EXPLORING THE RELATIVE IMPACTS OF ALTRUISTIC, BIOSPHERIC, AND EGOISTIC MOTIVATIONS TO ADOPT GREEN HOUSING FEATURES

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by

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

EXPLORING THE RELATIVE IMPACTS OF ALTRUISTIC, BIOSPHERIC, AND EGOISTIC MOTIVATIONS TO ADOPT GREEN HOUSING FEATURES

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a candidate for the degree of Doctor of Philosophy,

and hereby certify that, in their opinion, it is worthy of acceptance.

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Professor Deanna L. Sharpe

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Professor Newton D'Souza

DEDICATION

With heartfelt sincerity, this dissertation is dedicated to:

My husband Rafael, whose ability to listen to me has kept me afloat at the most difficult moments. His support and encouragement made me believe I could successfully complete this challenge. His remarkable intelligence and clarity help us both find balance in our lives.

My parents Vera and Tomaz, who taught me that all people are equal, that dreams need to be nourished, and that determination is my ally. They are living proof that hard work is the best road to success. Their love for each other is truly admirable and inspiring.

My little sister, my sisters-in-law, brothers-in-law, parents-in-law, and my niece. Their fun visits brought so much joy and made me feel renewed and ready to tackle new challenges. They kept me in the loop about everything that was happening while I was far away, and for that I am immensely grateful.

And finally to my good friends I met in Columbia and are now spread throughout the globe. Together we have mastered the art of having fun even when we missed home. We shared great conversations and also goofy conversations. They've inspired me to learn and better understand people. This handful of friends will forever be in my heart.

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"I just thought—what if I actually tried not to hurt the environment? What would that feel like? Is it possible? Is it practical?" – Collin Beavan, No Impact Man

As informal and naïve as it seems, the quote summarizes the conversation I had with Dr. Ronald Phillips when I told him about the type of behavior that inspired me. I also told him I planned to conduct research by trying, by finding out what was possible and what wasn't when investigating how people feel about adopting green housing features. And as the great mentor he is, he did not worry about my lack of experience and impractical sense, he saw the researcher I could one day become. And because of his willingness to take on the task of mentoring me, today I am a little closer to becoming a great researcher. I am sincerely grateful for his believing in my potential.

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Exploring the Relative Impacts of Altruistic, Biospheric, and Egoistic Motivations to Adopt Green Housing Features

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Abstract

There is widespread agreement about the critical importance of adoption of green housing features (GHF's) from the part of residents. Still, little is known about the motivations underlying this phenomenon. This study examines the adoptions of GHF's as a type of proenvironmental behavior (PEB) arguing that an increasingly diverse population adopts GHF's as the result of disparate motivations. According to Schultz' (2000) theory, different motivations stem from different expectations of benefit related to concern orientations toward environmental issues. It would be too simplistic, not to say naïve, to assume that adoption is limited to those purely concerned with the environment.

With the goal of assessing the relative importance of altruistic, biospheric, and egoistic motivations in shaping the overall adoption of GHF's, an online survey was developed and distributed to subjects across the US, via convenience sampling and also through the online task interface Mechanical Turk. Seeking to address the lack of studies that target the homeowner as decision-maker, a screening session verified that subjects owned their residence and reportedly had added green features to it. Subjects were asked to indicate from a list all the GHF's present at the home, and subsequently answered questions concerning their environmental, altruistic, and self-beneficial orientations.

Factor analysis and regression were employed to present the sample profile, the environmental concern orientations of the homeowners, and the predictive power of different motivations on the adoption of GHF's. Because residential features are consumer goods and therefore may be an object of high involvement for some individuals, the study incorporated a measure of involvement with home features to control for that possible confounding effect.

Main results reveal that a combination of altruistic and biospheric motivations, as well as affective involvement, were positively associated with the adoption of GHF's. Moreover, motivations can be used to predict level of importance attributed to different categories of features, with indulgent egoistic motivations presenting a positive relationship with recycled construction materials and features. At the aggregate level, the sample was over-represented by households with higher income than the median American income level, and also by politically liberal individuals. It is speculated that the income and political biases explain the lack of statistical significance of egoistic motivations on the prediction of adoption. Possibly, this wealthier and more politically liberal sample of adopters is more internally motivated and cares less for the economic savings traditionally associated with the green building market.

Identifying the motives that lead to the adoption of green housing features has implications for the sustainability of the very green building industry. A deeper understanding of the nuances of adoption from the part of the homeowner is an important asset for gaining consumer support in face of increasingly challenging environmental issues. Green building professionals, policymakers and researchers can apply the new

knowledge to educational and marketing efforts in order to avoid threats from unknown barriers to adoption and unadjusted expectations of benefits.

INTRODUCTION

The present research examines the motivational factors underlying the addition of green housing features to one's home, which is commonly known as the performance of residential green retrofit. The choice of this research topic is relevant because of its potential social, environmental, and economic impact. The study is based on the notion that homes in the US are massive consumers of energy and other natural resources. With waning resources and challenging climate, governments at the local, state, and federal levels have been investing in financial incentives directed toward homeowners who wish to improve their energy and water consumption efficiency, through efforts that will reduce the homes' environmental impact with the performance of green retrofit strategies.

Despite the relevance of the topic, there is a remarkable lack of research focusing on consumers' attitudes toward green housing features (henceforward referred to as GHF's). As financial and human resources are being directed toward incentives to reduce energy consumption, it becomes imperative to know what kinds of retrofits are considered most important among those homeowners who have performed some type of green improvement. It is also important to investigate the motivations that are driving the adoption of GHF's and the comparative importance of the array of these motivations.

Green technologies and materials are, by definition, developed and employed with the goal of reducing human negative impact on the natural environment through reduced resource consumption, appropriate disposal of waste, and the like. Benefits associated

with their adoption extend beyond purely environmental returns. They encompass improved health for the user, improved conditions for child development, saving money through energy-efficiency, *and* contributing to the provision of resources for the needs of future generations (Noiseux and Hostetler 2008). Determining which features are currently appealing and finding ways to make other attributes desirable through tailored marketing efforts is crucial for the advancement of residential green retrofit worldwide.

When the adoption of GHF's is considered a type of proenvironmental behavior (i.e., behavior performed with the goal of reducing in some way the negative impact of human activity on the natural environment), environmental concern comes into play as a strong predictor (Bloch and Banerjee 2001; Zanoli and Naspetti 2002; Schelly 2010). Environmentally concerned individuals demonstrate an understanding that the natural, built and social environments are interconnected and interdependent. As a result, they express concerns associated with the adverse consequences arising from the negative impact of human activity on the natural environment (Stern et al. 1999).

An extensive body of literature discusses the multiple dimensions of environmental concern. Several authors argue that environmental concern stems from concerns with the self (i.e., egoistic, such as maintaining health and saving financial resources), with society in general (i.e., altruistic, like being concerned with the quality of life of future generations), and with the planet (i.e., biospheric/biophilic concern, such as with fauna and flora) (Stern et al. 1999; Schultz 2000, 2001; Snelgar 2006). Given the relevance of environmental concern to the study of proenvironmental behavior, it is necessary to take into account different types of concerns in this study.

It is especially important to recognize that the different types of environmental concern are in themselves a motivation to perform proenvironmental behavior and are, consequently, a motivation to perform residential green retrofit. At the same time, the benefits associated with green housing features can easily fit into the dimensions of environmental concern. As mentioned earlier, green features' benefits form a frequently cited trio: improved health, economic savings, and reduced environmental impact. The first and the second could arguably be categorized as egoistic benefits, while the third could be labeled a biospheric benefit. The intersection between benefits provided by green features and environmental concern viewed as a type of motivation is crucial in the development of this study.

It is also worth noting that the simple desire to update a home's overall features can be a strong motivation that culminates with the incorporation of green attributes. Many of the most modern and highly technological home features available in the market today have an environmental component to them. One such example is the high-efficiency heating and cooling systems that save energy *and* provide better indoor air quality, have lower noise levels and therefore contribute to the development of a high-end, comfortable and modern home environment. There remain some situations where trade-offs exist between comfort, aesthetics or convenience and ecological benefits, as is the case with granite countertops versus recycled glass countertops. The methods of extraction of granite, the distances the raw material travels to reach stores and homeowners are all factors that weigh against environment-friendliness. However, granite countertops are still very desirable home features for their high aesthetic appeal and associated social prestige. The latter is not always the case with recycled glass

countertops, which, as the name says, are made of recycled material and hence more environment-friendly when compared to granite products, but the same comparison makes them less aesthetically appealing.

Another important facet of proenvironmental behavior is that it is frequently undertaken as a means of self-enhancement. Ottman et al. (2006) report that many consumers purchase green goods (from organic food to hybrid cars) in order to make a statement to society. They are motivated by the social desirability of being a responsible, environmentally minded citizen, and expect social rewards such as prestige and enhanced self-esteem when socializing with friends and family.

In order to account for the potential confounding role of motivations to retrofit that result in the implementation of green features but do *not* stem from environmental concern nor from expected health, economic and environmental benefits associated with green features, the concept of involvement with home features will also be explored in the proposed study. To account for the possible effects of proenvironmental behavior based on self-enhancement, that dimension will be incorporated in the egoistic type of environmental concern.

Considering the variety of concepts that surround the performance of green residential retrofit and their potential inter-relationships, the proposed study develops a new theoretical framework and a measurement tool to specifically address the following research questions: 1) What are the green features considered most important by residents who have performed residential green retrofit? 2) Considering different types of motivations to perform proenvironmental behavior (i.e., environmental concern, health, economic and environmental benefits, and involvement with home features), what are the

comparative weights of each type of motivation on the adoption of GHF's? 3) Can preferences for green features be predicted by different motivations?

In order to achieve the study's goals, the target sample will be composed of homeowners who have adopted some type of green housing feature in the recent past. Qualifying subjects must have added to their currently occupied and owned residence a green feature of any type, from appliances and systems to fluorescent light bulbs to low-maintenance landscape. The theoretical framework for the study, a detailed description of the methods employed, results, and discussion are presented in the sequence.

LITERATURE REVIEW

Due to increases in the global population and a progress-and-consumption economic model that has been permeating societies for nearly a century, non-renewable resources are becoming scarce. In this context, individuals today express higher levels of awareness of and concerns about the environment than they did a few decades ago (Noiseux and Hostetler 2008). Nonetheless, in the context of green housing features and green homes, the literature demonstrates that consumers still lack a deeper understanding of the concepts of green building and green features (Yudelson 2007; Hoffman and Henn 2008; Noiseux and Hostetler 2008; Purdie 2009).

Although buildings are leaders in the production of negative environmental impacts, surpassing common sources of pollution such as vehicles, there is little research about consumers' attitudes toward buildings' green features and even less about motivations to adopt those features. With the exception of works in environmental valuation of residences that possess green features, studies dealing with perceptions of and behaviors towards green products have mostly focused on non-durable products, such as organic food, or on energy-efficient appliances and systems (Zanoli and Naspetti 2002; Tanner and Kast 2003; Ek and Söderholm 2008; Schelly 2010), leaving green building features accounting for a very small portion of the empirical literature.

Due to the lack of studies specifically about the adoption of green housing features, this study is based on the vast literature about the adoption of other types of green products and green practices. The goal is to use existing theories to investigate the

adoption of green housing features as a type of proenvironmental behavior. Following this rationale, the subsections below review and discuss research pertaining to green building, residential green retrofit, as well as proenvironmental behavior and its antecedents/motivations.

2.1 Green homes and residential green retrofit

Commercial and residential buildings nestle most of human activities, and therefore are a significant source of pollutants, including millions of tons of solid waste every year. Buildings in general are also massive consumers of fuel-based electricity, which represents a social and economic concern due to, respectively, waning non-renewable resources and, consequently, increases in energy prices.

In what concerns residences, Purdie (2009) documents that, in 2007, the U.S. Energy Information Administration reported that these buildings are accountable for 21 percent of national carbon dioxide (CO_2) emissions. In 2008, the same agency reported that American homes consumed 21.8 percent of total national energy, 21 percent of total natural gas, and 31 percent of end-use electricity (Purdie 2009). Moreover, the economic crisis that occurred in 2008 brings private residences into the spotlight, emphasizing the need for affordable homes to shelter minorities and bankrupt families in need of low-maintenance, energy-efficient dwellings.

Residences equipped with green features emerge as a possible solution for the referred problems. In order for a home to be certified as green, it has to be built to perform according to a set of rules and standards provided by specific certification programs, such as US Green Building Council's LEED (Leadership in Energy and

Environmental Design) for Homes (USGBC 2013). The National Association of Home Builders defines green homes as "residential buildings that conserve energy, water and natural resources, use recycled or sustainable products, and protect indoor air quality" (NAHBGreen, 2011). Due to their ability to improve health, save in maintenance costs, and help preserve the environment, these residences are becoming popular in the United States. Nonetheless, a strong green homes' market is not yet present in many regions of the country.

Commercial and residential green buildings are prevalent throughout the Pacific Northwest region, although they seem to be present only in major cities such as Seattle, Washington, Portland, Oregon, and San Francisco, California, where the more experienced builders are located and where there is a large consumer market based on a higher socioeconomic population (Allen and Potiowsky 2008; Cascadia Region GBC 2009; City of Seattle 2009).

This scenario indicates the need to enhance consumer participation in the residential green building market. In order to explore and analyze aspects that would lead to an extension of this market through the participation of the mainstream consumer, there first needs to be a better understanding of the mainstream consumers' motivations to add green attributes to their current home.

The variables surrounding attitudes and behaviors towards homes with green features are associated with: a) health concerns (i.e.: preference for ventilation systems that provide higher indoor quality); b) economic concerns (green features' price premiums, energy-savings, returns in investments); c) green features' visual appearance (fear that features will compromise the aesthetics of the building); d) and life values, that

is, whether individuals have predominantly altruistic, biospheric, or egoistic orientations (Mainieri et al. 1997; Straughan and Roberts 1999; Banfi et al. 2005; Yeang 2006; Hoffman and Henn 2008; Capps 2009; Pasternack 2009; Purdie 2009).

