHAPTER 9: SYNTHEIS, CONCLUSION, AND POLICY RECOMMENDATIONS

A RECAP

In this dissertation I have tried to systematically excavate the many circumstances behind the aggregate decline in automobility among teens and young adults. To do this, I used latent profile analysis to identify four distinct traveler types: Drivers, Long-distance Trekkers, Multimodals, and Car-less (Part I). Each of these travel types tells a very different story about the lives and travels of members of the Millennial Generation. The focus of Part II was to use those traveler types to explore a number of hypotheses about the decline in driving. This chapter synthesizes the preceding chapters and contextualizes the findings within the transportation disadvantage literature.

Part I

The aim of Part I was to answer three research questions:

1) Can young adults in the United States be categorized by their travel patterns?
2) If so, how do members of each type travel?
3) How prevalent is each type?

Latent class analysis was used to identify four distinct traveler types based on seven indicator variables that together described travel on the survey day and over an extended period. These indicator variables were selected in an effort to capture the multifaceted nature of travel and included travel mode, number of trips, miles of travel, automobile access, and licensing. Based on this work, I identified four distinct traveler types: Drivers, Long-distance Trekkers, Multimodals, and Car-less.

The majority of young adults in the sample were Drivers and they made nearly all of their trips by automobile. They traveled a moderate amount each day—24 miles over the course of four trips. The typical Driver drove an average of 9,000 miles a year and 84 percent never used public transit.

Long-distance Trekkers were the most similar to Drivers, but they traveled much further over the course of a day (50 miles) and the year (50,000 miles). The typical Trekker completed the same number of trips as a Driver, indicating that their extra mobility did not translate into more activities. Just three percent of young adults were Long-distance Trekkers.

Unlike the Drivers and Trekkers, Multimodals traveled half of their miles by non-automobile modes. This is in part because the Multimodals were less likely than the Drivers or Trekkers to be licensed to drive and they had more limited automobile access. Despite traveling just 12 miles on the survey day, Multimodals made more trips on average than Drivers or Trekkers (5 versus 4), indicating that they participated in more activities outside the home. Nationwide just four percent of young adults were Multimodal. Even in locations that are potentially well suited to meet their needs (high densities and in large cities), there are few Multimodals. The highest share of Multimodals occurred at moderately high densities (17,000 people per square mile) and yet, even there, just seven percent of young adults were Multimodal.

Finally, Car-less young adults were the least likely to be licensed to drive and had the most limited access to an automobile in their homes. Moreover, fully half of the Car-less young people never use public transit, often because it was simply not available where they live. For these reasons, Car-less young people made very few trips—just two a day, indicating very limited activity participation outside the home. While travel within this type varied somewhat by residential location, even in the densest areas Car-less young people made fewer trips—and thus participated in fewer activities outside the home—than Drivers. The Car-less traveler type was the second most prevalent of all of the types, 14 percent, behind only Drivers.

Part II

The aim of Part II was to use the traveler types to explore how and why travel patterns changed for young adults. Specifically, I wanted to know whether the decline in driving reflected:

- A fundamental shift in attitudes and preferences? (Ch. 5: Resources)
- Financial constraints? (Ch. 5: Resources)
- The delayed onset of adult roles? (Ch. 6: Roles)
- A back-to-the-city movement? (Ch. 7: Residential location)
- Increased availability and relative utility of alternative modes in metropolitan areas? (Ch. 7: Residential location)
- Increased racial and ethnic diversity of young Americans? (Ch. 8: Race/ethnicity)

I used four analytical approaches to test these competing hypotheses. First, I compared changes in the prevalence of each traveler type for distinct subgroups between 1995 and 2009. A synthesis of the results is available in Appendix G on pp. 305 through 308.

Second, I estimated several multinomial logistic regression models with traveler type as the dependent variable and four types of explanatory variables: Resources, Roles, Residential location, and Race/ethnicity. A synthesis of those results was presented in Chapter 4 on pp. 100 through 104.

Third, I added an interaction term to each model to assess whether the independent relationship between each explanatory variable and travel changed significantly over time.

Finally, I calculated the predicted prevalence of each traveler type under two hypothetical scenarios: if young people had attained the same roles in 2009 as they had in 1995 and 2) if young people had the same racial composition in 2009 as in 1995.

Together, these analytical components shed light on each of the hypotheses outlined above. I address each in turn below.

Preferences or constraints?

In Chapter 5 I compared the changes in the prevalence of the traveler types between 1995 and 2009 by young peoples' economic resources. If we assume that young people with more resources (those who are employed, highly educated, and have relatively high-incomes) are better able than young people with few resources to act on their preferences, this analysis provides indirect evidence on the relative contribution of preferences and constraints to travel patterns and behavior. Preferences are likely at work if the decline in driving was concentrated among high-income people. Economic constraints likely predominate if the decline in driving was concentrated among young people with few resources.

While there were fewer Drivers in 2009 than in 1995 almost regardless of life circumstance, the decline in the prevalence of Drivers was much more pronounced for young people with limited resources (unemployed, low incomes, and/or limited educational attainment) than for young people with more resources (see Figure 41 on p. 126). In fact, the decline in the share of Drivers was not statistically significant (or meaningful in size) for young people with a moderate or high household income or for young people with at least some college education. The figure also indicates that the increase in Car-less-ness over time was primarily restricted to young adults with few resources. Together this suggests that economic constraints were more central than preferences in driving the decline in Drivers and the increase in Car-less-ness.

By contrast, the increase in Multimodals and decline in Trekkers was primarily concentrated among high-income young adults (see Figure 42 on p. 127). This finding provides indirect evidence that preferences were more important than economic constraints for the change in the prevalence of these traveler types.

This indirect test of preferences or constraints stops short of analyzing opinions and attitudes. It is, however, bolstered by another, indirect test in the United Kingdom. Chen, Le Vine et al. (2014) analyzed the diverging travel trends over time of pre-driving age young people (age 11 to 16) and young people who are legally allowed to drive (age 17 to 29). While the older group reduced their driving, the younger group actually used automobiles (as passengers) more often than in the past. The authors interpret this as evidence that economic constraints, not preferences, were the primary cause of the decline. If preferences were the primary cause, they reason, the younger group would have also increased their use of non-automobile modes. After all, it is unlikely that preferences for non-automobile travel were dormant in the younger group, but developed once young people reach driving age. Instead, the decline in driving among the older group likely reflects economic constraints that young adults face, but teens (who can rely on the financial support of their parents) do not.

Delayed onset of adult roles?

Chapter 6 explored the close connection between adult roles—living independently, marriage, and having a child—and travel. Each role is associated with responsibilities, like maintaining a household or chauffeuring children, which require travel. As Chapter 6 demonstrated, when young people take on adult roles, they tend to move away from so-called alternative modes of travel and increase their use of automobiles.

Young adults took on fewer adult roles in 2009 than in 1995 (see Figure 48 on p. 145), likely in response to economic constraints (Settersten, Furstenberg et al. 2006). This delay in roles contributed to the decline in Drivers and Trekkers and the increase in Multimodals and Car-less; role deferment explained ten to 30 percent of the aggregate change over time (see Table 14 on p. 165).

A back-to-the-city movement?

Chapter 7 demonstrated the close relationship between traveler type and residential location. In general, Long-distance Trekkers and Drivers were relatively more common outside of metropolitan areas and at lower densities, while Car-less young people were more common at higher densities. Residential location could have contributed to the aggregate decline in driving if more young adults lived in dense areas over time.

According to the NHTS data, this did not appear to be the case. In fact, relatively more young adults lived at low densities in 2009 than in 1995 and relatively fewer lived at high densities. This suggests that a back-to-the-city movement does not explain the aggregate decline in driving.

Increased availability and relative utility of non-automobile modes?

Residential location could contribute to the aggregate decline in driving if areas provided more alternative travel options over time. During the survey period many metropolitan areas added rail transit, adopted Complete Streets programs, and increased bicycle infrastructure. Even though young people did not move to higher density areas, travel by non-automobile modes may have become easier and more useful at any given density as a result of those improvements. If that were the case we would expect to see more Multimodals and Car-less over time within each density and particularly in moderate to high-density areas where the improvements were concentrated. However, this hypothesis was not supported by the data. In fact, the opposite was true; proportionally more people became Car-less over time outside of metropolitan areas and at low densities. Even if low-density areas provided improved infrastructure for alternative modes of travel, given the spatially dispersed origins and destinations in outlying suburbs, small towns, and rural areas, other modes like bicycles and public transit struggle to compete with the accessibility provided by the automobile. This suggests that the increase in Car-less-ness in those areas is yet another indication that economic constraints were the primary decline in driving.

Increased racial and ethnic diversity?

Finally, Chapter 8 explored the stark racial and ethnic differences in traveler type. For instance, while just nine percent of white young adults were Car-less in 2009, a quarter of Black or Hispanic young adults were Car-less. The Black-white gap in traveler types persisted when controlling for other factors, but it declined in size over time. Moreover, Black young adults were the only group that experienced a slight (albeit statistically insignificant) *increase* in the share of Drivers between 1995 and 2009. In contrast to Blacks, there were no statistically significant differences in the propensity to be a Driver (or Car-less) for Hispanic or Asian young adults when controlling for differences in resources, roles, and residential location.

Young adults were more racially and ethnically diverse in 2009 than in 1995 and, given the differences in traveler types described above, this compositional change in the population contributed to the aggregate decline in driving. Specifically, I found that changes in the racial composition of the population accounted for roughly 20 percent of the total decline in Drivers and increase in Car-less young adults. If racial differences continue to wane as they have for Black young adults, then the increasing diversity of young adults may not drive continued declines in the share of Drivers. If, however, racial gaps in traveler type persist or racial differences in resources, roles, and residential location endure or grow, the increasing diversity of young adults may lead to further declines in driving.

TRANSPORTATION DISADVANTAGE

> *"Nothing illustrates what has happened more vividly than the plight of today's twenty-year-olds. Instead of starting a new life, fresh with enthusiasm and hope, many of them confront a world of anxiety and fear. Burdened with student loans that they know they will struggle to repay and that would not be reduced even if they were bankrupt, they search for good jobs in a dismal market. If they are lucky enough to get a job, the wages will be a disappointment, often so low that they will have to keep living with their parents." (p. 265)*
>
> -Stiglitz (2012)

Joseph Stiglitz vividly describes the dismal economic conditions of the 2000s. This dissertation demonstrates that young people responded to these conditions—stagnating wages, widespread unemployment, and widening inequality—by driving less. These changes are best understood in the context of transportation disadvantage.

Transportation disadvantage is multi-faceted concept that encompasses the many ways in which someone may have limited access to safe, reliable, and convenient transportation (Kamruzzaman and Hine 2011, Delbosc and Currie 2012, Lucas 2012). For example, a person may suffer from transportation disadvantage if he must rely on other people for rides or if transit is inaccessible or of poor quality near his home.

Transportation disadvantage relates to well-being through social exclusion. Mobility-related social exclusion is,

> *"The process by which people are prevented from participating in the economic, political and social life of the community because of reduced*

accessibility to opportunities, services and social networks, due in whole or part to insufficient mobility in a society and environment built around the assumption of high mobility." (p. 210)

- Kenyon, Lyons et al. (2002)

These twin concepts—transportation disadvantage and social exclusion—inform planning policy in the United Kingdom (Social Exclusion Unit 2003, Lucas 2012). The central aim is to better understand social exclusion in an effort to promote social *inclusion* through transportation (Social Exclusion Unit 2003) and other means (Kenyon, Lyons et al. 2002). A host of studies have supported this effort by developing various ways of measuring disadvantage (Johnson, Currie et al. 2008, Kamruzzaman and Hine 2011), as well as exploring how disadvantage varies by location (Nutley 1996) and personal characteristics (Bostock 2001, Delbosc and Currie 2012). This idea has received far less attention in the U.S. and, where it has been addressed, the terms used are different.[31]

How can this framework of transportation disadvantage and social exclusion inform our understanding of the traveler types? As I described in Chapter 7 the majority of Car-less young people live *outside* of the densest regions, in areas with limited alternatives to the automobile (see Figure 67 on p. 188). The typical Car-less young person made just two trips on the survey day, suggesting that they participated in a single activity outside the home (one trip there and one trip home). This is a

[31] In the United States these issues are often discussed in conjunction with environmental justice.

staggeringly low level of mobility and accessibility, and marks these young people as at a high risk of social exclusion.

Transportation disadvantage over the life course

The concept of transportation disadvantage gains more importance in the context of a life-course perspective. The central aim of life-course research is to understand how experiences interact to shape outcomes over time (Elder, Johnson et al. 2003, Mortimer and Shanahan 2003). Moreover, inequalities in one generation tend to be transmitted to the next through systematic differences in expectations of upward mobility, earnings, time availability, and other factors (McLanahan 2004, McLanahan and Percheski 2008). I argue that transportation disadvantage may be another way that inequities are passed on from one generation to the next. To see how mobility-related social exclusion, particularly during the pivotal period of adolescence and young adulthood, could derail the life chances of young people, compare the experience of two hypothetical young men: Daniel and Craig.

Daniel's story

During his childhood and early teenage years Daniel's parents drove him to afterschool activities like piano lessons and soccer practice. When he was legally old enough to do so, Daniel got a learner's permit and practiced driving with his mom in her car. By 17 he had enough practice hours to earn an intermediate license and he began to establish his independence by driving himself to soccer and other activities. He used the family car on weekends to get a job at a local restaurant and soon he saved enough to purchase a used car. When he enrolled in college, Daniel took his car with him. He lived on campus and walked to class each day, but he used the car to drive to an internship once a week fifteen miles away. Daniel's internship led to a full-time job and he now commutes by car to work each day. Daniel and his wife plan to have children someday, and when they do they plan to buy a second car.

Craig's story

Craig, by contrast, grew up in a home without an automobile. His mom worked as a secretary when he was a child, but because of the unreliable local bus service, she was fired for being late to work too often. She took a new, lower paid job within walking distance at a nearby grocery store. Craig's mom couldn't drive him to practice afterschool so instead of playing on the basketball team, Craig and his friends tended to watch TV or hang around the neighborhood after school. Craig did not get a learner's permit because he did not see the point; there was not even car to practice with. When Craig graduated from high school he enrolled part-time in the local community college, a thirty-minute bus ride away. Like many community college students, he eventually dropped out because his full-time job and the bus trip took up too much of his time. Craig now works in the food service industry making just over minimum wage. He has a car, but he is finding it more and more difficult to scrounge up the money for gas. He and his girlfriend are expecting their first child soon.

Making sense of the stories

These storylines weave together evidence from the literature to illustrate how transportation disadvantage contributes to the diverging destinies of young people.

Young people who do not participate in afterschool activities report that transportation barriers (particularly not having a ride home) were the number one reason they did not participate (Dynarski, Moore et al. 2003). Children in no-car households are even less likely to have reliable access to afterschool programs (Ralph 2014). Parents without cars report that they cannot chauffeur their children to afterschool activities (Bostock 2001). At afterschool activities young people have adult supervision and build relationships with like-minded peers, both of which support healthy development (Eccles, Barber et al. 2003, Zaff, Moore et al. 2003). Students who cannot participate in afterschool activities (for any reason) tend to like school less, earn lower grades, and are less likely to graduate than students who do participate, even when controlling for other factors linked to school performance like previous test scores or socio-economic status (Eccles, Barber et al. 2003, Zaff, Moore et al. 2003).

Limited automobile access in the household limits or delays licensing and increases crash risks later in life. In surveys of young people without a permit or a license, the most commonly stated reason for the delay was not having access to a car (Tefft, Williams et al. 2013). Many states now require a minimum number of hours of driving practice, which is prohibitively difficult to do in a household with no vehicles. Young people who get a license later in life face elevated risks of an automobile crash because they did not benefit from the phased-in protections of graduated driver's licensing regulations (Williams and Mayhew 2008, McCartt, Teoh et al. 2010).

The effects of transportation disadvantage continue in the early twenties. Young people who were unable to participate in afterschool activities as a high school student due to transportation constraints (or other reasons) are less likely than otherwise similar young people to go on to college (Eccles, Barber et al. 2003). Many will enroll in community college, but only one in five community college students graduate (Knapp, Kelly-Reid et al. 2012). In addition, students without cars may face transportation constraints that lead them to forgo educational opportunities. For example, a small share of young people in the United Kingdom report missing out on opportunities (like internships) because of limited transportation (Social Exclusion Unit 2003).

Young people without access to a car may also face difficulties finding and securing employment (Raphael and Stoll 2001, Ong 2002, Raphael and Rice 2002). In the United Kingdom, a quarter of young people (ages 16 to 24) identified a suitable job, but did not apply for it because they could not reliably access the job site because of transportation constraints (Social Exclusion Unit 2003). Even in areas with abundant transit service, people can access vastly more job opportunities with a vehicle than without one (Shen 2001, Grengs 2010). The relationship between employment and automobile ownership is fraught with endogeneity. Which came first, the job or the car? Nevertheless, in a host of careful studies designed to account for endogeneity, people with a car were more likely to be employed and earned higher wages than people without a car (Raphael and Stoll 2001, Ong 2002, Raphael and Rice 2002, Pendall, Hayes et al. 2014).

Without a car young people may also find it more difficult to access health services (Wachs and Kumagai 1973, Social Exclusion Unit 2003). This hurts health outcomes and may make family planning more difficult, potentially leading to more unplanned pregnancies among young people without vehicles.

Finally, with lower expected earnings due to their limited educational attainment, it is far less likely that Craig and other Car-less young adults will age into stable car ownership. Then the cycle continues.

The burden of Car-less-ness varies by location

Car-less young people experience widely varying levels of access depending on their residential location. As Chapter 6 described, 76 percent of Car-less young people who live at low densities never used public transit (often because it was unavailable). At the highest densities, by contrast, 77 percent of young people used public transit at least once a week. These disparities in transit utilization partially explain why Car-less young people at high densities make more trips—and are presumably better off—than Car-less young people at low densities.

The link between accessibility and residential location for people without automobiles is not new. Lovejoy (2012), for instance, compared trip making in households with at least one motor vehicle per household adult with households with no vehicles. Lovejoy used the gap in trip making between otherwise similar households as an indicator of a mobility deficit. The mobility deficit was largest at low densities and smallest at high densities. In other words, members of no-car households at low densities made far fewer trips than similar households with automobiles. At high densities, by contrast, no-car households were able to meet many of their accessibility needs without a car and the households tended to make a similar number of trips with or without a vehicle.

Delbosc and Currie (2012) drew similar conclusions in their analysis of voluntary and involuntary low-car households in Australia. Households that were voluntarily low-car tended to reside in areas that were well-suited to their lifestyle. There were many alternative travel options available and, as result, they were able to participate widely in activities. By contrast, households that were involuntarily low-car tended to live in areas with few travel alternatives and, as a result, they made fewer trips, had more limited access to services and social networks, and were worse off than voluntary low-car households.

Together these findings suggest that Car-less young people are substantially better off, at least in terms of travel and access, when they live in densely settled urban areas. Indeed, according to Glaeser, Kahn et al. (2000), high access via travel modes other than solo driving is the primary reason low-income households locate in cities.

Are Trekkers disadvantaged?

Long-distance Trekkers may also face transportation disadvantage, albeit of a different type (Kamruzzaman and Hine 2011). First, the typical Trekker does not enjoy more *access* than the typical Driver, despite driving over five times more miles each year on average.

Many Trekkers likely seek out housing on the urban fringe, drawn by the relative low cost of housing. However, these households often face high transportation costs if members of the household have to travel great distances to work and other activities.

The total cost—housing and transportation—of living on the urban fringe are substantial (Lipman 2006). Table 17 presents my estimate of annual fuel costs for a Driver and a Trekker over the survey period. In 2009 the typical Trekker spent roughly five thousand dollars in fuel costs alone.[32] Many households underestimate these costs because, unlike housing, the cost of travel are dispersed among many transactions (such as insurance and vehicle maintenance) that are only loosely related to fuel (Lipman 2006). Moreover, because they drive so many miles, Trekkers are more susceptible to fuel price changes than Drivers. Between 1995 and 2009 the average price of a gallon of gas increased by 88 cents (adjusted for inflation). On net, this increased annual fuel costs by $670 for Drivers and $3,700 for Trekkers (again, adjusted for inflation). The effects of fuel price volatility may extend beyond individual households; Sexton, Wu et al. (2012) argue that higher fuel prices altered, "the calculus of suburban living," helping to trigger the housing crisis (p. 3).

[32] Of course Trekkers may be more likely than non-Trekkers to invest in fuel-efficient vehicles. In 2013 the fuel efficiency standard for a new car was 33.5 miles per gallon. I estimate that Trekkers who invest in a new, fuel-efficient car would spend $2,000 less each year on fuel than Trekkers with an average vehicle.

Table 17 Annual fuel costs for Drivers and Long-distance Trekkers by year (in 2013 dollars)

Year	Fuel cost (dollars/gallon)	Annual fuel cost: Long-distance Trekker (50,000 miles)	Annual fuel cost: Driver (9,000 miles)
1995	$1.62	$3,839	$691
2001	$1.86	$4,247	$764
2009	$2.50	$5,319	$957
2013	$3.53	$7,575	$1,364

Note: Reported prices are for a gallon of regular unleaded gasoline. Price was adjusted for inflation by the Energy Information Administration using the Gross Domestic Product Inflation Index (2013 dollars). Annual fuel cost estimates are based on the fleet wide average miles per gallon for vehicles with a short wheelbase. The annual fuel cost estimates are conservative because the U.S. fleet includes light duty vehicles with long wheelbases. According to the Bureau of Transportation Statistics the average light-duty vehicle on the road got 21.1 miles per gallon (mpg) in 1995, 21.9 mpg in 2001, and 23.5 in 2009, and 23.3 in 2012 (the most recent year available).

