HUMAN FACTORS
in the USE of
GREEN TRANSPORTATION

Sociology for Public Policy in
Transportation, Urban Planning, & Environmental Quality

A Thesis Presented to the Department of Sociology
In Partial Fulfillment of the Requirements for
the Degree of Bachelor of Arts with Honors

by

David W. Baker
University of Michigan
April 2017

Elizabeth A. Armstrong
Professor of Sociology & Organizational Studies
Honors Faculty Professor

Barbara A. Anderson
Professor of Sociology & Population Studies
Honors Faculty Advisor

Abstract

I perform a secondary quantitative analysis of an existing University of Michigan database from a recent survey on the school's culture of environmental sustainability. I use statistical methods to explore the relationships among indicators of environmental commitment, behavior, engagement, and awareness, as well as relationships between various demographic factors (e.g. age, gender, education, affluence, household characteristics, locations, distance) and green transportation behavior. Results of the analysis suggest that there is, as expected, a positive correlation between environmental commitment and various types of green behaviors and engagements, but that this correlation is weaker for green transportation that for other behaviors. This suggests the presence of other factors attenuating the relationship between commitment and green transportation behavior. The statistical analysis reveals several factors that may be among those inhibitors (Income, Time at Home, Remoteness from Town, and Commute Distance). These findings are potentially useful in public policy planning. Often, policy preferences would favor increased use of green transportation options, including mass transit systems. With information on factors that drive a wedge between green ethics and green behavior in the specific area of transportation, planners will be better equipped to devise strategies to mitigate those inhibiting factors, and achieve higher rates of compliance.

Acknowledgements

My Honors Program Faculty:
Instructor Professor Elizabeth A. Armstrong, Advisor Professor Barbara A. Anderson, and Grad Student Mentor David Mickey Pabello. I owe an enormous debt of gratitude to you for all the expert guidance and advice, without which I could not have succeeded.

My Graham Sustainability Institute and Institute for Social Research Collaborators:
SCIP Principal Investigators Professor Robert Marans & Professor John Callewaert, as well as Minako Edgar. Thank you for your patient and enthusiastic support, and swift response to my assorted technical inquiries. I hope that you will find some value in this analysis of your data.

My Honors Cohort:
Noah Betman, Rebecca Lynn, Hannah May, Michelle Rabaut, Maham Shaikh, Rebecca Wren. The camaraderie, friendship, and peer-support of a small group of fellow travelers is one of the most unique parts of an Honors Thesis experience. It has been a joy to have had you as peers for the last three semesters. I wish you the best in the future, and I would be pleased if our paths cross again.

My Friends:
Your support, encouragement, and enthusiasm during this unlikely midlife adventure was invaluable. Knowing that I had so many people interested in my progress gave me a sense of something bigger than myself, and kept me going during tough times. You are the best.

My Family:
For your incredible and enduring support through this entire process. This would not have been possible without you all. Thank you for your vital assistance, ceaseless encouragement, and for never pointing out just how crazy it was for me to do this at my age.

My Father:
Clayton C. Baker. Who saw me start this long journey, but sadly is not here to see its completion. As one of my greatest instructors, I am strongly indebted to you for this, and every, accomplishment.

Table of Contents

List of Tables

Introduction

From the awakening of the popular consciousness on environmental issues in the 1970's, to the present-day sense of urgency driven by the strong and growing evidence for anthropogenic global climate change, the development of a more environmentally sustainable human civilization has become one of the most important agenda items in the field of public policy. Public discourse on environmental sustainability often centers on the domains of natural science and technology - the former providing understanding of the underlying natural processes and our impact upon them; the latter offering potential engineering-based solutions to reduce or mitigate our impact. But there is also an important role for the social sciences in these discussions. Indeed, not only must the social science disciplines react to the effects of environmental challenges and changes, but they must also be a part of the solution space. Effectively responding to the relevant discoveries of the natural sciences and deploying the technological innovations offered by the engineering disciplines often requires reforms in the behavioral and institutional infrastructure of society as well. An applied approach to sociology can inform public policies and guide public programs.

One example of a well-established engineering-based solution to issues of sustainability is converting a portion of society's resource-intensive personal transportation practices (i.e. individual transportation in individual automobiles) to more resource-efficient, less impactful shared transportation practices, in the form of carpooling / ride sharing, or the use public mass transit systems. However, though the change is conceptually quite simple, achieving social compliance is not necessarily so. Behaviors become entrenched and difficult to dislodge and supplant with new behaviors.

Thus, to help realize the potential benefit of alternative mode of transportations, it becomes necessary to encourage adoption of the new practice by a significant portion of the population for a significant portion of their travel. This requires understanding the motivations of social actors. We must learn what social forces are at work in influencing perceptions of, attitudes toward, and use of green transportation options. It also requires that we evaluate our societal infrastructure and institutions for outdated features that may hinder wider adoption of green transportation, and then design retrofits to replace such features with ones that will better accommodate social integration of these green transportation paradigms.

In this research project, I gather information about mobile actors on various elements of their social context, their level of environmental consciousness, engagement on environmental and sustainability issues, their attitudes toward environmental sustainability and eco-friendly transportation options, their inclination to use it, and their pragmatic ability to follow-through on such inclination in actual practice. Then, I look for correlations between these various factors and the use of eco-friendly transportation options. The resulting findings reveal ways in which policy makers might effectively promote and encourage use of green transportation by addressing most directly those factors that appear influential. The findings also indicate possible obstacles in the existing infrastructure, and thus suggest ways in which policy makers can implement changes that will enable and encourage, rather than thwart or discourage, use of green transportation options by those inclined by other social factors to do so.

I make efforts to identify factors that appear to encourage a positive perception and use of eco-friendly transportation alternatives, and conversely, factors that appear to discourage the use of such green transportation options. A myriad of questions present themselves for consideration. What sociological factors influence individuals' willingness to use green

transportation? Does inclination to use green transportation vary by socio-economic class, gender, age, educational attainment, and/or other demographic parameters? Does inclination vary by type of community, i.e. urban, suburban, small town, or rural? Do properties of our institutions (e.g. places of employment, education, commerce, or governance) and the processes by which we interact with them enable or hinder the usage of green transportation? Are there social narratives at play that portray different modes of transportation as either a normal, desirable mode of behavior or as an inferior choice to some other more valued mode? If so, what are they? Do value systems, such as the aspiration to be a good citizen or an environmentally responsible consumer, or conversely to optimize personal autonomy or effuse an image of affluence, effect inclination towards or against usage of green transportation? Does public engagement (e.g. activism, advocacy) with environmental sustainability issues increase the subjects' own use of eco-friendly transportation? Further, does public engagement increase subjects' own use more than eco-consciousness or private behaviors alone? What social value systems, group identities, public roles, and community characteristics held by people are positively related to a favorable perception of green transportation for their own use? What factors in their interaction with the institutions and infrastructures of society influence people's ability to actually use green transportation, if they are so-inclined.

I hypothesize that that the stronger people's environmental values, the more they will practice environmental sustainable behaviors, including green transportation. I predict that more affluent people will be less likely to use green transportation. I expect to find that people who are more engaged in environmental issues will be more likely to use green transportation. I expect that there will be many people who are positively inclined toward green transportation, but for whom practical and institutional factors discourage their actual use of it. Such practical

factors include location of home and commute distance. I expect to find that women are more likely to use green transportation than men. I expect that as age and education increase, green transportation behavior will increase. I expect that people living a more settled, consistent lifestyle will be more likely to adopt green transportation behaviors.

Literature Review

Overview

Finding literature that is specifically sociological in perspective, and is relevant to transportation has been somewhat challenging. I have sometimes worked to adapt and apply more general sociological concepts to the subject of transportation, as well as rely on literature on transportation that may not be directly and expressly sociological in perspective, and work to identify points of connection to the discipline.

Since the ultimate goal of this project is to provide input to public policy planning, I've viewed this cross-functional background to be not entirely disadvantageous or unnatural. Additionally, the relative sparseness of sociology-specific literature on transportation suggests to me that this study may actually make a significant contribution in an underrepresented subject area.

Many of the studies that I have found dealing specifically with transportation issues (often public mass transit) are often focused on practical matters of urban planning or civil engineering. Additionally, many address economic issues such as cost/benefit analyses or return on investment, or conduct a political analysis on how projects can or have gained approval. So, while there are writings that address transportation from various social science perspectives (e.g.

economics, politics) and related, applied disciplines (e.g. urban planning), there are fewer that focus specifically on sociological perspectives.

I've found some articles that do study the sociological matters related to transportation, but many from the standpoint of providing the transportation services as a matter of public welfare for the elderly, poor, or other such disadvantaged groups. Thus, they focus on providing better service to those who would have fewer options to public transportation anyway. My research project is oriented toward finding ways we might encourage greater use of environmentally-sustainable transportation, including but not limited to public mass transit, by those who can afford and often use other options. Serving the first group is certainly an appropriate and worthy goal for applied sociology in its contribution to public policy. However, the motivation behind my project is finding ways to promote and facilitate the conversion of less environmentally-sustainable transportation choices and practices (particularly the use of single-occupant personal vehicles) into more sustainable choices and practices. This study is less about bringing the service to the people as a matter of social justice, and more about bringing the people to the service as a matter of environmental quality and sustainability. Thus, I have a greater interest in literature that addresses how to encourage or enable independently-mobile citizens to become greater, more-consistent consumers of public transportation.

The two high-level themes that seemed to repeatedly occur in the literature I found were the effect of practical concerns, such as convenience, feasibility, efficiency, service characteristics, and economic incentives, and on the other hand the effect of cultural factors, such as gender roles, habitus, taste, values, ideology, framing, social paradigms, and collective action dilemmas.