Given this diversity of topics, there was the need to conduct an exploratory study to better understand the relationships among variables emerging from them. Conducted in 2012, the exploratory study investigated homeowners' attitudes about green homes and homeowners' preferences for GHF's in Columbia, Missouri (Murarolli 2012). Results indicated that the most preferred features were energy-efficient windows and doors, followed by high-performance HVAC systems and finishes free of harmful chemicals.

Furthermore, results showed that the variables pertaining to willingness to pay for price premiums and the importance of rebates and tax incentives for green retrofit were statistically correlated. There were also statistically significant correlations among green features; however, no further analyses were conducted to investigate the nature of correlations. Due to a small sample size (n= 65), the analyses were limited to bivariate correlations and descriptive statistics based on the Multi-Attribute Utility Theory method.

Despite of the exploratory study's sample and generalization limitations, it identified important insights. For example, in a scale ranging from one to 10, no green feature received a mean score lower than 6.44. Regardless of the type of feature (water-saving, energy-saving, and health-related), all of them were, on average, considered important above the median level (i.e., five points), which has implications.

The highly educated sample (mainly faculty and staff of a large Midwestern University) most likely had more knowledge about the topic than did the average citizen, which might have lead to the referred result where all features were attributed high

importance levels. Secondly, the section on preferences for green features was not linked to any real-life situation. That is, respondents were not asked whether they had such features in their homes, nor did they rank them in order of priority in case they were to add those features to their home. It is then possible that, with cost limitations aside, the level of importance was inflated. But at the same time, because all features were considered important by consumers, it can also be inferred from the results that in real-life situations competing motivations stemming from economic, health, and environmental issues would play a role in consumers' decisions to add green features to their existing house.

In order to better understand level of importance attributed to features, this study will sample homeowners who have already made the decision to incorporate green features to their residences. This way, their understanding of green features and the motives to adopt them can be investigated in a real-life context. Because of a much lower number of green homes in the state of Missouri when compared to the West coast, surveying homeowners of green certified homes would prove unsuccessful. Instead, this study focuses on the adoption of GHF's, regardless of the certification status of residences.

Residential green retrofit is here defined as the incorporation (by means of replacement or addition) of green housing features that provide at least one of the following: resource conservation (i.e., energy, water, natural resources in general), and/or improved indoor air quality. A GHF is the feature incorporated to the home as a result of the retrofit. It can be any type of structural/building material, a system, an appliance or a device that provides resource conservation and/or improved air quality. In the case of

fluorescent light bulbs, they are only considered a retrofit if more than 5 of the total bulbs in the home are fluorescent.

This restriction is justified because fluorescent light bulbs are relatively inexpensive green features when compared to recycled building materials or other energy-efficient features. Other than being affordable, they provide better lighting, and last longer than their incandescent counterpart, making them a much more popular green feature than many others. If the minimum quantity of one fluorescent light bulb in the home were considered a retrofit, then virtually any home would qualify for the study, which is not desirable. The data need to present sufficient variability to generate a statistically sound and representative study.

And finally, a home is here operationalized as a residential property that a homeowner considers his/her current residence. It encompasses all types of houses (single and multi-family, one or more stories, site-built or manufactured), condominiums, and apartments.

2.2 Adoption of GHF's as proenvironmental behavior

Proenvironmental behavior (PEB) is defined as "behavior that has a reduced impact on the environment" (Reid, Sutton and Hunter 2010). Examples of PEB include switching off lights, recycling, purchasing recycled products and organic food, and using sustainable modes of travel. With regards to product purchases, there is an extensive literature in consumer behavior dealing with PEB, also named as green consumer behavior (Straughan and Roberts 1999), sustainable consumption (Tanner and Kast 2003), and ecologically conscious consumer behavior (Ottman et al. 2006). Despite of

differences in nomenclature, all terms refer to the same type of behavior that is here called PEB.

The focus of this study is on the type of PEB that translates into the purchase and consequent implementation of home features that provide a reduction of the negative environmental impact of a home. However, as discussed in the introduction, the adoption of GHF's might be an indirect form of PEB. Because green features can be added to a home for reasons that are not primarily related to environmental protection (this issue is more thoroughly discussed in the following sections), it is possible that the adoption of a green feature is a *coincidental*, *secondary*, or *indirect form of PEB*. Even if that is the case, it is still PEB, but the motivations for practicing it are inherently different from those of an individual who is primarily retrofitting with environmental protection in mind.

Given the peculiarities surrounding the adoption of GHF's as a type of PEB, the framework presented here does not focus solely on PEB as a purchase-related behavior. It also considers results from studies examining recycling, using modes of transportation other than traveling alone by personal car, and participation in environmental organizations. This wide array of studies allows for a thorough examination of the different antecedents/motivations to perform PEB, which is expected to aid in the understanding of this peculiar from of PEB that is green retrofit.

Studying green retrofit in a residential environment is particularly challenging not only because of the above-cited peculiarities of the activity as a form of PEB, but also because the residential environment itself is rich and complex. As explained by Reid et al. (2010), the household is a societal unit where many decisions have to be made by a

group (i.e., household members), and not an individual. Specifically in the case of adoption of GHF's, it is likely that decisions are made by the parents in the case of a family, or by the individual who is in charge of the financial resources.

This is the case because retrofitting necessarily involves a financial investment. Additionally, the vast majority of retrofit incentive programs available to homeowners are advertised as a way of reducing the home's energy bills (City of Columbia's Department of Water and Light, 2013). Energy-efficiency has long been the flagship of green building certification programs. Thus, a relatively large portion of the decision to retrofit involves financial resource expenditures.

Considering the decision-making process regarding adoption of GHF's, it is important to note that it poses a limitation to all research targeting homeowners. The few studies that deal with retrofit as a form of PEB are all limited in the sense that, more often than not, the unit of analysis is individuals and not households. Perhaps this is a limitation that hinders the production of more studies on the topic. Nonetheless, if it is properly acknowledged, it does not negatively impact the value of research undertaken in those circumstances. Rather, it shows that, despite the challenges and limited resources, this is an area very much worthy of study because of its peculiarities and complexities.

Examples of the rare attempts at capturing the nuances of the performance of residential green retrofit are discussed in the next session, along with studies on other forms of PEB.

2.3 Proenvironmental behavior, environmental concern, and value orientations

Studies investigating motivations to adopt GHF's are scarce. Other than the exploratory study conducted by Murarolli (2012), exceptions include a study of motivations behind the adoption of residential solar thermal features (Schelly 2010), a description of narratives of environmental sustainability in the context of residential green renovations (Maller, Horne and Dalton 2012), and a study of whether homeowners wish to have green features in their communities (Noiseux and Hostetler 2008).

Noiseux and Hostetler (2008) studied homeowners who had recently purchased homes in green communities versus those who had purchased homes in traditional, non-green certified communities. Differences in design preferences were compared between two pairs of green and conventional master-planned communities. Results showed that new homeowners in both types of communities indicated six green features that they reported were somewhat important or very important when last looking for a home. These features were indoor air quality, open green spaces near the home, energy-efficiency, energy-efficient appliances, a walkable community and water-saving appliances. The authors concluded, "people may prefer developments with green features, as long as the option exists and is well-marketed" (Noiseux and Hostetler 2008 p. 42).

Maller and colleagues (2012) defend the idea that opportunities to improve a home's performance present themselves in the course of a renovation, and can lead to *green renovations*. In Melbourne, Australia, Maller, et al. (2012) studied homeowners who identified themselves as green renovators. The general profile of the homeowners indicates a highly educated group, with the majority having two children and renovating from cottages to bungalows to townhouses. Results indicated that decisions in the

renovation process were generally made equally between partners. However, the relevance of gender relation effects on the design of spaces was noted.

The most common spaces to be renovated were bathrooms and kitchens, with the goal of creating separate areas for adults and children, and also for reasons of privacy and convenience. Major sustainable design innovations were more often present in kitchens as opposed to bathrooms, with water-efficient faucets and energy-efficient appliances being the most common green features. Additionally, some homeowners went to great lengths to use reclaimed materials such as wood and furniture, by using online forums and insistently approaching lumberyard managers to request discarded materials.

Because the region where the homes are located had been subject to extensive drought periods, reports of reducing the time spent in the shower and the wish to add water savings features were a common occurrence. One homeowner mentioned a desire to add a grey water system to the home, however, it was not possible because the original design of the house could not accommodate the addition of that technology. There were also reports of the complexity of grey water recycling systems being a barrier to adoption.

The authors concluded that, although most green renovators presented a genuine intention of making the home more efficient, most renovators increased floor size, and none systematically monitored household energy and water consumption. This suggests the existence of a conflict between reduced consumption and aspirations for the ideal home. To overcome this issue, the authors suggested “a broader engagement with a deeper narrative beyond efficiency, supported and embraced by policy, about the

relationship between the materiality of housing, daily routines and environmental impact" (Maller et al. 2012 p. 273).

With regards to motivations, Schelly (2010) used three types of indices to predict residential solar use. Of the three, the top performing one was the socioeconomic index, followed by the environmental concern index. Although environmental concern came in second place, the author reports that the performance of both indices were almost equivalent in the fully loaded regression model. This illustrates the "interplay between sociostructural constraints (captured by the socioeconomic index) and value-oriented motivations (included in the environmental concern index)" (Schelly 2010 p. 167) in shaping the decision to adopt residential solar thermal technology. These results are in accordance with findings from sociological studies of proenvironmental behavior, where it is suggested that both socioeconomic factors and value orientations may play a significant role in shaping the decision to perform PEB (Stern 2000; Schultz 2000, 2001).

Because it recognizes the important role played by value orientations and environmental concern on the performance of PEB, Schelly's (2010) work is closely related to studies of proenvironmental behavior in general and not only specifically to the context of GHF's. Environmental concern has been found to be a predictor or correlate of green buying (Mainieri et al. 1997), energy-saving behavior (Paço and Varejão 2010), recycling (Straughan and Roberts 1999), and purchase of organic food (Zanoli and Naspetti 2002; Tanner and Kast 2003).

The most widely accepted scales of environmental concern are, in essence, values-based measures. They include the New Ecological Paradigm Scale (Dunlap et al. 2000), the Adverse Consequences Belief Scale (Stern 2000), and the Environmental

Concern Toward Valued Objects Scale (Schultz 2000). The past and current study of values-based environmental concern, as well as the existence of many scales that are constantly tested and improved is justified because environmental concern has demonstrated to be a strong positive correlate of proenvironmental behavior (Lepisto 1974; Van Liere and Dunlap 1981). In addition, Dunlap et al. (2000) assert that environmental concern forms the basis from which proenvironmental behavior might emerge. In other cases, dimensions of the value orientations associated with environmental concern, especially altruism, figured as strong predictors of proenvironmental behavior (Mainieri et al. 1997; Straughan and Roberts 1999; Barr 2006; Paço and Varejão 2010).

In what concerns housing preference and choice, values also figure prominently as predictors. The Residential Choice and Belief Value Structures (RCBVS) Project is composed of 19 studies aimed at examining how individuals' conceptions and preferences of housing alternatives relate to actual behavior in the market (Montgomery, 1993). It is argued that housing features are judged according to the extent to which they are believed to relate to the attainment of life values (Lindberg, Garling and Montgomery 1987). Peoples' general life goal is to avoid unattractive states by achieving a limited set of life values which are, in turn, relevant for the way they evaluate their life status. Examples of life values used in the project are "happiness", "freedom", "togetherness", "money", "inner harmony" and "security" (Lindberg et al., 1987; Lindberg, 1988; Lindberg et al., 1989; Garvill et al., 1992; Montgomery, 1993).

The studies involved the following: evaluation of the attractiveness of housing attributes and how much respondents believed such attributes afford them the attainment

of a list of life values; rating how good or bad different life values and housing attributes were perceived to be; and answering questions concerning beliefs about the consequences that different housing attribute levels would have on the attainment of a list of life values (Lindberg et al. 1987). Results showed significant main effects of housing attributes (e.g., location and size) and life values, as well as a significant interaction between them.

Evaluations of the housing attributes were almost completely determined by perceived consequences on the attainment of "pleasure", "comfort", "security" and "money". Among life values, "family" was the most frequent one entering equations. Moreover, the attribute "cost" was inspected most frequently by respondents, and was among the ones believed to have the strongest impact on value fulfillment. This finding further emphasizes the relevance of financial resources in the context of adoption of GHF's, which is taken into account in the measurement tool (further discussed in the Method section).

Given the central role of values and value-orientations in both the prediction of proenvironmental behavior and preference and choice of housing features, this study will employ measures of value-orientations as part of the different dimensions of environmental concern. Because environmental concern has been regarded as a motivational factor to the practice of proenvironmental behavior (Dunlap et al. 2000; Bloch and Banerjee 2001; Barr 2006), it is here assumed that the different motivations to adopt GHF's will stem from different value-orientations, which in turn compose environmental concern. Nonetheless, the motivations to adopt that do not stem from environmental concern will be accounted for with the inclusion of measures from involvement with housing, discussed in detail in the next subsection.

2.4 Involvement with home features

Early works in consumer behavior demonstrate that the type of cognitive response to environmental stimuli that is today called *involvement* has had many definitions and different nomenclatures (Houston and Rothschild 1978). Some researchers have indeed used the term *involvement* to describe a "psychological, social or economic stake someone has on something," or "the extent to which something occupies one's thoughts" (Tyebjee 1978, p. 176). Others, in turn, have named this phenomenon *commitment*, describing it as a function of "the strength of an individual's belief system with regard to a product or brand" (Roberston 1976, p. 19). Others, still, have employed the term *arousal* to describe a "state of activation" in which the individual's body is ready to react to stimuli present in the physical environment (Tyebjee 1977; Tyebjee 1978; Houston and Rothschild 1978).