Sources: Fact #835: Average Historical Annual Gasoline Pump Price, 1929-2013 Office of Energy Efficiency and Renewable Energy. http://energy.gov/eere/vehicles/fact-835-august-25-average-historical-annual-gasoline-pump-price-1929-2013

Table 4-23 Average Fuel Efficiency of U.S. Light Duty Vehicle (2014) Bureau of Transportation Statistics
http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_23.html

TAKE-AWAYS FOR POLICY

The following sections highlight four take-aways for policymakers.

Recognize the distribution of the traveler types

First and foremost, policymakers should recognize and internalize the distribution of the traveler types: the vast majority of young people are Drivers; there are few Long-distance Trekkers, but they contribute disproportionately to total travel; young Car-less people with remarkably constrained mobility are the second most common traveler type; and Multimodals comprise a small share of the population. It can be difficult to reconcile personal experiences with the national data I present here, particularly if one tends to walk, bike, and ride transit and lives and works with many other people who do too. It is, after all, human nature for our experiences to shape our interpretation of the world. Yet, as this work demonstrates, those experiences of young, educated, urban, multi-modal professionals are far from universal.

Planning professionals, professors of urban studies or planning, and students in planning and public policy programs tend to (but not always) espouse a preference for walking, biking, and transit and often harbor some ambivalence about automobiles. I suspect that they tend to live and work in more walkable and transit-friendly locations than the average American and that they tend to live near, and interact with, people who share their preferences and experiences (Bishop 2009, Kahn and Morris 2009).

To these people, my data likely seem to grossly underestimate the prevalence of Multimodals and my description of Car-less-ness as a response to economic constraints appears overly pessimistic. These people know many Multimodals and most of the Car-less people they know are Car-less by choice. Yet as I demonstrate throughout this dissertation, many young people in America face Car-less-ness due to severe economic constraints and are making do in environments with few, if any, alternatives to the automobile.

The cause(s) of the decline and what to expect looking forward

While there was some evidence for the influence of preferences on traveler types, the preponderance of evidence suggests that economic constraints were the primary cause of the decline in driving. Increases in the share of Car-less young adults were concentrated among those with the fewest resources and in the least supportive environments for alternative modes of travel (low densities and outside of metropolitan areas). Moreover, young people who deferred taking on adult roles because of the recession were also less likely to use automobiles. Finally, changes in the racial and ethnic composition of young adults also contributed to the decline in vehicle travel, but keep in mind that for Hispanic and Asian young adults, the racial and ethnic effect actually reflects differences in resources, roles, and residential location.

My analysis of resources and roles suggests that as economic opportunities return and young people once again move out, get married, and have children, we can expect that most are likely to return to driving. In fact, evidence suggests that driving was already beginning to increase again at the time of this writing. In the first quarter of 2015 car sales for young adults were strong, contrary to some predictions about a fundamental change in preferences (Cao 2015). Moreover, in 2014 nationwide aggregate miles driven were the highest in six years (Federal Highway Administration 2014).

However, the degree to which young people return to driving will depend on the nature of the economic recovery and the life opportunities afforded to young adults. If retail and service positions continue to dominate the labor market and underemployment, low wages, and instability persist, we can expect the share of young adults struggling to afford automobility to remain troublingly high.

Recognize policy trade-offs

Given the forgoing, policymakers should keep transportation disadvantage and Car-less young adults in mind when they act on their other policy aims. Specifically, many transportation policymakers seek to reduce pollution, curb congestion, or encourage active travel by discouraging the use of automobiles. While these aims are vitally important, they often come into conflict with another worthwhile policy aim: to reduce the burden of transportation disadvantage. These trade-offs are explored below in terms of transportation policy and housing policy.

Policies that discourage driving (such as high vehicle registration fees or traditional automobile insurance fees) may make it more difficult or expensive to own and operate a vehicle and, as costs increases, more young adults may be unable to afford automobility and become Car-less. Meanwhile, Trekkers will be squeezed even more than they are currently. The following sections offer suggestions for policymakers to reduce automobility and encourage multimodality in ways that do not exacerbate the experience of Car-less young people.

Invest in transit systems in transit-supportive environments

Public transit providers should invest in robust, flexible transportation *systems* that connect people to opportunities rather than politically popular projects that superficially support transit and walkability, but do little to increase transit accessibility—like streetcars. As Walker argues convincingly, a robust bus system with frequent service will generate more ridership than a limited number of rail lines (Walker 2011). One approach gaining popularity is Bus Rapid Transit (BRT) systems, which include several components—exclusive rights of way, a limited number of stops, and off-board fare payment—that improve the speed and reliability of the bus (Walker 2011). BRT systems are less expensive to build than rail systems and in many conditions have lower operating costs (Hensher 2007, Tirachini, Hensher et al. 2010). BRT systems will not only do more to alleviate the plight of the transportation disadvantaged than comparatively priced rail systems, they will also do more to promote Multimodality because people will be able to access a larger number of opportunities with a BRT system.

Adopt marginal cost transportation pricing

Whenever possible the costs of automobile use should be charged as marginal costs rather than flat fees. Mileage-based insurance is a good example of marginal cost pricing. By essentially eliminating the marginal (insurance) cost of driving, flat insurance premiums encourage more driving (Bordoff and Noel 2008, Shoup 2011). By increasing the marginal cost of each mile, mileage-based insurance premiums (and other marginal fees) would encourage Drivers and Trekkers to drive less and encourage more people to be Multimodals. Moreover, the fees would actually reduce the cost of automobility for Car-less and Multimodal young adults because they would only have to pay for what they use.

Make bike and pedestrian improvements

Design solutions that improve the pedestrian environment and make walking and biking safer can encourage Multimodality, but to relieve the burden of Car-less-ness they must be distributed in areas of concentrated need. In many jurisdictions, design improvements are primarily distributed based on public complaints or comments (Dovey 2015) and, as a result, improvements tend to be concentrated in areas with abundant political capital. Areas with less well-off people tend to receive fewer new amenities.

Make new transportation services available to low-income people

21st century transportation services like Uber, Lfyt, and Zipcar can encourage Multimodality by increasing quality and flexibility of transportation options. Currently, however, such programs do little to ease the burden of Car-less-ness for those facing severe economic constraints. Nationwide, 13 percent of young people ages 25 to 34 did not have a bank account in 2013 and the figures for Black and Hispanic households of all ages were even higher (20% and 18% respectively) (Burhouse, Chu et al. 2014). People without a bank account, credit card, or a smart phone cannot use many of the new transportation services (Kodransky and Lewenstein 2014). Policymakers should work with private companies to insure that the next generation of transportation services is widely available, even to those with the fewest resources. One possibility could be to require bike-share, car-share, and transportation network companies to accept payments from debit cards unlinked to bank accounts.

Increase automobile access for poor people

Finally, automobiles provide vastly superior access to opportunities in most areas, particularly in low-density regions outside of metropolitan areas. In those areas, policies that help families afford reliable automobiles, perhaps by reducing the barriers to accessing car loans, can help expand access for many young people (Blumenberg 2004).

Provide more housing options in highly accessible areas

In addition to transportation-related trade-offs, policies that aim to reduce driving may increase competition for a limited number of accessible homes, that is housing in areas with adequate non-automobile transportation options. Competition for limited units in accessible areas drives up prices such that homes in accessible communities command a price premium over otherwise similar homes in less accessible areas (Cortright 2009). If the housing market were competitive, growing demand for homes in these areas would lead developers to increase the supply, but regulatory barriers often prevent that from happening (Levine 2005).

This is a pressing problem because living in walkable and transit-rich communities is not just a nice amenity for Car-less households; it is a lifeline. If low-income Car-less households are priced out of walkable areas, they will have no choice but to locate in areas with limited travel options. Based on the experience of involuntarily low-car households in Australia (Delbosc and Currie 2012) and no-car households at low densities in America (Lovejoy 2012), we can expect that Car-less young people in those areas are extremely likely to be cut off from employment, services, and social opportunities.

Making accessible housing more affordable can reduce transportation disadvantage by providing affordable options for households that cannot afford a car and by reducing the incentive for Long-distance Trekkers to locate far on the urban fringe. Adding more housing in accessible areas may also make it possible for Drivers to switch voluntarily to being Multimodal or Car-less. When accessible housing is underprovided many homeowners make a rational decision that being a Driver is optimal given the context. If the supply of accessible housing increased, more Drivers may rationally choose to relocate and alter their travel patterns. Finally, a Multimodal lifestyle is only possible in limited locations and those areas are in short supply (Levine

2005). Consequently, regulatory burdens may create a ceiling on the share of the population that can be Multimodal. Increasing the supply of Multimodal-enabled housing would lift the ceiling and enable a higher share of Multimodals.

Policymakers can increase the supply of accessible housing in many ways. First, invest in cost-effective transportation systems that make more areas accessible. Second, remove or reduce minimum parking requirements, which dramatically increases the cost of providing housing and constitutes a very large share of the cost of providing affordable housing (Shoup 2011, Manville, Beata et al. 2013). Policymakers should also prevent parking costs from being bundled with housing costs. Doing so masks the costs of automobility and forces homeowners and renters without an automobile to subsidize the expenses of people with an automobile (Manville and Shoup 2004, Shoup 2011). Policymakers can also allow more development in accessible areas by approving taller or larger buildings in accessible areas and by allowing homeowners to build and rent accessory dwelling units (granny flats). In some areas it may be necessary to encourage the development of affordable units, perhaps through inclusionary up-zoning where a jurisdiction makes providing affordable housing a condition of zoning changes (Hickey 2014).

Recognize income inequality

Finally, at the root of many of the problems outlined in this dissertation, economic inequality exacerbates the effects. While the policy and design solutions identified above can lessen some of the effects of inequality, they will not tackle the root issue. Moreover, transportation policy adjustments are almost certainly not the most effective ways to target inequality. Instead, a host of other policy areas should play a complementary role. As such, policies that directly tackle inequality will also influence urban outcomes.

APPENDICES

APPENDIX A: IDENTIFYING THE TRAVELER TYPES

More details about the NHTS

The following details about the national travel surveys are drawn from the User's Guides from 1995, 2001, and 2009. The NHTS surveys households from the civilian, non-institutionalized population using a stratified random sample of landline residential phone numbers. Respondents come from all 50 states and the District of Columbia, but were stratified initially by Census Division and metropolitan area. The sample excludes households living in hotels, military barracks, and other institutional settings, but does include college dormitories, fraternities, and sororities. Households were selected using random digit dialing of landline telephone numbers only. A cell phone sample was tested in 2009, but was not included in the final data.

Households with a telephone number that could be linked to an address received a letter before the first phone call with information about the survey and a five-dollar incentive to participate. In 2009 400,000 households were sent advanced letters. Surveyors contacted each household up to seven times to recruit households. Once a household member completed an initial interview, they were mailed a paper copy of the travel diary for each member of the household. The mailing included two dollars for each household member as an incentive to complete the survey.

All surveys were conducted over a 14-month period to account for seasonal variation. The travel day for each household was randomly assigned and included all days of the week and holidays. The travel day began at 4:00 AM and ended 24-hours later at 3:59 AM the next day. Households received a call to remind them about the survey the day before their randomly assigned travel day. After the travel day surveyors called each household for up to seven days to collect their travel diary information.

The weighted data from the NHTS are "representative of national estimates" (pp. 1-3, 2009). The survey weights are based on the probability of selection of the household's phone number, a value that varied by Census division and metropolitan area. Further adjustments were made for non-response rates, the number of telephone lines in the home, geography, race, ethnicity, and number of household vehicles. Finally, survey weighting also adjusts for day of the week and month of the interview.

In addition to the national survey, policymakers at the state or metropolitan level could pay to oversample in their region. These Add-on samples are included in the national sample and are weighted to account for the oversampling in those areas (U.S. Department of Transportation 2011). In 2001 2/3 of the total sample was from the Add-on areas. In 2009 the Add-on samples comprised the majority of the sample.

Previous versions of the survey had relatively low trip rates. In 1995, two changes were made to bring the trip-rate figures more in line with metropolitan surveys from the same area. First, travel diaries were mailed to each household starting in 1995. The downside of this change was that it required a two-stage interview process, which lowered response rates relative to previous survey years. Second, beginning in 1995, procedures for people who reported zero trips changed. In earlier versions of the survey, the surveyor did not ask a follow-up question if the respondent reported making no trips. If respondents report "no trips" as a way to avoid the survey while appearing to comply, reported trip rates would be lower than actual trip rates. In 1995 a follow-up question was added whenever a respondent reported making no trips: "Does that mean you stayed at the same place all day?" As a result of this change, the number of people reporting no trips fell dramatically from 25 percent in 1990 to 12 percent in 1995.

Between 1995 and 2009 some changes occurred. For example, in the 1995 and 2001 samples, a household member completed two odometer readings for each household vehicle to help estimate annual miles driven per vehicle. This was not done in 2009.

In all three years, interviews were conducted using Computer-Assisted Telephone Interviewing technology. Surveys were conducted in English and Spanish in 2001 and 2009. The response rate for the surveys declined over time from 34 percent in 1995 and 2001, to 19.8 percent in 2009.

Table 18 How many classes? Travel patterns in each class for two- to five-class solutions

	Share of young adults	Miles per day	Share of miles by non-auto mode	Number of trips	Autos per adult
Two-class solution					
Class 1	87%	42	1%	4.7	1.1
Class 2	13%	15	92%	3.4	0.7
Three-class solution					
Class 1	86%	43	1	4.6	1.0
Class 2	3%	26	.446	5.2	0.9
Class 3	11%	14	.99	3.2	0.6
Four-class solution					
Class 1	82%	41	1%	4.6	1.1
Class 2	4%	78	1%	4.9	1.2
Class 3	3%	26	45%	5.2	0.9
Class 4	11%	14	99%	3.2	0.6
Five-class solution					
Class 1	66%	38	1%	4.6	1.1
Class 2	1%	76	5%	4.9	1.2
Class 3	10%	70	1%	5.1	1.2
Class 4	11%	39	4%	4.9	0.9
Class 5	12%	15	93%	3.4	0.7

Continued on next page

How many classes? Continued

	Share of young adults	Driver	Use transit: Never	Use transit: Once a week or more	Miles per year
Two-class solution					
Class 1	87%	92%	87%	5%	12,600
Class 2	13%	52%	49%	39%	3,800
Three-class solution					
Class 1	86%	93%	87%	5%	12,700
Class 2	3%	66%	61%	27%	5,700
Class 3	11%	51%	48%	40%	3.700
Four-class solution					
Class 1	82%	93%	87%	5%	10,600
Class 2	4%	100%	92%	2%	60,000
Class 3	3%	66%	62%	27%	5,400
Class 4	11%	51%	48%	405	3,600
Five-class solution					
Class 1	66%	93%	100%	0%	9,000
Class 2	1%	100%	90%	5%	100,000
Class 3	10%	100%	92%	2%	35,000
Class 4	11%	84%	0%	40%	7,600
Class 5	12%	51%	50%	39%	3,300

Note: Values are unweighted. Source: 1995 NPTS, 2001 and 2009 NHTS.

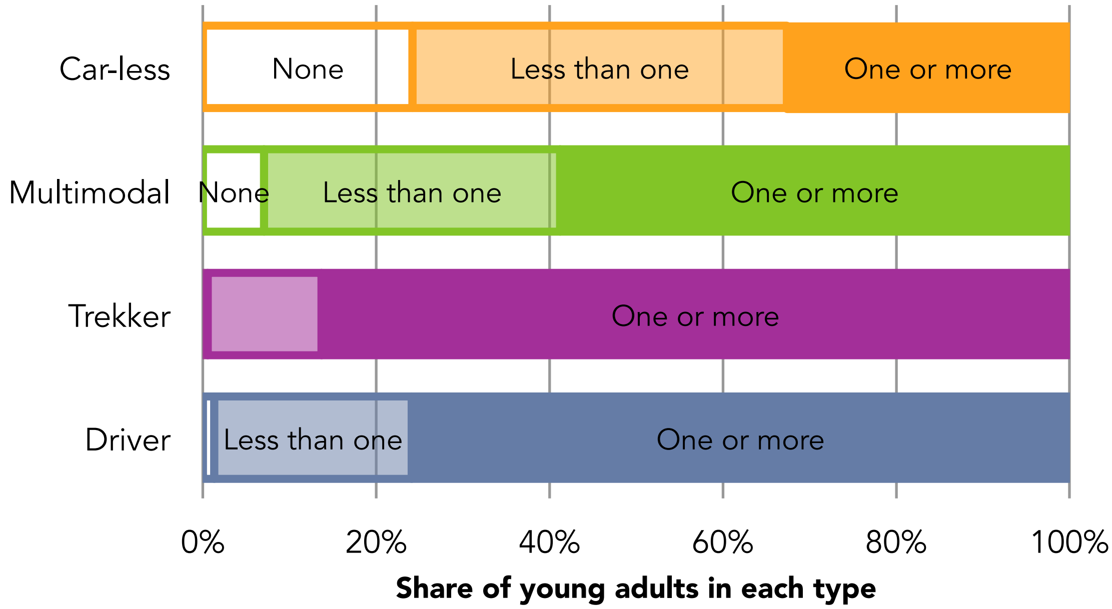
APPENDIX B: DESCRIBING THE TRAVELER TYPES

Table 19 Travel patterns of young adults (age 16 to 36) in the United States by traveler type in 2009

	Percentile		
	50th (Median)	**25th**	**75th**
Miles of travel on the survey day			
Driver	24	12	48
Trekker	50	21	107
Multimodal	12	5	29
Car-less	2	0	12
Trips on the survey day			
Driver	4	2	6
Trekker	4	3	7
Multimodal	5	4	6
Car-less	2	2	4
Share of miles by auto on the survey day (%)			
Driver	100	100	100
Trekker	100	100	100
Multimodal	52	66	45
Car-less	0	0	0
Annual miles driven			
Driver	9000	7000	6000
Trekker	50000	5000	20000
Multimodal	300	300	7700
Car-less	0	0	2000

Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 79 Automobile access of young adults (Age 16 to 36) by traveler type in 2009



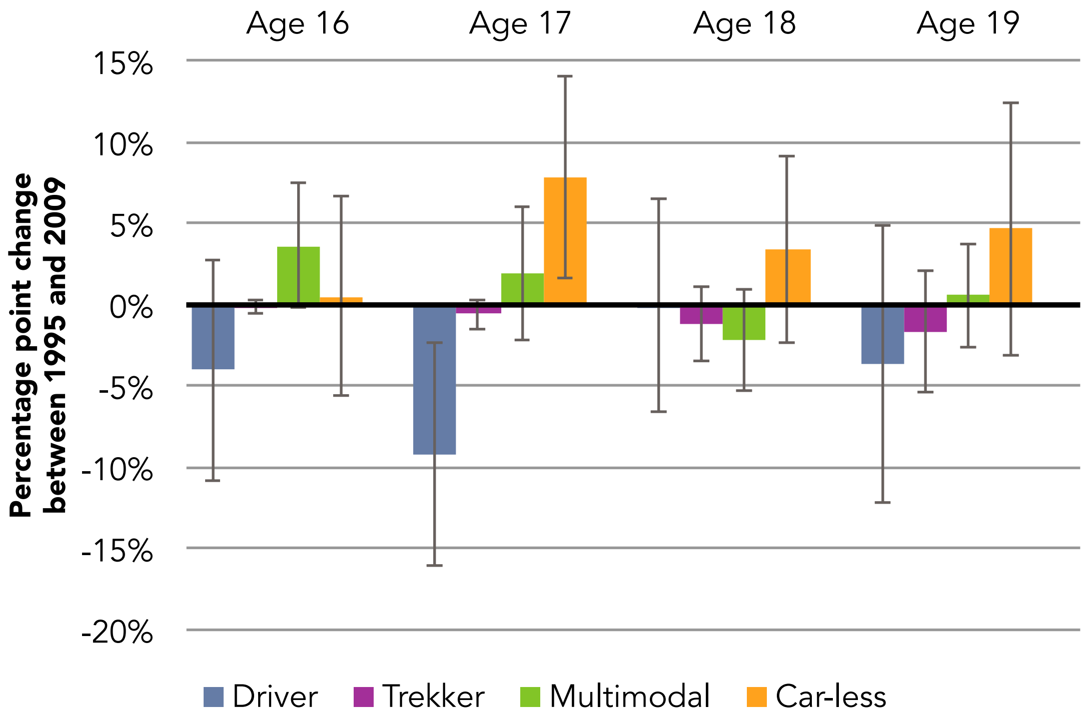
Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Table 20 Prevalence of the traveler types of young adults (Age 16 to 36) by year

		Point estimate	95% confidence interval	
			Lower bound	Upper Bound
1995				
	Driver	83.1%	82.1	84.0
	Trekker	4.2%	3.7	4.8
	Multimodal	2.6%	2.3	2.9
	Car-less	10.1%	9.4	10.9
		100.0%		
2001				
	Driver	80.1%	79.1	81.2
	Trekker	4.9%	4.4	5.5
	Multimodal	3.1%	2.7	3.6
	Car-less	11.8%	11.0	12.7
		100.0%		
2009				
	Driver	79.4%	78.1	80.7
	Trekker	3.2%	2.7	3.7
	Multimodal	3.6%	3.1	4.2
	Car-less	13.8%	12.7	15.0
		100.0%		