Pragmatic and Self-interest Perspectives

Antonucci's et. al. 2014 study on passenger satisfaction with public transportation looked at how service characteristics of the public mass transit system influenced customer satisfaction. It used a set of 20 different indicators, such as waiting times, punctuality, frequency, comfort, safety, which were grouped into a few broader category variables like service organization and safety and reliability. Analysis found what relative weights different service characteristics had in determining customer satisfaction (punctuality and regularity were quite high, as was staff conduct). Additionally, the set of respondents were grouped in several different ways for analysis, such as gender, age, education, employment, and area of residence. He discovered that satisfaction was negatively correlated with age, students were more satisfied than workers, frequent riders were less satisfied that less frequent riders, reason for riding was related to satisfaction (those who used out of necessity were least satisfied), and satisfaction varied considerably based on area of residence. To the extent that satisfaction influences ridership (not so applicable to those who ride out of necessity), this study begins to offer some insights into how to increase ridership via two means: the characteristics of the service itself, and the characteristics of the ridership or potential ridership. The latter aspect could be used to target potential riders in groups shown to be positively inclined, and/or to identify groups for which greater efforts should be made to bring the group and the service into greater compatibility.

In D.L. Guber's 2003 book, *The Grassroots of a Green Revolution*, in chapter 8 "The Martketplace: Motivating the Citizen-Consumer," the author looks at the effect of environmental concern on economics – particularly, on the purchasing decisions of consumers. She describes a counter intuitive disconnect between green consumption and green voting behaviors. She begins by calling attention to an interesting paradox. Economic theory assumes that in both

consumption and voting, people behave as rational, self-interested actors seeking to maximize their own personal benefit. In the political realm, however, there are alternative theories that suggest that social considerations and altruism may replace self-interest. If true, then one might expect voting to be environmentally motivated (altruistic), but consumption to be based on personal cost/benefit considerations (rational self-interest). The paradox is that there is evidence for exactly the opposite – that people may vote based on personal gain, but purchase based on altruistic motivations.

Four explanations are considered by Guber: self-interest, ideology, efficacy, and advertising. The author points out that green purchases sometimes also correspond to self-maximizing purchases, and the latter may actually be the person's true motivation. Examples include energy efficient products and organic produce, which though green, also have tangible self-interest aspects: saving money and reducing health risks, respectively. It is also noted that political ideology may reduce the willingness of political conservatives or moderates to vote for the liberal candidates who more often espouse environmentalism, but in the marketplace, individual purchases are not partisan, and are in fact consistent with the free market ideals held by center-right voters. The efficacy argument is that people may feel that their divisible and discretionary purchasing dollars are a more effective way to promote or implement measured environmental change than their single, unitary vote is. The advertising explanation is that producers may be quite effective in marketing and promoting their product with an environmental focus, and imbue private goods with a public meaning, therefore appealing to altruistic, social forces within the consumer.

Though Guber's voting consideration is not relevant to my study, the consumer behavior certainly is. This writing discusses some surprising and non-intuitive patterns. It offers a cross-

disciplinary and synergistic approach that combine thoughts and ideas not only from sociology, but also economics and political science. It certainly has perspectives to offer in determining why people do or do not choose green transportation, and possible mechanisms of persuasion to encourage them to do so. The perspectives provided by this study are helpful to my project in its search for the inhibitors to green transportation choices, and possible policy measures for mitigation.

Ideological and Cultural Perspectives

Steinbach's et. al. 2011 paper on cycling, though not completely applicable to all forms of green transportation (such as public mass transit), does nevertheless address social identities as factors in inclination towards alternative, eco-friendly methods of urban transportation. In this study, a qualitative interview is conducted with 78 members of London's cycling community, which is overwhelmingly populated by affluent white men. The study finds that the consumer choice of cycling as a mode of transportation is driven by tastes and preferences with a strong relationship to group identity, symbolism, and emulation of an archetype. Though the quantitative nature of my project, and the data elements available to my secondary analysis, may not provide as rich a set of opportunities to look for these sort of connections, I may have some means to consider, at least speculatively, values and identities as factors in inclination towards green transportation. An additional value of this article is that it provides a model for a more in-depth study of the University of Michigan cycling community, if that should be desired.

Gartman's 2004 article offers an evaluation of the history of the automobile as a key element of American culture. As such, it offers information on the values and processes that have produced a default preference for personal automobiles as the transportation mode of choice in America. Further, it is at least somewhat applicable, by comparison and contrast, to an

understanding of the value systems involved in eco-friendly transportation choices, as well as the general background context in which eco-friendly transit exists and with which it competes.

Several articles, though not related specifically to eco-conscious behaviors nor transportation, nor detailing a specific study, are relevant to understanding some potential theoretical sociological contexts relevant to my project. Trigg (2001) offers general background on theories of taste and conspicuous consumption vis-à-vis the sociologists Thorstein Veblen and Pierre Bourdieu, and is applicable to an analysis on social values as factors in inclination towards green transportation. Hoyer et. al. (2012) also offers perspectives on the effects of social values and explores taste and consumer behavior.

Carfagna's et. al. 2014 work, like the aforementioned Trigg and Hoyer articles, delves deeply into sociological theory, but unlike those works, Carfagna's article is more closely related to the topic of my study. While transportation is one of the consumer choices touched upon, this article considers more generally the eco-conscious ethical consumer and the emergence of an eco-habitus in which sustainable consumer choices have attained a high level of cultural capital. The article looks at data from several studies, both quantitative and qualitative. Though again my data resources may not enable plumbing the depths of these ideas, they do offer some analytical and speculative possibilities via measures of Commitment, Engagement, and Behavior in various areas of green behavior.

Bourdieu, in his 1979 *Distinction: A Social Critique of the Judgement of Taste*, develops broad and far reaching theories about class and the boundaries between them, including the concept of habitus, which is essentially the social conditioning that a person attains by immersion within his culture from birth onward. In his theories, classes are distinguished by different tastes, which he illustrates almost entirely with aesthetic examples which seem to bear

little resemblance to the matter of transportation choices. Further, his theories tend to lock people into their class structures because it is so difficult to attain through effort and learning the cultural particulars that are ingrained as habitus for those raised in the given class. This rigidity does not offer much hope for encouraging changes in behavior, which is the ultimate aim of my study. The one interesting point of Bourdieu's theory that may be particularly applicable is his suggestion that taste of the elite shows a preference for things that are beyond necessity. Therefore, bus transportation, which is for many in lower classes, a necessity, might be distasteful to people in some classes. My data resources do include some basic demographic information indicative of socio-economic status or class, so these theories may be brought to bear in discussion of my findings.

The 2000 article *Transport Policy Scenarios for the EU: 2020 Images of the Future* by Banister, Dreborg, Hedberg, and Hunhammar, discusses possible developments in European transportation systems vis-à-vis a goal of "sustainable mobility". While the paper addresses both sociological and non-sociological factors. It notes that "technology alone will not achieve targets" and "fundamental changes have to take place in the way in which people make travel choices" and asserts "the significance of changes in values and attitudes". (27) These assertions are quite similar to and consistent with one of the underlying premises of my work.

Banister's paper recognizes two "external elements" affecting development of sustainable transportation. The second of them is specifically the sociological factors, such as societal cooperation, socially responsible behavior, free-rider problems, self-interest, markets, public goods/bads, common interest, collective action, and social dynamics. The article makes reference to some standard socio-political scenarios and topics, such as game theory, The Tragedy of the Commons, and The Prisoners Dilemma. (28-29) Additionally, this paper asserts

that market forces must be augmented "either by political intervention or by 'grassroots' initiatives" or both, to promote "green values". (31) It also notes that the impact of urban land use (urban planning) and "'local life-styles'" on transportation demand in the three different "images" of possible futures that they develop. (33, 34, 36, 44) In short, this paper suggests multiple social factors that may influence acceptance of sustainable transportation, and points to several areas of further investigation for my project.

Beland's 2014 article, "*Developing Sustainable Urban Transportation: Lesson Drawing and the Framing of Montreal's Bikesharing Policy*," discusses the specific case of the city of Montreal and its implementation of a specialized type of public transportation, in the form of bikesharing. The paper is policy oriented, but notes that increasingly "scholars react against purely materialist and institutional accounts of policy development to stress how the perceptions of political actors, stakeholders, and the public impact policy decisions and outcomes." (546, underlining added for emphasis) To address this new focus in policy, "two aspects of the broad ideational literature are used." (547) These two ideational aspects are identified as "lesson drawing" and "framing". (546) Lesson drawing is a form of "social learning" affecting the analytical and decision making processes of officials charged with policy design. As such, it may be less relevant to my research that the other ideational aspect: framing. Framing is the discursive process by which public perception and collective identities are influenced towards a positive reaction to the public transportation service. (547-548) The author notes that it is possible to create perceptual dissonance through inconsistent framing. In this case study, the specific example is that the presence of advertising exuded a commercialized image that conflicted with the environmentally-responsible citizen image that had been crafted and promoted. The ideas presented in this article on framing are relevant to my project, and to the

policy implications that flow from it, as the process influences interest in using the services, and it operates on a sociological level.

Aaron M McCright's 2010 paper, "*The Effects of Gender on Climate Change Knowledge and Concern in the American Public*," seeks to give a more thorough and theoretical evaluation of gender differences in knowledge and attitudes towards climate change, in contrast to earlier studies which treated gender as a minor, tangential concern. He asks if there are gender differences in knowledge, as well as self-perceptions of that knowledge, and if there are gender differences in concern for the issue. He devises several hypotheses, the first, and most important two being: that men have more accurate knowledge on climate change than women, and that women underestimate their understanding more than men. (It is worth noting that he examines knowledge specifically, whereas most studies measure concern.) To test these hypotheses, he devises a study based on eight recent years of Gallup Poll data on environmental issues. His findings regarding the first of these hypotheses indicate that there is a weak correlation between gender and accurate climate change knowledge, but that contrary to his expectation and indications from the literature, women have more accurate knowledge. Thus, he must reject his first hypothesis. For his second hypothesis, however, he finds strong support in the data: women have a significant tendency to underestimate their climate change knowledge more than men do. The researcher does form and test several other hypotheses: women are slightly more concerned than men; people who are employed full-time are less concerned; people who are more religious are less concerned; people who self-rate their knowledge highly are less concerned; homemakers are more concerned; parenthood increases concern by women, but decreases concern by men. He finds support for the first of these, but evidence to reject the others. Though this paper is specifically focused on climate change concern and knowledge as a dependent variable, to the

extent that the principles of the study can be abstracted out to a more general environmental level, it provides relevant perspective on the role of gender in environmental responses.