Despite nomenclature differences, early studies seem to agree upon the fact that the state of being involved, aroused, or committed to something (usually a product or a brand in the primary stages of research) impacts social behavior through the generation of physiological and psychological responses to environmental stimuli. There is also consensus among researchers in what refers to the existence of different levels and different types of involvement.

Involvement levels range from high to low (Robertson 1976; Tyebjee 1977; Tyebjee 1978; Lastovicka and Gardner 1978), while the categories are: enduring, situational, and response involvement (Houston and Rothschild 1978). In this context, involvement is believed to exist in a continuum between the extremes. Low involvement is related to low risk decisions and products, is believed to require a less complex

cognitive structure in comparison to high involvement. Low involvement is also a result of weak relationships between the environmental stimuli (i.e., a product, a brand, an advertisement) and the individual receiver's set of values and beliefs. In what concerns high involvement, scholars appear to unanimously agree that it leads to information seeking and processing about the subject of involvement (Houston and Rothschild 1978; Bloch and Richins 1983; Zaichkowsky 1985, 1986, 1987).

Despite one's level or type of involvement, involvement theory assumes the central role of values and beliefs (Bloch and Banerjee 2001), with research pointing to personal factors (i.e., a person's value system and life experiences) as the antecedent factors or causes of involvement (Zaichkowsky 1986; McQuarrie and Munson 1991). Involvement has been conceptualized in terms of leisure activities, advertising, purchase situations, products in general, brands, and product class. For the purposes of this study, involvement with products will be employed to investigate respondents' involvement with home features.

This study also includes the theory of ego-involvement because it focuses on involvement that is closely linked to preferences, attitudes, worldviews and values (Sherif and Cantril 1947; Tyebjee 1977; Houston and Rothschild 1978), and to the concept of self-identity (Belk 1988; McIntyre 1989; Ahuvia 2005). This approach is chosen because it is in consonance with the theories of proenvironmental behavior and environmental concern.

Involvement with home features is here defined as the extent to which an individual believes home features can aid in the accomplishment of their life goals and also to meet expectations of benefit/rewards. In the context of this definition, life goals

are related to the person's value-orientation (i.e., altruistic, egoistic, biospheric), which influence expectations of benefits stemming from the adoption of home features, green or not.

In order to capture the different levels of this definition of involvement, the revised version of the Personal Involvement Inventory (Zaichkowsky 1994) will be employed to measure the motivational state of involvement. It is based on the notion that there are three major antecedents of involvement: characteristics of the person, characteristics of the stimuli (i.e., here home features), and characteristics of the situation. Zaichkowsky (1994) contends that "one or more of these factors could affect the level of involvement with the stimulus in context of involvement with products […] or with purchase situations" (Zaichkowsky 1994 p. 59). The author's view also accounts for both affective and cognitive involvement, and is deemed adequate for employment in this study given both practical and affective benefits that home features can provide.

It is worth noting that the state of being involved is, overall, a matter of preference. People are involved with what they like and prefer, and not involved with what they do not care about. Kaplan (1988) explains that preference is an indicator of aesthetic judgment, established when affective and cognitive mechanisms are in use. One of the affective components of preferences is the duality of pleasure-pain and like-dislike. Although there is involvement with situations that simply arrest attention, such as dangerous ones, empirical evidence from studies about involvement with products make a clear case that people are involved with what they like (Selin and Howard 1988; Danet and Katriel 1989; Radford and Bloch 2011).

Another affective component of preference is that of "interest" or "potency", and is closely related to fascination and pleasure (Kaplan 1988, p. 58). Many home features afford dwellers with environments that are pleasant and comfortable. Moreover, green features in particular can elicit feelings of fascination due to their high technological stand. Some conventional features, on the other hand, often provide higher aesthetic pleasure due to their inherent characteristics, as cited in the example of granite countertops versus recycled glass countertops.

Given the existence of possible trade-offs between green and conventional home features, as well as the matter of homeowners' preferences for types of green features, the use of the revised PII in this study appears to be sound.

METHOD

3.1 Population and Sample Selection

The requirements for respondent participation in the study were homeownership and having added at least one green feature to the residence, with the exception of compact fluorescent light bulbs, which should be present at a minimum of five bulbs. These requirements restricted the number of potential participants. In order to maximize the sample size two recruitment methods were employed.

A convenience sampling method that relied on snowballing was employed as the primary recruitment method. The electronic survey link was distributed via social media, and friends were asked to forward the link to contacts they believed met the requirements. Recipients of the survey link included a demographically diverse sample regarding age, gender, profession, and place of residence.

The second sampling method relied on recruitment through the Amazon Mechanical Turk (MTurk). MTurk is a crowdsourcing platform—an online task marketplace where jobs are outsourced to undefined groups of people in the form of an open call (Mason and Suri 2012). Virtually any individual from hundreds of different countries can complete the available tasks, becoming a "Worker". Human Intelligence Tasks (HIT's), as they are named, may be posted by individuals who have a bank account in the US or in India.

MTurk was originally developed as a platform for humans to complete tasks that computers cannot or have difficulty in completing, such as extracting data from images,

conducting audio transcription, and categorizing images. Today, with hundreds of thousands of Workers, "it also serves as an ideal platform for recruiting and compensating subjects in online experiments" (Mason and Suri 2012, p. 2) and in non-experimental surveys (Buhrmester et al. 2011). The quality of data retrieved from MTurk has been empirically assessed, with results demonstrating that "payment levels do not appear to affect data quality" (Buhrmester et al. 2011, p. 4) because Workers seem to be internally motivated (Buhrmester et al. 2011, Mason and Suri 2012). Test-retest reliabilities were very high, indicating that MTurk data meets or exceeds the psychometric standards associated with published research (Buhrmester et al. 2011). Moreover, in experiments "the behavior of subjects on Mechanical Turk is comparable to the behavior of laboratory subjects" (Mason and Suri 2012, p. 2).

Previous research indicates that MTurk participants were "more demographically diverse than standard Internet samples and significantly more diverse than typical American college samples" (Buhrmester et al. 2011, p. 4). In short, MTurk is seen by social scientists as an effective way of recruiting large sample sizes with good data quality, higher variability, and for a relatively low cost.

In accordance with the research literature, a survey link template was created in MTurk, linking Workers to a Qualtrics webpage that housed the survey. In order to maintain the quality standards of the study and avoid subject participation among those who did not meet the requirements, several cautionary measures were employed in the creation of the task in MTurk. The website itself allows for the customization of Worker requirements, with requirements chosen based on the available literature. The requirements included the participation of Master Workers only, as those have earned the

title of Master from Amazon for demonstrating "the ability to provide successful results for specific types of tasks across multiple Requesters" (Amazon Mechanical Turk Requester UI Guide 2013, p. 3).

In order to complete the task, Workers also had to have a HIT approval rate of 85 percent or higher, and be located in the US. The extension of participation to Workers from Europe and Canada would have been beneficial from the perspective of variation in the data, and increase in the sample size. Nonetheless, studies about the profile of Workers from those regions are either scarce or nonexistent, which could pose a risk to data generalizability. Although all Workers could preview the HIT, only Workers who met all requirements for participation could complete it.

When Workers met the requirements, they were able to accept the task and were directed to a screen that explained the need to be a homeowner and have added at least one green feature to their residence in order to participate. It was made explicit that if one of the requirements were not met, they would not be permitted to proceed and would not be compensated for their time.

Because there is always the risk of cheating behavior occurring in Internet-based surveys, suggestions from the literature were followed so that cheating would be more time consuming than abandoning the task or responding honestly. This was accomplished by strategically adding screening questions throughout the survey, inquiring about when the residence was purchased, and if the features were already present when the owner moved in. The order of responses changed, with 'YES' appearing first in some questions, and "NO' in others. These questions were asked more than once using slightly different formats, leaving room for contradictory information to be captured. When that was the

case, the participant was not permitted to continue and was directed to a page stating that they did not qualify to participate. Respondents could not go back and change their answers, so that the screening process could stay strict and effective. Workers were only paid when they successfully reached the conclusion of the survey and entered a five-digit completion code to the survey and the same code again to the MTurk page.

The HIT was reposted frequently, in several batches in the 42-day data collection period. This approach allowed for a careful verification of the data quality as it arrived, with an average of five assignments turned in per day. With each survey completed, the Worker ID was checked to eliminate those who took the survey more than once. When duplication occurred, the second survey was deleted and the assignment rejected. Workers were explicitly informed that they were not to complete the HIT more than once, so when they did they were not compensated. A few Workers contacted the researcher to ask whether they had already taken the survey, especially towards the final days of posting, demonstrating the presence of ethical behavior from their part.

Due to the addition of extra screening questions to the MTurk survey, two separate surveys and survey links were created and distributed to each sample. Both surveys are located in Appendix A, and were developed in accordance with the reviewed literature containing the same preliminary screening questions and explanation of requirements.

3.2 Data Collection – convenience sample

Data were collected in the period from November 5th to December 15th, 2013. The link was distributed to 219 friends—184 through social network, and the remaining

through email correspondence. Forty-five faculty members and graduate students of the University of Missouri from the departments of Forestry, Natural Resources, Architectural Studies, and Animals Science also received the survey link. The on-campus organizations Mizzou Office of Sustainability and the program Sustain Mizzou also received the link through their contact email address and were asked to distribute it within the office, adding two contacts to the recruiting list. Local businesses in the area of organic food and environmental/fair trade products in Columbia, Missouri were also contacted and sent the survey link via email, namely The Peace Nook, The Root Cellar, and Clovers Natural Market (i.e., three additional contacts). Finally, three associates from the City of Columbia's Water and Light Department were contacted and received the survey link to forward to others – totaling 269 people or email addresses that received the survey link directly from the researcher. Table 1 describes the subjects recruited through the convenience/snowball method.

Table 1 – Convenience sample recruiting

Source	Number of subjects recruited/email accounts contacted
Social network	184
E-mail correspondence	• 45 faculty and graduate students; • 2 on-campus organizations; • 3 local businesses; • 3 City of Columbia associates;
Total recruited: 269	

The survey link was accessed a total of 155 times. This number represents 57.62 percent of the total 269 individuals/email accounts that received the link. Of the 155 individuals, 105 subjects finished the survey, that is, 67.74 percent.

3.3 Data collection – MTurk sample

Through MTurk, the survey was posted (i.e., as a HIT) in small batches usually twice daily (a batch is a group of assignments posted at a given moment). Posting occurred concomitantly with the convenience method recruiting, from November 5th to December 15th, 2013.

Initially subjects received a $.88 compensation for completing the survey. The dollar amount was calculated based on suggested compensation identified in the literature (Buhrmester et al. 2011; Mason and Suri 2012). The rationale is that the more time the survey takes, the higher the compensation. In order to try to improve the speed with which responses were received, the compensation was increased until the rate of $1.48.

Table 2 presents the details of the 24 batches created, totaling 142 assignments (i.e., surveys) posted. The information in Table 2 includes the number of assignments per batch and the time elapsed between the posting and one of the following: a) the time when all assignments in the batch were completed, or b) the time when the researcher cancelled the batch due to inactivity.

It is clear from the table that a few batches resulted in no completed assignments. This might be explained by the fact that, at the beginning, the Worker requirement "number of approved HIT's" was set too high, at 100 HIT's approved. That is a high number for Workers who complete tasks occasionally, or those who are new to MTurk.

For that reason, this requirement was reset to 50 HIT's approved, therefore broadening the pool of Workers who qualified to participate.

Although the total number of surveys posted to MTurk was 142, the actual number of surveys started via MTurk is 170. That is, 170 Workers accepted the task and started the screening session. This difference is explained by the fact that many subjects who started the survey did not qualify to participate and did not reach survey completion. Such subjects left incomplete assignments that could be completed by other Workers. For this reason, the number of subjects who clicked the survey link on MTurk is higher than the number of times the link was posted.

The number of completed surveys was 112, although eight responses were deleted because they belonged to Workers who had already responded (i.e., duplicates). That brings the MTurk sample total to 104, representing 73.24 percent of the initial number.

Table 2 – MTurk batch details

Batch number	Compensation $	Average time/ assignment	Assignments completed/posted	Time of posting	Batch duration
1	0.88	6min 45sec	2/2	11:47AM	1h 23min
2	0.88	0	0/5	9:36AM	1h 24min
3	0.88	0	0/5	2:06PM	1h 55min
4	0.98	0	0/2	8:33AM	3h 1min
5	0.88	7min 4sec	4/8	11:35AM	14h15min
6	0.88	8min 39sec	1/8	9:54PM	8h 51min
7	0.88	6min 35 sec	5/5	11:13AM	40min
8	0.88	8min 36sec	5/5	4:01PM	6h 15min
9	0.88	4min 55 sec	5/5	9:19AM	5h 23min
10	0.88	7min 40sec	7/7	8:42AM	24h 3min
11	0.98	6min 23sec	7/7	8:17AM	24h 7min
12	0.98	20min 43sec	4/4	8:56AM	59min
13	0.98	9min 37sec	5/5	12:57PM	3h 43min
14	0.98	9min 4sec	4/8	9:26AM	9h 7min
15	0.98	10min 19sec	4/4	4:03PM	1h 5min
16	0.98	18min 9sec	4/4	8:51AM	9h 57min
17	1.18	15min 47sec	8/8	8:42AM	2h 9min
18	1.18	9min 29sec	8/8	2:20PM	3h 28min
19	1.18	7min 58sec	9/10	11:28AM	10min
20	1.18	9min 6sec	6/8	11:13AM	3h 51min
21	1.48	14min 34sec	7/7	9:31AM	3h 56min
22	1.48	11min 54sec	8/8	2:44PM	11h31min
23	1.48	8min 8sec	7/7	11:07AM	10h 40 min
24	1.48	5min 57sec	4/4	8:44AM	2h 6 min

3.4 Measurement Instrumentation

The main goal of the study was to discover the relative weights of different motivations to adopt GHF's among altruistic, self-beneficial, and biospheric concerns. Additionally, the study aims at investigating the impact of involvement with housing

features on the adoption of GHF's and attitudes toward them. The predictive power of different concern orientations is also measured towards the adoption of GHF's. Finally, the study compares data frequencies from the two samples to assess disparate results.