Note: Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 80 Change in the prevalance of the traveler types between 1995 and 2009 by age (Age 16 to 19)



Note: Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

APPENDIX C: RESOURCES

Model results: Resources

Table 21 Multinomial logistic regression result: Household income quintile by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.75***	-0.63***	-0.93***
Live independently	0.82***	-0.08	-0.01
Married	-0.19*	-0.55***	-0.42***
Has a child	0.27**	-0.26	-0.36***
Female	-0.99***	-0.22**	-0.15***
Female X Has a child	-0.46***	-0.16	0.01
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.35*	-0.39*	-0.57***
In 2001 (relative to 1995)	-0.36	-0.09	-0.15
In 2009 (relative to 1995)	0.05	-0.31	0.06
Q3	0.36	-0.46**	-0.71***
In 2001 (relative to 1995)	-0.27	-0.53	-0.22
In 2009 (relative to 1995)	-0.12	0.29	-0.31
Q4	0.47**	-0.54***	-0.96***
In 2001 (relative to 1995)	-0.50*	-0.02	-0.2
In 2009 (relative to 1995)	-0.37	0.37	-0.06
Q5	0.54**	-0.70***	-0.92***
In 2001 (relative to 1995)	-0.43	0.13	-0.02
In 2009 (relative to 1995)	-0.76**	0.48	-0.17
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.13	0.04	0.13
750	-0.31*	0.11	0.08
1,500	-0.55***	0.15	0.36**
3,000	-0.84***	0.29*	0.35***
7,000	-0.74***	0.53***	0.73***
17,000	-0.96***	1.26***	1.39***
30,000	-0.60*	1.64***	2.86***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.31**	0.29	-0.28**
250 to 500,000	-0.25*	0.13	-0.12
0.5 to 1 million	0.04	-0.11	-0.19
1 to 3 million	-0.11	0.2	-0.06
3 million or more	-0.01	0.24	0.12

Continued on next page

Household income model cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.33	0.21	-0.04
East North Central	-0.17	0.01	-0.55***
West North Central	0.22	-0.2	-0.60***
South Atlantic	0.15	-0.01	-0.53***
East South Central	0.29	-0.55*	-0.97***
West South Central	0.35	-0.38*	-0.82***
Mountain	0.21	-0.25	-0.63***
Pacific	-0.04	-0.3	-0.66***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.23	0.17	0.64***
NH Asian	-1.14***	0.01	0.12
Hispanic	-0.11	-0.22	0.28***
NH Other	0.27	0.12	0.25*
YEAR (Base: 1995)	0	0	0
2001	0.51**	0.29	0.27**
2009	0.13	0.11	0.31**
Constant	-2.93***	-2.78***	-1.06***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 22 Multinomial logistic regression result: Employment status by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.40**	-0.72***	-0.79***
In 2001 (relative to 1995)	0.51*	-0.03	-0.10
In 2009 (relative to 1995)	0.62**	0.22	-0.27*
Live independently	0.83***	-0.08	0.00
Married	-0.20*	-0.55***	-0.42***
Has a child	0.26**	-0.26	-0.37***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.46***	-0.17	0.02
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.23*	-0.51***	-0.59***
Q3	0.22*	-0.49***	-0.89***
Q4	0.18	-0.42***	-1.06***
Q5	0.19	-0.46***	-1.00***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.12	0.04	0.14
750	-0.30*	0.11	0.08
1,500	-0.56***	0.16	0.36**
3,000	-0.84***	0.30*	0.35***
7,000	-0.75***	0.53***	0.73***
17,000	-0.97***	1.27***	1.40***
30,000	-0.59*	1.64***	2.86***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.31**	0.29	-0.29**
250 to 500,000	-0.24	0.14	-0.12
0.5 to 1 million	0.06	-0.11	-0.19
1 to 3 million	-0.11	0.21	-0.05
3 million or more	0.00	0.23	0.12

Continued on the next page

Employment status Cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.33	0.19	-0.03
East North Central	-0.16	0.00	-0.55***
West North Central	0.23	-0.22	-0.59***
South Atlantic	0.16	-0.01	-0.53***
East South Central	0.3	-0.56*	-0.97***
West South Central	0.35	-0.40*	-0.81***
Mountain	0.22	-0.26	-0.62***
Pacific	-0.04	-0.3	-0.65***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.22	0.16	0.64***
NH Asian	-1.17***	0.00	0.12
Hispanic	-0.11	-0.24	0.28***
NH Other	0.27	0.1	0.24
YEAR: (Base: 1995)			
2001	-0.28	0.24	0.24**
2009	-0.65**	0.13	0.40***
Constant	-3.25***	-2.67***	-1.10***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 23 Multinomial logistic regression result: Educational attainment by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.535**	-0.201	-1.035***
Live independently	-0.499**	-0.674**	-0.109
Married	-0.243*	-0.345*	-0.438***
Has a child	0.126	-0.220	-0.308*
Female	-0.849***	-0.062	-0.236*
Female X Has a child	-0.633***	0.104	0.108
RESOURCES: Educational attainment (Base: Less than HS)			
HS graduate	0.087	-0.011	-0.376
In 2001 (relative to 1995)	0.030	0.135	-0.677*
In 2009 (relative to 1995)	0.391	-0.495	-1.038**
Some college	0.330	-0.395	-0.653**
In 2001 (relative to 1995)	-0.258	-0.199	-0.626*
In 2009 (relative to 1995)	-0.357	-0.475	-0.811**
College degree	-0.085	-0.261	-0.730**
In 2001 (relative to 1995)	-0.387	-0.025	-0.675*
In 2009 (relative to 1995)	-0.513	-0.492	-0.882**
Advanced degree	-0.377	-0.195	-0.540*
In 2001 (relative to 1995)	0.141	0.548	-0.28
In 2009 (relative to 1995)	-0.311	-0.748	-0.812*

Continued on the next page

Educational attainment Cont.

	Trekker	Multimodal	Car-less
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.096	-0.366	-0.015
750	-0.194	-0.103	-0.265
1,500	-0.611***	-0.008	-0.05
3,000	-0.787***	0.593	0.264
7,000	-0.723***	0.668*	0.667**
17,000	-0.968***	1.875***	1.452***
30,000	-0.612	2.230***	3.001***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.435*	0.320	-0.134
250 to 500,000	-0.343	0.323	0.123
0.5 to 1 million	0.182	-0.290	-0.392
1 to 3 million	-0.09	-0.057	-0.018
3 million or more	-0.026	0.194	0.088
Census Division (Base: New England)			
Middle Atlantic	-0.279	0.098	0.122
East North Central	0.081	0.046	-0.427
West North Central	0.437	0.157	-0.553*
South Atlantic	0.281	-0.005	-0.290
East South Central	0.443	-0.046	-0.877**
West South Central	0.625*	-0.358	-0.589**
Mountain	0.200	0.128	-0.551*
Pacific	0.018	-0.377	-0.560**
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.192	-0.235	0.692***
NH Asian	-1.499***	-0.119	0.116
Hispanic	-0.208	-0.306	0.22
NH Other	0.019	0.068	0.497*
YEAR (Base: 1995)			
2001	0.357	0.110	0.645*
2009	0.142	1.038*	1.127***
Constant	-2.505***	-3.857***	-1.163***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 24 Did the relationship between employment and travel type change over time while controlling for other variables?

	df	χ^2	$p>\chi^2$	sig.
Trekker	**2**	**2.46**	**0.086**	*
Multimodal	2	0.80	0.449	
Car-less	2	1.78	0.169	

Note: Results are a test of an interaction term between employment status and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of resources, roles, race, and residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. Drivers and the not employed are the omitted categories.

Table 25 Did the relationship between household income and traveler type change over time while controlling for other variables?

	df	χ^2	$p>\chi^2$	sig.
TREKKER				
Q1	2	4.54	0.103	
Q2	2	0.26	0.876	
Q4	2	0.36	0.836	
Q5	2	3.35	0.188	
Joint	**8**	**14.29**	**0.075**	*
MULTIMODAL				
Q1	2	1.05	0.593	
Q2	2	0.75	0.688	
Q4	2	2.27	0.321	
Q5	2	4.49	0.106	
Joint	8	8.52	0.385	
CAR-LESS				
Q1	**2**	**8.97**	**0.011**	**
Q2	2	1.33	0.514	
Q4	2	2.81	0.245	
Q5	2	0.29	0.867	
Joint	**8**	**13.67**	**0.091**	*

Note: Results are a test of an interaction term between household income quintile and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of resources, roles, race, and residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. Drivers and the middle income quintile are the omitted categories.

Table 26 Did the relationship between educational attainment and traveler type change over time while controlling for other variables?

	df	χ^2	$p>\chi^2$	sig.
TREKKER				
Less than HS	2	0.5	0.592	
Some college	**2**	**2.8**	**0.061**	*
College degree	**2**	**4.0**	**0.018**	**
Advanced degree	2	1.6	0.200	
Joint	8	1.4	0.204	
MULTIMODAL				
Less than HS	2	0.5	0.635	
Some college	2	0.4	0.681	
College degree	2	0.1	0.915	
Advanced degree	2	0.7	0.500	
Joint	8	0.8	0.632	
CAR-LESS				
Less than HS	**2**	**5.4**	**0.005**	***
Some college	2	0.3	0.727	
College degree	2	0.2	0.861	
Advanced degree	2	0.9	0.409	
Joint	**8**	**1.8**	**0.071**	*

Note: Results are a test of an interaction term between educational attainment and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of resources, roles, race, and residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. Drivers and the high school only are the omitted categories.

APPENDIX D: ROLES

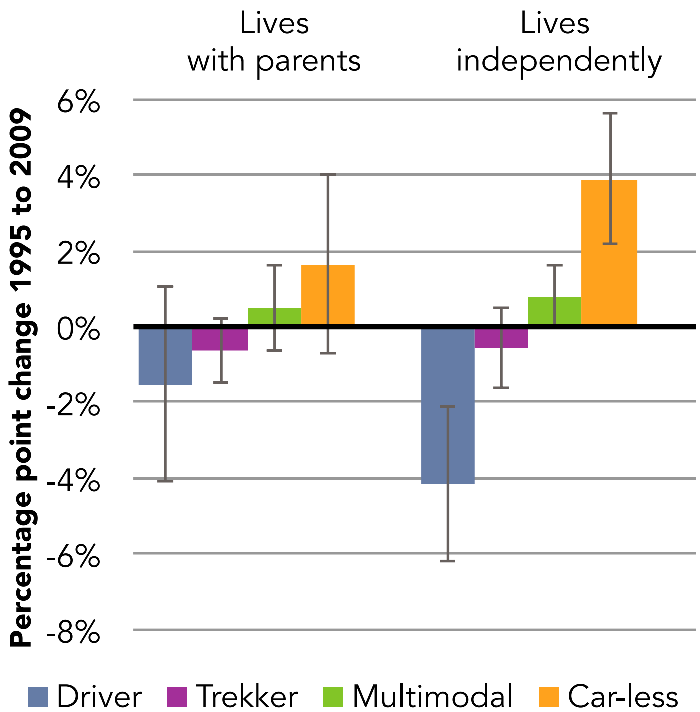
Table 27 Differences in Roles, Resources, and Race of young adults (Age 16 to 36) by their employment status in 2009

	Not employed	Employed
ROLES		
Live independently	43	61
Married	22	38
Has a child	15	19
RESOURCES		
Household income quintile(s)		
Lowest	36	22
Middle	48	60
Highest	16	19
	100	100
Educational attainment (Age 26 to 36 only)		
Less than HS	14	5
HS or more	86	95
College or more	32	47
Advanced degree	13	19
RACE		
NH White	59	67
NH Black	13	10
NH Asian	5	4
Hispanic	20	17
NH Other	3	2
	100	100

Note: All reported differences by employment status were statistically significant at $p< 0.05$. There was no statistically significant difference in the residential location (population density or size of the metropolitan statistical area) of young adults by employment status. All values are weighted using the provided survey weights. Source: 2009 NHTS, weighted values.

Living arrangement

Figure 81 Change in the prevalance of the traveler types of young adults (Age 16 to 36) between 1995 and 2009 by living arrangement



Note: Solid bars reflect the best estimate of the percentage point change in the prevalence of each traveler type between 1995 and 2009. Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Table 28 Differences in Roles, Resources, and Race of young adults (Age 16 to 36) by their living arrangement in 2009

	Lives with parents	Lives independently
ROLES		
Employed	60	76
Married	1	58
Has a child	4	30
RESOURCES		
Household income quintile(s)		
Lowest	25	27
Middle	55	57
Highest	20	16
	100	100
Educational attainment (Age 26 to 36 only)		
Less than HS	7	7
HS or more	75	73
College or more	37	33
Advanced degree	20	16
RACE		
NH White	67	63
NH Black	11	11
NH Asian	4	5
Hispanic	17	18
NH Other	2	3
	100	100

Note: All reported differences by living arrangement were statistically significant at $p < 0.05$. There was no statistically significant difference in the residential location (population density, size of the metropolitan statistical area, or census division) of young adults by living arrangement. All values are weighted using the provided survey weights. Source: 2009 NHTS, weighted values.

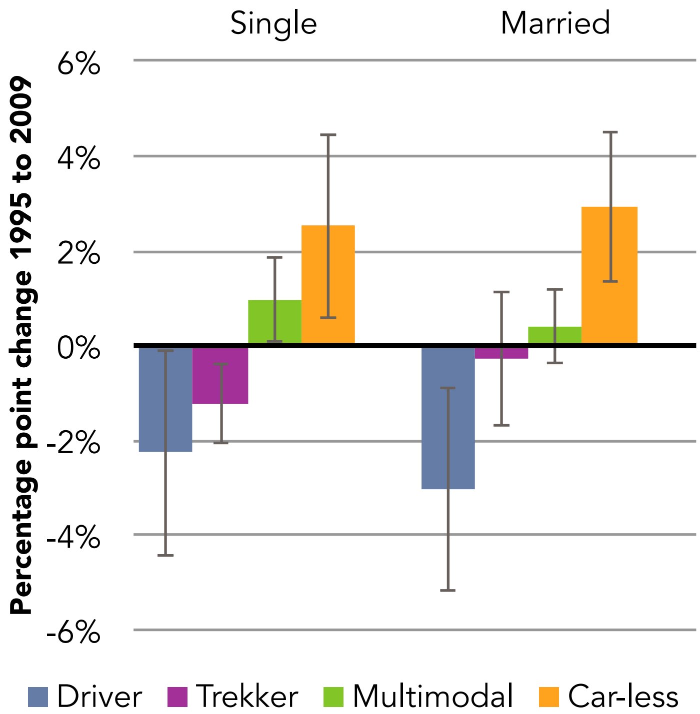
Relationship status

Table 29 Differences in Roles, Resources, and Race of young adults (Age 16 to 36) by marriage status in 2009

	Single	Married
ROLES		
Employed	64	79
Live independently	34	98
Has a child	7	40
RESOURCES		
Household income quintile(s)		
Lowest	30	19
Middle	53	62
Highest	17	20
	100	100
Educational attainment (Age 26 to 36 only)		
Less than HS	7	6
HS or more	93	94
College or more	36	50
Advanced degree	14	20
RACE		
NH White	62	70
NH Black	13	6
NH Asian	4	6
Hispanic	18	17
NH Other	3	2
	100	100
RESIDENTIAL LOCATION		
Population density (people per square mile)		
<1,500	42	49
3000	18	18
7000	26	21
17000	9	7
30000	5	3
	100	100

Note: All reported differences by living arrangement were statistically significant at $p < 0.05$. There was no statistically significant difference in size of the metropolitan statistical area of young adults by marriage status. All values are weighted using the provided survey weights. Source: 2009 NHTS, weighted values.

Figure 82 Change in the prevalance of the traveler types of young adults (Age 16 to 36) between 1995 and 2009 by relationship status



Note: Solid bars reflect the best estimate of the percentage point change in the prevalence of each traveler type between 1995 and 2009. Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Parenthood

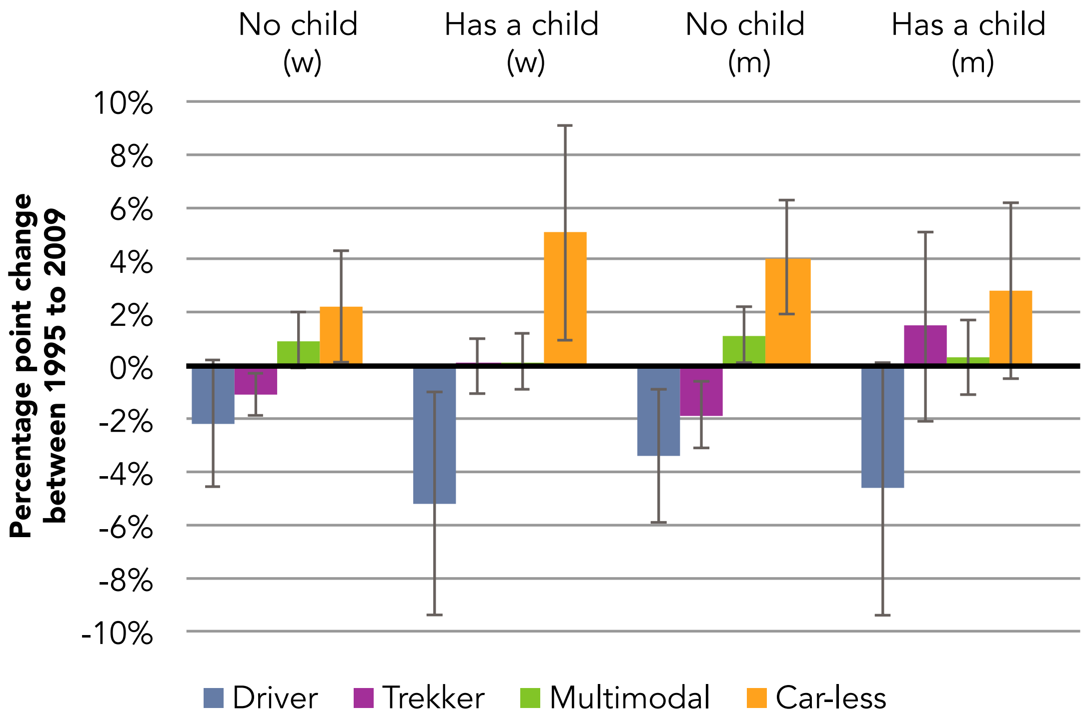
Table 30 Differences in Roles, Resources, and Race of young women (Age 16 to 36) by parenthood in 2009

	No child	Has a child
ROLES		
Employed	63	60
Lives independently	50	89
Married	25	67
RESOURCES		
Household income quintile(s)		
Lowest	26	33
Middle	55	57
Highest	19	10
	100	100
Educational attainment (Age 26 to 36 only)		
Less than HS	4	13
HS or more	96	87
College or more	56	32
Adv. degree	26	10
RACE		
NH White	64	59
NH Black	12	12
NH Asian	5	2
Hispanic	16	24
NH Other	3	2
	100	100

	No child	Has a child
RESIDENTIAL LOCATION		
Population density (people/sq. mile)		
<2,000	41	49
3,000	19	16
7,000	26	23
17,000	9	8
>25,000	5	4
	100	100
Size of the metro area		
Outside a metro	15	23
<250,000	6	8
250-500,000	10	10
1/2 to 1 million	8	7
1 to 3 million	21	20
3+ million	40	32
	100	100

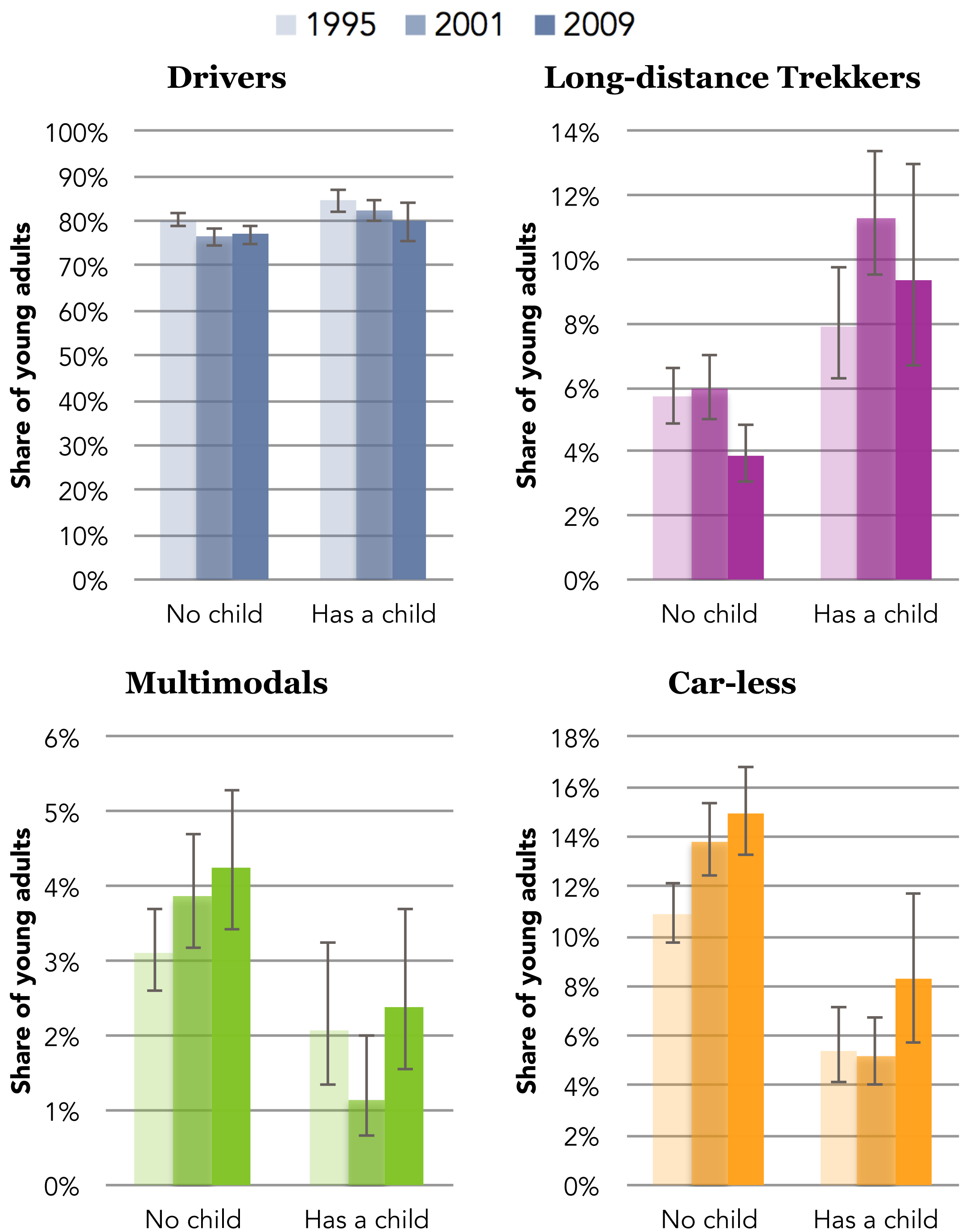
Note: All reported differences by parent stats were statistically significant at $p < 0.05$, except for employment, which was not significantly different for mothers and women without children. All values are weighted using the provided survey weights. Source: 2009 NHTS, weighted values.