Adam Yates, et. al., 2015 paper, "*Changes in Public and Private Environmentally Responsible Behaviors by Gender*," studies gender differences in environmentally responsible behaviors (ERBs). It also considered political orientation and environmental concern. This study divides behaviors into two distinct categories: private (e.g. household recycling) and public (e.g. political activism) types of behaviors. The study analyzes data from the General Social Survey for 1994 and 2010. The researchers develop a model based on the premise that "gender affects political ideology that in turn affects environmental concern". They propose 6 specific hypotheses. H1: Women do more private ERBs than men. H2: Men do more public ERBs than women. H3: Gender differences in ERBs have decreased. H4: Political orientation explains some gender differences in private ERBs. H5: Environmental concern explains some gender differences in private ERBs. H6: Political orientation and environmental concern have less effect on women than men in terms of public ERBs. They found that indeed women are more involved than men in private ERBs, but that it was not consistently true (findings differed based on year) that men were more involved than women in public ERBs. The study also found that political orientation was strongly correlated to ERBs, which seemed to explain some of the apparent gender differences. Not surprisingly, they found that environmental concern was strongly correlated to ERBs, and that this may explain some apparent political differences. (Since there is also tends to be a relationship between environmental concern and political ideology.) H1 was supported, H2 was supported for 2010, but not 1994. H3 had mixed results. H4 had some support. H5 was strongly supported. H6 was not well supported. This study offers a lot of deeper insight into possible apparent correlations between gender and

environmentally-oriented behaviors. The study went below the surface, with multivariate analysis to look for confounding variables or additional/alternative correlations that might add more illumination or even possibly prove more explanatory than the original correlations. Thus, it offers a richer analysis than simply correlating environmentalism with gender, with no consideration given to why such a correlation might logically exist. The understandings and perspective provided by this study are helpful to me in my own research, since gender is a parameter that I analyze as an independent variable.

The 1984 article, "*Commitment to the Dominant Social Paradigm and Concern for Environmental Quality*," by pioneering environmental sociologist Riley E. Dunlap and Kent D. Van Liere, explores the theory that America's prevailing values and beliefs – i.e. worldview or "dominant social paradigm" (DSP) – precipitate a lack of concern for the environment. More specifically, they conduct research to test the hypothesis that there is a negative correlation between American DSP and environmental concern. The theory is that ideas and preferences established in, and preserved from, the early American cultural experience, which were devised in a time of relatively high levels of resources and relatively low environmental impact, are inherently incompatible with environmentally-friendly values appropriate to contemporary society. They use a survey to gather data on social and environmental attitudes, and then conduct analysis to identify components of DSP, and to look for negative correlation between these DSP dimensions and concern for the environment.

Dunlap and Van Liere identify eight different dimensions to DSP, each measured via a set of several related indicator variables. These eight dimensions are support for, or faith in, laissez faire principles, status quo, property rights, science & technology, individual rights, economic growth, material abundance, and future prosperity. Their research does find the

expected negative correlation between DSP and environmental concern. They note that there are people who support both DSP and environmental protection, which sets up a social dissonance in the individuals concerned. They also note that, though perhaps desirable, it is unlikely that DSP will be significantly altered any time soon. This conclusion has unsettling implications for policy goals, since if DSP is entrenched, and it is incompatible with green ethics, then changing behavior becomes a much more difficult proposition.

Though the Dunlap and Van Liere article is focused on environmental concern (values) rather than actual behaviors, it suggests socio-political values as independent variables that could and should be analyzed for correlation to green transportation behaviors.

The 2006 article, "*Social Paradigms and Attitudes toward Environmental Accountability*," by William E. Shafer, also examines the question of compatibility or incompatibility between the Dominant Social Paradigm (DSP) and what he introduces as the New Ecological Paradigm (NEP), which includes increased corporate accountability for environmental impact. Here, DSP is defined and characterized very similarly to the definition of Dunlap and Van Liere. As well, Shafer hypothesizes a negative correlation between DSP and corporate environmental accountability and NEP. Also like the other researchers, Shafer uses a survey to collect data for analysis. The survey subjects are MBA students. The study found that DSP and NEP attitudes were negatively correlated with each other. It found that NEP was positively correlated with environmental accountability, while DSP was negatively correlated with environmental accountability (though the latter results were somewhat mixed).

Methods

Data

I performed secondary analysis of an existing data set. This data set has been assembled by surveys conducted by the Sustainable Cultural Indicators Program (SCIP) under the auspices of the University of Michigan's Graham Sustainability Institute and the University of Michigan's Institute for Social Research. The Principal Investigators of the program are Professor Robert Marans and Professor John Callewaert. The program is designed to measure and track year-to-year changes in the culture of environmental sustainability at the University of Michigan. It has been compiling a broad and diverse set of environmentally-oriented indicators along with demographic and work-related data for the last several years via annual surveys of University of Michigan faculty, staff, and students. The survey data is supported by documentation that includes Code Books and Annual Program Reports. Additionally, two documents – the Questionnaire Crosswalk Tables and the Questionnaire Bridge and Change Log – provide information mapping questions and variables across the different surveys and data sets, by year and by respondent type (Student versus Faculty/Staff). Currently, data sets for 2012, 2013, 2014, and 2015 are available in a format ready for loading and analysis in SPSS statistical analysis software, and make use of helpful SPSS-supported features such as variable and value labels. In addition to being partitioned by year, the data sets are partitioned into discrete Faculty/Staff and Student data sets. Further, for Students, there are data sets for both cross-sectional and panel (longitudinal) studies. (Faculty/Staff does not have a panel component.)

I have chosen to analyze only the Faculty/Staff data. The rationale for this decision is the expectation that the Faculty/Staff population most characterize typical working adults in American society at large, while Students are living under specialized and temporary conditions

that substantially influence their transportation behaviors. Therefore, findings from studies of Faculty/Staff can reasonably be presumed to be much more generalizable to the wider population, while any findings from a study of Students would not be very generalizable.

Faculty and Staff, though both employees, and more similar to each other than either are to Students, are nonetheless different from each other in a number of respects. For instance, while Faculty necessarily share similar high levels of educational attainment commensurate with their similar roles in teaching and research, Staff comprise a much wider range of roles, and hence education and income. Many other employers have similar diversity in their workforces, so this combined Faculty/Staff analysis not incompatible with the broader society.

I restrict my analysis to the data set generated by the 2015 survey – the most recent available. I could have pooled the data for the multiple years, which would have produced a larger sample size, but I chose not to for several reasons. For one, I was concerned about the possibility that the pooled data would reflect a high degree of re-sampling. The sample size was a large enough portion of the population that random sampling may not have been sufficient to minimize resampling, and I was unsure if the survey was administered in a selective fashion to avoid it. For another, many of the various measures could be changing over time; if commitment, awareness, and behavior were less in previous years, the inclusion of previous year's data, though providing a large sample, could dilute or distort a measure's reflection of current conditions, making it somewhat less helpful as a current resource for public policy planning.

The data set contains demographic and work-oriented data, including information on the location of workplace and residence, and the distance of the commute between them. Additionally, there is a great deal of information on awareness, attitudes, behaviors, and

engagement, in regards to a variety of environmental sustainability topics. Engagement and behavior are similar concepts. Engagement signifies socially-interactive actions like activism, organizational membership, event participation. Behavior signifies more independent, individual actions, such as transportation choices, recycling, and energy conservation. One of the environmental sustainability topics is transportation, which is the focus of my project. There are a number of questions that can be taken as indicators of social or public engagement with environmental sustainability issues. They range from more casual and personal, such as asking whether the respondent ever encourages their friends to engage in specific sustainable behaviors, to the more formal and public, such as contributing money to environmental organizations or attending environmental events. These metrics on people's interactive actions in the realm of environmental action are, of course, potentially relevant to sociological analysis.

In addition to the raw survey response data, the data files include some post-processed data. There are some instances of "cleansed" data, in which the values of open-ended, free-text-entry items are intelligently mapped by the SCIP team to a more useful standardized set of functionally equivalent values. There are some instances of "recoded" data, in which some values/categories of closed-ended entry items may be coalesced with others, to produce a collapsed and simplified set of values/categories for easier analysis. There are some instances of rolled-up data, where continuous values are grouped into value ranges for easier analysis. And lastly, there are several indexes constructed by the SCIP team, often as composites of multiple raw data elements, as effective indicators of the overall degree of intensity of some category of personal attributes in some topical module. These environmentally-oriented indexes fall into one of four different classifications: Awareness (knowledge), Behaviors, Engagement, and Commitment (values). Typically, there are several specific indexes under these high-level

categories to measure, for instance, certain subcategories of Behavior or Awareness. The index for Green Transportation Behavior is of particular importance to my project. The Commitment index is different than the others, in that there is only one, and it is for commitment to environmental sustainability in general, not a specific topic as for the other indexes.

All of the SCIP-created indexes are similarly structured. All are normalized on a 0 to 10 scale, with 0.00 being the lowest level of the phenomenon being measured, and 10.00 being the highest. The number of tiers, or levels, within that range varies for the different indexes, but those tiers are always represented by equally-spaced values – the increments between levels of a given index are always the same. That is, for an index of N levels, the increment between levels is 10.00 / (N – 1). All have been created by the SCIP team, and are valued based on the values of raw variables from survey responses. They are typically composites of multiple data variables that are closely related in concept, and often statistically correlated with each other.