The surveys address: a) the most common GHF's across the samples; b) the level of importance attributed to each group of features, namely: water-saving, energy-saving, features that improve indoor air quality, and recycled or repurposed materials; c) self-beneficial, altruistic, and biospheric attitudes toward GHF's; d) self-beneficial, altruistic, and biospheric attitudes toward environmental issues; and finally e) level of involvement with housing features in general.

After fully developed, both surveys were tested with five graduate students from the University of Missouri's departments of Architectural Studies and Marketing. Adjustments were made to reflect the comments from the pre-test. It was unanimous among the pre-testers that the option "not sure" should be added as a response to the list of green features where there were originally only the options "yes" and "no" to indicate presence and absence of features. Frequent comments were also made about the terms used to name/describe green features, and more common or lay terms were employed. An item addressing the year a feature was implemented was seen as a burden and a discouragement to respond honestly in a survey that was already lengthy. Pre-testers felt they would probably not remember the date correctly as many added different features at different times. As a result, that question was removed.

The response "other" was added to the question about political inclination, as suggested by pre-testers. Finally, pre-testers reported having difficulty understanding a

few adjectives on the scale about involvement with home features. However, that is a well-established scale and was not modified to avoid threats to validity and reliability.

In MTurk, seven subjects (non-Master Workers) answered the test survey and reported having no problems accessing the link or completing the survey. Possibly the most valuable information from the pre-test in MTurk was the assessment of the efficacy of the additional screening/cross-check questions, targeted at hindering cheating behavior. One of the respondents did answer yes to all yes/no questions, and fell in contradiction, demonstrating that the adopted strategy was effective to identify misconduct. After the pre-test results, only Master Workers were allowed to participate thereby further reducing the likelihood of cheating.

The final surveys contained four basic screening items in the yes/no format; 10 bipolar, seven-point adjective scales for the involvement with home features scale (Personal Involvement Inventory, Zaichkowsky 1994); a list of 14 GHF's with the responses "yes, no, and not sure" referring to the presence of them in the residence; an open-ended question for any additional green features not included in the list; and six-point Likert-type scales for the level of importance of types of home features, attitudes toward green housing features in relation to environmental issues, and the adapted environmental concern for valued objects scale (Schultz 2000), containing the three environmental concern types (i.e., biospheric, altruistic, and egoistic). The final section of the surveys contains demographic items about the residence and the individual characteristics of the respondents.

Participation in the survey was anonymous for both samples, as no direct identifiers were collected. The only possible identifier recorded was the respondent's IP

address, which was not part of the analysis, therefore remaining confidential. Original survey data were accessed solely by the principal investigator. All data are digitally stored in the Department of Architectural Studies in order to be reviewed if clarification is required.

3.5 Data Analysis

3.5.1 Open coding

The data were downloaded from Qualtrics and saved to Microsoft Excel, where the datasets of the two samples were merged and variables were labeled according to topic and location in the survey. A dichotomous "group" variable was created to denote sample membership, with the following value labels: "1=paid respondent" and "0=not paid respondent".

Next, the reverse-scored items were recoded into different variables. Although it was unlikely that any other data were going to be added to the dataset, the option "recode into different variable" was chosen because it is more commonly used in place of "recode into same variable", as a cautionary measure.

In section one "involvement with home features" items ranging from positive to negative attitudes (i.e., items 1, 3, 4, 6, 7, and 9) were recoded so that higher scale points would indicate positive attitudes, and vice-versa. In section four "concern orientations toward GHF's" items denoting negative statements (i.e., items 2, 8, and 11) were also recoded so that higher numbers reflected higher disagreement with negative attitudes.

Open-ended responses were transferred to five new Microsoft Excel spreadsheets, and analysis began with coding the five such items: a) "other green features", referring to

green features that might have been present at respondents' homes but were not mentioned in the provided list; b) "year of home purchase", added to the MTurk sample as an additional screening question; c) "other concerns/not concerned", with regards to environmental concerns not listed or cases when the respondent was not concerned with environmental problems; d) "age of residence"; and e) "more years", referring to how many more years the respondents intended to stay at their current residence.

The same coding procedure was followed for all open-ended items. In accordance with Gleim, Smith, Andrews, and Cronin Jr. (2013), two coders acting independently categorized the responses, with discrepancies in coding discussed between the coders. In some instances, respondents provided either an extensive answer addressing many topics or included more than one "other" green feature or concern. In those cases, individuals were classified into multiple categories, increasing the number of responses for the question.

The variables "other green features" and "other concerns/not concerned" yielded 13 categories each. "Age of residence" and "more years" yielded six categories each, and "year of home purchase" had fewer categories with a total of four. After coding, the numeric categories created were entered into the dataset to replace descriptive text, yielding all numerical responses. Table 3 presents the coded numeric responses to the open-ended items.

Table 3 – Post-coding numeric categories of originally open-ended items

Variable	Categories
Age of residence	1. 0-10 2. 11-25 3. 26-45 4. 46-65 5. 66-100 6. 101 or older
More years	1. 1.5-4 2. 5-10 3. 11-30 4. 31-60 5. For life 6. Don't know/not sure
Other green features	1. Heating Ventilation Air Conditioning 2. Electrical 3. Plumbing 4. Daylight/lighting 5. Air infiltration 6. Windows 7. Appliances 8. Building alterations 9. Chemicals 10. Landscaping 11. Recycling 12. Insulation 13. Others
Other concerns/not concerned	1. Not concerned 2. Human life/future 3. Geographical/species changes 4. Fauna 5. Flora 6. Earth 7. Pollution 8. Burden of green 9. Political/economic issues 10. Resource quality/availability 11. Behavior of others 12. Not sure 13. Others
Year of home purchase	1. 1986-1990 2. 1991-2000 3. 2001-2010 4. 2011-2013

3.5.2 Data screening

The data were then transferred to the Statistical Package for the Social Sciences (SPSS 22.0, IBM 2013) used for the quantitative analyses. The analysis began by

conducting frequency counts and descriptive statistics for all variables, in order to verify that all data were within acceptable ranges. Because SPSS recognizes empty cells as missing values, no additional coding was created for those values.

Careful assessments of frequencies showed the additional screening items in the MTurk survey were indeed effective in preventing cheating behavior (see Results section). Because such items were no longer needed, they were dropped from the dataset. In addition, all cases that failed to pass the initial screening items present in both surveys were dropped from the analysis, so that results were not affected by them. All incomplete cases were also dropped to ensure that the subsequent analyses reflected high quality data without the influence of a high number of missing values.

Histograms showed two of the measures that compose the dependent variable presented unacceptable kurtosis and skewness values – "green appliances" and "green lighting". Transformations were used to correct the issue, according to recommendations from Tabachnick and Fidell (2012). After a few attempts, the log of "lighting" presented the best improvement by addressing substantial positive skewness. The inverse of "appliances" presented the best solution to severe positive skewness, however, the transformed variable still failed to meet acceptable kurtosis and skewness values (i.e., cut off point used was 3 or -3 for both kurtosis and skewness, as is usual for psychological research).

As a result, the decision was made to dichotomize all green feature variables, for "appliances" and "lighting" both had very high adoption and their threat to the assumption of normality could substantially impact all the analyses and generate misleading results. The decision is also justified because other green feature measures

presented skewness and kurtosis values close to 3 or -3, so the choice of a logistic, more forgiving model seemed the best approach (Gordon 2010; Tabachnick and Fidell 2012).

Next, factor analyses were run on the attitudinal measures, that is, section one "involvement with home features", section three "importance of categories of green housing features", section four "motivations to adopt green housing features", and section five, the adapted Schultz' scale of environmental concern orientations (2000). All factor analyses were based on principal components, with Eigenvalues higher than one, and with varimax rotation.

Provided that KMO and Bartlett's tests from the factor analyses presented reasonable results, the analyses progressed to use factor scores in regressions to address the research questions. Results are presented in the next section.

RESULTS

4.1 Frequencies

Between the two samples, a total of 317 respondents undertook the survey. Data screening revealed that there were a few out-of-range values in: a) item "energy-efficient appliances" in section two; b) item "other-electrical", also in section two; c) in item "year of home purchase," in the second additional screening question for the MTurk sample; and d) "state of residence" in the demographics section. In the latter two cases, out-of-range values were the result of errors in coding from the part of the coders. Some items still presented years/state numbers as responses, instead of the categorical variables created. This was corrected by manually entering the categories that corresponded to each year/state. In the first and second cases, the out-of-range values were addressed by dropping the cases out of range.

Table 4 shows the frequencies for the initial screening questions. The vast majority of the individuals who started the survey owned their residence and had added green features to it. A small percentage had added exclusively fluorescent light bulbs as green features. Of those, one individual had added less than five of such bulbs. As mentioned in the Analyses section, all incomplete cases were dropped after verification of the screening items.

Table 4 – Frequencies of screening items, aggregate level

Item/response	Valid responses	Percent valid
Own House/yes	290	91.5
Added features/yes	250	78.9
Only green light fixture/yes	43	13.6
Less than five bulbs	1	0.3
More than five bulbs	37	11.7

After deletion of incomplete cases (i.e., respondent did not finish survey) and cases with missing data, the final total sample size totaled 209 subjects. Demographic items reveal that both samples are slightly over-represented by females (62.5% MTurk sample and 54.3% convenience sample), and liberals predominate with regards to political orientation (46.2% of the MTurk sample and 37.1% of the convenience sample). A few differences exist, though-- while the majority of the paid group is between 18 and 35 years of age (54.8%), the convenience group is mainly composed by subjects between 46 and 65 years old (52.4%). The convenience sample presents higher education and income levels than the MTurk sample, with a PhD degree existing among 37.1 percent of the group versus some college education (44.2%) in the MTurk group. While 54.7 percent of the convenience sample presents annual household income over $100,000, only 7.7 percent of the MTurk sample presents that level of income. Table 5 presents a comparison between the two samples across demographic characteristics.

Table 5 – Demographic comparison between samples

Item	Convenience Highest %	MTurk Highest %
Age of residence	11-25 and 26-45, 25.7%	26-45, 25%
Stay at residence one or more years	1+, 91.4%	1+, 99%
Stay at residence - how many more years	5-10, 40.7%	5-10, 48%
Country of residence	US, 96.2%	US, 100%
US state of residence	Missouri, 77%	California 13.5%
Parental status	Children at residence, 44.8%	Children at residence, 48.1%
Gender	Female, 54.3%	Female, 62.5%
Political orientation	Liberal, 37.1%	Liberal, 46.2%
Level of education	PhD, 37.1%	Some college, 44.2%
Age group	46-65, 52.4%	18-35, 54.8%
Annual household income	$100,000+, 54.7%	30,000-49,999, 28.8%

Section one "involvement with home features" contains the revised version of the Zaichkowsky Personal Involvement Inventory (PII) scale (1994), with reverse-scored items that were recoded into new variables, as explained in the Analysis section. The involvement item with the highest mean was "important – unimportant", with mean of 6.11 out of the maximum of seven. The lowest mean was presented by item "fascinating – mundane", with a 5.24 mean out of seven. Table 6 presents the means for each PII item, demonstrating that all items were positively skewed.

Table 6 – Means for the PII items

Item	Mean value
1. Important – unimportant*	6.11
2. Boring - interesting	5.84
3. Relevant – irrelevant*	6.12
4. Exciting – unexciting*	5.25
5. Mean nothing – mean a lot	5.66
6. Appealing – unappealing*	6.03
7. Fascinating – mundane*	5.24
8. Worthless – valuable	6.07
9. Involving – uninvolving*	5.47
10. Not needed – needed	5.97

*denotes reverse-scored item

Results from section two "added green features" indicate that the most frequently added feature is energy-efficient appliances. The least frequently added feature is environmentally friendly floors. A total of 62 respondents answered the subsequent open-ended item that inquired about the presence of other features at the residence. Overall, it resulted in a repetition of already listed features. A few exceptions mentioned passive solar systems, solar panels, photovoltaic systems, septic systems, edible landscape, and metal roofs. Table 7 shows the frequencies for adoption of the 14 green features listed in the survey.

Table 7 – Number of green features adopted

Green feature	Number of adoptions	% Aggregate Sample
1. Energy-efficient appliances, with Energy Star seal	187	89%
2. Energy-efficient heating/cooling systems (furnaces, boilers, a/c units and central A/C, heat pumps)	137	66%
3. Programmable thermostat	148	71%
4. Tank-less water heater (heats water as you need it)	29	14%
5. System or device that enhances indoor air quality (examples: high-efficiency attic vents and HEPA filters)	76	36%
6. Salvaged or recycled materials (examples: wood, hardware, tiles, bricks, furniture including antiques and heirlooms)	120	57%
7. Environmentally friendly floors (examples: bamboo, recycled fiber carpet, cork floor, biodegradable linoleum)	28	13%
8. Non-toxic finishes (like in cabinets and furniture), adhesives and/or paint.	103	49%
9. Double or triple-pane windows	141	67%
10. Energy-efficient light fixtures (five or more)	172	82%
11. Appropriate sealing and weather-stripping (examples: caulk around windows and doors, inside and outside; foam gaskets in exterior wall outlets, etc.)	162	78%
12. Native, low-maintenance outdoor turf and plants (require less irrigation)	107	51%
13. Fiberglass-free or recycled wall insulation	31	15%
14. Reduced water consumption systems or water reuse systems (examples: dual-flush toilets; rain water collection; grey water system)	77	37%

Results from section three “importance of categories of green housing features” is formatted as a six-point scale. All four categories of features received mean scores above four. The feature category with the highest level of importance at the mean level is “energy-saving appliances, heating/cooling systems and devices” with mean 5.22 out of six, which answers one of the research questions.

The entire MTurk sample (n=104) responded that they owned their own residence in the confirmatory screening questions. The additional screening item "year of home purchase" indicated that the majority of respondents purchased their residences between the years 2001 and 2010 (n=61).