Figure 83 Change in the prevalance of the traveler types of young adults (Age 16 to 36) between 1995 and 2009 by parent status and sex



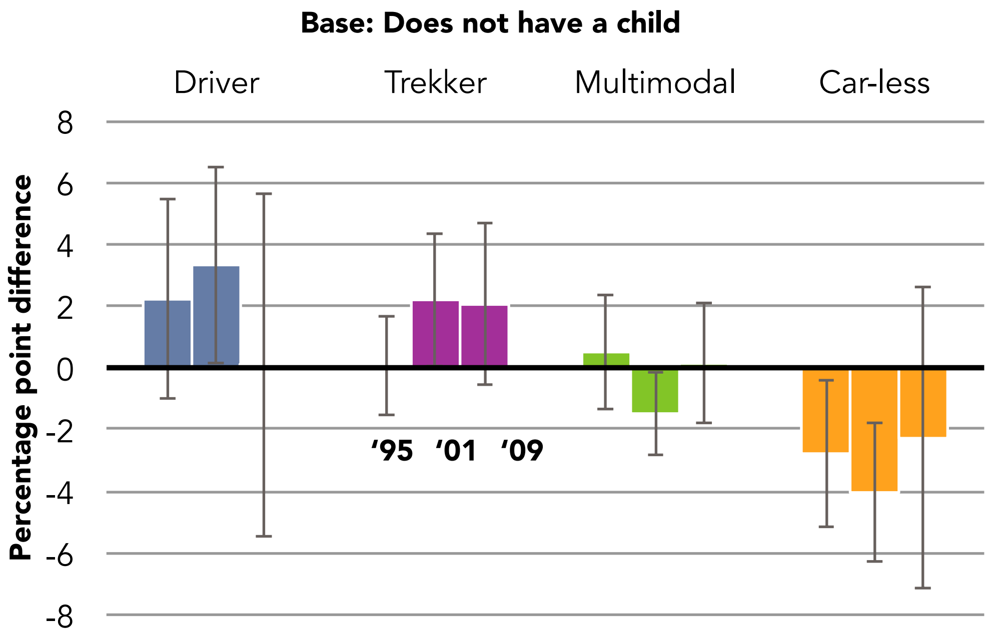
Note: Solid bars reflect the best estimate of the percentage point change in the prevalence of each traveler type between 1995 and 2009. Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 84 Traveler type by parent status and year for young men (Age 16 to 36)



Note: Values are unadjusted (not the result of a statistical model) and are weighted using the provided survey weights. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 85 Independent effect of having a child on traveler type for young men (Age 16 to 36)



Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. The model includes an interaction term between year (1995, 2001, and 2009) and parent status, as well as control variables associated with the other Roles, Resources, Residential location, and Race/ethnicity. Estimates are weighted to reflect the population of the United States using the provided survey weights. Effect sizes are relative to the base category. Bars above the axis indicate that mothers were more likely to be that traveler type relative to the base, everything else equal. The inverse is true for bars below the axis. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Model results: Adult Roles

Table 31 Multinomial logistic regression result: Living independent by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.75***	-0.64***	-0.93***
Live independently	0.71***	-0.22	-0.07
In 2001 (relative to 1995)	0.17	0.15	-0.03
In 2009 (relative to 1995)	0.19	0.23	0.19
Married	-0.20*	-0.55***	-0.43***
Has a child	0.26**	-0.27	-0.36***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.46***	-0.15	0.02
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.22*	-0.51***	-0.59***
Q3	0.21	-0.49***	-0.89***
Q4	0.17	-0.42***	-1.05***
Q5	0.18	-0.47***	-0.99***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.12	0.03	0.13
750	-0.31*	0.11	0.08
1,500	-0.56***	0.15	0.36**
3,000	-0.84***	0.30*	0.35***
7,000	-0.75***	0.53***	0.73***
17,000	-0.97***	1.27***	1.40***
30,000	-0.59*	1.64***	2.87***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.31**	0.29	-0.28*
250 to 500,000	-0.24	0.14	-0.12
0.5 to 1 million	0.06	-0.11	-0.19
1 to 3 million	-0.11	0.21	-0.05
3 million or more	0.00	0.24	0.13

Continued on next page

Live independently (cont.)

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.33	0.21	-0.04
East North Central	-0.17	0.01	-0.56***
West North Central	0.23	-0.21	-0.60***
South Atlantic	0.15	-0.01	-0.53***
East South Central	0.3	-0.55*	-0.97***
West South Central	0.35	-0.39*	-0.82***
Mountain	0.22	-0.25	-0.63***
Pacific	-0.04	-0.3	-0.66***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.22	0.16	0.64***
NH Asian	-1.16***	0.00	0.11
Hispanic	-0.11	-0.24	0.28***
NH Other	0.26	0.09	0.24
YEAR (Base: 1995)			
2001	0.06	0.11	0.20*
2009	-0.23	0.12	0.14
Constant	-3.47***	-2.63***	-0.96***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 32 Multinomial logistic regression result: Marriage status by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.75***	-0.64***	-0.93***
Live independently	0.83***	-0.09	-0.01
Married	-0.31**	-0.43***	-0.54***
In 2001 (relative to 1995)	0.21	-0.32	0.12
In 2009 (relative to 1995)	0.16	-0.06	0.23
Has a child	0.25**	-0.23	-0.36***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.45***	-0.17	0.01
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.22*	-0.51***	-0.59***
Q3	0.21	-0.49***	-0.89***
Q4	0.17	-0.42***	-1.05***
Q5	0.18	-0.46***	-1.00***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.12	0.04	0.13
750	-0.31*	0.11	0.07
1,500	-0.56***	0.15	0.36**
3,000	-0.84***	0.30*	0.34**
7,000	-0.75***	0.54***	0.73***
17,000	-0.97***	1.27***	1.39***
30,000	-0.59*	1.64***	2.86***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.31**	0.29	-0.28**
250 to 500,000	-0.24	0.13	-0.12
0.5 to 1 million	0.06	-0.12	-0.19
1 to 3 million	-0.11	0.20	-0.05
3 million or more	0.00	0.23	0.13

Continued on next slide

Married cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.34	0.21	-0.04
East North Central	-0.17	0.01	-0.56***
West North Central	0.23	-0.21	-0.60***
South Atlantic	0.15	-0.01	-0.53***
East South Central	0.3	-0.55*	-0.97***
West South Central	0.34	-0.39*	-0.82***
Mountain	0.22	-0.25	-0.63***
Pacific	-0.04	-0.29	-0.66***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.22	0.16	0.64***
NH Asian	-1.16***	0.00	0.11
Hispanic	-0.11	-0.23	0.28***
NH Other	0.27	0.1	0.24
YEAR (Base: 1995)			
2001	0.09	0.28**	0.14*
2009	-0.16	0.27**	0.19**
Constant	-3.50***	-2.75***	-0.96***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 33 Multinomial logistic regression result: Has a child (female only) by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.24	-0.49***	-1.02***
Live independently	0.90***	-0.22	0.01
Married	-0.43**	-0.45***	-0.53***
Has a child	-0.25	-0.25	-0.53***
In 2001 (relative to 1995)	0.16	-0.43	0.12
In 2009 (relative to 1995)	0.48	-0.14	0.44*
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.06	-0.42**	-0.58***
Q3	0.1	-0.68***	-0.95***
Q4	0.32	-0.66***	-1.01***
Q5	0.44*	-0.70***	-0.94***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.17	0.14	0.02
750	-0.26	0.41	-0.08
1,500	-0.78***	0.01	0.06
3,000	-1.15***	0.28	0.39**
7,000	-0.87***	0.56**	0.64***
17,000	-0.94**	1.44***	1.35***
30,000	-0.55	2.03***	2.90***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.31	0.42*	-0.37*
250 to 500,000	-0.16	0.37	0.1
0.5 to 1 million	-0.01	0.21	-0.18
1 to 3 million	0.13	0.51**	0.03
3 million or more	-0.19	0.49**	0.30**

Continued on the next page

Has a child (female) cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	0.00	-0.12	-0.22
East North Central	0.17	-0.01	-0.86***
West North Central	0.52	0.00	-0.77***
South Atlantic	0.66	0.05	-0.52***
East South Central	0.66	-0.52	-1.00***
West South Central	0.83*	-0.60**	-1.21***
Mountain	0.57	-0.73**	-0.85***
Pacific	0.61	-0.34	-0.93***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.10	0.11	0.66***
NH Asian	-0.69	-0.23	0.04
Hispanic	-0.07	-0.13	0.58***
NH Other	0.29	0.23	0.41**
YEAR (Base: 1995)			
2001	-0.10	0.46***	0.14
2009	-0.42*	0.28	0.08
Constant	-4.29***	-3.18***	-0.97***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

Table 34 Multinomial logistic regression result: Has a child (male only) by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	1.26***	-0.78***	-0.82***
Live independently	0.76***	0.04	-0.02
Married	-0.14	-0.58***	-0.33***
Has a child	-0.01	0.09	-0.37**
In 2001 (relative to 1995)	0.27	-0.79**	-0.21
In 2009 (relative to 1995)	0.37	-0.08	0.13
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.27*	-0.59***	-0.59***
Q3	0.24*	-0.33*	-0.84***
Q4	0.13	-0.22	-1.09***
Q5	0.09	-0.27	-1.04***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.10	-0.04	0.23
750	-0.32*	-0.13	0.19
1,500	-0.48***	0.28	0.61***
3,000	-0.75***	0.31	0.28
7,000	-0.69***	0.51**	0.81***
17,000	-0.98***	1.14***	1.42***
30,000	-0.65*	1.32***	2.87***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.33**	0.20	-0.24
250 to 500,000	-0.30*	-0.01	-0.31
0.5 to 1 million	0.06	-0.38	-0.20
1 to 3 million	-0.20	-0.01	-0.12
3 million or more	0.04	0.04	-0.04

Continued on the next page

Has a child (male) cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.4	0.47*	0.16
East North Central	-0.24	0.04	-0.27
West North Central	0.16	-0.38	-0.43
South Atlantic	0.01	-0.07	-0.55***
East South Central	0.21	-0.59	-0.91***
West South Central	0.23	-0.2	-0.41*
Mountain	0.12	0.06	-0.43*
Pacific	-0.22	-0.25	-0.39*
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.26	0.23	0.63***
NH Asian	-1.34***	0.2	0.19
Hispanic	-0.14	-0.3	-0.02
NH Other	0.28	0.03	0.12
YEAR (Base: 1995)			
2001	0.2	0.19	0.21**
2009	-0.11	0.28*	0.30***
Constant	-3.91***	-2.65***	-1.19***

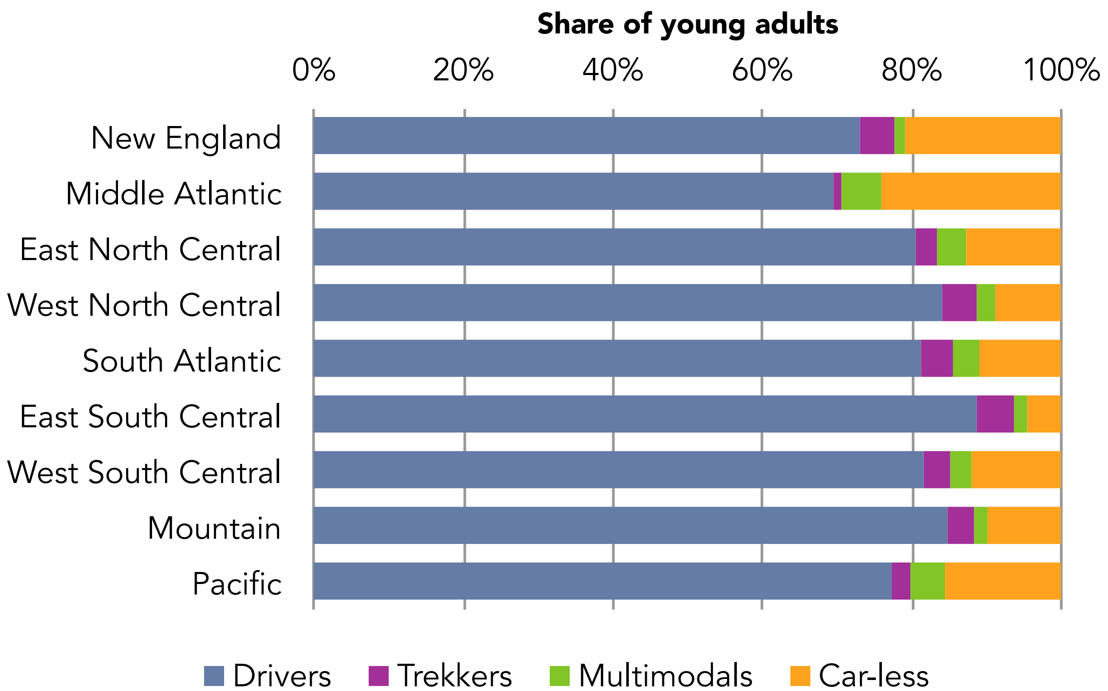
Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p 98.

APPENDIX E: RESIDENTIAL LOCATION

Region

This section provides additional analysis of traveler type by census region. Figure 86 indicates that traveler type varies slightly by region. Drivers are most common in the East South Central region and Car-less are most common in the Middle Atlantic region.

Figure 86 Residential location and traveler type of young adults (Age 16 to 36) in 2009: Region

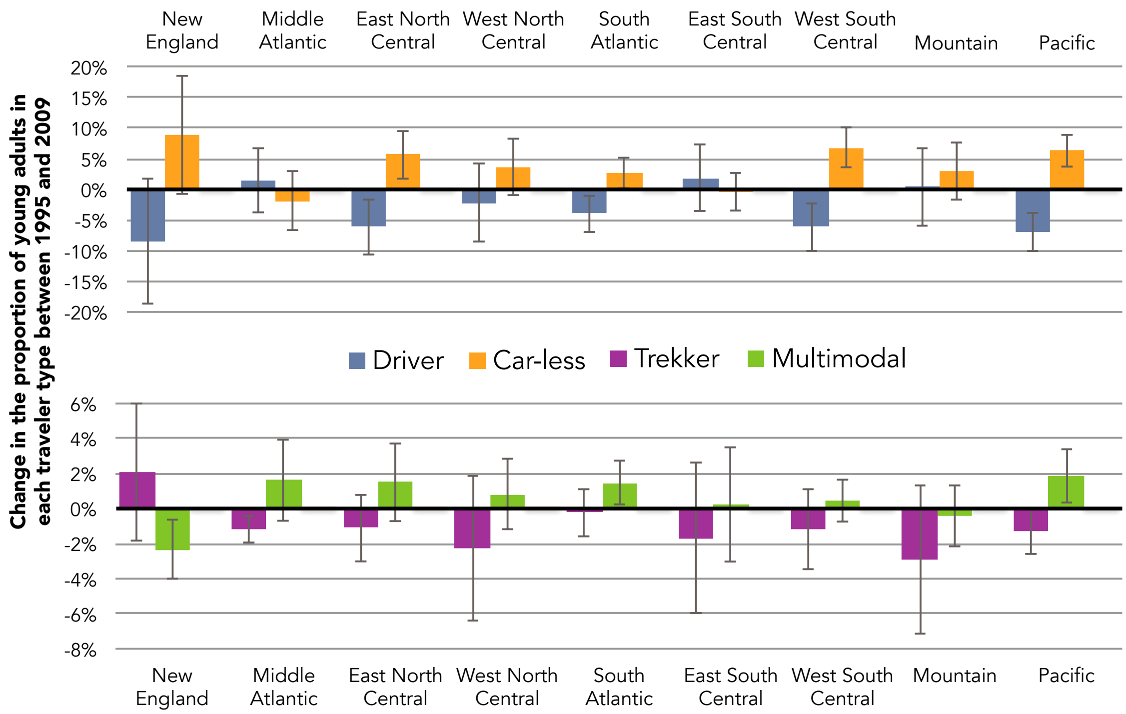


Note: Estimate of the prevalence of the traveler types in the young adult population using the provided survey weights. Source: 2009 NHTS, weighted values.

As Figure 87 indicates, the Pacific region experienced the most dramatic changes in travel overall. Over time there were far fewer Drivers and Trekkers and far more Car-less and Multimodals in the Pacific region. Other regions with dramatic changes included New England and East North Central. By contrast, there was essentially no change in the traveler types in the East South Central region and Middle

Atlantic. The Mountain region experienced a large decline in Trekkers, but non-significant increases in the other traveler types. The general trend of fewer Drivers and more Car-less over time was reversed in just one area (Middle Atlantic) and the change over time was not statistically significant.

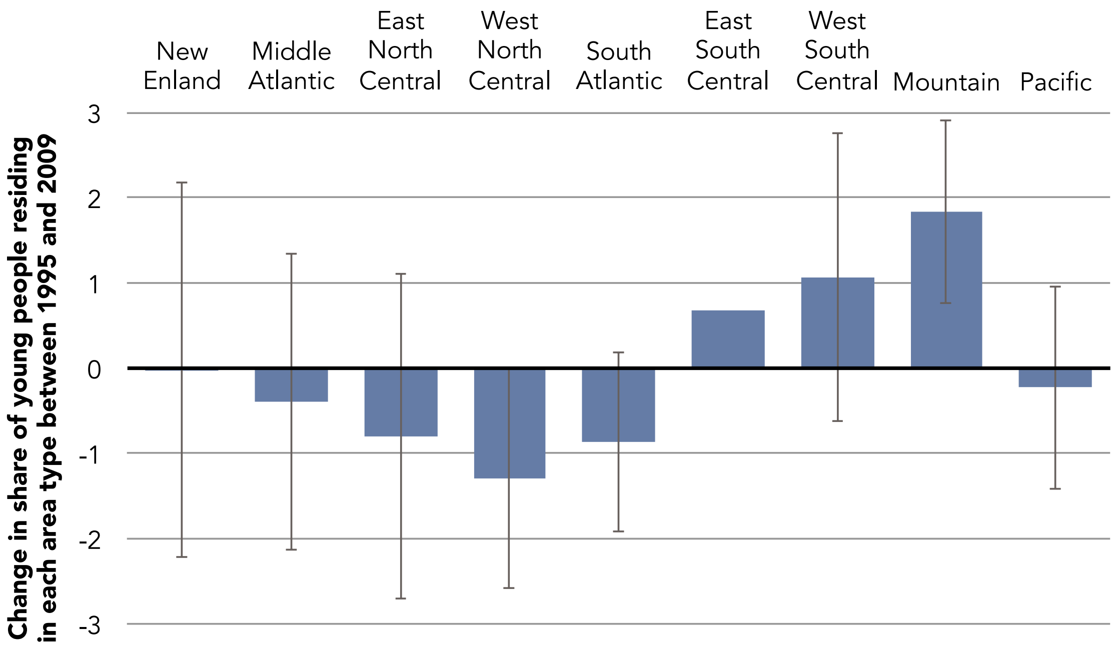
Figure 87 Change in the prevalence of the traveler types between 1995 and 2009 by region



Note: The prevalence of each traveler type in 1995 and 2009 are based on NHTS survey weights. Error bars reflect the 95 percent confidence interval around the estimate of the difference between survey years. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Finally, as Figure 88 indicates, relatively more young adults lived in the Mountain region (MT, ID, WY, NV, UT, CO, AZ, NM) and fewer lived in West North Central (ND, SD, MN, NE, IA, KS, MO) in 2009 than in 1995. Neither of these regions had a statistically significant independent relationship with traveler type, so the increase in the share of young people living in those regions did not contribute to the decline in vehicle travel.