The Green Transportation Behavior index is a measure of how eco-friendly or environmentally-sustainable (green) a survey respondent's Transportation Behavior is. This is a 4-value variable. The equally-spaced values (0.00, 3.33, 6.67, 10.00) represent four increasingly-green levels of Transportation Behaviors, in terms of relative impact on the environment. The least green (0.00) represents driving a personal automobile. The next level up (3.33) represents any form of vehicle pooling or ride sharing. The next level up (6.67) represents riding a bus, bus and biking combination, or riding a personal motorcycle (or moped/scooter). The most green (10.0) represents walking or biking. These ratings are determined in response to a close-ended survey question that asks "How do you most often travel to and from home to your work place?", with the following answer choices:

1. Drive a car
2. Walk
3. Bike
4. Ride the bus
5. Ride the bus and bike
6. Motorcycle, moped, or scooter
7. Park and Ride
8. Other (please specify)
9. Ride share (i.e. van, car pool, dropped off, etc)

The (General Environmental) Commitment index is a measure of how committed a survey respondent is to environmental sustainability overall. This is a 4-value variable. The equally-spaced values (0.00, 3.33, 6.67, 10.00) represent four increasingly-strong levels of commitment. The lowest (0.00) represents not at all committed. The next level up (3.33) represents not that committed. The next level up (6.67) represents somewhat committed. The highest (10.0) represents very committed. These ratings are determined in response to a close-ended survey question that asks "Overall, how committed are you to sustainability? Are you:", with the following answer choices:

1. Very committed
2. Somewhat committed
3. Not that committed
4. Not at all committed

Other Behavioral indexes of interest are Waste Prevention Behavior, Conservation Behavior, and Natural Environment Behavior. Additionally, there are several Engagement indexes of interest: General Sustainability Engagement, plus UM Sustainability Engagement and its alternative form UM Sustainability B Engagement (the latter factors in a couple of additional raw variables in its composition that the former does not). There is also an Awareness index of interest: Transportation Awareness.

Analysis

I chose to use the SPSS software package for statistical analysis to conduct the data analysis. This was the appropriate choice for several reasons. First, the SCIP data sets are natively in SPSS format, and have been set up to utilize the common features and conveniences (e.g. labels) of that environment. Secondly, it is an industry-standard, full-featured statistical analysis package. Also, it is readily available on University of Michigan computers, and supported by the IT group. Conveniently, both my Faculty Advisor and Grad Student Mentor are quite familiar with the package, and so were able to effectively advise, coach, and train me in its operations. And serendipitously, I had received training in and gained experience with the package via two other courses during the lead-up to my Honors research.

I chose to use the syntax file interface of the SPSS package, as opposed to the interactive point-and-click interface. This had the advantage of making my analysis a self-documenting process by capturing a permanent record of my work, and made all data manipulation and analytic operations reproducible with complete accuracy as much and as often as necessary.

Another high-level choice that I made was to use the data definition capabilities of SPSS (APPLY DICTIONARY, COMPUTE, …) and the repeatability of the syntax file interface to effectively create a set of useful, intuitive, semantically-clear aliases (actually clones) for the SCIP data elements of interest for my analysis, which themselves often had names that were extremely terse and/or cumbersome and generally cryptic (e.g. q6_2015, RC_DST2SBRGN_2015). This significantly accelerated analysis and enhanced the readability of my syntax file code and the resulting output. In this thesis, I will use simplified, plain-English

forms of these clear names when discussing the variables. I provide a mapping between the original SCIP variable names and my plain-English clear names in Appendix A.

Several common SPSS commands are used to perform operations and tests. For understanding individual data elements, DESCRIPTIVES and FREQUENCIES commands are used. Bivariate analysis of relationships between data elements is performed using the CROSSTABS, T-TEST, and CORRELATIONS commands. For multivariate analysis of relationships, the REGRESSION command is used.

The first step in analysis was to use the DESCRIPTIVES and FREQUENCIES commands to examine individual data elements of potential interest to determine if they were amenable to statistical analysis. I looked specifically to see that there were not too many missing values and that there was a reasonable distribution of values over the possible range, since data that is either too sparse or too clumpy can present potential problems for statistical methods. Too many records with missing values (whether physical or logical) in important data items would diminish the effectiveness of analysis. Similarly, data elements whose values did not exhibit at least some variability would render analysis pointless. (For example, one cannot make observations about the effect of gender on behavior if most people declined to answer the gender question, or if all or most of your respondents were of one gender.) The data elements of interest were examined. Missing values were found to be minimal, and no points of concern were observed regarding the distribution of values across the spectrum of possible values.

From here forward, my analysis shifts to examining relationships between and among data elements.

In most of these analytical operations, the dependent variable is, conceptually, Green Transportation Behavior. (Exceptions will be clearly identified as such, where they occur.) I use

two different variables to measure this concept. The first is the SCIP-created 4-level Green Transportation Behavior index, discussed above. The second is a variable that I created. It is a roll-up of the Green Transportation Behavior index into a two-tiered (Boolean) rendering. This Transportation Behavior Is Green indicator is false (0) when the Green Transportation Behavior index is 0.00, which indicates the driving of a personal auto – the least green behavior, and it is true (1) when the Green Transportation Behavior index is any of the other three values, which indicates that some green form of transportation is used.

The first group of relationships examined were those amongst the various indexes of interest. Using the CROSSTABS and CORRELATIONS commands, I looked at the relationships between Commitment and the various Behaviors and Engagements, as well as relationships between other Behaviors and Green Transportation Behavior. This analysis is bivariate in nature. This establishes general, high-level characteristics of the relationships between Commitment and the various Behaviors, as well as between pairs of Behaviors. It gives us a sense of consistency of relationships between Commitment and Behaviors, and helps us spot anomalies.

Thereafter, I extended the analysis to include data elements of interest from the survey responses. Primarily, these are of demographic and work-related nature. The T-TEST and CORRELATIONS commands are used. This analysis is still at the bivariate level. The purpose of this phase is to identify independent variables that seem to correlate with Green Transportation Behavior. Identifying such variables can provide input into public policy planning for environmental management and transportation by suggesting what factors might be targeted with policy measures to most effectively increase Green Transportation Behavior. Additionally, if the earlier phase identified any Green Transportation Behavior -specific

anomalies between commitment and behaviors, this could point to possible explanations for any such anomalies.

These demographic and work-related variables can be conceptually grouped into several small families that are arguably related by being alternative indicators of some more general phenomenon. The variables of interest, and the groupings I have organized them into, is as follows:

Measures of Common Demographic Characteristics:
- Gender (Female or Male)
- Age
- Education

Measures of Affluence:
- Income (Annual Household)
- Own or Rent (of Home)
- Staff or Faculty (Position)

Measures of Social Stability/Continuity
- Time at Work
- Time at Home
- Tenured or Untenured (Faculty only)

Assorted Measures
- Number of People in Home
- Number of Vehicles in Home

Measures of Proximity/Distance
- Commute Distance
- Commute Distance Rollup
- Remoteness from Town (Ann Arbor, Ypsilanti, Washtenaw, Michigan)
- In/Out of Town (Ann Arbor, Other) (custom-created roll-up)

After I completed the bivariate analysis of the various demographic and work-related data elements as independent variables for possible correlation to Green Transportation Behavior, the next step was to use multivariate analysis via the REGRESSION command to consider interactions amongst the independent variables. This enabled me to identify those variables that

become statistically significant when controlling for others. It also reveals the relative strengths of the various correlations when controlling for other variables.

Lastly, after identifying the variables that appear to have statistically significant correlation to Green Transportation Behavior as the dependent variable, and determining the directionality and relative strength of those correlations, it was time for the final phase of the analysis. Here, I analyzed those independent variables related to Green Transportation Behavior for possible correlation with the other Behaviors and Engagements. If I find that these independent variables relate to other Behaviors and Engagements differently (in strength or direction) than they relate to Green Transportation Behavior, then it may offer insights into causes for any similar inconsistencies that were observed when Commitment, Behaviors, and Engagements were analyzed for their relationships to each other.

Results

Relationships Among Indexes of Commitment, Behaviors, Engagement, and Awareness

Analysis continued with the pre-built indexes of the SCIP database. Operating under the assumptions that

1) attitude motivates behaviors,

2) awareness enables behaviors, and

3) behaviors often coincide with other related behaviors,

I looked for relationships amongst the various relevant indexes, and evaluated the nature of those relationships.

The general Commitment index was of particular interest as an indicator of attitudes. Coupled in turn with each of four Behavioral indexes - Waste Prevention, Conservation, Natural

Environment, and Transportation - this was a natural first line of inquiry. As an adjunct to this inquiry, a custom indicator was created from the Green Transportation Behavior index. While the original index was a four-tiered indicator of increasingly green Transportation Behavior (walking & biking being the best, followed by riding the bus, then car/van-pooling, and with driving a personal auto the worst), a Boolean variable was created combining all green options into one versus the ungreen option of driving a personal auto. This Boolean Transportation Behavior Is Green indicator was added to this analysis. SPSS CROSSTABS and CORRELATIONS commands were used to evaluate the relationships.

All five (including the Boolean indicator) of these Behavioral indexes were found to have a statistically significant correlation with Commitment (p=.000 in all five cases). All correlations were, as expected, positive – as general Commitment increased, Behavior increased. The strength of the correlations was Waste Prevention .237, Conservation .200, Natural Environment .193, Transportation .171, and Transportation Boolean .157. Note that while all Behavioral indexes showed a positive correlation to Commitment, Green Transportation Behavior (including the Boolean indicator) showed a weaker correlation than the others.

The output from the CROSSTABS command also generates some interesting findings. I will illustrate by showing and discussing the Natural Environment Behavior index, and then showing and comparing the Green Transportation Behavior index.

Table 1. Crosstabulation of Levels of Commitment and Natural Environment Behavior for Survey Respondents

		Index of Natural Environment Behavior									
		0.00	1.11	2.22	3.33	4.44	5.56	6.67	7.78	8.89	10.00	Total
Index of Commitment	0.00	11.1%	3.7%	14.8%	3.7%	14.8%	11.1%	11.1%	14.8%	3.7%	11.1%	100.0%
	3.33	5.2%	4.7%	6.1%	9.9%	9.0%	11.8%	10.8%	11.3%	11.8%	19.3%	100.0%
	6.67	2.7%	2.8%	5.5%	10.2%	9.4%	10.9%	12.2%	12.7%	13.5%	20.1%	100.0%
	10.00	0.8%	1.5%	1.5%	7.5%	4.5%	8.0%	10.6%	14.6%	17.3%	33.7%	100.0%
	Total	2.7%	2.8%	4.7%	9.4%	8.3%	10.3%	11.6%	13.0%	14.1%	23.1%	100.0%

Note: % within Index of Commitment

Notice in the crosstabulation above, that as Commitment increases from 0 to 10, at each increasing level of Commitment, the percentage of respondents at the lowest level of Behavior (0) progressively decreases, while the percentage of respondents at the highest level of Behavior progressively increases, and similar patterns of respondent numbers migrating from left to right as Commitment increases can be observed in many other cells of the matrix, as well.