Findings from section four "motivations to adopt green housing features" show that "the adoption of green features can help protect animals an plants" has the highest mean of 4.96 out of six. Among the reverse-scored items, "I worry that I might not receive a satisfying return in my investment in green features when/if I sell my residence" shows a mean of 4.07 (i.e., "somewhat disagree"). In section five "general environmental concern orientations" the item with the highest mean is "I am concerned about environmental problems because of the consequences for future generations", with a score of 5.3 out of six.

4.2 Factor analyses' results

Factor analysis on items from section one "involvement with home features" yielded two components, that is, the same result found by Zaichkowsky upon the revision of the scale (1994). The order of the factors was reversed in comparison to Zaichkowsky's, but the author does assert that "the two groupings may flip between two factors" (1994, p. 62), hence the solution was deemed acceptable. Table 8 presents the solution explaining 67.856 percent of the total variance, the significance and the test results.

Table 8 – Involvement with home features, Factor Structure

Item	Factor 1	Factor 2	Communalities
1. Unimportant – important	.637	.376	.547
2. Boring – interesting	.509	.612	.634
3. Irrelevant – relevant	.676	.437	.649
4. Unexciting – exciting	.134	.863	.763
5. Mean nothing – mean a lot	.804	.351	.769
6. Unappealing – appealing	.530	.626	.672
7. Mundane – fascinating	.178	.849	.752
8. Worthless – valuable	.835	.216	.744
9. Uninvolving – involving	.383	.631	.544
10. Not needed - needed	.840	.085	.712

Note a. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .902
b. Bartlett's Test of Sphericity, Approx. Chi-square = 1226.821, sig = .000

Although variance explanation could probably be improved with the deletion of a few items (i.e., exciting, interesting, appealing), the decision was made to maintain the results due to the validity and reliability of the original scale, which has generated its widespread use in other studies. Again, as reported by Zaichkowsky (1994), in Factor 1 items appear more associated with the practicality of features as opposed to Factor 2, where emotions predominate. Hence, Factor 1 is named "*Cognitive involvement*" and Factor 2 "*Affective involvement*" (Zaichkowsky 1994).

Items in section three "importance of categories of green housing features" yielded one factor explaining 60 percent of the total variance. Table 9 shows the solution, significance and test results. Because all items loaded on the same factor, the scale is named "Importance of categories of green housing features".

Table 9 – Importance of categories of features, Factor Structure

Item	Factor 1	Communalities
1. Water-saving appliances and features	.805	.648
2. Energy-saving appliances, heating/cooling systems and devices	.759	.576
3. Finishes, devices, and features that improve indoor air quality	.786	.618
4. Recycled, refurbished, and/or repurposed construction materials, features and furniture	.749	.562

Notes: a. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .704
b. Bartlett's Test of Sphericity, Approx. Chi-square = 247.567, sig = .000

The best solution for items in section four "motivations to adopt green housing features" resulted in a fixed number of three factors explaining 67.318 percent of the total variance. Table 10 shows the final nine components, the significance, and test results.

As shown in the table, items in Factor 1 are a combination of *biospheric* and *altruistic* orientations, justifying the label "*Altruistic and biospheric motivations*". In Factor 2 are egoistic items related to practical aspects of green housing features—aesthetics, return on investments, and expenses. Thus, Factor 2 is labeled "*Practical egoistic motivations*". Finally, Factor 3 also presents egoistic items, but more related to the affective component of self-benefit—comfort and looking good, leading to the label "*Indulgent egoistic motivations*".

Table 10 – Motivations to adopt green housing features, Factor Structure

Item	Factor 1	Factor 2	Factor 3	Communalities
1. A resource-efficient house provides more comfort	.240	.256	.752	.688
2. Pollution from residences harms community	.815	.087	.262	.740
3. Pollution from residences harms the planet	.867	.149	.129	.791
4. Reducing residence's negative impact helps future generations	.820	.155	.183	.730
5. Adoption can help protect animals and plants	.848	.170	.106	.759
6. Adoption makes me look good	.190	-.216	.783	.696
7. Aesthetics should not be traded for greenness	.076	.664	-.058	.450
8. Green features are too expensive to adopt	.104	.781	.078	.627
9. I worry about return on investments	.211	.730	.020	.578

Notes: a. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .822
b. Bartlett's Test of Sphericity, Approx. Chi-square = 657.136, sig = .000

For items in section five "environmental concern orientations", that is, the adapted Schultz' (2000) scale, the best solution yielded a fixed number of three factors explaining 78.409 percent of the total variance. Table 11 shows the final solution, the significance, and test results.

Similar to the first factor obtained from the motivational items, Factor 1 here is also a combination of *altruistic* and *biospheric* items, and is labeled "*Biospheric and general altruistic concerns*". Factor 2, again, contains the *egoistic* concerns and is labeled "*Egoistic concerns*". Factor 3 presents a specific concern for the wellbeing of children and is named "*Concern for children*".

Table 11 – Environmental concern orientations, Factor Structure

Item	Factor 1	Factor 2	Factor 3	Communalities
1. My future	.405	.689	.298	.727
2. Children	.317	.253	.881	.941
3. Animals	.768	.154	.265	.684
3. People in the community	.793	.274	.210	.749
4. Humanity	.849	.057	.289	.808
5. My health	.660	.495	.147	.703
6. Future generations	.675	.057	.601	.820
7. Plants and trees	.835	.201	.224	.788
8. My prosperity	.041	.911	.067	.836

Notes: a. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .880
b. Bartlett's Test of Sphericity, Approx. Chi-square = 1211.709, sig = .000

Factor scores generated from the analyses were multiplied by the score for each item generating weighted factor scores. The weighted factor scores belonging to the same factor were then summed to form the total factor scores, and the procedure was repeated for all factors (i.e., three factors from the motivational items and another three from the environmental concern items). The factor scores were then entered into the regression models as independent measures in two-tailed tests where $\alpha = .05$.

4.3 Regression results

Table 12 presents regression models of adoption of green housing features (i.e., composite measure) on the attitudinal measures alone and with the addition of control variables (i.e., demographics and involvement with home features). Demographic items other than income did not present any statistical significance in the models.

Table 12 – Regression of adoption of green housing features on motivations to adopt green housing features and controlling for involvement with home features and income

Adoption of GHF's	Model 1 Coefficient (Std. Error)	Model 2 Coefficient (Std. Error)	Model 3 Coefficient (Std. Error)
Altruistic and biospheric motivations	.026 (.009)**	.024 (.009)	.023 (.010)*
Practical egoistic motivations	.015 (.014)	.020 (.014)	.014 (.014)
Indulgent egoistic motivations	.011 (.022)	.012 (.022)	.007 (.023)
Income		.387 (.117)**	
Cognitive involvement			-.002 (.008)
Affective involvement			.010 (.007)
Constant	7.123 (.178)***	5.834 (.428)***	7.104 (1.79)***

Model 1: Adjusted R^2 = .029; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 2: Adjusted R^2 = .073; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 3: Adjusted R^2 = .030; p<.05*; p<.01**; p<.001*** (two-tailed tests)

According to the results of Model 1, it is expected that individuals have a .026 unit increase in adoption of GHF's for each unit increase in altruistic and biospheric motivations, which is statistically significant (p<.01 level). ANOVA results show good overall model fit with statistical significance (p<.05). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

In Model 2, it is expected that each unit increase in income will lead to a .387 unit increase in adoption of GHF's, which is statistically significant (p<.01). ANOVA results show good overall model fit with statistical significance (p<.001). Results for condition index and variance inflation factor (VIF) are close to 1, again demonstrating no problems of multicollinearity.

In Model 3, controlling for cognitive and affective involvement, it is expected that each unit increase in altruistic and egoistic motivations will lead to a .023 in the adoption of GHF's, statistically significant (p<.05). ANOVA results once more show good overall

model fit with statistical significance ($p<.05$). Results for variance inflation factor (VIF) are close to 1.

Table 13 shows regression models of adoption of green housing features on the environmental concern measures alone and with the addition of control variables (i.e., demographics and involvement with home features). Demographic items other than income did not present any statistical significance in the models.

Table 13 – Regression of adoption of green housing features on environmental concern orientations and controlling for involvement with home features and income

Adoption of GHF's	Model 1 Coefficient (Std. Error)	Model 2 Coefficient (Std. Error)	Model 3 Coefficient (Std. Error)
Biospheric and gen. altruistic	.024 (007)***	.022 (.007)**	.024 (.007)**
Egoistic	.022 (020)	.027 (.020)	.013 (.022)
Concern for children	.193 (168)	.130 (166)	.198 (.169)
Income		.362 (.118)*	
Cognitive involvement			-.005 (.008)
Affective involvement			.008 (.007)
Constant	7.113 (.174)***	5.920 (.425)***	7.112 (.174)***

Model 1: Adjusted R^2 = .058; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 2: Adjusted R^2 = .096; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 3: Adjusted R^2 = .057; p<.05*; p<.01**; p<.001*** (two-tailed tests)

In Model 1, it is expected that each unit increase in biospheric and general altruistic concerns will lead to a .024 unit increase in the adoption of GHF's ($p<.001$). ANOVA results show good overall model fit with statistical significance ($p<.01$). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

Results from Model 2 indicate that for each unit increase in biospheric and general altruistic concerns, individuals are expected to present a .022 unit increase in

adoption of GHF's (p<.01). Moreover, for each unit increase of income, individuals are expected to have a .362 unit increase in adoption, statistically significant at the p<.05 level. ANOVA results show good overall model fit with statistical significance (p<.001). Results for variance inflation factor (VIF) are close to 1.

Model 3 shows that each unit increase in biospheric and general altruistic concerns is expected to lead to a .024 unit increase in adoption (p<.01). ANOVA results show good overall model fit with statistical significance (p<.01). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

Table 14 shows regression models of adoption of green housing features on the involvement with home feature measures alone and with the addition of control variables (i.e., demographics and level of importance of groups of home features). Demographic items other than income and respondent's age did not present any statistical significance in the models.

Table 14 – Regression of adoption of green housing features on involvement with home features and controlling for importance of groups of features and income

Adoption of GHF's	**Model 1 Coefficient (Std. Error)**	**Model 2 Coefficient (Std. Error)**	**Model 3 Coefficient (Std. Error)**	**Model 4 Coefficient (Std. Error)**
Cognitive inv.	.004 (.008)	.004 (.007)	.004 (.007)	-.008 (.008)
Affective inv.	.014 (.006)	.015 (.006)*	.015 (.006)*	.006 (.007)
Income		.407 (.117)***		
Age			.378 (.174)*	
Importance				.045 (.011)***
Constant	7.192 (.173)***	5.839 (.425)***	6.399 (.403)***	7.127 (.167)***

Model 1: Adjusted R^2 = .015; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 2: Adjusted R^2 = .065; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 3: Adjusted R^2 = .032; p<.05*; p<.01**; p<.001*** (two-tailed tests)
Model 4: Adjusted R^2 = .086; p<.05*; p<.01**; p<.001*** (two-tailed tests)

lthough the constant in Model 1 is statistically significant, ANOVA results show no statistical significance ($p>.05$) for the overall model. In Model 2, each unit increase in affective involvement is expected to result in a .015 unit increase in adoption ($p<.05$), and each additional unit of income is associated with a .407 unit increase in the adoption of GHF's ($p<.001$). ANOVA results show good overall model fit with statistical significance ($p<.001$). Results for variance inflation factor (VIF) are close to 1.

In Model 3, each unit increase in affective involvement with home features is expected to generate a .015 unit increase in adoption ($p<.05$). Furthermore, each additional year of age is expected to generate a .378 unit increase in the adoption of GHF's ($p<.05$). ANOVA results show good overall model fit with statistical significance ($p<.05$). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

Model 4 indicates that each unit increase in importance attributed to GHF's is associated with a .045 unit increase in adoption of GHF's, statistically significant ($p<.001$). ANOVA results show good overall model fit with statistical significance ($p<.001$). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

Table 15 shows the regression model of the sum of factor scores of importance attributed to groups of features on the involvement with home feature measures. No demographic items presented statistical significance in the tested models.

Table 15 – Regression of overall level of importance of green housing features on involvement with home features

Overall Importance of GHF's	Model 1 Coefficient (Std. Error)
Cognitive involvement	.279 (.047)***
Affective involvement	.182 (.040)***
Constant	1.470 (1.072)

Model 1: Adjusted R^2 = .219; p<.05*; p<.01**; p<.001*** (two-tailed tests)

The model shows that each additional unit of cognitive involvement with home features is expected to result in a .279 unit increase in the overall level of importance attributed to features (p<.001). Each additional unit of affective involvement is expected to lead to a .182 (p<.001) unit increase in the overall level of importance attributed to features. ANOVA results show good overall model fit with statistical significance (p<.001). Results for condition index and variance inflation factor (VIF) are close to 1, demonstrating no problems of multicollinearity.

Next, regressions of the four separate categories of green home features on motivations to adopt green housing features were run, as shown in Tables 16, 17, 18 and 19. The sum of factor scores of importance attributed to groups of features was also regressed on motivations (Table 20).

Table 16 suggests that each unit increase in Altruistic and biospheric motivations is expected to lead to a .013 unit increase in the level of importance attributed to water-saving features (p<.001), and each unit increase in Indulgent egoistic motivations is expected to generate a .018 unit increase the level of importance attributed to water-saving features (p<.05).

Table 16 – Regression of level of importance of water-saving features on motivations to adopt green housing features

Importance of water-saving features	Model 1 Coefficient (Std. Error)
Altruistic and biospheric motivations	.013 (.003)***
Practical egoistic motivations	.009 (.005)
Indulgent egoistic motivations	.018 (.008)*
Constant	4.726 (0.66)***

Model 1: Adjusted R^2 = .080; p<.05*; p<.01**; p<.001*** (two-tailed tests)

With regards to energy-saving features, each unit increase in Altruistic and biospheric motivations is expected to lead to a .012 unit increase in importance (p<.001).