Figure 88 Change in the residential location of young adults (Age 16 to 36) between 1995 and 2009: Region



Reported estimates are for the population of young adults using the provided survey weights. Bars above the axis indicate that a larger share of young adults lived in that type of location in 2009 than in 1995. Error bars reflect the 95 percent confidence interval around the estimate. Source: 1995 NPTS, 2001 and 2009 NHTS, weighted values.

Table 35 The Roles, Resources, and Race of Young Adults (Age 16 to 36) in the United States by Population Density (2009)

	<2,000	3,000	7,000	17,000	>25,000
ROLES					
Employed	69%	69%	70%	67%	62%
Live independently	54	55	54	59	66
Married	37	34	29	29	24
Has a child	20	16	17	16	16
RESOURCES					
Household income quintile(s)					
Lowest (0-20%)	24%	21%	26%	42%	45%
Middle (21-80%)	60	58	56	42	40
Highest (80-100%)	18	24	21	20	22
	102	103	103	104	106
Educational attainment (Age 26 to 36 only)					
Less than HS	5%	4%	6%	14%	15%
HS or more	95	96	94	86	85
College or more	42	52	44	43	42
Advanced deg.	16	20	17	19	23
RACE					
NH White	78%	64%	57%	40%	25%
NH Black	7	12	13	12	21
NH Asian	3	5	6	7	8
Hispanic	10	14	22	40	43
NH Other	2	4	2	2	3
	100	100	100	100	100

Note: All differences by density are significant at $p<0.05$. Source: 2009 NHTS, weighted values.

Table 36 The Roles, Resources, and Race of Young Adults (Age 16 to 36) in the United States by size of the metropolitan area (2009)

	Outside an MSA	<250 thousand	250-500 thousand	1/2 to 1 million	1 to 3 million	3+ million
ROLES						
Employed (%)	69%	72%	69%	65%	71%	68%
Live independently (%)	58	54	58	56	56	53
Married (%)	35	34	40	32	32	31
Has a child (%)	24	21	21	20	17	14
RESOURCES						
Household income quintile(s)						
Lowest (0-20%) (%)	31	34	26	31	23	24
Middle (21-80%) (%)	61	54	60	55	61	51
Highest (80-100%) (%)	8	12	13	15	17	26
	100	100	100	100	100	100
Educational attainment (Age 26 to 36 only)^						
Less than HS (%)	7	5	9	5	5	7
HS or more (%)	93	95	91	95	95	93
College or more (%)	35	36	44	42	46	49
Advanced degree (%)	11	12	15	15	18	22
RACE^						
NH White (%)	81	72	68	65	70	52
NH Black (%)	8	10	13	8	9	13
NH Asian (%)	1	1	4	4	3	8
Hispanic (%)	9	12	13	23	16	24
NH Other (%)	2	5	2	1	2	3
	100	100	100	100	100	100

Note: All differences by size of the metropolitan area are significant at p<0.05.
Source: 2009 NHTS, weighted values.

Model results: Residential location

Table 37 Multinomial logistic regression result: Population density by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.81***	-0.08	0.00
Live independently	0.75***	-0.64***	-0.92***
Married	-0.19*	-0.55***	-0.42***
Has a child	0.27**	-0.26	-0.36***
Female	-0.98***	-0.22**	-0.15**
Female X Has a child	-0.46***	-0.16	0.01
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.23*	-0.51***	-0.58***
Q3	0.2	-0.49***	-0.89***
Q4	0.16	-0.42***	-1.05***
Q5	0.16	-0.47***	-0.99***
RESIDENTIAL LOCATION:			
Population density (Base: Less than 1,500 people per square mile)			
3,000	-0.65***	0.23	0.35**
In 2001 (relative to 1995)	0.29	-0.09	0.00
In 2009 (relative to 1995)	-0.22	0.01	-0.43*
7,000	-0.37**	0.15	0.64***
In 2001 (relative to 1995)	-0.15	0.47*	0.12
In 2009 (relative to 1995)	-0.23	0.38	-0.31*
17,000	-0.88***	0.93***	1.26***
In 2001 (relative to 1995)	0.37	0.40	0.14
In 2009 (relative to 1995)	0.14	0.32	-0.20
30,000	-0.94*	1.66***	2.87***
In 2001 (relative to 1995)	0.86	0.02	0.04
In 2009 (relative to 1995)	0.96	-0.44	-0.59**
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.43***	0.32*	-0.23
250 to 500,000	-0.35**	0.17	-0.07
0.5 to 1 million	-0.07	-0.08	-0.12
1 to 3 million	-0.25*	0.24*	0.01
3 million or more	-0.14	0.27*	0.19*

Continued on the next page

Population density table (cont.)

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.32	0.21	-0.05
East North Central	-0.15	0.01	-0.56***
West North Central	0.24	-0.20	-0.60***
South Atlantic	0.16	-0.01	-0.54***
East South Central	0.31	-0.55*	-1.00***
West South Central	0.36	-0.39*	-0.82***
Mountain	0.23	-0.26	-0.64***
Pacific	-0.04	-0.30	-0.67***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.19	0.17	0.66***
NH Asian	-1.18***	0.00	0.12
Hispanic	-0.12	-0.23	0.29***
NH Other	0.27	0.10	0.25*
Year (Base: 1995)			
2001	0.15	0.02	0.12
2009	-0.04	0.12	0.49***
Constant	-3.68***	-2.57***	-0.98***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p. 98.

Table 38 Multinomial logistic regression result: Size of the metropolitan area by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.81***	-0.07	0.00
Live independently	0.75***	-0.63***	-0.92***
Married	-0.19*	-0.55***	-0.42***
Has a child	0.27**	-0.27	-0.37***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.45***	-0.15	0.01
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.22*	-0.52***	-0.59***
Q3	0.20	-0.49***	-0.89***
Q4	0.15	-0.42***	-1.05***
Q5	0.16	-0.47***	-0.99***
RESIDENTIAL LOCATION:			
Population density (Base: Less than 1,500 people per square mile)			
3,000	-0.59***	0.21	0.19*
7,000	-0.49***	0.44***	0.56***
17,000	-0.70***	1.17***	1.22***
30,000	-0.31	1.55***	2.67***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.44*	0.12	0.26
In 2001 (relative to 1995)	0.23	-0.01	-0.65*
In 2009 (relative to 1995)	-0.24	0.60	-0.81**
250 to 500,000	-0.21	-0.39	0.30
In 2001 (relative to 1995)	-0.03	0.90**	-0.39
In 2009 (relative to 1995)	-0.48	0.64	-0.57*
0.5 to 1 million	0.11	-0.21	0.00
In 2001 (relative to 1995)	0.01	-0.41	-0.14
In 2009 (relative to 1995)	-0.76*	0.66	-0.20
1 to 3 million	0.04	0.02	0.26
In 2001 (relative to 1995)	-0.10	0.24	-0.02
In 2009 (relative to 1995)	-0.99***	0.51	-0.58**
3 million or more	-0.16	-0.11	0.50***
In 2001 (relative to 1995)	0.14	0.42	-0.06
In 2009 (relative to 1995)	-0.07	0.76**	-0.74***

Continued on the next page

MSA size model cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	-0.32	0.21	-0.05
East North Central	-0.15	0.02	-0.57***
West North Central	0.23	-0.20	-0.61***
South Atlantic	0.17	0.01	-0.55***
East South Central	0.31	-0.54*	-1.00***
West South Central	0.37	-0.38*	-0.85***
Mountain	0.21	-0.25	-0.66***
Pacific	-0.03	-0.29	-0.68***
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.18	0.17	0.65***
NH Asian	-1.19***	0.01	0.13
Hispanic	-0.11	-0.24	0.29***
NH Other	0.27	0.10	0.25*
Year (Base: 1995)			
2001	0.14	-0.08	0.29
2009	0.21	-0.34	0.82***
Constant	-3.75***	-2.40***	-1.16***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p. 98.

Table 39 Did the relationship between population density and traveler type change over time while controlling for other variables?

	df	χ^2	$p>\chi^2$	sig.
TREKKER				
<2,500	2	0.42	0.655	
3,000	2	1.36	0.256	
17,000	2	0.78	0.457	
>25,000	2	1.47	0.230	
Joint	8	1.04	0.406	
MULTIMODAL				
<2,500	2	1.82	0.162	
3,000	2	1.61	0.200	
17,000	2	0.02	0.977	
>25,000	2	2.01	0.134	
Joint	8	1	0.434	
CAR-LESS				
<2,500	**2**	**2.96**	**0.052**	*
3,000	2	0.19	0.827	
17,000	2	0.12	0.886	
>25,000	2	0.6	0.552	
Joint	8	1.43	0.178	

Note: Results are a test of an interaction term between population density and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of Resources, Roles, Race, and other Residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. The Drivers and areas outside of metropolitan regions are the omitted categories.

Table 40 Did the relationship between metropolitan area and travel type change over time while controlling for other variables?

	df	χ^2	$p>\chi^2$	sig.
TREKKER				
<250 thousand	2	2.74	0.254	
250-500,000	2	2.33	0.312	
1/2 to 1 million	2	2.81	0.246	
1 to 3 million	2	4.58	0.101	
3+ million	2	0.04	0.982	
Joint	8	11.58	0.315	
MULTIMODAL				
<250 thousand	2	2.78	0.249	
250-500,000	2	4.34	0.114	
1/2 to 1 million	**2**	**13.32**	**0.001**	***
1 to 3 million	**2**	**8.67**	**0.013**	**
3+ million	**2**	**12.12**	**0.002**	***
Joint	**8**	**26.41**	**0.003**	***
CAR-LESS				
<250 thousand	2	4.26	0.119	
250-500,000	**2**	**8.19**	**0.017**	**
1/2 to 1 million	2	1.43	0.489	
1 to 3 million	**2**	**9.21**	**0.010**	**
3+ million	**2**	**51.91**	**0.000**	***
Joint	**8**	**75.48**	**0.000**	***

Note: Results are a test of an interaction term between size of the metropolitan area and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of Resources, Roles, Race, and other Residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. The Drivers and areas outside of metropolitan regions are the omitted categories.

Table 41 Multinomial logistic regression result: Census region by year

	Trekker	Multimodal	Car-less
ROLES:			
Employed	0.81***	-0.08	-0.01
Live independently	0.76***	-0.65***	-0.92***
Married	-0.19*	-0.55***	-0.43***
Has a child	0.26**	-0.25	-0.38***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.45***	-0.16	0.02
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.22*	-0.52***	-0.58***
Q3	0.19	-0.50***	-0.88***
Q4	0.15	-0.42***	-1.04***
Q5	0.15	-0.47***	-0.99***
RESIDENTIAL LOCATION:			
Population density (Base: Less than 1,500 people per square mile)			
3,000	-0.59***	0.21	0.18*
7,000	-0.47***	0.44***	0.55***
17,000	-0.67***	1.18***	1.22***
30,000	-0.29	1.54***	2.67***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.42***	0.32*	-0.22
250 to 500,000	-0.36**	0.17	-0.07
0.5 to 1 million	-0.05	-0.07	-0.12
1 to 3 million	-0.27**	0.25*	0.02
3 million or more	-0.13	0.29*	0.21**
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.18	0.16	0.65***
NH Asian	-1.19***	0.00	0.12
Hispanic	-0.13	-0.23	0.28***
NH Other	0.26	0.08	0.24*
Year (Base: 1995)			
2001	0.57	0.15	0.20
2009	0.86*	-1.14**	0.23

Continued on next page

Census model cont.

	Trekker	Multimodal	Car-less
Census Division (Base: New England)			
Middle Atlantic	0.15	-0.14	0.12
In 2001 (relative to 1995)	-0.20	0.01	-0.12
In 2009 (relative to 1995)	-1.41**	1.35**	-0.40
East North Central	0.33	-0.46*	-0.74***
In 2001 (relative to 1995)	-0.46	0.17	0.20
In 2009 (relative to 1995)	-0.98	1.57***	0.30
West North Central	0.90**	-0.86**	-0.63**
In 2001 (relative to 1995)	-0.77	0.57	-0.33
In 2009 (relative to 1995)	-1.26**	1.62**	0.39
South Atlantic	0.48*	-0.49*	-0.43**
In 2001 (relative to 1995)	-0.21	0.23	-0.28
In 2009 (relative to 1995)	-0.69	1.54***	-0.05
East South Central	0.72**	-0.70	-0.88***
In 2001 (relative to 1995)	-0.23	-0.27	0.15
In 2009 (relative to 1995)	-0.99	1.06	-0.42
West South Central	0.68**	-0.62**	-1.04***
In 2001 (relative to 1995)	-0.11	-0.23	0.05
In 2009 (relative to 1995)	-0.86	1.25**	0.46
Mountain	0.93**	-0.38	-0.39
In 2001 (relative to 1995)	-0.80	0.06	-0.51
In 2009 (relative to 1995)	-1.34*	0.70	-0.19
Pacific	0.50*	-0.69***	-0.84***
In 2001 (relative to 1995)	-0.62	-0.19	0.32
In 2009 (relative to 1995)	-0.98*	1.64***	0.17
Constant	-4.13***	-2.30***	-0.90***

Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p. 98.

APPENDIX F: RACE/ETHNICITY

Table 42 Sample size by race/ethnicity and year

Year: 1995

	Drivers	Trekkers	Multimodals	Car-less
NH White	15,379	719	523	1,446
NH Black	968	38	83	530
NH Asian	405	5	32	126
Hispanic	909	33	49	318
NH Other	503	20	29	138
	18,164	815	716	2,558

Year: 2001

	Drivers	Trekkers	Multimodals	Car-less
NH White	15,866	913	586	1,437
NH Black	651	36	55	390
NH Asian	600	5	29	183
Hispanic	1343	59	51	419
NH Other	521	29	30	100
	18,981	1042	751	2,529

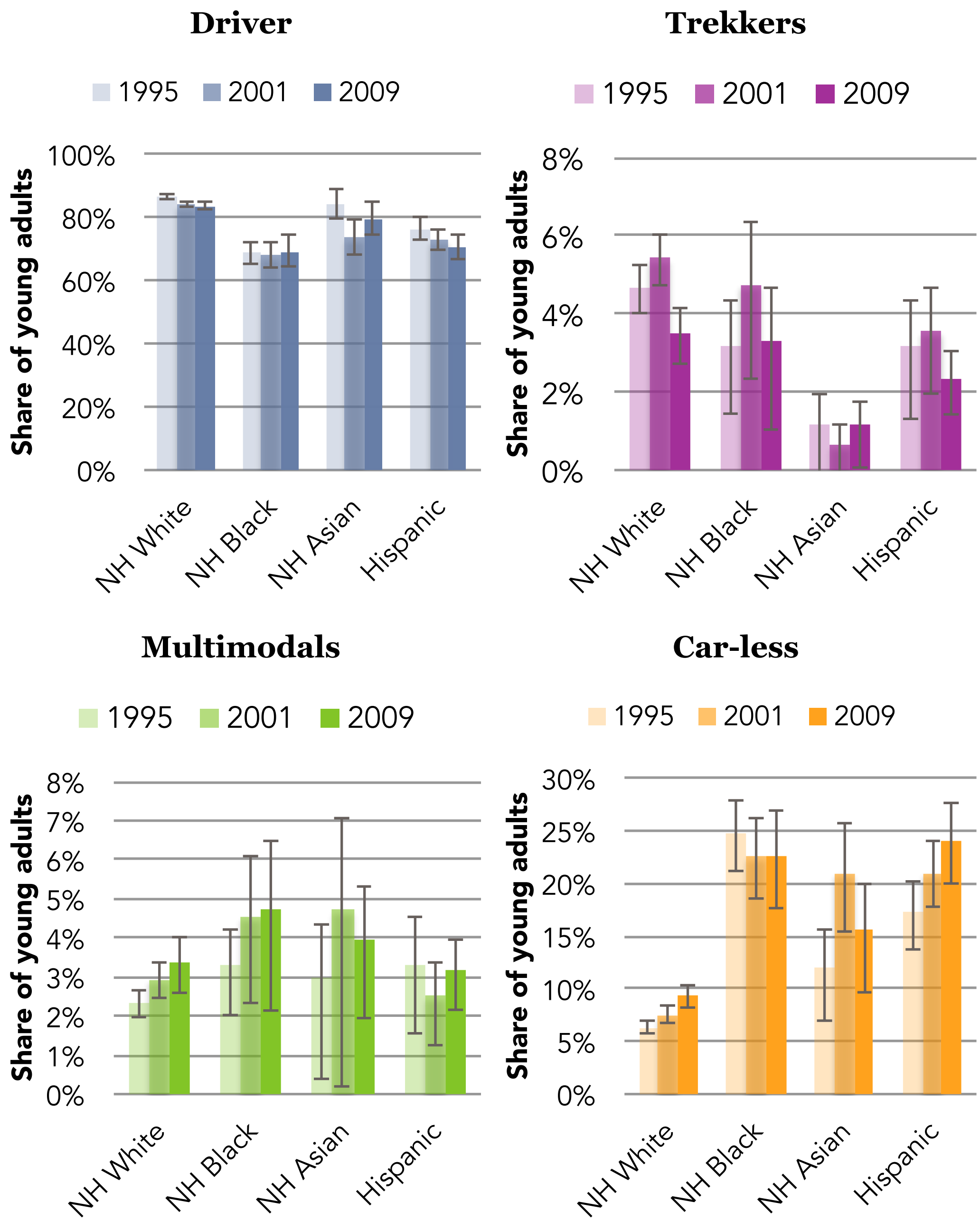
Year: 2009

	Drivers	Trekkers	Multimodals	Car-less
NH White	18,251	761	719	1,802
NH Black	1242	65	75	338
NH Asian	923	15	45	120
Hispanic	2593	97	133	631
NH Other	559	29	29	96
	23,568	967	1001	2,987

Note: There were exceptionally small samples of minority Trekkers. Source: 1995 NPTS, and 2001 and 2009 NHTs, weighted values.

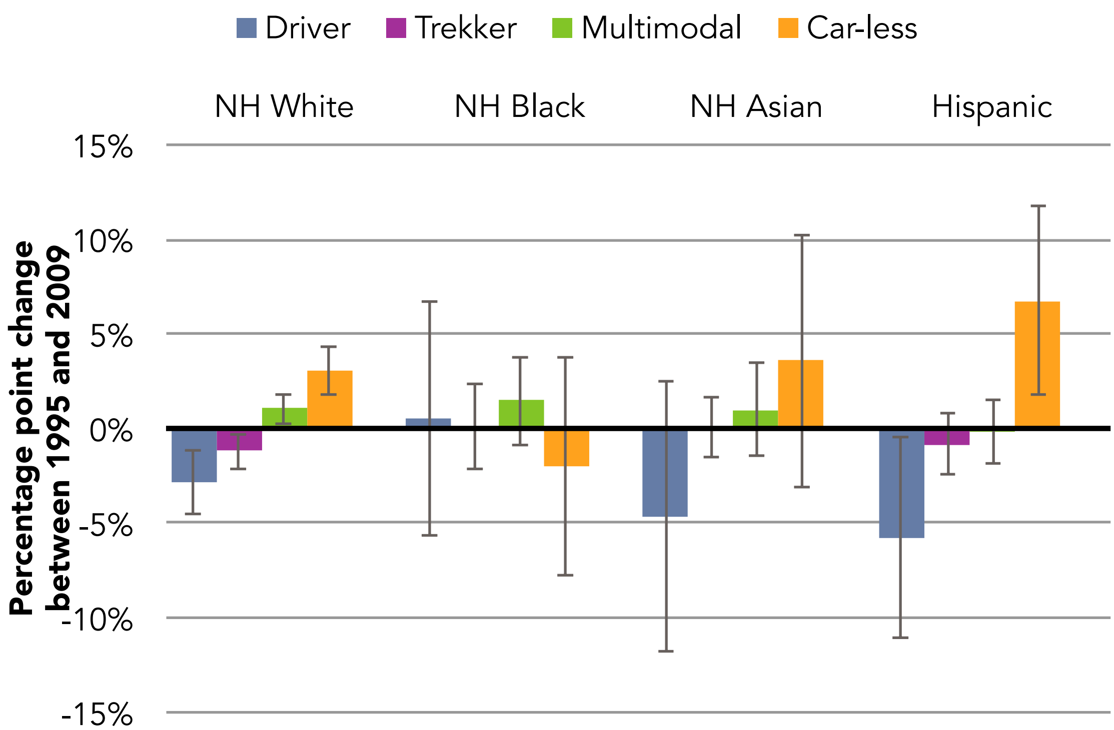
Descriptive data on traveler type by race/ethnicity

Figure 89 Prevalence of the traveler types by race/ethnicity and year for young adults (Age 16 to 36)



Note: Chart is based on descriptive data only. Error bars reflect the 95 percent confidence interval around the population estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 90 Change in the prevalence of the traveler types between 1995 and 2009 by race and ethnicity



Note: Solid bars reflect the best estimate of the percentage point change in the prevalence of each traveler type between 1995 and 2009. Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Table 43 Racial differences in Roles, Resources, and Residential location of young adults (Age 16 to 36) in 2009

	NH White	NH Black	NH Asian	Hispanic
RESOURCES				
Employed (%)	**72**	62	65	65
Household income quintile(s)				
Lowest (0-20%) (%)	18	**39**	18	50
Middle (21-80%) (%)	**61**	52	55	41
Highest (81-100%) (%)	21	9	**27**	9
Educational attainment (Age 26 to 36 only)				
Less than HS (%)	3	4	1	**24**
HS or more (%)	97	96	**99**	76
College or more (%)	48	35	**81**	25
Advanced degree (%)	21	9	**27**	9
RESIDENTIAL LOCATION				
Population density (People per square mile)				
<2,000 (%)	**54**	30	27	25
3,000 (%)	18	21	**22**	15
7,000 (%)	22	**31**	30	**31**
17,000 (%)	5	9	13	**19**
>25,000(%)	2	9	9	**11**
	100	100	100	100
Size of the metropolitan area				
Outside a metro (%)	**22**	13	3	9
<250 thousand (%)	**8**	6	2	5
250-500 thousand (%)	9	**11**	7	6
1/2 to 1 million (%)	8	6	6	**10**
1 to 3 million (%)	**23**	18	15	19
3+ million (%)	31	46	**67**	51
	100	100	100	100

Notes: All differences by race/ethnicity are statistically significant at p< 0.05. The highest row percentage is in bold, and the lowest is underlined. All differences by race/ethnicity were statistically significant, except for those noted in italics. Source: 2009 NHTS, weighted values.