In the crosstabulation below, we see a similar pattern, but to a strikingly smaller degree. Notice that even at the highest level of Commitment (10), still 62% of respondents report the lowest level (0) of Behavior. As another point of comparison, note that in the crosstabulation above, even at the lowest level of Commitment (0), the respondents are somewhat evenly distributed over the range of Behavioral values, but in the crosstabulation below, the 0 Commitment band is skewed dramatically to the left – 90% in the lowest level of Behavior.

Table 2. Crosstabulation of Levels of Commitment and Transportation Behavior for Survey Respondents

		Index of Transportation Behavior				
		0.00	3.33	6.67	10.00	Total
Index of Commitment	0.00	89.7%		3.4%	6.9%	100.0%
	3.33	84.2%	4.9%	5.3%	5.7%	100.0%
	6.67	74.7%	6.6%	6.5%	12.2%	100.0%
	10.00	61.9%	5.1%	10.8%	22.1%	100.0%
	Total	73.3%	5.9%	7.3%	13.5%	100.0%

Note: % within Index of Commitment

There are also three different indexes of Engagement with sustainability in general and with specific sustainability initiatives. Arguably, Engagement is conceptually similar to Behavior. This being so, to provide further data points for analysis, I decided to also perform the same correlation analysis as for the Behaviors above to look at correlation between Commitment

and Engagement, and see how those relationships compared to the relationship between Commitment and Green Transportation Behavior.

All three of these Engagement indexes were found to have a statistically significant correlation with Commitment (p=.000 in all four cases). All correlations were, as expected, positive – as general Commitment increased, so too did Engagement increase. The strength of the correlations was General Sustainability .401, U-M Initiatives .193, U-M Initiatives B .171. Recall that the previously-determine strength of correlations between Commitment and Green Transportation Behavior was Transportation .171 and Transportation Boolean .157. Note that all three Engagement indexes showed a positive correlation to Commitment, and that those correlations were generally (one exception of a tie) strong that the correlation between Commitment and Green Transportation Behavior. That is, again, Green Transportation Behavior shows a weaker correlation to Commitment than other measures do.

Having now found evidence that Green Transportation Behavior is more weakly correlated to Commitment than other behaviors, and having found evidence that Green Transportation Behavior, in contrast to other Behaviors, is strongly skewed to the lowest, least green levels, the next step is to look for various factors beyond Commitment with which Green Transportation Behavior (and its related Boolean indicator) are correlated. Additionally, I also analyze how those factors are related to Commitment. Understanding what influences Green Transportation Behavior may give us insights into what might be responsible for Transportation Behavior's relatively poor levels of green-conformance. Noting differences in how various factors are related to Commitment vs Green Transportation Behavior can also be informative.

Measures of Common Demographic Characteristics

There are a handful of demographic variables that are commonly used as independent variables in many studies. Among these are Gender, Age, and Education level. These data elements are, in fact, available in the SCIP database. The evaluation continues with these variables. As with the index evaluations, I will use primarily the CORRELATIONS command. Additionally, since Gender is a binary variable (the handful of alternative responses or non-responses were treated as logically missing values with the MISSING command), a T-TEST is performed for that variable.

I use the T-TEST command and the CORRELATIONS command to analyze the relationships between Gender, as an independent variable, and dependent variables of Commitment and Green Transportation Behavior (in both the original 4-tiered form, and the custom-created Boolean form). I find that there is not a statistically significant difference between women and men for Commitment. However, there is a statistically significant difference between women and men for Green Transportation Behavior, using both the 4-value and 2-value indicators. Both show positive correlations, meaning, in this case, that men are more likely to practice Green Transportation Behavior. The 4-value test yields r=.107 and p=.000. The 2-value test yields r=.069 and p=.003.

To analyze for relationships between Age and alternatively Commitment and Green Transportation Behavior (4-valued and 2-valued indicators), I use the CORRELATIONS command. The results of all three tests are significant (p=.000). The findings are quite interesting in that, though there is a positive correlation of .112 between Age and Commitment, there is a negative correlation of -.130 (4-value indicator) and -.141 (2-value indicator) between

Age and Green Transportation Behavior. That is, as Age increases Commitment increases, but at the same time, Green Transportation Behavior decreases.

I performed the same set of correlation tests substituting Education for Age. All three tests produced results that were statistically significant ($p<.01$), and all showed a positive correlation – as Education increased, Commitment and Green Transportation Behavior increased. The strength of the correlation was strongest for Commitment, at .164; it was .118 and .059 for 4-valued and 2-valued indicators respectively of Green Transportation Behavior.

Measures of Affluence

Another common focus for statistical analysis in the social sciences is various measures of wealth, affluence, or socio-economic class or status. The SCIP database provides three variables that might function, to varying degrees, as indicators of such properties. These variables are Annual Household Income, home Ownership or Rental, and whether the respondent is Staff or Faculty. Income is multi-valued, and it is a rolled-up, or aggregated, variable with income specified as being within given ranges. The Own/Rent and Staff/Faculty variables are Boolean. Correlation tests will be used for all three factors. The two Boolean indicators will also be analyzed with the T-Test.

The applicability of Income to affluence is obvious. Very broadly speaking, home Ownership is usually considered to be characteristic of higher socio-economic class. Additionally, in a university environment, it can reasonably be presumed that, on average, Faculty are more likely to be in higher socio-economic brackets than Staff, since the former have higher minimal qualifications whilst the latter can vary considerably depending upon their specific job function.

For Income, I find a statistically significant (p=.001) small positive correlation of .078 with Commitment. However, when testing for correlation to Green Transportation Behavior, I find statistically significant (p=.000) and much stronger negative correlations of -.175 and -.231 for 4-value and 2-value indicators, respectively. The higher the Income, the less likely the respondent practices Green Transportation Behaviors.

For the Own/Rent indicator, I do not find a statistically significant difference in Commitment. I do find a statistically significant (p=.000) difference in Green Transportation Behavior, with Renters more likely to practice it. The correlations are fairly strong at .248 and .253 for the 4-valued and 2-valued indicators, respectively. This means that, conversely, the presumably more-affluent home Owners are far less likely to practice Green Transportation Behavior. This parallels the pattern observed in the analysis of Income, above.

For the Staff/Faculty indicator, I find statistically significant (p<=.01) differences in Commitment and Green Transportation Behavior. Faculty are more likely than Staff to both be Committed and to practice Green Transportation Behaviors. The strength of the correlations is .192 for Commitment, and for Green Transportation Behaviors it is .126 and .060 for 4-valued and 2-valued indicators, respectively.

Since these three variables are all being treated as indicators of affluence, I use the REGRESSION command to do some multi-variate analysis on the interrelationships among these three and determine the strength of correlations of each when controlled for the others. An initial regression test on these three along with the 4-valued Green Transportation Behavior indicator do not decisively eliminate any of the three. All three remain statistically significant (p=.000), and the absolute values of the standardized beta coefficients are .206 for income, .171 for Own/Rent, and .246 for Staff/Faculty. (For the 2-valued Green Transportation Behavior

indicator, the results were also statistically significant (p=.000) and the absolute values of the standardized beta coefficients are similar: .253 for Income, .150 for Own/Rent, and .200 for Staff/Faculty.)

However, in anticipation of the fact that proximity and distance factors will be analyzed shortly, and suspecting that there may be interrelationships between these factors and Own/Rent or Staff/Faculty, I ran regression tests with the inclusion of the Commute Distance variable (arguably, the most straight-forward and precise variable of this group, and the one most recommended by my advisor). The result is that Own/Rent is no longer statistically significant when controlled for Commute Distance, and that Staff/Faculty, though still statistically significant, becomes very weak at .059. If, as expected, proximity proves to be an important factor in Green Transportation Behavior, then I can likely dispense with the Own/Rent and Staff/Faculty indicators, and rely on Income as my sole indicator of affluence. Since seems to confirm the intuitive sense that Income is the most directly applicable of the three to the measurement of affluence, the other two being at best somewhat indirect.

Measures of Continuity in Work and Home

There were several variables that seemed to perhaps hint at some level of circumstantial stability or continuity. It seemed plausible that the more settled a respondent is in their work and home arrangements – the two endpoints of their commute – the more likely they might be to adopt and continue with green modes of transportation.

The two main variables involved are the length of time employed at U-M and the length of time at current residence (hereafter TimeAtWork, TimeAtHome, respectively). Another variable that might be less directly applicable was the Boolean indicator of whether or not the Faculty employee was Tenured or Untenured.

T-tests and correlation tests indicate that there was a statistically significant (p=.019) but relatively weak (-.070) difference between Tenured and Untenured Faculty in Commitment, but that there was not a statistically significant difference in Green Transportation Behavior. Additionally, the factor of Tenure is only relevant to Faculty, and not to Staff. For all of these reason, the Tenured indicator could readily be dismissed from further analysis.

The two Length of Time indicators for Work and Home were analyzed with correlation tests. For Commitment, the Time at Work variable did show a statistically significant (p=.009) though relatively weak (.059) correlation. On the other hand, Time at Home did not show such a statistically significant correlation. In terms of Green Transportation Behavior, however, both Time at Work and Time at Home showed a statistically significant (p=.000) negative correlation. For Time at Work, the 4-valued and 2-valued correlations were -.153 and -.162, respectively. For Time at Home, the correlations were -.197 and -.200. These negative correlations were the opposite of what I had expected. Counter-intuitively, the longer one is settled into a job or a home, the less likely they are to practice Green Transportation Behavior.

Measures of Household Parameters

There are a pair of data elements in the database for the Number of People in Home and Number of Vehicles in Home. Several of thoughts came to mind on how these might potentially relate to Green Transportation Behavior, so these two variables were analyzed with correlation tests.

The correlation tests for Number of People in Home revealed that there is not statistically significant correlation with either Commitment or Green Transportation Behavior. Thus, this variable is dropped from further analysis and consideration.