Table 17 – Regression of level of importance of energy-saving features on motivations to adopt green housing features

Importance of energy-saving features	Model 1 Coefficient (Std. Error)
Altruistic and biospheric motivations	.012 (.003)***
Practical egoistic motivations	.003 (.005)
Indulgent egoistic motivations	.007 (.007)
Constant	5.158 (.058)***

Model 1: Adjusted R^2 = .062; p<.05*; p<.01**; p<.001*** (two-tailed tests)

Each additional unit in Altruistic and biospheric motivations is expected to generate a .017 unit increase in importance of indoor air quality features, and a unit increase in Indulgent egoistic motivations is associated with a .033 unit increase in importance of indoor air quality features.

Table 18 – Regression of level of importance of indoor air quality features on motivations to adopt green housing features

Importance of indoor air features	Model 1 Coefficient (Std. Error)
Altruistic and biospheric motivations	.017 (.004)***
Practical egoistic motivations	.001 (.006)
Indulgent egoistic motivations	.033 (.009)***
Constant	4.318 (.071)***

Model 1: Adjusted R^2 = .137; p<.05*; p<.01**; p<.001*** (two-tailed tests)

The effect of Practical egoistic motivations is only statistically significant for importance of recycled features—each unit increase in egoistic concerns is expected to lead to a .020 unit increase in importance (p<.01). Each additional unit of Altruistic and biospheric motivations is associated with a .018 unit increase in importance, while a unit increase in Indulgent egoistic motivations is associated with a .035 unit increase in importance of recycled features. The referred results are statistically significant (p<.001), as indicated in Table 19.

Table 19 – Regression of level of importance of recycled features on motivations to adopt green housing features

Importance of recycled features	Model 1 Coefficient (Std. Error)
Altruistic and biospheric motivations	.018 (.004)***
Practical egoistic motivations	.020 (.006)**
Indulgent egoistic motivations	.035 (.009)***
Constant	4.081 (.074)***

Model 1: Adjusted R^2 = .183; p<.05*; p<.01**; p<.001*** (two-tailed tests)

Table 20 illustrates the effects of motivations on the overall importance of green features. A unit increase in Altruistic and biospheric motivations is associated with a .370 unit increase in importance of green features, and each additional unit of Indulgent egoistic motivations is associated with a .534 unit increase in importance (both at

p<.001). Significant with p<.05, a unit increase in Practical egoistic motivations is associated with a .210 unit increase in importance.

Table 20 – Regression of overall level of importance of green housing features on motivations to adopt green housing features

Weighted Factor of Importance of GHF's	Model 1 Coefficient (Std. Error)
Altruistic and biospheric motivations	.370 (.058)***
Practical egoistic motivations	.210 (.088)*
Indulgent egoistic motivations	.534 (.140)***
Constant	.418 (1.111)

Model 1: Adjusted R^2 = .222; p<.05*; p<.01**; p<.001*** (two-tailed tests)

DISCUSSION

5.1 Sample's demographic profile

Results indicate that, in general, individuals who undertook the survey appropriately met the participation requirements – they owned their current residences and had added green features to them. During the design phase of the study there was the concern that MTurk Workers would try to participate without qualifying, due to the financial compensation, but results demonstrated that was not the case.

Specifically, results form the additional screening items strategically placed throughout the MTurk survey indicated that no respondent fell in contradiction regarding residential ownership or having added green features to it. With regards to attempts at completing the survey more than once, two Workers out of the total 112 did participate more than once, but their behavior was detected at the MTurk website and the data were discarded (i.e., eight complete surveys mentioned in Data Collection in the Method section).

The results of this study appear to be in accordance with the literature that states Workers are internally motivated as opposed to completing tasks exclusively for the financial compensation (Buhrmester et al. 2011, Mason and Suri 2012). One might also speculate that participants' high level of respect for the requirements might be, in part, the reflection of a growing social awareness of adoption of green housing features and/or the practice of proenvironmental behavior in general.

Opinion polls conducted in the last few decades have shown major increases in environmental concern among Americans, as well as a high increase in the perception that the government was dedicating too little attention to environmental problems (Mainieri et al. 1997). In the last decade alone, it was found that approximately half of Americans believe the environment in the country is getting worse, and "more than two-thirds of Americans consider themselves either active environmentalists or sympathetic to environmental concerns" (Harris Interactive 2005, in Noiseux and Hostetler 2008, p. 42). Authors of empirical studies go further in asserting that a growing environmental consciousness can definitely affect the behavior of consumers who are increasingly interested in purchasing hybrid cars, organic food, and energy-efficient appliances (Ottman et al. 2006; Noiseux and Hostetler 2008; Maller et al. 2012). Such consciousness could have a spillover effect on other levels of behavior like participating in surveys that address environmental concerns and proenvironmental behavior, possibly explaining the results that reflect respect for the requirements.

Notwithstanding, this possible respect should be considered with care. While the convenience sample is somewhat familiar to the researcher, for it is greatly composed of members of the academic population, the MTuk sample is not only more diverse but also widely unknown in terms of professional background. Considering that such respect would come from knowledge about environmental causes and GHF's, it becomes difficult to assess the authenticity of MTurk responses due to lack of information on subjects' background. This is certainly a limitation posed by the incorporation of this sample and as such should be taken into account in many stances of this discussion.

Another concern during the design phase was the presence of energy-efficient lighting as the only green features at the residence. Results once more demonstrated this was not a problem, because only 13.6 percent of those who undertook the survey fell under that category, and the vast majority of them had added more than five bulbs (86 percent). Therefore, the screening items proved to be effective, and one might even say that the survey's cover letter and consent form were also effective in communicating participation requirements.

The third concern was the possibility of the MTurk sample being demographically too distinct from the convenience sample. Again, this concern was relieved when a comparison of frequencies between the two samples indicated what van be considered an overall similarity in most of the demographic items, including a slight over-representation of females. Such over-representation appears to be in consonance with theories arguing that females are more prone to environmental concerns due to socially determined roles. It has been previously said that women, as caretakers and managers of the household's resources (i.e., gatekeepers) tend to be aware of the consequences of their consumption and disposal of resources, as well as about the transmission of disease and availability of resources in general (Straughan and Roberts 1999; Tanner and Kast 2003; Paço and Varejão 2010; Reid et al. 2010).

Differences in household income, US state of residence, level of education attained, and age group were expected because of the nature of the samples. Most importantly, items related to characteristics of residences such as "age of residence" also yielded similar results, thus not representing a threat to the generalizability of the study from that perspective.

With regards to demographic characteristics, a visual comparison of the MTurk results to the mainstream US population described in previous research (Buhrmester et al. 2011) demonstrated that it is indeed more diverse than typical American college samples, which works in favor of social research due to the increase in variability. However, there are sample-related drawbacks to the study.

The convenience sample presented results in which more than half of the respondents fell into one category, as in the case of age, US state of residence (for obvious reasons), and income groups. As a result, the overall variability of the data was decreased in those cases. It is possible that this drawback is related to the lack of statistically significant results for the majority of the demographic items. This and other possibilities are further addressed in this section.

In the cases of "level of education attained" and "gender", there were almost statistically significant results ($p<.08$) in the prediction of adoption. As for the effects of "annual household income", there were statistically significant results in a few models, which might be related to the higher diversity of income groups in the MTurk sample.

Nonetheless, it is worth noting that "income" has been identified as a very important correlate, moderator, and/or predictor of the performance of proenvironmental behavior in general (Mainieri et al. 1997; Straughan and Roberts 1999; Tanner and Kast 2003; Paço and Varejão 2010). At the aggregate level, respondents are more or less proportionally distributed among all categories, with only 14.8 percent belonging to the first category (below $29,999 annually). As stated in several empirical studies, green housing features are associated with a premium cost (Hoffman and Henn 2008; Noiseux and Hostetler 2008; Purdie 2009; Maller et al. 2012), hence the association between

income and adoption. Thus, the fact that income showed statistical significance is not a surprise.

It is worth noting that, at the aggregate level, approximately 27 percent of the sample falls into the annual household income of $100,000 or more. That has important implications for the study, especially due to the price premiums mentioned above. Considering that the median annual income of American households is approximately $51,000 (US Census Bureau 2012), the sample is over-represented by wealthier households in comparisons to the median American household, as only 17 percent of subjects at the aggregate level present that level of income. In light of that, it is possible that adopters of GHF's have a higher purchase power than the average American.

The highest percentage of residence age falls between the categories 11 to 25 and 26 to 45 years old, meaning that the homes were built in the period between 1968 and 2002. Considering that features were added to the homes after they were built (i.e., as per one of the participation requirements), there is a wide spectrum of cases that range from items such as appliances and lighting being replaced to cases when residences underwent some type of renovation to accommodate features such as new heating/cooling systems, tank-less water heating systems, energy-efficient windows, and green finishes.

It is important to relate the number of adoptions for each listed feature to the age of residences because, as explained by Maller et al. (2012), some residential structures simply cannot accommodate specific types of green features. One example is rainwater collection systems that reportedly cannot be installed to some types of residences in Australia because the older structures do not accommodate the extra plumbing and devices required by that type of feature (Maller et al. 2012). Even if the American and the

Australian residential building processes are disparate, building codes evolve, and so do building styles. Thus, common sense indicates that, after a certain age, houses might present challenges to homeowners who wish to add green features to them, not only because renovations can bring unforeseeable problems, but also because some features simply cannot be accommodated.

It is then possible that the three lowest adoption scores are related to the referred challenges posed by older residences. In fact, "Systems or devices that enhance indoor air quality", "Reduced water consumption systems or water reuse systems", and "Environmentally friendly floors" are all features that, when adopted, require work to be complete in technically sensitive areas of the building, such as the roof, plumbing lines, and the floors. On the contrary, the most frequently adopted feature "energy-efficient appliances with Energy Star seal" do not require any work other than item replacement, just like the second and third most frequently adopted features, respectively "Energy-efficient light fixtures" and "Appropriate sealing and weather-stripping".

In the case of appliances, it is also important to remember that many financial incentives are available to homeowners who wish to replace older items. Governments and electricity providers at the local, state and federal levels offer rebates and other incentives directly to homeowners as a way of helping to shorten the period of return in investments. And when compared to "Energy-efficient heating/cooling systems" that are also included in incentive programs, appliances are more affordable in terms of upfront costs and do not require specialized labor to be installed. Appliances are also much more visually displayed than heating, ventilation and air conditioning systems (HVAC). The latter stays behind doors and/or outdoors most of the time, and design is not a priority of

manufacturers for obvious reasons. But appliances do have an apparent "look" that gives away whether they are up to date or dated. Thus, an aesthetic component may also play a role in the adoption of appliances.

Going back to demographics, the vast majority of respondents intend to stay at their current residence for over one year, with approximately 40 percent reporting plans to stay at the same residence for up to ten years more. These results are understandable when one considers that respondents have made at least some investment in the property by adding green features. However, there is a limitation to the results—the fact that the features respondents reported are "present" at their current residence but, per the requirement to participate, only one of them could have been "added" by them.

The requirement stated that the participant must have added at least one feature to the residence, but the survey item about the actual features inquires about their presence at the residence, lacking the specifics of which features were added and which were already in the house when respondent made the home purchase. Nonetheless, for the purposes of discussing the time respondents intend to stay at the residence, the results are valid. Even if the investment factor is omitted from the equation, the presence of green features brings many benefits to residents and therefore may, alone, justify their reported intention to stay longer.

In what concerns respondent's country of residence, it is worth recalling that the survey was open to homeowners residing in countries where green features are similar to US green features in terms of purpose and installation to the building. Such countries are Canada, Australia, New Zealand, and European nations such as Switzerland, Sweden, The Netherlands, and England. The inclusion of those countries reflects an attempt to

expand the pool of qualified participants, especially in the convenience sample. However, results indicate an extremely low presence of non-American residences. For this reason, results presented are representative of US residences only.

US state of residence, on the other hand, did present diversity in the MTurk sample. While 77 percent of respondents in the convenience sample reside in Missouri, California holds the highest number of residents in the MTurk sample, but only at 13.5 percent. All 50 states were represented in the MTurk sample, with California followed by New York and Pennsylvania, both with 7.7 percent each, and by Texas with 6.7 percent. The diversity of states in the MTurk sample is in accordance with the above-mentioned literature that describes Workers are very diverse (Buhrmester et al. 2011), and results made the aggregate sample more diverse with Missouri's percentage dropping to 40 percent.

The item "parental status" offers insight into the presence of children at the residence. At the aggregate level, 46.4 percent report having children who live at the residence, while 35.9 percent report having no children at all. The remaining 17.7 percent report having children, but they do not reside with the homeowner. Theories of environmental concern, here considered motivations, address the fact that altruistic concerns are related to the welfare of children, as they represent the future of humanity (Schultz 2000; Schutlz 2001). Considering the fact that the sample is over-represented by women, the bearers of children and traditionally their caretakers, it comes as no surprise that nearly half of respondents have children who live with them.

What is somewhat surprising given the relationship between females and children is the fact that over 30 percent of the sample has no children at all. Moreover, the results

for “no children” and the “children do not reside” add up to over 50 percent of the aggregate sample. This finding indicates that homeowners have other motivations than altruistic ones related to children to adopt green features or to purchase a house with green features.

Political orientation has been previously described as a “deciding demographic feature” among early adopters of innovations and in the sustainable consumption literature (Schelly 2010, p. 153). In the present study, the overall majority (46.2 percent) reports being politically liberal, followed by “moderates” with 31.7 percent of responses. It can be said that the sample is composed by approximately close numbers of liberals and moderates along with a smaller percentage of conservatives (20.2 percent). Only 1.9 percent of respondents chose the option “other/prefer not to say”. The over-representation of liberals indicates the sample is politically biased, just like is it biased in economics terms due to the over-representation of households with income levels equal to or higher than $100,000. Although the effect of political orientation was not statistically significant in the study, politically liberal individuals have been described as “more likely to engage in sustainable consumption habits” (Schelly 2010, p. 153) and have been linked to higher levels of environmental concern.