Table 44 Household income quintile by race/ethnicity and year

SHARE IN THE LOWEST INCOME QUINTILE

	NH White	NH Black	NH Asian	Hispanic
1995	17%	36%	19%	39%
2001	18%	43%	22%	53%
2009	18%	39%	18%	50%

SHARE IN THE HIGHEST INCOME QUINTILE

	NH White	NH Black	NH Asian	Hispanic
1995	19%	7%	22%	9%
2001	23%	6%	24%	6%
2009	21%	9%	27%	9%

Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Model results: Race/ethnicity

Table 45 Multinomial logistic regression result: Race/ethnicity by year

	Trekker	**Multimodal**	**Car-less**
ROLES:			
Employed	0.76***	-0.64***	-0.93***
Live independently	-0.83***	0.08	0
Married	-0.20*	-0.54***	-0.43***
Has a child	0.26**	-0.27	-0.37***
Female	-0.99***	-0.22**	-0.16***
Female X Has a child	-0.46***	-0.15	0.01
RESOURCES: Household income quintile (Base: Lowest income quintile)			
Q2	0.23*	-0.51***	-0.59***
Q3	0.22*	-0.50***	-0.89***
Q4	0.17	-0.43***	-1.05***
Q5	0.19	-0.48***	-0.99***
RESIDENTIAL LOCATION:			
Population density (Base: 50 people per square mile)			
300	-0.12	0.04	0.14
750	-0.30*	0.11	0.08
1,500	-0.56***	0.15	0.36**
3,000	-0.84***	0.30*	0.35**
7,000	-0.74***	0.53***	0.73***
17,000	-0.96***	1.27***	1.38***
30,000	-0.58*	1.64***	2.87***
Size of the metropolitan area (Base: Outside an MSA)			
Less than 250,000	-0.32**	0.28	-0.27*
250 to 500,000	-0.25*	0.14	-0.11
0.5 to 1 million	0.05	-0.11	-0.19
1 to 3 million	-0.11	0.2	-0.05
3 million or more	0	0.23	0.13
Census Division (Base: New England)			
Middle Atlantic	-0.33	0.2	-0.04
East North Central	-0.17	0.01	-0.56***
West North Central	0.23	-0.22	-0.60***
South Atlantic	0.16	-0.01	-0.52***
East South Central	0.3	-0.56*	-0.97***
West South Central	0.35	-0.39*	-0.82***
Mountain	0.22	-0.25	-0.64***
Pacific	-0.03	-0.3	-0.66***

Continued on the next page

RACE table (cont.)

	Trekker	Multimodal	Car-less
RACE/ETHNICITY: (Base: NH White)			
NH Black	0.01	0.15	0.89***
In 2001 (relative to 1995)	0.33	0.03	-0.27
In 2009 (relative to 1995)	0.33	0	-0.48**
NH Asian	-1.05*	-0.21	-0.21
In 2001 (relative to 1995)	-0.75	0.42	0.66**
In 2009 (relative to 1995)	0.28	0.18	0.25
Hispanic	-0.11	0.05	0.28*
In 2001 (relative to 1995)	-0.02	-0.48	0
In 2009 (relative to 1995)	0.05	-0.34	0.01
NH Other	0.24	-0.47	0.11
In 2001 (relative to 1995)	0.01	0.38	0.35
In 2009 (relative to 1995)	0.08	0.98*	0.06
Year (Base: 1995)			
2001	0.17*	0.24**	0.20**
2009	-0.13	0.27*	0.32***
Constant	-2.73***	-2.81***	-1.04***

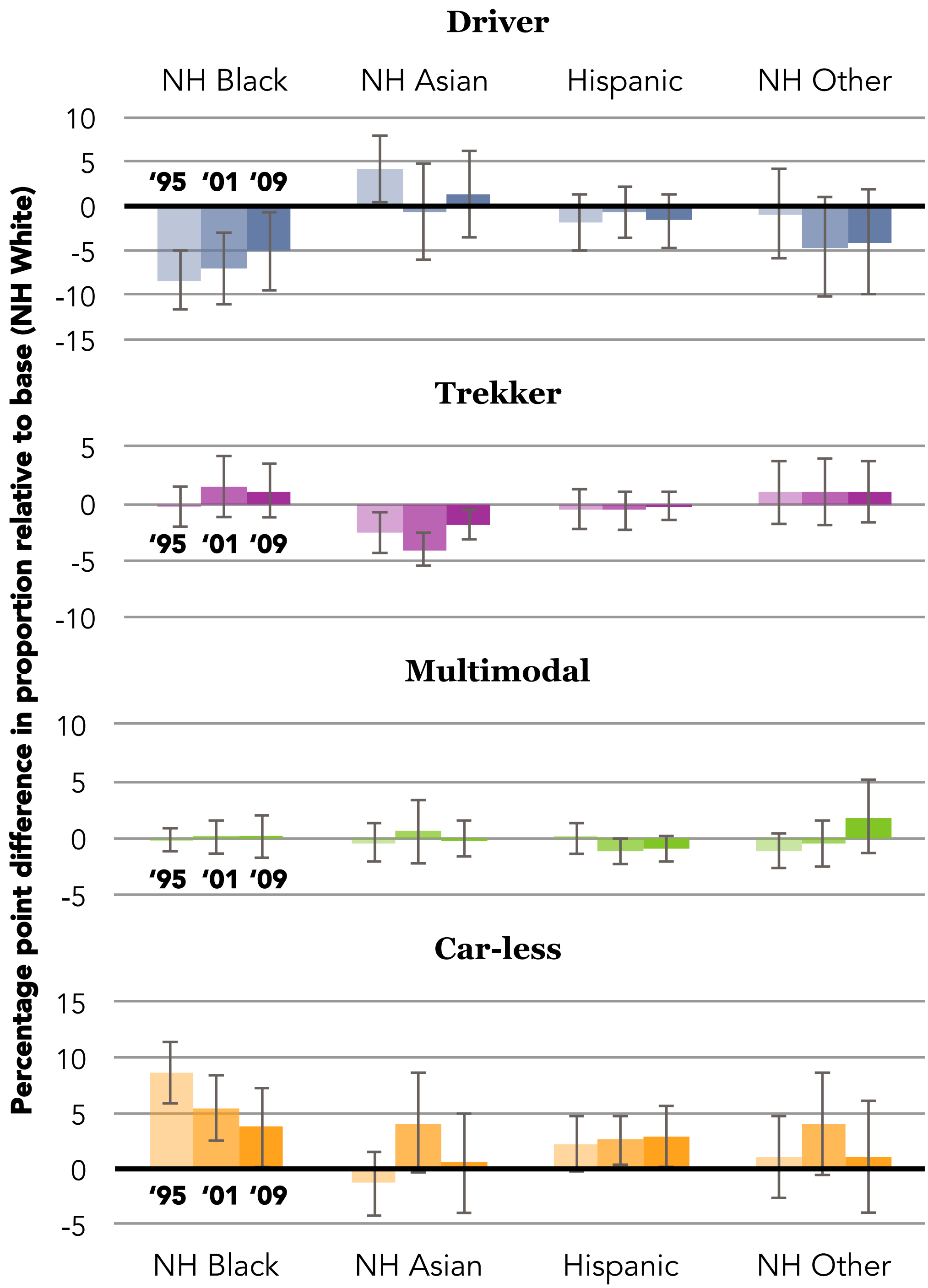
Note: Result of a multinomial logistic regression model with traveler type as the dependent variable. Driver is the omitted category. Fit statistics for the model can be found in Table 13 on p. 98.

Table 46 Did the relationship between race/ethnicity and traveler type change over time?

	df	χ^2	$p>\chi^2$	sig.
TREKKERS				
NH Black	2	1.14	0.5655	n.s.
NH Asian	2	3.22	0.1995	n.s.
Hispanic	2	1.47	0.4800	n.s.
NH Other	2	1.39	0.4991	n.s.
Joint	8	6.61	0.5787	n.s.
MULTIMODALS				
NH Black	2	2.62	0.2693	n.s.
NH Asian	2	4.23	0.1209	n.s.
Hispanic	2	2.14	0.3433	n.s.
NH Other	2	1.19	0.5526	n.s.
Joint	8	10.07	0.2599	n.s.
CAR-LESS				
NH Black	**2**	**23.42**	**0.0000**	*******
NH Asian	**2**	**24.93**	**0.0000**	*******
Hispanic	2	3.31	0.1912	n.s.
NH Other	2	1.72	0.4225	n.s.
Joint	**8**	**46.42**	**0.0000**	*******

Note: Results are a test of an interaction term between race/ethnicity and year in a multinomial logistic regression model with traveler type as the dependent variable. Control variables include measures of Resources, Roles, Race, and other Residential location variables. Significant changes over time are indicated in bold. If the test is significant, the relationship changed over time. The Drivers and areas outside of metropolitan regions are the omitted categories.

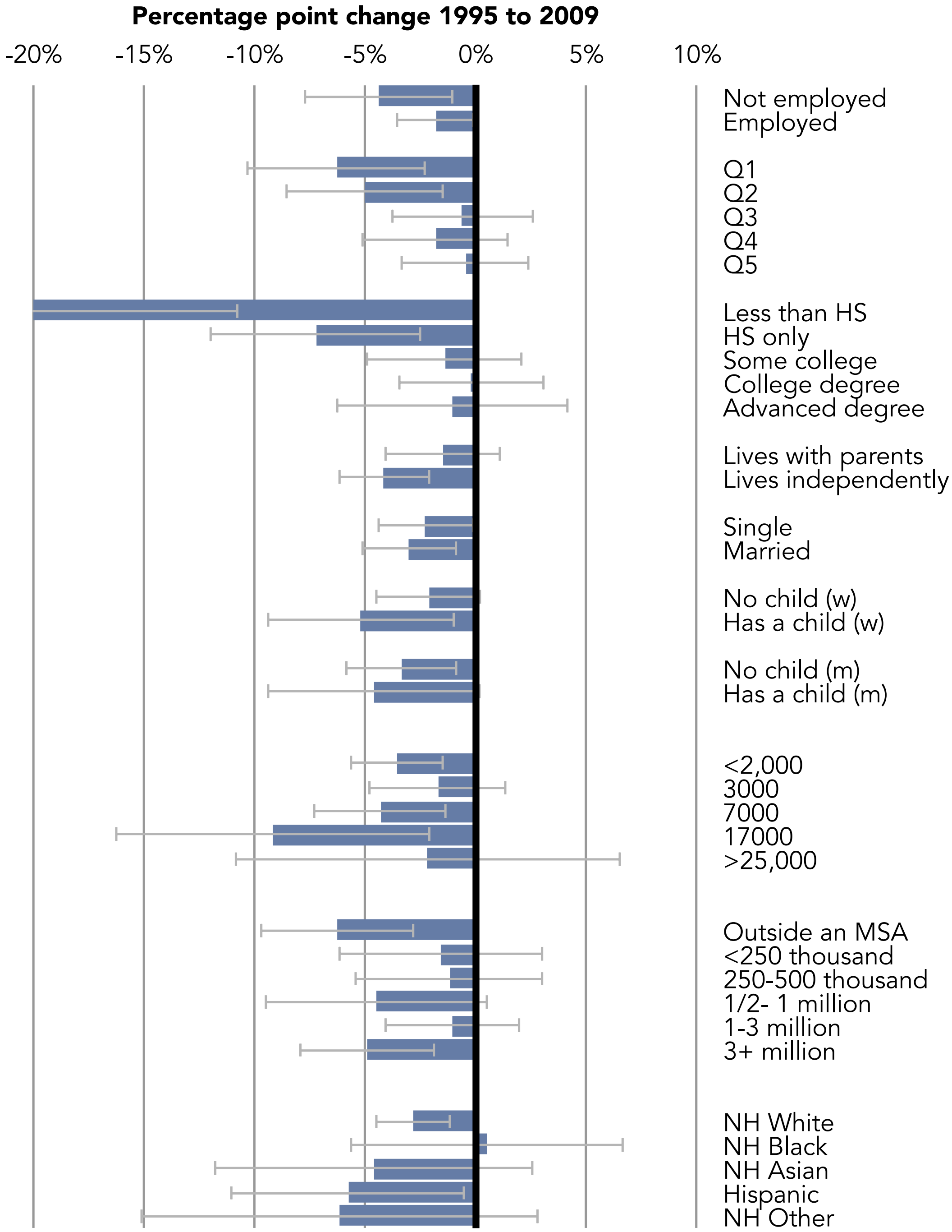
Figure 91 Independent effect of race/ethnicity by year



Note: Solid bars reflect the best estimate of the independent effect of race/ethnicity on the propensity to be in each traveler type. These are results form a multinomial logistic model with traveler type as the dependent variable. Model controls for differences in resources, roles, and residential location (see Chapter 4 for more details). Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

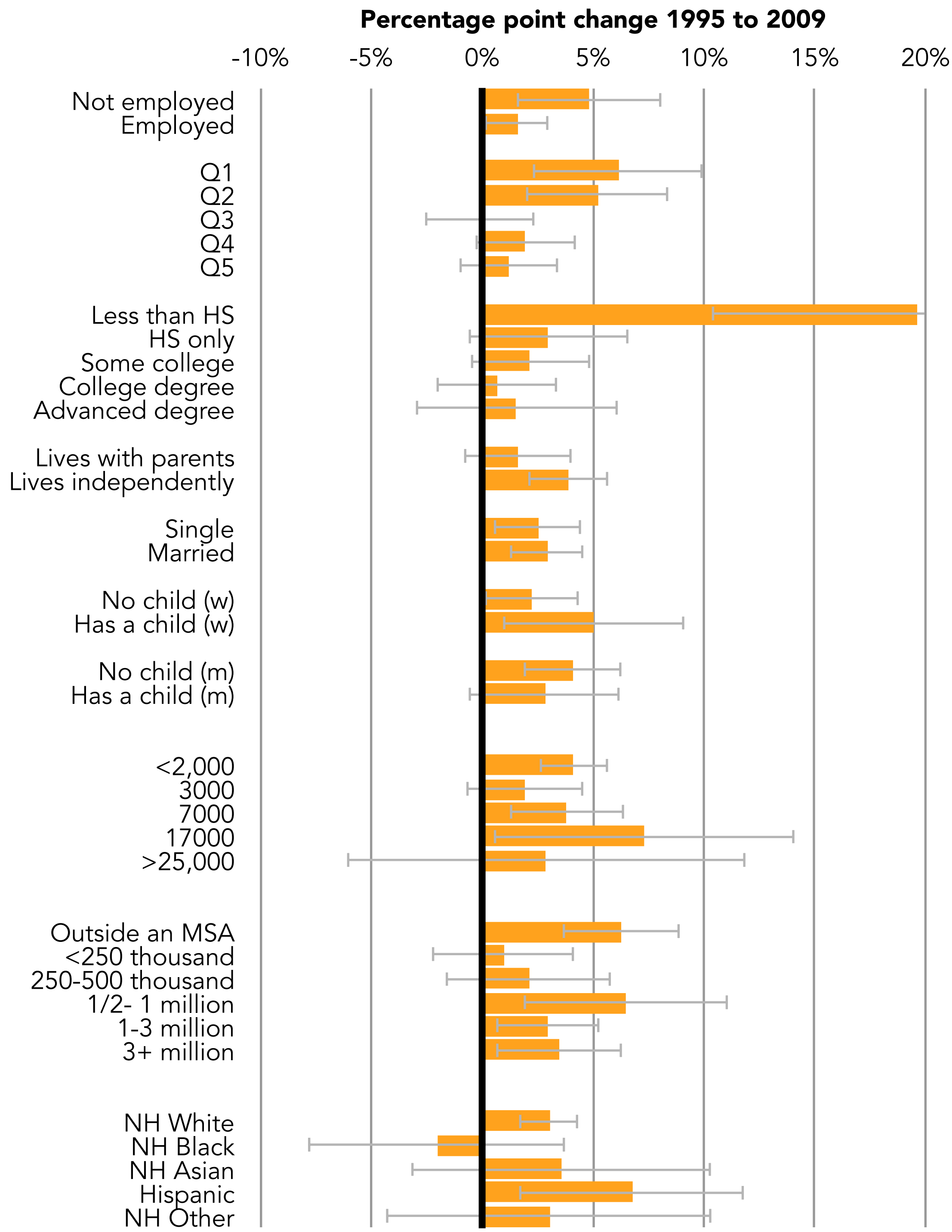
APPENDIX G: CONCLUSION

Figure 92 Synthesis: Change in the prevalence of Drivers between 1995 and 2009 for young adults (Age 16 to 36)



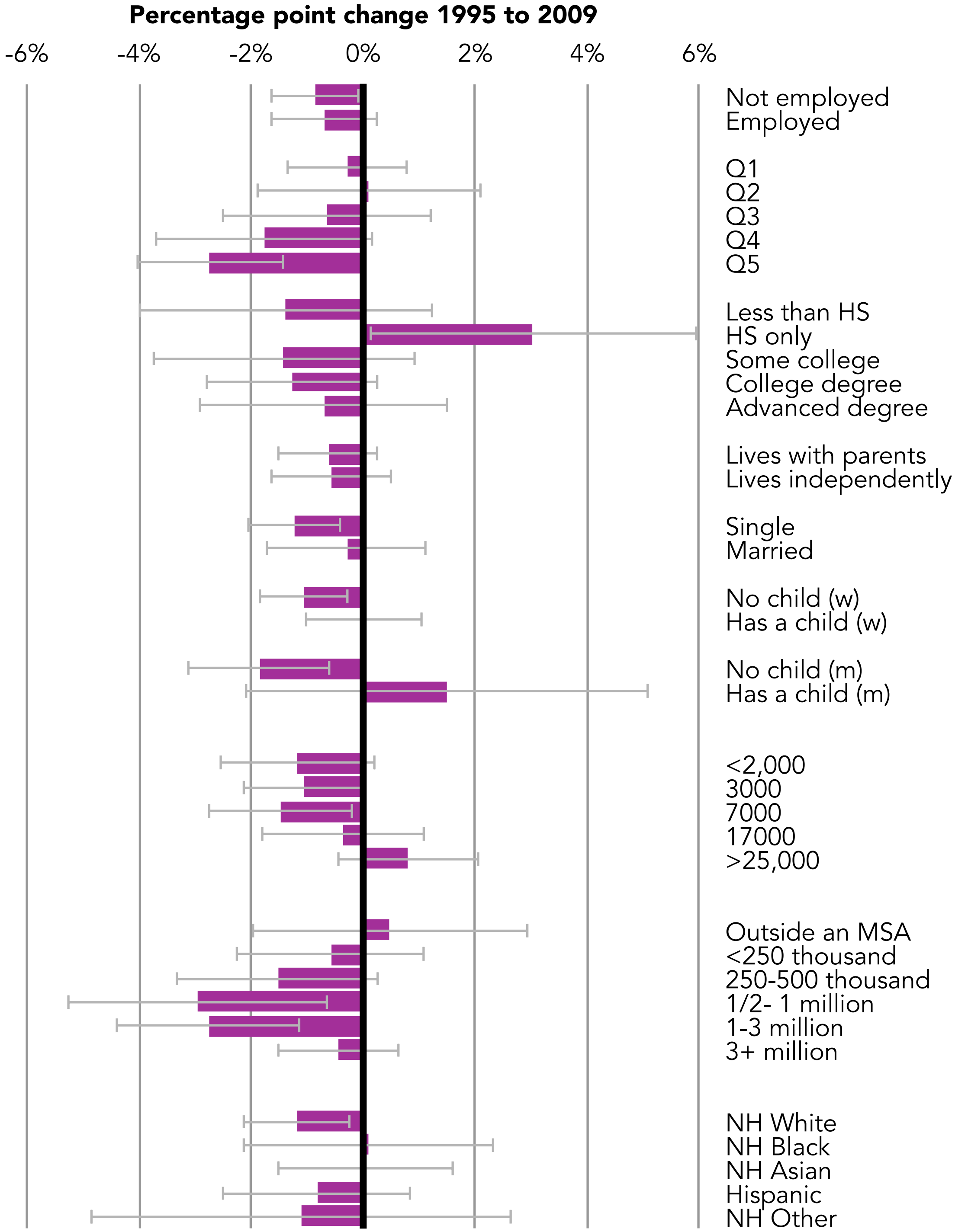
Note: Error bars reflect the 95 percent confidence interval around that estimate. The bar for Less than high school is -20 percent and the error bar extends to just under -30 percent. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 93 Synthesis: Change in the prevalence of Car-less young adults (Age 16 to 36) between 1995 and 2009