On the other hand, correlation tests for Number of Vehicles in Home show that there are statistically significant (p=.000) negative correlations with Commitment (-.095) and Green Transportation Behavior (-.346 for 4-valued indicator, -.335 for 2-valued indicator). As Number of Vehicles in Home increases, Green Transportation Behavior decreases. This is one of the strongest correlations with Green Transportation Behavior to be found in the database, only comparable to some of those for proximity variables. It is arguably intuitive - people who have cars tend to drive cars – but it is not immediately clear what the cause/effect directionality might be. Do people who have cars therefore use them more? Or do people who want to drive themselves make an effort to own cars? Or is it some of both?

Measures of Proximity and Distance

It seems quite appropriate to consider the home-to-work Commute Distance, as well as the community of location of home and work. All three parameters may influence Transportation Behaviors. Commute Distance has an obvious and significant effect on the feasibility of some forms of Green Transportation, such as walking and biking. And aside from their contributory role in Commute Distance, the locations of the home and work endpoints can also have a direct influence on Green Transportation Behavior, since not all communities are well-served by and/or connected by public transportation options. The SCIP database has several variables to assist in such analysis.

There are fairly precise details about where respondents are working in the Ann Arbor U-M system, including campus and building. The full database also contains more precise details (nearest intersection) on the location of the respondents' residences, but this information has been removed from the version of the database that I have been working with, because of its potential as personally identifying information. I could have requested the additional residential

data, pending approval, but chose not to. The precise location of workplace, and home, offers possibilities for analysis, but it was beyond the scope of this study. I will, therefore, not make use of these data elements.

The SCIP database also contains very precise measures of home-to-work Commute Distance, calculated, I believe, from the aforementioned home & workplace location data using Geographic Information Systems software. Commute Distance is available in the database in a raw, continuous form, as a measure of mileage. There is also a rolled-up version of the data element, in which individual mileage measurements are aggregated into several standardized ranges of distance.

Additionally, SCIP contains some very broad information on location of residence based on zip-codes. This data element indicates whether the respondent resides in Ann Arbor, Ypsilanti, elsewhere in Washtenaw county, elsewhere in Michigan, or beyond. Roughly speaking, it is effectively an indicator of nearness/remoteness of community of residence to Ann Arbor, and this is how I have interpreted and used it in my analysis. Further, I created a custom roll-up variable that aggregates these multiple values into a Boolean indicator of either in or out of Ann Arbor (i.e. Ann Arbor or Other). Consistent with my use of these two data elements, I will refer to them conceptually as Remoteness from Town and In/Out of Town.

Analysis was performed using these four data elements: Remoteness from Town, In/Out of Town, Commute Distance, and Commute Distance Roll-up. Correlation tests were used, and for the Boolean In/Out of Town indicator the T-Test was also employed.

For Remoteness from Town, there are statistically significant (p=.000) correlations with Commitment and Green Transportation Behavior. The closer one's community of residence is to (or in) Ann Arbor, the more Committed they are (r=.189) and the more they practice Green

Transportation Behavior (r = .315 & .260 for 4-valued and 2-valued indicators, respectively). Conversely, of course, the more remote their community of residence is from Ann Arbor, the less Commitment and Green Transportation Behavior they exhibit.

For In/Out of Town, there are statistically significant (p=.000) differences in Commitment and Green Transportation Behavior, with Ann Arbor residents being more committed (r=.188) and practicing more Green Transportation Behaviors (r = .340 & .280 , 4-valued & 2-valued indicators, respectively) than out-of-towners.

For Commute Distance, in both the raw, detailed form, as well as the aggregated, rolled-up form, there were statistically significant (p=.000) correlations with Commitment and Green Transportation Behavior. Shorter Commute Distances were associated with more Commitment and Green Transportation Behavior; longer Commute Distances were associated with less of those measures. For Commute Distance (raw), the absolute value of the coefficients for Commitment and Green Transportation Behavior 4-valued and 2-valued were, respectively: .158, .295, .233. For Commute Distance Roll-up, the corresponding values were .200, .447, .363.

Tentative Predictors and Multi-variate Analysis to Control for Interrelationships

At this point, having identified some potential predictors of Green Transportation Behavior, I use the REGRESSION command to conduct some multi-variate analysis on them to determine relative importance of them when controlling for the others. The initial list of variables for the regression tests include Commitment, Gender, Age, Education, Income, Time at Work, and Time at Home. For these tests as described here, I used the 4-valued Green Transportation Behavior indicator.

The proximity and distance measures present a special challenge. It is clear that this class of attributes has a substantial impact on Transportation Behavior, however I am still uncertain

which of the four indicators are going to prove most useful, so I alternately use each of them in given regression tests, and observe the results. (I do not use more than one of them at a time, because they naturally have correlations with each other, and one of the main functions of the regression test is to illuminate such interrelationships among the predictor variables.)

The first series of regression tests indicate that, no matter which proximity/distance measure I use, Age and Time at Work are not statistically significant when controlled for the other variables in the test. I conduct two more series of regression tests, dropping first Age and then Time at Work from the list of variables. The outcomes of the tests are slightly different, depending on which proximity/distance variable is used. Curiously, both of the aggregated variables, In/Out of Town and Commute Distance Rollup, result in Education now showing as not statistically significant, but the non-aggregated forms, Remoteness from Town and Commute Distance (raw), cause Education to remain statistically significant. Part of the output for the two latter regressions are shown below. The numbers (significance and standardized correlation coefficients / Beta) are similar in each scenario, and they both tell essentially the same story. Note that Income, Time at Home, and the proximity/distance factors all show with negative correlations of modest strength.

Table 3. Multivariate Analysis - Results of Regression A

	Standardized Coefficients Beta	Sig.
Commitment	0.133	0.000
Gender	0.068	0.002
Education	0.061	0.015
Income	-0.210	0.000
Time at Home	-0.106	0.000
Remoteness from Town	-0.271	0.000

Note: Dependent Variable = Index of Transportation Behavior

Table 4. Multivariate Analysis - Results of Regression B

	Standardized Coefficients Beta	Sig.
Commitment	0.140	0.000
Gender	0.072	0.005
Education	0.068	0.015
Income	-0.212	0.000
Time at Home	-0.111	0.000
Commute Distance	-0.244	0.000

Note: Dependent Variable = Index of Transportation Behavior

Regression tests were also performed to see if Number of Vehicles in Home remained significant and strong when controlling for other variables, particularly Income. Tests also included Commitment and Commute Distance. The significant and strong negative correlation between Number of Vehicles in Home and Green Transportation Behavior remained. As mentioned previously, there is uncertainty about the directionality of possible cause and effect in this correlation. For this reason, I decided to drop Number of Vehicles in Home from further analysis in this project, though it could be an interesting point for further research in a different project.

A regression test was also performed to see if the previously observed correlation for Time at Home remained statistically significant and of similar strength when controlling for Commitment, Income, and Commute Distance. In fact, Time at Home did remain statistically significant with a modest negative correlation.

If one compares the standardized beta coefficients of the multi-variate regression tests with the coefficients from the bi-variate correlation tests, the strength of most of the individual relationships (including that of commitment) decreased when controlled for the other variables,

but not uniformly. Gender and Education become considerably less strong. Time at Home also is notably less strong. Commute Distance becomes less strong, but it is a relatively slight change; the same is true of Remoteness from Town. The relationship between Income and Green Transportation Behavior becomes stronger.

In short, though I have found several statistically significant predictors, the strongest appear to be Income and measures of proximity/distance, followed by Commitment and Time at Home, and with Gender and Education being the weakest. (Note: When these tests were repeated using the Boolean Green Transportation Indicator, Gender and Education became statistically insignificant, however the critical findings regarding the three strong negative predictors was still evident.) It is interesting to see that, with Commitment being the exception, three of the four strongest correlations are negative. Additionally, we see that for the remaining two predictors, the correlations, though positive, are relatively weak. That is, I find that, while Commitment has a strong positive influence on Green Transportation Behavior, three other factors - Income, Location/Distance, Time at Home – counter that with a strong negative influence on it.

Evaluating the Tentative Predictors Against Other Behaviors and Engagements

Recall that above I found that though there were expected positive correlations between general environmental Commitment and various specific environmental Behaviors and Engagements, that the correlation was noticeably weaker for Green Transportation Behavior than all the other Behaviors and Engagements.

In the subsequent subsections, I identified several specific predictors for Green Transportation Behavior. Two show weak positive correlations, and four show stronger negative

correlations. Now, I evaluate those same variables as possible predictors for the other Behaviors and Engagement, paying particular attention to the strength and polarity of correlations.

For this exercise, the Behaviors include Waste Prevention, Conservation, and Natural Environment, and again, for convenient side-by-side reference, the original 4-valued Green Transportation Behavior index, along with my custom-made Boolean aggregate of it. The engagements include U-M Sustainability Initiatives, U-M Sustainability Initiatives B, and General Sustainability. The other, hypothetical predictor variables, include Gender, Education, Income, Time at Home, Remoteness from Town, and Commute Distance.

A series of correlation tests were run, and the coefficients of significant correlations was recorded, and is shown concisely in the tabulation below.

Table 5. Comparison of Correlations of GTB Predictors to Other Behaviors and Engagements

Predictors	Behaviors					Engagements		
	GTB-2	GTB-4	WPB	CB	NEB	UMSE	UMSBE	GSE
Gender	0.069	0.107			-0.119			
Education	0.059	0.108	0.147	0.078			-0.046	0.154
Income	-0.231	-0.175	0.066	0.075	-0.241			0.174
Time at Home	-0.200	-0.197	0.099	0.112	-0.181	0.098	0.114	0.170
Remoteness from Town	-0.260	-0.315	-0.146	-0.054	-0.150	-0.058		-0.155
Commute Distance	-0.233	-0.295	-0.143		-0.162			-0.124

While Gender shows a weak to mild positive correlation for Green Transportation Behavior, it is not statistically significant for five out of the other six types of Behavior/Engagement; for Natural Environment Behavior, there is a modest negative correlation.

Similarly, Education has a weak to mild positive correlation with Green Transportation Behavior. For the other Behavior/Engagement types, it is not statistically significant for two of them, has a weak negative correlation with U-M Sustainability Initiative B, and weak to mild positive correlations with the others.

For Gender and Education, no striking patterns are evident that differentiate greatly between Green Transportation Behavior and the other Behaviors/Engagements being evaluated.