In the US democrats have been more strongly linked to environmental issues especially due to former vice-president’s Al Gore’s efforts to publicize the seriousness of the consequences from global warming and its threats to the world economy. But with many of his remarks being challenged by scientists, the US population might have felt confused and suspicious with regards to the issue (Owen 2011). The same applies to other environmental problems as society becomes aware of what Owen (2011) calls “the

conundrum". The author argues that on trying to address certain environmental issues, firms, governments, and society in general see themselves faced with the consequences of their good intentions. A clear example is the governmental incentive of the use of natural gas while farmers and environmentalists nationwide point to the disastrous environmental consequences associated with fracking.

One could argue that conundrums are also present in politics, as more citizens see themselves not simply as democrats or republicans, but as liberals who see benefits in both democratic and republican discourses. As the rate of information exchange increases and citizens start having an also increasing access to not only documents about politician's views, but also to videos of them expressing their ideas more intimately (i.e., the Romney incident during the last presidential campaign), confusion might be striking voters.

Missouri was represented by the Republican Party in the late 1980's and early 1990's, shifting to a majority of Democratic leaders from the later 1990's to the present. It has the reputation of being a "swing" state, that is, no single candidate or party has overwhelming support in securing the state's electoral college votes. This might be related to the fact that liberals are highly represented in this study. Alternatively, the results might be explained by a large portion of the convenience sample being drawn from university faculty and staff who may or may not be from Missouri. As a large public Midwestern university, the University of Missouri attracts professionals from all over the nation, making its Columbia campus demographically more diverse in comparison to the state's population. But if one considers that all 50 states are represented in the sample to

some extent, then the argument of there being a liberalization tendency does appear to be sound.

Level of education also presented very diverse results in the aggregate level, with the highest percentage lying in "some college" (26.3 percent), followed by "BS degree" with 23 percent, MS degree with 21.5 percent and PhD degree at 20.6 percent. This diversity was expected mainly due to Workers, who probably balanced out the high number of PhD degrees in the convenience sample.

Studies of adoption of innovations and sustainable consumption report that early adopters are in general more highly educated in comparison to non-adopters, the same way that green consumers are more highly educated than their conventionally-consuming counterparts (Schelly 2010). The literature explains that education measures structural factors that may hinder or encourage green consumption by means of knowledge and income. A positive relationship between education and proenvironmental attitudes and concerns has also been found in proenvironmental behavior studies (Mainieri et al. 1997; Straughan and Roberts 1999; Paço and Varejão 2010). Furthermore, on interviewing green renovators, Maller and colleagues also came across a predominance of tertiary degrees and occasional post-graduate degrees (Maller et al. 2012). Given the previous examples, it appears that results from this study are consistent with the research literature.

Results for age indicate a good distribution between categories, with only the category 65 years or older being left with a lower percentage of respondents (5.3 percent). When proenvironmental behavior and environmental concern first started to be studied, there was a tendency for younger individuals to present higher performance of PEB or higher concern (Mainieri et al. 1997; Straughan and Roberts 1999). However,

more recently there has been "a reversed trend for age, with environmental concern and behaviors being stronger among persons above 50 years" (Mainieri et al. 1997, p. 191). Other authors argue the case that people who grow up while environmental issues are salient tend to present more favorable attitudes and behaviors toward the environment (McKechnie 1970; Straughan and Roberts 1999). Considering that society has been presenting increasing awareness about environmental issues in the past 50 years, it is possible that virtually all respondents present a reasonably positive attitude toward environmental matters. Again, the variability in the sample works in favor of the quality of the study.

5.2 Main results

5.2.1 Involvement with home features

Results from section one "involvement with home features" clearly demonstrate that, overall, the sample presented a high level of involvement with home features (i.e., all measures presented means above five points out of seven). Several survey items were reverse-scored so that higher numbers in the scale indicated higher positive attitudes toward home features.

These results are not surprising, for purchasing a home is most likely the highest expense many people make in a lifetime. Furthermore, as explained by Maller and colleagues, houses and the concept of home "are integral to most people's lives and can also be seen as the physical embodiment of values and aspirations" (2012, p. 256). At a more practical level, residences offer shelter and protection, other than housing most of our valuable objects.

It is possible that green housing features were seen by the respondents as an extension of the home and thus as objects of involvement. At the same time, when one goes through the trouble to choose and add a green feature to their residence, that creates what the literature denominates situational involvement (SI) (Houston and Rothschild 1978; Zaichkowsky 1986; McIntyre 1989). SI happens when a stimulus elicits concern about one's behavior in the context of that stimulus. It easily fades though, prevailing strong only for the duration of such a situation. However, upon being questioned about the green features, homeowners' level of SI may have increased, contributing to the findings.

Scholars appear to unanimously agree that high levels of involvement lead to information seeking and processing about the subject of involvement (Houston and Rothschild 1978; Bloch and Richins 1983; Zaichkowsky 1985, 1986, 1987). This suggests the possibility that respondents were indeed knowledgeable about home features in general and, consequently, about the specific category of *green* home features.

In the context of the consumption of environment-friendly products, Gleim et al. (2013) found that consumer expertise is one of the main determinants of consumption, and along with price constitutes a great barrier to purchasing environment-friendly products. It would be reasonable to speculate, then, that involvement with home features would lead to information-seeking behavior about green alternatives, which could result in a higher practice of pro-environmental behavior (i.e., in this study adoption) in comparison to a product with which there is no involvement.

Another noteworthy remark is that involvement theory assumes the central role of values and beliefs (Bloch and Banjeree 2001), with research pointing to personal factors

(i.e., a person's value system and life experiences) as antecedent factors or causes of involvement (Zaichkowsky 1986; McQuarrie and Munson 1991). Combining this with the notion that houses are already highly related to personal and family values, the results are, again, very reasonable.

The PII results might also be linked to the respect for the requirements demonstrated by both the convenience and the MTurk sample. And as a consequence of such respect, one might speculate that respondents' level of involvement with home features might have affected their attitudinal responses in the survey.

Also important is the expectation of receiving a reward, which is critical to involvement and is named *satisfaction* in Bloch and Banerjee's (2001) proposed model of the antecedents of involvement. There are many types of rewards; cited by product-related studies is self-realization, while leisure studies emphasize relief from the stress and strain of life, and improved health (Ragheb and Beard 1980; Shimp and Sharma 1983; Buchanan 1985; Selin and Howard 1988; McIntyre 1989). With relation to benefits, home features present both practical or measurable benefits such as functionality, or in the case of green features economic savings, as well as abstract benefits such as comfort.

This duality of benefits, as it is named here, was clearly reflected by the factors retrieved from the PII scale items—cognitive and affective involvement with home features. The first factor contained the measures: a) *valuable* suggesting monetary value, or value in terms of time expenditure; b) *needed* suggesting purpose of use; c) *mean a lot to me*; d) *important*; and e) *relevant*. As explained by Zaichkowsky (1994), items in the cognitive factor are more rational in nature, stressing states of information processing.

More importantly, the cognitive aspect of involvement signals the achievement of idealization states, closely related to the practical benefits of home features. On the other end of the continuum are items from the second factor suggesting deep emotions, moods and lack of rationality (i.e., *interesting, appealing, exciting, fascinating, and involving*). Therefore, there appears to be a match between the duality of benefits from home features and the two dimensions of the involvement construct.

Although factor results in this study are in accordance with Zaichkowsky's (1994) findings, none of the types of involvement was statistically significant in the prediction of adoption of GHF's when acting as control variables. This indicates that motivational factors dealing specifically with GHF's are better predictors of adoption when compared to involvement with home features in general. The stronger relationship among items that are directly related to the green component is not surprising.

The situation changed when the involvement factors were entered as main predictors of adoption. Affective involvement did present statistically significant coefficients in the models with income and respondent's age as control variables. The relationship between affective involvement and income is easily explained—if home owners have the money to spend in features with an added cost, they are less likely to try to control impulsive emotions leading to purchase, or in this case, adoption. The over-representation of higher income levels in the sample may be intrinsically related to predominant effect of affective involvement over cognitive involvement.

This rationale might also explain the main effect of age along with the effect of affective involvement, for older individuals are more likely to have higher income due to the presence of dual income in the household. That is, an older individual is more likely

to have a better job and thus a higher income when compared to a younger individual (Mainieri et al 1997; Straughan and Roberts 1999; Paço and Varejão 2010). The older individual is also more likely to reside with a partner, which contributes to increased household income. Again, if money is not a barrier, one might be more prone to making emotional purchases. And because of the higher income levels in the sample when compared to the median American annual household income, it is worth noting that these results cannot be regarded as representative of the average population.

The highest statistical significance for the involvement factors as main predictors was presented in the model where the overall importance attributed to GHF's was the dependent measure. That effect also seems straightforward in the sense that, if one is involved with home features, it seems natural they will attribute higher importance to green features. Hence the main effect of the affective as well as the cognitive component of involvement, for importance has both an emotional and a practical side to it.

5.2.2 Adoption of green housing features

In addition to the remarks made about results from section two "green features present at residence" in the previous section, it is important to discuss a few other points. First, the "other green features" open-ended survey item resulted, overall, in a repetition of already listed items, but the respondents' wording of items was different from the survey's wording. For example, although the category "fiberglass-free or recycled insulation" was indicated in the list, nine respondents mentioned something in terms of "*super-insulation*", or "*improved insulation*" in the open-ended item. A similar type of response was found in regards to "energy-efficient heating/cooling systems", which was

in the list but did not prevent respondents from specifying in the open-ended item what type of such system they had. There were mentions to geothermal systems, wood-burning stoves and fireplaces, and energy-efficient fans. Other similar cases include "water-saving devices/systems or appliances" with mentions to low-flow showerheads, and energy-efficient appliances with respondents listing all appliances in the house that are energy-efficient.

In the case of insulation, it is widespread knowledge among professionals and common knowledge among lay people that meeting insulation requirements improves thermal comfort and energy-efficiency. Thus, it may have been a limitation of the study to not include "insulation that meets or exceeds state recommendations" in the list of features. As for the other cases, there is more than one plausible explanation for the repetition of information.

First, it is possible that even well informed consumers find themselves confused by the amount of information associated with green products. In the case of GHF's, for instance, different nomenclature can be confusing, as in the case of *water saving bath fixtures* and *low-flow bath fixtures.* These are many times used interchangeably, but a closer evaluation of the terms clarifies that low-flow fixtures are indeed water saving, but not all features save water by using low flow mechanisms. Some features are considered water saving because they recycle water instead of delivering less water. It is then not surprising that the mainstream consumer may find it difficult to keep up with green technological innovations and the nomenclature associated with them. Gleim et al. (2013) asserts that insecurities about which option is best for the environment and how the

products actually perform are major barriers inhibiting the increase of green consumption.

It is also possible that repeating the information in the open-ended item was an attempt at making sure what they marked as "present" was correct, which is illustrated by the following responses: *"Not sure if this is 'green' or not but we heat with a woodburning stove in the winter"*, and *"not sure if this qualifies, or if it's covered under 'indoor air quality': radon elimination system".*

Homeowners' repetition of information might also stem from pride rather than confusion. It has been previously mentioned that being environmentally mindful is seen as a socially desirable behavior. It has also been argued that driving a Toyota Prius, for instance, is seen as a way of showcasing social and environmental responsibility (Ottman et al. 2006; Maynard 2007). This could mean that listing what they have done to the house is a way of seeking recognition, or validation of their efforts; or it may even be a way to showcase it.

A few respondents went through the trouble of writing about the whole passive solar heating logic, using up to 600 characters to describe all the green features present at the residence. Similarly, the owners of the most energy-efficient house in the Midwest (EPA, 2005) seemed very proud of and eager to describe how much less energy they use in their home when compared to neighbors. They were also very pleased to comment on how the snow on their roof takes a longer period of time to start melting in comparison to their neighbors' (Fisher 2014). And they should be proud of it; all of them. After all, they went through a lot of planning, research and thought to accomplish energy-efficiency and other milestones that benefit both them and the environment. The same way it is not easy

to learn about the Toyota Prius' technology, green building is, again, a complicated subject that demands time and effort. If compared to the adoption of energy-efficient appliances, or to the use of caulk, energy-efficient systems and products related to the building shell are much more complex features.

The mention to solar panels and photovoltaic technology in the open-ended item is also an indication that, in future studies, the inclusion of such items in the list may be beneficial. Their absence in this study is justified by: a) the fact that the convenience sample was retrieved mainly from Missouri residents, and solar technology is still not considered popular in the state due to poor cost-effectiveness (Goldschmidt, 2013); and b) the uncertainty about the data quality from the MTurk sample. No literature was found about proenvironmental behavior studies conducted through MTurk, and without precedent the decision was made to keep the green items as simple as possible rather than complex.

The low adoption of tank-less water heaters might indicate a reflection of the social and psychological barriers to green building, associated with taken-for-granted beliefs on the individual level (Hoffman and Henn 2008). As explained by Ottman et al. (2006), reminiscences of the conventional wisdom that green products do not work as well as their regular counterparts cause some green products to be held in lower regard by the public. This might be the case of tank-less water heaters that, when originally developed, were associated with bad performance.

No one wants to run out of hot water, and the symbolism of having an actual tank full of it might have a strong psychological effect. Although recent models show an improved and very reliable technology, it is possible that society is still caught up on

memories of past poor performances. In summary, if compared to other green features such as appliances or non-toxic paint, tank-less water heating systems are not only a newer technology but also a much higher expense and require careful consideration of risks.

Water is also associated with cleanliness and hygiene. The relatively low popularity of "reduced water consumption systems" in the study (37 percent adoption) might be also be due to the psychological negative effect associated with using less water to, for example, flush the toilet. In the open-ended items, one respondent reported having a low-flush toilet and finding it inconvenient because their toilets ends up clogged by the toilet paper. So psychological barriers associated with product efficacy and quality might extend to low-flow features and not be exclusively related to tank-less water heaters.