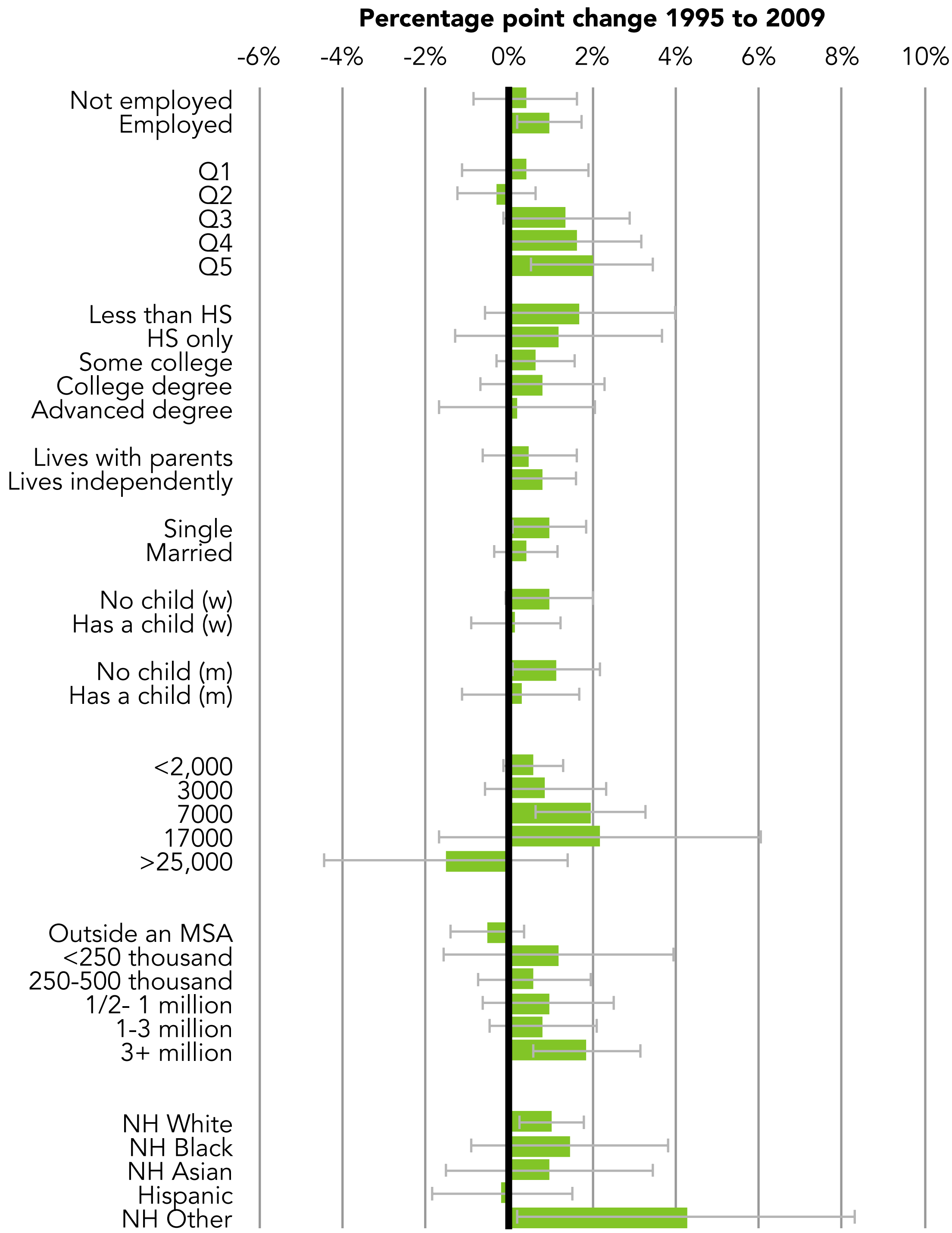
Note: Error bars reflect the 95 percent confidence interval around that estimate. The bar for Less than high school is 20 percent and the error bar extends to just under 30 percent. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 94 Synthesis: Change in the prevalence of Long-distance Trekkers between 1995 and 2009 for young adults (Age 16 to 36)



Note: Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

Figure 95 Synthesis: Change in the prevalence of Multimodals between 1995 and 2009 for young adults (Age 16 to 36)



Note: Error bars reflect the 95 percent confidence interval around that estimate. Source: 1995 NPTS, and 2001 and 2009 NHTS, weighted values.

SOURCES

Abel, J. R., R. Deitz and Y. Su (2014). Are Recent College Graduates Finding Good Jobs? Current Issues in Economics and Finance. New York, Federal Reserve Bank of New York. **20:** 8.

Alcindor, Y. (2012). Research shows that teens in no hurry to be behind the wheel. USA Today.

American Association of State Highway and Transportation Officials (2013). Commuting Mode Choice Commuting in America 2013**:** 32.

American Association of State Highway and Transportation Officials (2013). Vehicle and Transit Availability. Commuting in America 2013. Washington, DC, American Association of State Highway and Transportation Officials**:** 24.

American Public Transportation Association (2014). Public Transportation Ridership Report, American Public Transportation Association. **Fourth Quarter 2013:** 31.

Anable, J. (2005). "'Complacent Car Addicts' or 'Aspiring Environmentalists'? Identifying travel behaviour segments using attitude theory." Transport Policy **12**(1): 65-78.

Anable, J., B. Lane and T. Kelay (2006). An evidence base review of public attitudes to climate change and transport behaviour. London, The Department for Transport**:** 228.

Arnett, J. J. (2004). Emerging adulthood: The winding road from the late teens through the twenties. New York City, Oxford University Press.

Ayres, I. and P. Siegelman (1995). "Race and Gender Discrimination in Bargaining for a New Car." The American Economic Review **85**(3): 304-321.

Bagley, M. N. and P. L. Mokhtarian (2002). "The impact of residential neighborhood type on travel behavior: a structural equations modeling approach." The Annals of Regional Science **36**(2): 279-297.

Bamberg, S., I. Ajzen and P. Schmidt (2003). "Choice of Travel Mode in the Theory of Planned Behavior: The Roles of Past Behavior, Habit, and Reasoned Action." Basic and Applied Social Psychology **25**(3): 175-187.

Banks, R. R. (2011). Is marriage for white people?: How the African American marriage decline affects everyone, Penguin.

Bartko, W. T. and J. Eccles (2003). "Adolescent Participation in Structured and Unstructured Activities: A Person-Oriented Analysis." Journal of Youth and Adolescence **32**(4): 233-241.

Baslington, H. (2008). "Travel Socialization: A Social Theory of Travel Mode Behavior." International Journal of Sustainable Transportation **2**(2): 91-114.

Baum, C. L. (2009). "The effects of vehicle ownership on employment." Journal of Urban Economics **66**(3): 151-163.

Baxandall, P. (2013). Moving Off the Road: A State-by-State Analysis of the National Decline in Driving, CALPIRG.

Beige, S. and K. Axhausen (2012). "Interdependencies between turning points in life and long-term mobility decisions." Transportation **39**(4): 857-872.

Ben-Akiva, M. and T. J. Atherton (1977). "Methodology for short-range travel demand predictions: analysis of carpooling incentives." Journal of Transport Economics and Policy: 224-261.

Bento, A. M., M. L. Cropper, A. M. Mobarak and K. Vinha (2005). "The Effects of Urban Spatial Structure on Travel Demand in the United States." Review of Economics and Statistics **87**(3): 466-478.

Berube, A., E. Deakin and S. Raphael (2006). Socioeconomic Differences in Household Automobile Ownership Rates: Impications for Evacuation Policy. University of California Transportation Center Working PApers. California, University of California Transportation Center.

Bianchi, S. M., M. A. Milkie, L. C. Sayer and J. P. Robinson (2000). "Is Anyone Doing the Housework? Trends in the Gender Division of Household Labor." Social Forces **79**(1): 191-228.

Bishop, B. (2009). The Big Sort: Why the Clustering of Like-Minded American is Tearing Us Apart. New York, Houghton Mifflin Harcourt.

Bittman, M., P. England, L. Sayer, N. Folbre and G. Matheson (2003). "When Does Gender Trump Money? Bargaining and Time in Household Work." American Journal of Sociology **109**(1): 186-214.

Blumenberg, E. (2004). "En-gendering Effective Planning: Spatial Mismatch, Low-Income Women, and Transportation Policy." Journal of the American Planning Association **70**(3): 269-281.

Blumenberg, E. and M. Manville (2004). "Beyond the Spatial Mismatch: Welfare Recipients and Transportation Policy." Journal of Planning Literature **19**(2): 182-205.

Blumenberg, E. and M. Smart (2011). Migrating to Driving: Exploring the Multiple Dimensions of Immigrants' Automobile Use. Auto Motives: Understanding Car Use Behaviors. K. Lucas, E. Blumenberg and R. Weinberger. Bingley United Kingdom, Emerald Group Publishing Limited**:** 225-252.

Blumenberg, E., B. Taylor, M. Smart, K. Ralph, M. Wander and S. Brumbaugh (2012). What's Youth Got To Do With It? Exploring the Travel Behavior of Teens and Young Adults. Los Angeles, UCLA Institute of Transportation Studies.

Bordoff, J. and P. Noel (2008). "Pay-as-you-drive auto insurance: A simple way to reduce driving-related harms and increase equity." Hamilton Project Discussion Paper.

Bostock, L. (2001). "Pathways of disadvantage? Walking as a mode of transport among low-income mothers." Health & Social Care in the Community **9**(1): 11-18.

Bradbury, K. (2011). Trends in U.S. Family Income Mobility, 1969-2006. Working Papers. Boston, Federal Reserve Bank of Boston**:** 51.

Brand, C. and B. Boardman (2008). "Taming of the few—The unequal distribution of greenhouse gas emissions from personal travel in the UK." Energy Policy **36**(1): 224-238.

Bricker, J., A. B. Kennickell, K. B. Moore and J. Sabelhaus (2012). Changes in U.S. Family Finances from 2007 to 2010: Evidence from the Survey of Consumer Finances. Federal Reserve Bulletin. Washington D.C., Board of Governors of the Federal Reseve System **98:** 80.

Buehler, R. and A. Hamre (2014). "The multimodal majority? Driving, walking, cycling, and public transportation use among American adults." Transportation: 1-21.

Bureau of Labor Statistics (2012). E-16 Unemployment rates by age, sex, race, and Hispanic or Latino ethnicity. Household Data.

Burhouse, S., K. Chu, R. Goodstein, J. Northwod, Y. Osaki and D. Sharma (2014). National Survey of Unbanked and Underbanked Households, Federal Deposit Insurance Corporation**:** 64.

Cao, J. (2015). Millennials Embrace Cars, Defying Predictions of Sales Implosion. Bloomberg.

Carnevale, A. P., A. R. Hanson and A. Gulish (2013). Failure to Launch: Structural Shift and the New Lost Generation, Georgetown University**:** 76.

Carrasco, J. and E. Miller (2006). "Exploring the propensity to perform social activities: a social network approach." Transportation **33**(5): 463-480.

Carter, P. L. (2009). "Geography, Race, and Quantification." The Professional Geographer **61**(4): 465-480.

Casselman, B. (2014). "The American Middle Class Hasn't Gotten a Raise in 15 Years." FiveThirtyEight http://fivethirtyeight.com/features/the-american-middle-class-hasnt-gotten-a-raise-in-15-years/ 2015.

Chatman, D. G. (2009). "Residential choice, the built environment, and nonwork travel: evidence using new data and methods." Environment and Planning A **41**(5): 1072-1089.

Chatman, D. G. (2014). "Estimating the effect of land use and transportation planning on travel patterns: Three problems in controlling for residential self-selection." The Journal of Transport and Land Use **7**(3): 10.

Chen, Q., S. Le Vine and J. Polak (2014). Generation Next: The changing travel habits of pre-driving age young people in Britain. London, Center for Transport Studies, Imperial College**:** 46.

Chu, X., S. E. Polzin, J. R. Rey and E. T. Hill (2000). Mode Choice by People of Color for Non-Work Travel. Travel Patterns of People of Color. Washington D.C., U.S. Department of Transportation**:** 137-180.

Cisco (2011). 2011 Cisco Connected World Technology Report**:** 110.

Clifton, K. (2003). "Independent Mobility among Teenagers: Exploration of Travel to After-School Activities." Transportation Research Record **1854**: 74-80.

Cohn, D. V., J. S. Passel, W. Wang and G. Livingston (2011). Barely Half of U.S. Adults are Married- A Record Low. Pew Social & Demographic Trends, Pew Research Center.

Contrino, H. and N. McGuckin (2009). Travel Demand in the Context of Growing Diversity. TR News. Washinton DC, Transportaiton Research Board. **264:** 5.

Copeland, L. (2013). Young people driving less, embrace other transportation. USA Today.

Cortright, J. (2009). Walking the Walk: How Walkability Raises Home Values in U.S. Cities, CEOs for Cities.

Cortright, J. (2011). The Young and Restless in a Knowledge Economy. Portland, Oregon, CEOs for Cities**:** 63.

Costa, D. L. and M. E. Kahn (1999). "Power Couples: Changes in the Locational Choice of the College Educated, 1940-1990." National Bureau of Economic Research Working Paper Series **No. 7109**: 47.

Crane, R. (2000). "The Influence of Urban Form on Travel: An Interpretive Review." Journal of Planning Literature **15**(1): 3-23.

Cumming, G. (2014). "The New Statistics: Why and How." Psychological Science **25**(1): 7-29.

Cunningham, M. (2007). "Influences of Women's Employment on the Gendered Division of Household Labor Over the Life Course: Evidence From a 31-Year Panel Study." Journal of Family Issues **28**(3): 422-444.

Currie, G. and A. Delbosc (2009). Car ownership and low income on the urban fringe-Benefit or hindrance? 32nd Australian Transport Research Forum. Aukland, Australi.

Curry, A. and C. Hughes The Future of Sustainable Transport in Europe, Ford Motor Company**:** 58.

Davis, B. and T. Dutzik (2012). Transportation and the New Generation: Why Young People Are Driving Less and What it Means for Transportation Policy, Frontier Group and US PIRG Education Fund.

Delbosc, A. and G. Currie (2012). "Choice and disadvantage in low-car ownership households." Transport Policy **23**(0): 8-14.

Delbosc, A. and G. Currie (2012). Using online discussion forums to study attitudes toward cars and transit among young people in Victoria. Australian Transport Research Forum. Perth, Australia.

Delbosc, A. and G. Currie (2013). "Causes of Youth Licensing Decline: A Synthesis of Evidence." Transport Reviews **33**(3): 271-290.

DeNavas-Walt, C. and B. D. Proctor (2014). Income and Poverty in the United States: 2013. Current Population Reports. Washington DC, United States Census Bureau and U.S. Department of Commerce**:** 72.

Dill, J. and N. McNeil (2013). "Four Types of Cyclists?" Transportation Research Record: Journal of the Transportation Research Board **2387**(-1): 129-138.

Döring, L., J. Albrecht, J. Scheiner and C. Holz-Rau (2014). "Mobility Biographies in Three Generations – Socialization Effects on Commute Mode Choice." Transportation Research Procedia **1**(1): 165-176.

Dovey, R. (2015). "NYC, San Francisco on Different Paths to Pedestrian Safety." Next City https://nextcity.org/daily/entry/vision-zero-new-york-san-francisco-pedestrian-safety.

Dutzik, T. and P. Baxandall (2013). A New Direction: Our Changing Relationship with Driving and the Implications for America's Future, Frontier Group and U.S. Pirg Education Fund.

Dynarski, M., M. Moore and J. Mullens (2003). When Schools Stay Open Late: The National Evaluation of the 21st-Century Community Learning Centers Program First Year Findings. Washington D.C., U.S. Department of Education.

Eccles, J. S., B. L. Barber, M. Stone and J. Hunt (2003). "Extracurricular Activities and Adolescent Development." Journal of Social Issues **59**(4): 865-889.

Edin, K. and M. J. Kefalas (2005). Promises I can Keep: Why Poor Women Put Motherhood Before Marriage. London, University of California Press.

Elder, G. H. J., M. K. Johnson and R. Crosnoe (2003). The Emergence and Development of Life Course Theory. Handbook of the Life Course. J. T. Mortimer and M. J. Shanahan. New York, Kluwer Academic**:** 3-22.

Ellwood, D. (1986). The Spatial Mismatch Hypothesis: Are There Teenage Jobs Missing in the Ghetto? The Black Youth Employment Crisis. R. B. Freeman and H. J. Holzer. Chicago, University of Chicago Press. **0-226-26164-6:** 147-190.

Eshghi, A., D. Haughton, P. Legrand, M. Skaletsky and S. Wollford (2011). "Identifying Groups: A Comparison of Methodologies." Journal of Data Science **9**: 271-291.

Ewing, R. and R. Cervero (2010). "Travel and the Built Environment." Journal of the American Planning Association **76**(3): 265-294.

Farber, H. S. (2007). Is the company man an anachronism? Trends in Long-Term Employment in the United States, 1973 to 2006. The Price of Independence. S. Danziger and C. E. Rouse. New York, Russell Sage Foundation**:** 56-83.

Farber, S. and A. Páez (2011). "Running to stay in place: the time-use implications of automobile oriented land-use and travel." Journal of Transport Geography **19**(4): 782-793.

Federal Highway Administration (2014). New Data Show U.S. Driving at Highest Level in Six Years. Federal Highway Administration. Washington DC, Federal Highway Administration. **30-14**.

Ferris, B., K. Watkins and A. Borning (2010). OneBusAway: Results from providing real-time arrival information for public transit. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Atlanta, Georgia, USA, ACM**:** 1807-1816.

Frey, W. H. (2011). Melting Pot Cities and Suburbs: Racial and Ethnic Change in Metro America in the 2000s. State of Metropolitan America. Washington DC, Brookings Institution**:** 16.

Frey, W. H. (2014). "Multiracial Marriage on the Rise." The Avenue http://www.brookings.edu/blogs/the-avenue/posts/2014/12/18-multiracial-marriage-frey 2015.

Fry, R. (2013). A Rising Share of Young Adults Live in Their Parents' Home. Washington D.C., Pew Research Center**:** 19.

Fry, R. (2013). Young Adults After the Recession: Fewer Homes, Fewer Cars, Less Debt. Washington D.C., Pew Research Center**:** 39.

Fry, R. and K. Parker (2012). Record Shares of Young Adults Have Finished Both High School and College, Pew Research Center.

Garceau, T. J., C. Atkinson-Palombo and N. Garrick (2015). Peak Car Travel in the United States: A Two-Decade Long Phenomenon at the State Level. Transportation Research Board Annual Meeting. Washington, DC.

Giuliano, G. (2003). "Travel, location and race/ethnicity." Transportation Research Part A: Policy and Practice **37**(4): 351-372.

Glaeser, E. L. and J. D. Gottlieb (2006). Urban Resurgence and the Consumer City. Cambridge, Massachusetts, Harvard Institute of Economic Research. **2109:** 47.

Glaeser, E. L., M. E. Kahn and J. Rappaport (2000). Why do the Poor Live in Cities? Cambridge, Massachusetts, Harvard Institute of Economic Research. **1891:** 62.

Gobillon, L., H. Selod and Y. Zenou (2007). "The Mechanisms of Spatial Mismatch." Urban Studies **44**(12): 2401-2427.

Goldenberg, L. (1998). "Choosing a Household Survey Method: Results of Dallas—Fort Worth Pretest." Transportation Research Record: Journal of the Transportation Research Board **1625**(1): 86-94.

Goodwin, P. and K. Van Dender (2013). "'Peak Car' — Themes and Issues." Transport Reviews **33**(3): 243-254.

Grengs, J. (2010). "Job accessibility and the modal mismatch in Detroit." Journal of Transport Geography **18**(1): 42-54.

Grimal, R., R. Collet and J.-L. Madre (2013). "Is the Stagnation of Individual Car Travel a General Phenomenon in France? A Time-Series Analysis by Zone of Residence and Standard of Living." Transport Reviews **33**(3): 291-309.

Harvard Graduate School of Education (2011). Pathways to Prosperity. Massachusetts, Harvard University**:** 44.

Haustein, S., C. A. Klöckner and A. Blöbaum (2009). "Car use of young adults: The role of travel socialization." Transportation Research Part F: Traffic Psychology and Behaviour **12**(2): 168-178.

Hensher, D. A. (2007). "Sustainable public transport systems: Moving towards a value for money and network-based approach and away from blind commitment." Transport Policy **14**(1): 98-102.

Hickey, R. (2014). Inclusionary Upzoning: Tying Growth to Affordability. Inclusionary Housing, Center for Housing Policy**:** 20.

Hymowitz, K. S., J. S. Carroll, W. B. Wilcox and K. Kaye (2013). Knot Yet: The Benefits and Costs of Delayed Marriage in America, National Marriage Project at the University of Virginia.

Ihlanfeldt, K. R. and D. L. Sjoquist (1998). "The spatial mismatch hypothesis: A review of recent studies and their implications for welfare reform." Housing Policy Debate **9**(4): 849-892.