Income has a strong negative correlation with Green Transportation Behavior, but only shows a similar strong negative correlation with one other Behavior/Engagement. For two of them, it is not statistically significant, and for three of them it has a positive correlation – two being fairly weak, and one being stronger.

Time at Home has a strong negative correlation with Green Transportation Behavior. It has a similarly strong negative correlation with Natural Environmental Behavior, but a modest positive correlation with all the other Behaviors/Engagements.

Remoteness from Town has a strong negative correlation with Green Transportation Behavior. It has a statistically significant correlation with five of the other Behaviors/Engagements, and is in all five cases negative, but is also in all five cases notably weaker than that for Green Transportation Behavior.

Commute Distance has a strong negative correlation with Green Transportation Behavior. It has a statistically significant correlation with three of the other Behaviors/Engagements, and is in all three cases negative, but is also in all three cases notably weaker than that for Green Transportation Behavior.

For Income, Time at Home, Remoteness from Town, and Commute Distance, a clear pattern emerges. Though these four variables are strongly negatively correlated with Green Transportation Behavior, they do not generally show this same relationship with the other Behaviors/Engagements – they either are not statistically significant; are positively correlated; or are negatively correlated, but much more weakly.

Recall again the early discovery that one characteristic that differentiates Green Transportation Behavior from the other Behaviors/Engagements is the weaker, though still positive, correlation with general environmental Commitment. Now another differentiating character of Green Transportation Behavior has been uncovered: the more strongly negative correlations with these four variables of Income, Time at Home, Remoteness from Town, and Commute Distance. Arguably, the distinctive strong negative correlations of these four variables with Green Transportation Behavior work to offset some of the positive correlation with general environmental Commitment, and help account for the fact that the correlation between Commitment and Green Transportation Behavior is, though still positive, weaker than the correlations between Commitment and any of the other Behaviors/Engagements. That is, I may have identified the factors specific to Transportation that interfere with Commitment leading to Behavior. In brief, it appears that people who are more affluent, have been in there home for a long time, and live at greater distances from work and town, are more likely to drive personal automobiles to work, even if they might espouse a general commitment to environmental sustainability.

Discussion

Through statistical data analysis of the SCIP data set, as documented in the Methods and Results sections above, I have found evidence for several relevant phenomena. Some of these were consistent with expectations, whereas some were unanticipated or even counterintuitive. First, there is evidence that, as expected, Commitment to environmental sustainability produces environmentally sustainable Behaviors as well as Engagements with environmentally sustainable programs or initiatives. Second, there is evidence that Green Transportation Behavior is

somewhat unique in that it seems to respond to Commitment less than other Behaviors and Engagements. Conceptually, it seems that something drives a wedge between Commitment and Green Transportation Behavior, but not between Commitment and other Behaviors and Engagements. This established a special puzzle that I wanted to solve in the course of my subsequent more detailed analysis.

I wanted to find factors beyond general environmental Commitment that seem to have an influence, either positive or negative, on Green Transportation Behavior. These would provide valuable insights for public policy planning related to eco-friendly transportation. The puzzle, however, provided additional motivation, since it suggested the existence of strong and unique negative influences that might be fertile ground for efforts at mitigation to increase compliance by lifting the impediment to the natural positive effect of Commitment. These considerations led me to search for other factors effecting Green Transportation Behavior, but particularly with an eye toward identifying those that might explain this wedge phenomenon. Thirdly, through bivariate and multivariate analysis of multiple plausible candidates, I ultimately discovered a few specific factors that seem to have a measurable effect on Green Transportation Behavior, and also specifically some that seem to have a strong and negative effect uniquely on Green Transportation Behavior. These factors are arguably responsible, at least in part, for the observed wedge.

The factors of greatest effect are Gender, Education, Income, Time at Home, Remoteness from Town, and Commute Distance. Of these, the last four have a strong negative influence on uniquely on Green Transportation Behavior, and are arguably the wedge factors – these are the factors that seem to explain why Commitment does not lead to Green Transportation Behavior as

strongly as it leads to other green Behaviors and Engagements. Gender, when female, also seems to discourage the Commitment to Green Transportation Behavior connection.

The Gender relationship is interesting. There is some research that has suggested women are more concerned about the environment than men are (McCright 2010). We might therefore expect more Green Transportation Behavior by women than men. But the analysis I have conducted of SCIP data reveals, counterintuitively, that after controlling for other factors, men are actually slightly more likely to engage in Green Transportation Behavior. My advisors and I have speculated along several lines. It may be that women, as per traditional gender roles, are more likely to be responsible for transporting children to and from daycare and school, and be "on-call" to respond during the day, if needed. Similarly, they may be more likely to be the spouse most responsible for various domestic support functions, including errands before, after, or even during working hours. These social requirements, then, might explain their greater inclination to drive a personal automobile. Unfortunately, data was not available on marital status nor on number and ages of children, which could have been helpful in exploring this idea. Alternatively, many forms of Green Transportation Behavior are arguably less physically secure than the inside of a personal automobile, and typical commute times may occur during hours of darkness in some parts of the year. Women may on average feel less comfortable than men with some of these situations, and thus be discouraged from taking advantage of some forms of Green Transportation Behavior.

It is noteworthy that even when controlling for interrelated factors, such as Income and other indicators of affluence, Education does have a mild positive relationship to Green Transportation Behavior. One might speculate that this is due to a higher eco-consciousness among more educated people. It may also indicate the operation of theories of habitus and taste,

with more educated people sharing a cultural inclination to environmentally responsible behavior. As note, though, the relationship is not terribly strong, so I will note the possibility without placing strong emphasis on it. The idea, however, does represent a possibility for further research, perhaps with a dedicated survey and data set, or a qualitative effort based on interviews.

The negative relationship between Income and Green Transportation Behavior merits some consideration. It is interesting to note that while, generally speaking, higher Education levels are associated with higher Incomes, the relationship of each of those two interrelated factors to Green Transportation Behavior is very different – Education increases Green Transportation Behavior whereas Income decreases Green Transportation Behavior. I have already speculated that the habitus of the educated classes may involve an ethic of environmental responsibility. It may also be true that the habitus of the affluent classes may exhibit taste either for personal automobile transportation and/or against Green Transportation Behavior. The tastes of the more affluent may also include types of housing and neighborhoods that are at a greater distance from city centers. One or more factors may be at the root of these matters of taste. It is possible that the more affluent have a preference for maximum personal autonomy, which is best provided by personal automobiles. It may be that some forms of Green Transportation Behavior, such as public mass transit systems, are associated with other classes, and not seen as natural part of the milieu of the more affluent or professional classes. Additionally, drawing from the field of economics, it could be argued that, in American society, green modes of transportation are an inferior good, which means that they are consumed more when Income is less, and consumed less as Income increases, and more desirable options become affordable. Conversely, it could be argued that for people of lower Incomes, use of Green Transportation Behavior is driven by

inherent economic incentives. However, more pragmatic factors may be at work, as well. It is possible that the more affluent hold the types of jobs that require maximum availability and flexibility, and that it is simply not feasible to use green transportation options. All these ideas could be productive ground for additional research. Given the difference in the use of public mass transit and cycling in Europe versus America, comparative research might shed light on how the dynamics of taste and habitus function differently in American and European society in terms of Green Transportation Behavior. As well, it could provide insight into notion of altruistic consumers versus the strictly rational, self-interested actor of the traditional economics model. Additionally, such research might offer perspectives on collective action problems, and how the different cultures are responding to them.

I have already mention that the negative relationship between Time at Home and Green Transportation Behavior was counter to my expectation. I had presumed that stability and continuity in residential (and workplace) arrangements would make it more likely that a person would 'get around to' considering transportation alternatives, but the findings were the opposite. I might speculate that homes of longer occupation are more likely to be more desirable homes in more desirable neighborhoods, and hence be associated with greater affluence. Conversely, homes of shorter duration may be accommodations typical of earlier stages of a career, and hence while Income and affluence is lower. Or it could be that the reluctance to move and the reluctance to adopt green transportation, are both manifestations of an underlying resistance to change in the people in question. More research to understand the explanation might be interesting.

The pair of factors of Remoteness from Town and Commute Distance reflect both distance (the latter most directly and precisely) and community of residence (the former more

directly). Distance is understandably a critical factor in some modes of Green Transportation Behavior, such as walking and biking, which are impractical for long commutes. In addition to its interrelationship with distance, remoteness from Ann Arbor reflects some other underlying factors. Communities of residence may have their own cultural orientations relative to environmentalism and transportation, which again brings us back to theories of taste and habitus. And from a more pragmatic standpoint, different communities may vary in the extent to which they are covered by bus stops and integrated with the transportation infrastructure serving Ann Arbor (wherein the workplaces of our study are located). Though it was scrubbed (as personally identifying information) from the version of data I had, SCIP does incorporate more detailed data on residential location, based on city, zip code, and nearest major intersection. This information could be combined with other information from other sources to perform more detailed analysis. For instance, information on bus stop locations could be obtained from transit authorities, and compared to residence location to evaluate the possible effect of proximity to a bus stop on bus use. Such an analysis would address the role of ease or difficulty of access as factors influencing use of Green Transportation Behavior.

One general caveat that should be noted in regards to this study is that the data set to be analyzed, though very detailed, is limited in its population of study. The SCIP project is specific to associates (Students, Faculty, Staff) of the University of Michigan Ann Arbor. This study is based on the Faculty and Staff data only. Thus, results of this project's analysis may not be generalizable to other populations. Specifically, it may not reflect other communities, types of communities, or types of respondents. Indeed, if the findings of this project are suggestive of interesting and useful insights, it would be a logical future undertaking to scale up this type of study to a more broadly representative sampling of a more general population, considering cities

of different affluence and size, and people of a wider array of occupations and socio-economic levels, as well as socio-political ideologies and other such cultural properties.

Conclusion

As I have stated elsewhere throughout this thesis, the ultimate goal of this project is not just to provide abstract or theoretical knowledge, but knowledge that can be usefully applied to the development of public policies and programs in the areas of transportation, urban planning, and environmental management. It starts from a presumption that, for many reasons, policy planners in these disciplines often have a desire to promote the use of transportation alternatives that will reduce environmental impact, relieve traffic congestion, decrease roadway wear, and minimize demand for parking spaces in concentrated business districts more than the traditional American model of single-occupancy personal vehicles.