Johnson, V., G. Currie and J. Stanley (2008). Drivers of disadvantage and prosperity-is car ownership a good indicator? Australian Transport Research Forum. Gold Coast, Queensland, Australia.

Jorritsma, P. and J. Berveling (2014). Not carless, but car-later. Netherlands, KiM Netherlands Institute for Transport Policy Analysis**:** 65.

Kahn, L. B. (2010). "The long-term labor market consequences of graduating from college in a bad economy." Labour Economics **17**(2): 303-316.

Kahn, M. E. and E. A. Morris (2009). "Walking the Walk: The Association Between Community Environmentalism and Green Travel Behavior." Journal of the American Planning Association **75**(4): 389-405.

Kamruzzaman, M. and J. Hine (2011). "Participation index: a measure to identify rural transport disadvantage?" Journal of Transport Geography **19**(4): 882-899.

Kenyon, S., G. Lyons and J. Rafferty (2002). "Transport and social exclusion: investigating the possibility of promoting inclusion through virtual mobility." Journal of Transport Geography **10**(3): 207-219.

King, D., M. Manville and M. Smart (2014). Use of public transit isn't surging. Washington Post.

Knapp, L. G., J. E. Kelly-Reid and S. A. Ginder (2012). Enrollment in Postsecondary Institutions, Fall 2011; Financial Statistics, Fiscal Year 2011; and Graduation Rates, Selected Cohorts, 2003-2008. Washinton DC, U.S. Department of Education

National Center for Education Statistics**:** 23.

Kochhar, R. and D. V. Cohn (2011). Fighting poverty in a tough economy, Americans move in with their relatives. Social and Deomographic Trends. Washington DC, Pew Research Center**:** 49.

Kodransky, M. and G. Lewenstein (2014). Connecting Low-Income People with Opportunity with Shared Mobility, Institute for Transportation and Development Policy and Living Cities**:** 41.

Kuhnimhof, T., R. Buehler, M. Wirtz and D. Kalinowska (2012). "Travel trends among young adults in Germany: increasing multimodality and declining car use for men." Journal of Transport Geography **24**(0): 443-450.

Lanza, S. T., L. M. Collins, D. R. Lemmon and J. L. Schafer (2007). "PROC LCA: A SAS Procedure for Latent Class Analysis." Structural Equation Modelling **14**(4): 671-694.

Lanzendorf, M. (2003). Mobility biographies. A new perspective for understanding travel behaviour. TenthInternational Conference on Travel Behaviour Research, Lucerne/Switzerland, 10.-15.8.

Lanzendorf, M. (2010). "Key Events and Their Effect on Mobility Biographies: The Case of Childbirth." International Journal of Sustainable Transportation **4**(5): 272-292.

Larsen, J., K. W. Axhausen and J. Urry (2006). "Geographies of Social Networks: Meetings, Travel and Communications." Mobilities **1**(2): 261-283.

Le Vine, S., P. Jones, M. Lee-Gosselin and J. Polak (2014). "Is Heightened Environmental Sensitivity Responsible for Drop in Young Adults' Rates of Driver's License Acquisition?" Transportation Research Record: Journal of the Transportation Research Board **2465**(-1): 73-78.

Le Vine, S., C. Latinopoulos and J. Polak (2013). "A tenuous result: re-analysis of the link between internet-usage and young adults’ driving-licence holding Comments on ‘Recent changes in the age composition of drivers in 15 countries’." Traffic Injury Prevention **14**(6): 654.

Le Vine, S., C. Latinopoulos and J. Polak (2014). "What is the relationship between online activity and driving-licence-holding amongst young adults?" Transportation **41**(5): 1071-1098.

Leaf, W. A., B. G. Simons-Morton, J. L. Hartos and V. S. Northrup (2008). "Driving miles estimates by teen drivers: how accurate are they?" Injury prevention : journal of the International Society for Child and Adolescent Injury Prevention **14**(1): 59-61.

Lenhart, A., R. Ling, S. Campbell and K. Purcell (2010). Teens and Mobile Phones, Pew Research Center Internet & American Life Project.

Levine, J. (2005). Zoned Out: Regulation, Markets, and Choices in Transportation and Metropolitan Land Use. Washington, DC, Resources for the Future.

Levine, J., J. Grengs, Q. Shen and Q. Shen (2012). "Does Accessibility Require Density or Speed?" Journal of the American Planning Association **78**(2): 157-172.

Levinson, D. M. and K. J. Krizek (2005). The Machine for Access. Access to Destinations. D. M. Levinson and K. J. Krizek. Oxford, Elsevier Ltd.**:** 1-10.

Lipman, B. J. (2006). A Heavy Load: The Combined Housing and Transportation Burdens of Working Families, Center for Housing Policy**:** 32.

Livingston, G. (2011). In a Down Economy, Fewer Births. Pew Social and Demographic Trends, Pew Research Center**:** 15.

Lofquist, D., T. Lugaila, M. O'Conell and S. Feliz (2012). Households and Families: 2010. 2010 Census Briefs. Washington DC, U.S. Census Bureau**:** 21.

Lovejoy, K. (2012). Mobility fulfillment among low-car households: Implications for reducing auto dependence in the United States. Doctoro of Philosophy, University of California, Davis.

Lucas, K. (2012). "Transport and social exclusion: Where are we now?" Transport Policy **20**(0): 105-113.

Lyons, G. (2003). "The introduction of social exclusion into the field of travel behaviour." Transport Policy **10**(4): 339-342.

Magidson, J. and J. K. Vermunt (2002). "A Nontechnical Introduction to Laten Class Models." Statistical Innovations **1**: 15.

Mans, J., E. Interrante, L. Lem, J. Mueller and M. Lawrence (2012). "Next Generation of Travel Behavior." Transportation Research Record: Journal of the Transportation Research Board **2323**(-1): 90-98.

Manville, M., A. Beata and D. Shoup (2013). "Turning Housing Into Driving: Parking Requirements and Density in Los Angeles and New York." Housing Policy Debate **23**(2): 350-375.

Manville, M. and D. Shoup (2004). "People, parking, and cities." Access **25**: 2-8.

Martin, E. and S. Shaheen (2011). "The Impact of Carsharing on Household Vehicle Ownership." Access **38**: 22.

Martin, J. A., B. E. Hamilton, M. J. K. Osterman and S. C. Curtin (2013). Births: Final Data for 2012. National Vital Statistics Reports. Washington D.C., U.S. Department of Health and Human Services. **62:** 68.

McCartt, A. T., E. R. Teoh, M. Fields, K. A. Braitman and L. A. Hellinga (2010). Graduated Licensing Laws and Fatal Crashes of Teenage Drivers: A National Study, Insurance Institute for Highway Safety.

McDonald, N. and M. Trowbridge (2009). "Does the built environment affect when American teens become drivers? Evidence from the 2001 National Household Travel Survey." Journal of Safety Research **40**(3): 177-183.

McKenzie, B. (2014). Modes less traveled-Bicycling and walking to work in the United States: 2008-2012. American Community Survey Reports. Washington D.C., U.S. Census Bureau. **ACS-25:** 18.

McLanahan, S. (2004). "Diverging destinies: How children are faring under the second demographic transition." Demography **41**(4): 607-627.

McLanahan, S. and C. Percheski (2008). "Family Structure and the Reproduction of Inequalities." Annual Review of Sociology **34**(1): 257-276.

McNeil, D. (2006). Error in Self-reported Mileage for California Vehicles, California Department of Insurance**:** 27.

Mitchell, M. N. (2012). Interpreting and Visualizing Regression Models Using Stata. College Station TX, STATA Press.

Mokhtarian, P. (2009). "If telecommunication is such a good substitute for travel, why does congestion continue to get worse?" Transportation Letters **1**(1): 1-17.

Mokhtarian, P. L. (2002). "Telecommunications and Travel: The Case for Complementarity." Journal of Industrial Ecology **6**(2): 43-57.

Mortimer, J. T. and M. J. Shanahan (2003). Handbook of the Life Course. New York, Kluwer Academic Publishers.

Naess, P. (2014). "Tempest in a teapot: The exaggerated problem of transport-related residential self-selection as a source of error in empirical studies." The Journal of Transport and Land Use **7**(3): 23.

National Center for Education Statistics (2013). Median annual earnings of ful-time year-round workers 25 to 34 years old and full-time year-round workers as a percentage of the labor force, by sex, race/ethnicity, and educational attainment: Selected years, 1995 through 2012. N. C. f. E. Statistics.

National Employment Law Project (2012). The Low-Wage Recovery and Growing Inequality. Data Brief. New York, National Employment Law Project**:** 8.

Noble, B. (2005). Why Are Some Young People Choosing Not to Drive? European Transport Conference. Strasbourg, France, Association for European Transport.

Nutley, S. D. (1996). "Rural transport problems and non-car populations in the USA: A UK perspective." Journal of Transport Geography **4**(2): 93-106.

OECD Organisation for Economic Co-operation and Development Note: What are equivalence scales? OECD Project on Income Distribution and Poverty, OECD**:** 2.

Offer, S. and B. Schneider (2011). "Revisiting the Gender Gap in Time-Use Patterns: Multitasking and Well-Being among Mothers and Fathers in Dual-Earner Families." American Sociological Review **76**(6): 809-833.

Office of Energy Efficiency and Renewable Energy (2014). Fact #835: Average Historical Annual Gasoline Pump Price, 1929-2013 Office of Energy Efficiency and Renewable Energy.

Ong, P. M. (2002). "Car ownership and welfare-to-work." Journal of Policy Analysis and Management **21**(2): 239-252.

Ong, P. M. and M. A. Stoll (2007). "Redlining or risk? A spatial analysis of auto insurance rates in Los Angeles." Journal of Policy Analysis and Management **26**(4): 811-830.

Oreopoulos, P., T. von Wachter and A. Heisz (2012). "The Short- and Long-Term Career Effects of Graduating in a Recession." American Economic Journal: Applied Economics **4**(1): 1-29.

Osgood, D. W., G. Ruth, J. S. Eccles, J. E. Jacobs and B. L. Barber (2005). Six paths to adulthood. On the Frontier of Adulthood: Theory, Research, and Public Policy. R. A. J. Settersten, F. F. Furstenberg and R. G. Rumbaut. Chicago, University of Chicago Press.

Parker, K. (2012). The Boomerang Generation: Feeling OK about Living with Mom and Dad. Pew Social & Demographic Trends. Washing D.C., Pew Research Center**:** 20.

Passel, J. S., G. Livingston and D. V. Cohn (2012). Explaining Why Minority Births Now Outnumber White Births. Social & Demographic Trends, Pew Research Center.

Pendall, R., C. Hayes, A. George, Z. McDade, C. Dawkins, J. S. Jeon, E. Knaap, E. Blumenberg, G. Pierce and M. Smart (2014). Driving to Opportunity: Understanding the Links among Transportation Access, Residential Outcomes, and Economic Opportunity for Housing Voucher Recipients, Urban Institute**:** 75.

Pew Research Center (2012). The Lost Decade of the Middle Class: Fewer, Poorer, Gloomier. Pew Social & Demographic Trends, Pew Research Center.

Pew Research Center (2014). Milleninials in Adulthood: Detached from Institutions, Networked with Friends, Pew Research Center**:** 68.

Pew Research Center (2014). The Rising Cost of Not Going to College, Pew Research**:** 64.

Pisarski, A. (2006). Commuting in America III. T. R. Board. Washington D.C., Transportation Research Board.

Ralph, K. (2014). Who will drive me to soccer practice? What declining auto use rates mean for teens. Transportation Research Board Annual Meeting. Washington DC.

Ralph, K., B. Taylor and M. Smart (2014). What explains the gender gap in schlepping? . Transportation Research Board Annual Meeting, Washington DC, Transportation Research Board.

Raphael, S. and L. Rice (2002). "Car ownership, employment, and earnings." Journal of Urban Economics **52**(1): 109-130.

Raphael, S. and M. A. Stoll (2001). Can Boosting Minority Car-Ownership Rates Narrow Inter-Racial Employment Gaps? Working Papers, Berkeley Program on Housing and Urban Policy. Berkeley, Institute of Business and Economic Research, UC Berkeley. **# W00-002**.

rholeywell. (2013). "Who Uses Public Transportaiton in Your City?" Governing Data Retrieved February 23, 2015, 2015, from http://www.governing.com/gov-data/transportation-infrastructure/public-transportation-demographics-ridership-data-for-cities.html.

Rosenthal, E. (2013). The End of Car Culture. New York Times. New York City.

Ross, D. (2014). Millennials Don't Car About Owning Cars, And Car Makers Can't Figure Out Why. Fast Company.

Sayer, L. C. (2005). "Gender, Time and Inequality: Trends in Women's and Men's Paid Work, Unpaid Work and Free Time." Social Forces **84**(1): 285-303.

Scheiner, J. (2007). "Mobility Biographies: Elements of a Biographical Theory of Travel Demand (Mobilitätsbiographien: Bausteine zu einer biographischen Theorie der Verkehrsnachfrage)." Erdkunde **61**(2): 161-173.

Scheiner, J. and C. Holz-Rau (2013). "A comprehensive study of life course, cohort, and period effects on changes in travel mode use." Transportation Research Part A: Policy and Practice **47**(0): 167-181.

Schneider, D. (2011). "Wealth and the Marital Divide." American Journal of Sociology **117**(2): 627-667.

Schoettle, B. and M. Sivak (2013). The reasons for the recent decline in young driver licensing in the U.S. Michigan, University of Michigan Transportation Research Institute**:** 25.

Schreiber, J. B. and A. J. Pekarik (2014). "Technical Note: Using Latent Class Analysis versus K-means or Hierarchical Clustering to Understand Museum Visitors." Curator: The Museum Journal **57**(1): 45-59.

Schwanen, T. I. M., M. Dijst and M.-P. Kwan (2008). "ICTs and the decoupling of everyday activities, space and time: Introduction." Tijdschrift voor economische en sociale geografie **99**(5): 519-527.

Settersten, R. A. J., F. F. Furstenberg and R. G. Rumbaut (2006). On the Frontier of Adulthood. Chicago, University of Chicago Press.

Settersten, R. A. J. and B. Ray (2010). Not Quite Adults: Why 20-Somethings Are Choosing a Slower Path to Adulthood, and Why It's Good for Everyone. New York, Bantam Books.

Sexton, S., J. Wu and D. Zilberman (2012). How High Gas Prices Triggered the Housing Crisis: Theory and Empirical Evidence, Selected Works**:** 33.

Shanahan, M. J. (2000). "Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective." Annual review of sociology **26**(1): 667-692.

Shen, Q. (2001). "A Spatial Analysis of Job Openings and Access in a U.S. Metropolitan Area." Journal of the American Planning Association **67**(1): 53-68.

Shoup, D. (2011). The High Cost of Free Parking. Chicago, American Planning Association.

Shults, R. A. and A. F. Williams (2013). "Trends in driver licensing status and driving among high school seniors in the United States, 1996–2010." Journal of Safety Research **46**(0): 167-170.

Sivak, M. and B. Schoettle (2011). "Recent Changes in the Age Composition of Drivers in 15 Countries." Traffic Injury Prevention **13**(2): 126-132.

Sivak, M. and B. Schoettle (2012). "Update: Percentage of Young Persons With a Driver's License Continues to Drop." Traffic Injury Prevention **13**(4): 341-341.

Smart, M., E. Blumenberg and B. Taylor (2013). Trip-making Participation of Youth: Trends From 1990-2009. 92nd Annual Meeting of the Transportation Research Board. Washington D.C.

Smock, P. J., W. D. Manning and M. Porter (2005). "“Everything's There Except Money”: How Money Shapes Decisions to Marry Among Cohabitors." Journal of Marriage and Family **67**(3): 680-696.

Social Exclusion Unit (2003). Making the connections: transport and social exclusion. London.

Stein, J. (2013). Millennials: The Me Me Me Generation. Time.

Stiglitz, J., A. Sen and J.-P. Fitoussi (2009). Report by the Commission on the Measurement of Economic Performance and Social Progress**:** 292.

Sullivan, T. A., E. Warren and J. L. Westbrook (2006). "Less Stigma or More Financial Distress? An Empirical Analysis of the Extraordinary Increase in Bankruptcy Filings." Stanford Law Review **59**(2): 213-256.

Tang, L. and P. Thakuriah (2012). "Ridership effects of real-time bus information system: A case study in the City of Chicago." Transportation Research Part C: Emerging Technologies **22**(0): 146-161.

Tavernise, S. (2013). Fertility Rate Stabilizes as the Economy Grows. The New York Times. New York City.

Taylor, B., K. Ralph, E. Blumenberg and M. Smart (2013). Who knows about kids these days? Analyzing the determinants of youth and adult person-miles of travel in 1990, 2001, and 2009? 92nd Annual Meeting of the Transportation Research Board. Washington D.C.

Taylor, P., K. Parker, R. Kochhar, R. Fry, C. Funk, E. Patten and S. Motel (2012). Young, Underemployed and Optimistic: Coming of Age, Slowly, in a Tough Economy. Social & Demographc Trends. Washington D.C., Pew Research Center**:** 67.

Tefft, B. C., A. F. Williams and J. G. Grabowski (2013). Timing of Driver's License Acquisition and Reasons for Delay among Young People in the United States, 2012. Washington DC, AAA Foundation for Traffic Safety**:** 23.

Thakuriah, P., S. Menchu and L. Tang (2010). "Car Ownership Among Young Adults." Transportation Research Record: Journal of the Transportation Research Board **2156**(1): 1-8.

Thompson, D. and J. Weissmann (2012). The Cheapest Generation. The Atlantic. Washington D.C. **September 2012**.

Thornton, A. (2009). Surveys of public attitudes and behaviours toward the environment-tracker survey. London, Department for Environment, Food, and Rural Affairs (United Kingdom)**:** 91.

Tirachini, A., D. A. Hensher and S. R. Jara-Díaz (2010). "Comparing operator and users costs of light rail, heavy rail and bus rapid transit over a radial public transport network." Research in Transportation Economics **29**(1): 231-242.

Touré (2011). Who's Afraid of Post-Blackness?: What it Means to be Black Now. New York City, Free Press.

Transit Center (2014). Who's on Board: 2014 Mobility Attitudes Survey, Transit Center**:** 27.

Transportation Research Board (2009). Driving and the Built Environment: Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions. Transportation Research Board Special Report, National Research Council. **298**.

Trowbridge, M. and N. McDonald (2008). "Urban Sprawl and Miles Driven Daily by Teenagers in the United States." American Journal of Preventive Medicine **34**(3): 202-206.

U.S. Census Bureau. (2015). "Young Adults Then and Now." Census Explorer, 2015, from https://http://www.census.gov/censusexplorer/censusexplorer-youngadults.html.

U.S. Department of Agriculture (2013). Rural America At a Glance: 2013 Edition. Economic Brief. Washington, DC, U.S. Department of Agriculture. **24:** 6.

U.S. Department of Transportation (2009). National Household Travel Survey, Federal Highway Administration.

U.S. Department of Transportation (2011). 2009 National Household Travel Survey User's Guide, U.S. Department of Transportation.

Van Acker, V. and F. Witlox (2010). "Car ownership as a mediating variable in car travel behaviour research using a structural equation modelling approach to identify its dual relationship." Journal of Transport Geography **18**(1): 65-74.

Van Heeke, T., E. Sullivan and P. Baxandall (2014). A New Course: How innovative university programs are reducing driving on campus and creating new models for transportation, U.S. PIRG Education Fund**:** 42.

Vij, A. (2013). Incorporating the Influence of Latent Modal Preferences in Travel Demand Models. Doctor of Philosophy, University of California, Berkeley.

Wachs, M. and T. G. Kumagai (1973). "Physical accessibility as a social indicator." Socio-Economic Planning Sciences **7**(5): 437-456.

Walker, J. (2011). Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Our Lives. Washington, DC, Island Press.

Waller, P. F. (2003). "The genesis of GDL." Journal of Safety Research **34**(1): 17-23.

Watkins, K. E., B. Ferris, A. Borning, G. S. Rutherford and D. Layton (2011). "Where Is My Bus? Impact of mobile real-time information on the perceived and actual wait time of transit riders." Transportation Research Part A: Policy and Practice **45**(8): 839-848.

Weissmann, J. (2012). Why Don't Young Americans Buy Cars? The Atlantic.

Williams, A. F. and D. R. Mayhew (2008). "Graduated Licensing and Beyond." American Journal of Preventive Medicine **35**(3, Supplement): S324-S333.

Williams, A. F. and R. A. Shults (2010). "Graduated Driver Licensing Research, 2007–Present: A Review and Commentary." Journal of Safety Research **41**(2): 77-84.

Wray-Lake, L., C. A. Flanagan and D. W. Osgood (2010). "Examining Trends in Adolescent Environmental Attitudes, Beliefs, and Behaviors Across Three Decades." Environment and behavior **42**(1): 61-85.

Yelowitz, A. S. (2007). Young Adults Leaving the Nest: The Role of the Cost of Living. The Price of Independence: The Economics of Early Adulthood. S. Danziger and C. E. Rouse. New York, Russell Sage Foundation**:** 170-206.

Zaff, J. F., K. A. Moore, A. R. Papillo and S. Williams (2003). "Implications of Extracurricular Activity Participation During Adolescence on Positive Outcomes." Journal of Adolescent Research **18**(6): 599-630.

Zickhuhr, K. (2012). Three-quarters of smartphone owners use location-based services. Washington D.C., Pew Research Center Internet & American Life Project.

Zipcar (2013). Millennials and Technology, Slideshare.