Policy analysts, urban planners, and civil engineers are admirably adept in devising systems and designing infrastructure to enable alternative transportation to meet these policy goals. But this alone is not enough to ensure adoption by the public. As this study has shown, there are various social factors at work that discourage participation in alternative transportation schemes – even in cases where environmental consciousness and a green ethic already exist. Furthermore, at least some of these inhibitors are specific to Green Transportation Behavior versus other environmentally-oriented Behaviors.

By illustrating these various phenomena, and by identifying some of the factors that influence adoption of Green Transportation Behaviors, including those that appear to be uniquely strongly negative to Transportation, I hope I have offered insights to planners that will be helpful in designing public policy that can mitigate some of these inhibitors, as well as leverage positive

factors. The result would be policies and programs that not only provide infrastructure, but more thoroughly encourage and facilitate its use. Though further research is, in many cases, called for to build on this study and explore some of the underlying causes suggested, I offer this study as an example of the kind of sociologically-oriented approach that may be helpful in achieving improved success rates relative to policy goals.

Evidence presented suggests a number of categories of relevant factors: commitment to environmental sustainability, ease or difficulty of access to transportation systems, issues of convenience and/or feasibility in regards to other aspects of lifestyle, economic incentives, cultural biases / habitus / taste. A few specific but highly-abbreviated examples of possible policy responses follow in the paragraphs below.

If further research corroborates speculation on less-than-expected participation by women, policy measures that, in collaboration with public safety departments, seek to increase public security during peak commute times and/or at bus stops or along common travel routes may boost participation. On a totally different angle, engaging schools, daycare facilities, and employers to devise creative solutions to accommodate the special needs of working parents may remove some barriers to participation. On-site or adjacent daycare may reduce the need for a working parent to drive a personal automobile.

Secure bike storage facilities at workplaces may encourage bicycling, as might workplace shower facilities. Equipping buses with bike racks would enable this combined form of green transportation, and might make a critical difference when neither mode alone would be practical.

In addition to assuring adequate local coverage of transportation systems, working across jurisdictions to better integrate outlying areas and satellite communities may improve accessibility, convenience, and feasibility of participation.

Since economics appears to be a substantial factor, economic incentives could encourage participation. For instance, if an employer pays for parking, perhaps the option of instead having that amount applied to bus fares could be offered.

It appears that there may be strong cultural influences at work, such as taste and the perception of public transportation as an inferior good. This may be one of the more challenging areas to address, but there are plenty of good historic examples of prolonged and concerted public education campaigns making a difference in public perception, and ultimately influencing behavior. As well, efforts could be made to understand the particular aspects of why public transportation may be perceived as an inferior good, and modify the systems accordingly.

Managing the quality of our environment, both built and natural, is an integral consideration in many fields of public policy, including but not limited to transportation. With the natural sciences informing our understanding of the physical world and ecological processes, and engineering offering solutions to meet our needs for infrastructure while minimizing harmful impact, the social sciences round out the public policy planner's toolkit with insights into how to create programs that can integrate more seamlessly with society, be more readily adopted by people and institutions, and better serve the public interest. With this troika of tools, planners and analysts are well-equipped to craft robust, holistic public policies for environmentally-sustainable transportation that achieve higher rates of public acceptance.

Appendix A

Mapping Between SCIP Variable Names and Plain-English Clear Names used in Thesis

SCIP Variable Name	**Plain-English Clear Names**
RC_CMMindex_FCST	Commitment Index
RC_TTAindex_FCST	Transportation Awareness Index
RC_WPBindex_FCST	Waste Prevention Behavior Index
RC_NEBindex_FCST	Natural Environment Behavior Index
RC_CBindex_FCST	Conservation Behavior Index
RC_TTBindex_FCST	Green Transportation Behavior Index
RC_GSEindex_FCST	General Sustainability Engagement Index
RC_UMSEindex_FCST	U-M Initiatives Engagement Index
RC_UMSEindex_FCST_1	U-M Initiatives B Engagement Index
FCST54_2015	Own or Rent
FCST55_2015	Time at Home
FCST58_2015	Number of People in Home
FCST59_2015	Number of Vehicles in Home
FCST60_2015	Age
FCST61_2015	Gender
CL_FCST62_2015	Education
FCST63_2015	Income
RC_CurResZip_2015	Remoteness from Town
FCST47_2015	Staff or Faculty
FCST49_2015	Tenured or Untenured

FCST51_2015 ..... Time at Work

DST2BLD_2015 ..... Commute Distance

RC_DST2BLD_2015 ..... Commute Distance Rollup

Appendix B

Data Elements, Survey Questions, Response Options, Codings

Gender

What is your gender?

1. Female
2. Male
4. Choose not to respond
5. Other

Age

How old are you?

1. Under 25
2. 25 - 29
3. 30 - 39
4. 40 - 49
5. 50 - 59
6. 60 - 69
7. 70 or over

Education

What is the highest level of education you have completed?

1. High school graduate or less
2. Some college
3. College graduate
4. Graduate or professional degree
5. Other: (please specify)

Income

What category best represents your 2011 annual household income?

1. Less than $50,000
2. $50,000-$74,999
3. $75,000-$99,999
4. $100,000-$149,999
5. $150,000-$199,999
6. $200,000 or more

Own or Rent (of Home)

Do you own or rent?

1. Own
2. Rent

Staff or Faculty (Position)

Are you?

1. Staff
2. Faculty

Time at Work

How long have you worked at UM?

1. Less than a year
2. 1 – 2 years
3. 3 – 5 years
4. 6 – 10 years
5. 11 – 20 years
6. More than 20 years

Time at Home

How long have you lived at your current residence?

1. Less than a year
2. 1 – 2 years
3. 3 – 5 years
4. 6 – 10 years
5. More than 10 years

Tenured or Untenured (Faculty only)

Are you?

1. Tenured Faculty
2. Non-tenured faculty

Number of People in Home

Number of people, including yourself, who live in your current residence.

(open-ended)

Number of Vehicles in Home

Number of cars and trucks (passenger vehicles) owned/leased by your household.

0. None
1. 1
2. 2
3. 3
4. 4 or more

Commute Distance

Travel distance from residence to the working building

(continuous) (Calculated from geocoded values of [other variables])

Commute Distance Rollup

Travel distance from residence to the working building

(recoded)

1. “<1 mile”
2. “1 – 1.99 mile”
3. “2 – 3.99 mile”
4. “4 – 5.99 mile”
5. “6 – 9.99 mile”
6. “10 – 14.99 mile”
7. “15 – 19.99 mile”
8. “>= 20 mile”

Remoteness from Town (Ann Arbor, Ypsilanti, Washtenaw, Michigan)

What is the zip code of your current residence?

(recoded)

1. Ann Arbor (48103,48104,48105,48106,48108,48109)
2. Ypsilanti (48197, 48198)
3. Other Washtenaw
4. Other Michigan
5. Elsewhere

References

Antonucci, Laura, Corrado Crocetta, Francesco D. d'Ovidio, and Ernesto Toma. 2014. "Passenger Satisfaction: A Multi-group Analysis." *Quality and Quantity, 48*(1), 337-345. doi:http://dx.doi.org/10.1007/s11135-012-9771-7

Banister, David, Karl Dreborg, Leif Hedberg, Sven Hunhammar, and et al. 2000. "Transport Policy Scenarios for the EU: 2020 Images of the Future." *Innovation, 13*(1), 27-45. Retrieved from http://search.proquest.com/docview/211963041?accountid=14667

Béland, Daniel. 2014. "Developing Sustainable Urban Transportation." *The International Journal of Sociology and Social Policy, 34*(7), 545. Retrieved from http://search.proquest.com/docview/1651702956?accountid=14667

Bourdieu, Pierre. English Translation: unknown, French Original:1979. *Distinction: A Social Critique of the Judgement of Taste*. (Richard Nice, Translator). Cambridge, MA: Harvard University Press. (Original work published 1979)

Carfagna, Lindsey B., Emilie A Dubois, Connor Fitzmaurice, Monique Y Ouimette, Juliet B Schor, and Margaret Willis. 2014. "An Emerging Eco-habitus: The Reconfiguration of High Cultural Capital Practices Among Ethical Consumers." *Journal of Consumer Culture* 14.2 (2014): 158-178.

Dunlap, Riley E., and Kent D. Van Liere. 1984. "Commitment to the Dominant Social Paradigm and Concern for Environmental Quality." *Social Science Quarterly* 65: 1013-1028.

Gartman, David. 2004. "Three Ages of the Automobile: The Cultural Logics of The Car." *Theory, Culture & Society* 21.4-5 (2004): 169-195.

Guber, Deborah L. 2003. "Chapter 8: The Marketplace: Motivating the Citizen Consumer" *The Grassroots of a Green Revolution*. Cambridge, MA: MIT Press.

Hoyer, Wayne D., and Nicola E. Stokburger-Sauer. 2012. "The Role of Aesthetic Taste in Consumer Behavior." *Journal of the Academy of Marketing Science* 40.1 (2012): 167-180.

McCright, Aaron M. 2010. "The Effects of Gender on Climate Change Knowledge and Concern in the American Public." *Population and Environment* 32: 66-87.

Shafer, William E. 2006. "Social Paradigms and Attitudes toward Environmental Accountability." *Journal of Business Ethics* 65:121-147.

Steinbach, Rebecca, Judith Green, Jessica Datta, and Phil Edwards. 2011. "Cycling and the City: A Case Study of How Gendered, Ethnic and Class Identities Can Shape Healthy Transport Choices." *Social Science & Medicine* 72.7 (2011): 1123-1130.

Trigg, Andrew B. 2001. "Veblen, Bourdieu, and Conspicuous Consumption." *Journal of Economic Issues* 35.1 (2001): 99-115.

Yates, Adam, Ye Luo, Catherine Mobley, and Erin Shealy. 2015. "Changes in Public and Private Environmentally Responsible Behaviors by Gender: Findings from the 1994 and 2010 General Social Surveys." *Sociological Inquiry*: 1-29.