The case of the low adoption of environmentally friendly floors might be different. With the exception of bamboo flooring, other environmentally friendly options have only been developed recently. Considering that, at the time of the survey, respondents who had invested in renovating floors had already completed all of it, it is likely that they switched from vinyl tile to carpet or from carpet to wood flooring. In the latter case, it is very common, in older houses, to have well preserved wood flooring underneath tile or carpet. Given that many houses in the sample were more than 30 years old, the presence of wood flooring might have prevented some homeowners from adopting environmentally friendly flooring.

The same case might apply to environmentally friendly insulation. Insulation is hardly replaced in buildings, as it is more common to have insulation added on top of existing layers. Given the age of the majority of the homes in the sample, it is not

surprising that respondents mentioned having added insulation but the actual adoption of green insulation was low (only 15 percent of the sample adopted the feature).

Considering the aesthetic appeal of windows, it is no surprise that the adoption of double or triple-pane windows was among the highest adoption scores. Moreover, building codes in some states require new construction to have them. Thus, in many cases, it is possible that those were already installed when the homeowners moved in.

In the case of energy-efficient lighting, the ease of adoption might explain the high score. Other than requiring relatively minimal investments from homeowners, bulbs are not typically all replaced at once, so a gap between investments is allowed. Their replacement does not require specialized labor either, making them popular among homeowners.

One item that is not frequently cited in green building literature is native or low-maintenance landscape, for they are not part of the building per se. However, green home manuals and other works address the benefit of having natural shade during the summer and wind barriers during the winter in terms of energy-efficiency and improved thermal comfort (Chiras 2004; Yudelson 2007). Moreover, many residential lots already come with some trees that are often retained by homeowners. It is also part of the American culture to have trees at home, so in case no vegetation strategically placed exists when a house is purchased, planting trees becomes an easy solution.

The high number of adoption of programmable thermostats is most likely due to their benefits in terms of convenience and also to its low cost, making it popular among homeowners. Convenience also applies to “recycled” items such as furniture. Family heirlooms, as well as antiques, are very common among Americans, and those might

contribute to the high adoption of “recycled” items. That is, it is more likely that the majority of these items are represented by furniture than recycled construction materials, a less commonly adopted feature. This happens because much of the materials coming from demolition cannot be repurposed or salvaged. Moreover, repurposing materials such as wood requires specialized equipment and knowledge to allow for appropriate treatment and finish.

Results for “non-toxic finishes, adhesives, or paint” show nearly half the sample adopted them. Given the associated health benefits, one might expect adoption would be greater. However, many consumers are not entirely aware of products that fall into that category. The same way that asbestos was once used and has now been banned, building contractors report that several types of construction materials nowadays are produced with much less toxic or volatile materials. But sometimes they are the only ones aware of that, with the homeowners expressing more concern about the looks of cabinets than the level of toxicity of their finishes (Goff 2013). It is then possible that many more residences from the sample are equipped with low-toxicity products or completely non-toxic items but homeowners are unaware of the fact.

5.2.3 Importance of categories of green housing features

Results from section three “importance of categories of features” are similar to the results from the exploratory study conducted in 2012 (Murarolli), for all categories of features were rated with high importance levels (at least four points out of six). Furthermore, the first study found that the features with the highest importance level were energy-efficient windows and doors, and the present study found energy-efficient

appliances and systems leading the scores, that is, both have in common energy-efficiency.

The energy-efficiency category in the present study was described as "Energy-saving appliances, heating/cooling systems and devices", thus lacking the words "windows and doors". This is because the option here was made to favor the importance of *categories* over the importance of *features*. As explained in the previous involvement sub-section, homes are probably the most important purchase the average individual makes in a lifetime. This means that virtually any investment or improvement made to the home tends to be deemed important. Thus, it was already expected that the results would be replicated. Given that the main goal of the study is to uncover motivations to adopt, the decision was made to try and create items that could be more easily linked to latent motivational factors.

Following that decision, the categories of features were developed in a manner that reflects different benefits provided by them, with a wording that signals the predominance of one type of motivation over another. This was *not* done in a sufficiently obvious manner to cause respondents to perceive the strategy, but in the context of the study, the categories do signal attitudinal tendencies. To most homeowners, the category "energy-saving" implies economic savings, indicating self-beneficial motivation. "Water-saving" could also imply economic savings but these features are less frequently adopted in comparison to energy-saving features (i.e., due to the already mentioned links to hygiene and cleanliness and to policy strategies), and as such might indicate a more biospheric motivation (i.e., resource-saving) than self-benefitting.

The category "non-toxic" relates to healthy-living motivations, which are also self-benefiting but differ from the energy-saving category because the benefit is not simply economic, which is an important distinction in the study. Finally, the category "recycled materials and furniture" is associated with altruistic tendencies. Although the practice of recycling paper, food packaging, and the like is different from buying recycled construction materials or using antique furniture, these activities are inherently similar in the sense that they both "show how other people are better off as a result" of their practice (Straughan and Roberts 1999, p. 568). The quote indicates the way consumers view the act of recycling, or helping the environmental in general—as an action that helps everybody at the end. And this type of view has been described as altruism or as a self-transcendent tendency in previous research (Stern et al. 1999; Straughan and Roberts 1999; Schultz et al. 2005; Snelgar 2006). Thus, the latest category is predominantly associated with altruism.

Nonetheless, results from the factor analysis of the categories of features do not appear to match the argument that egoistic orientations predominate in energy-savings features while the other categories of features are related to other orientations. Although the items were designed to represent different motivations, only one factor was extracted from the categories. Differently from what was expected, this indicates that homeowners might view different benefits in the same category and, consequently, have different motivations to adopt features within categories.

One possible explanation for the factor results is that the attribution of importance to categories rather than to features might have reduced the variation in the data, for attitudinal orientations alone seem to be inadequate to explain attribution of importance.

However, when one considers the overall role of energy-efficient features in the green building market and in an economic context, other explanations seem more plausible, as the discussed in the next paragraphs.

Other than signaling egoistic orientation, the attribution of high importance scores to energy-saving features might very well be a reflection of respondents' higher knowledge of that category when compared to others. Respondents might feel comfortable attributing higher levels of importance to those features because they are familiar with their measurable benefits.

When compared to the benefits stemming from recycling or non-exposure to toxicities, benefits from energy-savings are more easily accessible and quantifiable to homeowners through utility bills. Additionally, the green building market heavily revolves around energy-efficiency. The very own US Green Building Council's LEED certification program has the word *energy* in its name—Leadership in *Energy* and Environmental Design. The Energy Star program, developed by the US Environmental Protection Agency in the 1990's is also focused on energy.

For about three decades governmental and non-governmental organizations worldwide have been publicizing the need to make society less dependent on fuel-based electricity, and energy prices are skyrocketing (Dinan and Miranowski 1989; Malpezzi 2002; Fuerst 2009; Purdie 2009). It would be no surprise, in a future investigation, to find that part of the high importance attributed to energy-efficient features is due to these facts and not simply to egoistic motivations due to savings.

Furthermore, not only does the measurability of energy savings allow for an assessment of financial savings, it is also concrete evidence of environmentally friendly

behavior that can serve as a reassuring element. Previous studies do discuss the link between higher levels of environmental concern (rooted in altruism *and* biosphericism) and adoption of energy-saving features (Noiseux and Hostetler 2008; Schelly 2010; Maller et al. 2012), suggesting that the importance attributed to energy-saving features might as well have an altruistic and/or biospheric component in addition to an egoistic component. It is possible that the economic benefits from energy-savings outweigh other benefits provided by these features. However, that does not necessarily imply that altruistic and/or biospheric benefits are ignored by consumers.

Useful to this argument is the economic theory of utility maximization. Studies about the environmental valuation of residential energy-saving features argue that consumers will tend to invest in features that will yield the largest utility rate (Johnson and Kaserman 1983). And given the evolution of incentives and rebates to energy-efficient improvements, if return on investment happens, it happens with energy-saving measures.

In the context of this study this means that energy-saving features have an advantage over other categories of features because their financial performance is measurable. Other categories lack that concrete factor and as a result appear to provide a smaller utility rate. Consumers feel safer investing in items that have a higher indication of providing return on investment on top of helping the environment and improving indoor comfort (Johnson & Kaserman 1983; Dinan and Miranowski 1989; Nevin and Watson 1998; Ball 2005; Miller et al. 2008). This could also be related to the higher importance attributed to the energy-saving category.

Other studies in the same substantive area also indicate that homeowners' willingness to pay for green housing features, regardless of the type of feature, decreases after at least one adoption has been made (Banfi et al. 2005). Yet, according to the utility approach, this happens because the utility for the first improvement is higher than for the following ones that happen when the house is already at a better level of energy performance. In summary, the economic theories illustrate the important role played by self-beneficial motivations on adoption but do not exclude the importance of other factors that compose the overall utility rate.

A positive outcome from the importance measure was its statistically significant effect in the prediction of adoption. When used as a control variable along the main predictors "affective and cognitive involvement with home features", the overall importance of categories proved to be a stronger predictor of adoption of GHF's. Again, this might be easily explained by the fact that green features offer many benefits, and because the overall importance measure was used, it means that levels of importance for all categories were represented. As a result, the high importance scores derived form all of the different benefits offered by the features were inevitably represented generating a powerful result.

5.2.4 Motivations to adopt green housing features

Section four "motivations to adopt green housing features" contained the newly developed items measuring different motivations to adopt GHF's. It is worth recalling that measures were created based on the idea that personal values are inherently linked to environmental concern, with the latter constituting a motivational factor for the

performance of proenvironmental behavior (Stern and Dietz 1994; Stern et al. 1999; Schultz 2000; Snelgar 2006).

Mean score results showed that a biospheric item had the highest score among the 11 items in the scale—4.96, which is only .01 more than the second highest mean that belongs to an altruistic item. None of these two items was reverse-scored, so the high means indicate favorable attitudes toward the adoption of GHF's. This favorability is not surprising given that homeowners did practice the behavior in question (i.e., adoption).

The lowest mean score is for an egoistic item addressing concerns about trading aesthetics for greenness. The score of 3.52 indicates neutrality for falling between "somewhat agree" and "somewhat disagree". The second lowest mean belongs to the egoistic item "Having green features at home makes me look good".

Looking exclusively at the descriptive scores, one might conclude that the two strongest motivations to adopt GHF's are biospheric and altruistic in nature, with egoistic motivations emerging as weaker factors. However, it is important to remember that, as explained by Schultz (2000), types of environmental concern are not assumed to be independent from one another. The author proposes that "objects are valued because of their perceived relation to self and that egoistic, altruistic and biospheric concerns reflect varying levels of the inclusiveness of an individuals' notion of self" (Schultz 2000, p. 393). Therefore, even if an individual presents predominantly high scores in one type of concern/motivation that does not prevent them from having other types of motivations. The interpretation of mean scores does not allow for that verification, but regression results do, and will be discussed further in this sub-section.

It is here argued then, that all types of concern/motivations may be predictive of adoption of GHF's, but each has a different foundation. Nonetheless, it does seem that "biospheric concerns provide a broader motive for behavior" (Schultz 2000, p. 394) when compared to egoistic concerns. Individuals who tend to biospheric motivations would be concerned about issues at the global level, or more abstract and general. If they were to participate in protests, for example, they would be inclined to participate in events about local issues that directly affect them in terms of time and location, and also in events directed to global issues, such as global warming. The egoistically concerned, on the contrary, would be more active in a local level only. With that being said, one might speculate that, because altruistic and biospheric items lead the results, the homeowners in the sample tend to be more globally active about environmental issues than only locally active.

When interpreting the lower egoistic scores in this study it is important to take into account the already mentioned over-representation of wealthier income groups in comparison to the American population. Because this sample of adopters is wealthier, they might be less concerned about economic benefits originated from savings and more interested in altruistic and biospheric benefits.

Additionally, there is the potential presence of social desirability bias (SDB) in the study. It has long been common knowledge among social researchers that sensitive topics are indeed prone to SDB, to the point where it can pose risks to results. In survey research, the effect of SDB causes respondents to inflate positive attitudes because of social pressures (Babbie 2008). This applies to environmental issues and other sensitive topics such as abortion. Being "against" the environment could be seen as a lack of social

consciousness or mere egoism. On the contrary, being "against" abortion would tend to lead to social reinforcement.

In the case of this study, the influence of such bias was probably decreased in what concerns the dependent measures, for respondents had already adopted them. However, it is still possible that it affected responses to the attitudinal measures, to some extent. This could possibly explain the neutrality expressed about trading aesthetic quality for greenness. Given what is known about homes, that is, that they are a concrete representation of personal values and character, it would be reasonable to expected that people do care about their homes' appearance. For instance, the exploratory study conducted with homeowners found a high mean score for the statement "I would not like it if my house looked too differently from my neighbors' houses in terms of its buildings materials" (Murarolli 2012). This illustrates that social assimilation can be an important factor not only in other realms of social life but also in the context of green homes. In this study, the neutral results could reflect respondents' reluctance to admit they care about appearance for fear of social reprimand.

At the same time that results of egoistic orientations can be deflated due to social desirability, it can also cause an opposite situation in terms of behavior. Sometimes individuals go beyond reporting positive attitudes in a survey—they act positively toward environmental issues to avoid social consequences, or to exploit society's expectations about that type of behavior. For example, when in public such as at an office space, an individual might place papers in a designated recycling bin while not recycling at all at home. Moreover, it has already been mentioned here that the purchase of the iconic hybrid Toyota Prius has been linked to a "feel good" aspect of social and environmentally

responsibility. One could drive a Prius because it is trendy and society sees it as an environmentally responsible behavior, and not because of a concern with the world's dependency on oil or with the ozone layer.

In both cases, individuals might recognize that their actions are indeed helping the environment, but that is not the main benefit they acquire from the behavior. Those examples elicit the egoistic orientation disguised as altruistic and/or biospheric behaviors, and illustrate the need to empirically investigate why people behave the way they do.

Schultz (2000) not only defends the co-existence of different motivations, he points to the influence of situational factors on motivations when discussing the results of a laboratory experiment manipulating the feeling of empathy, what the author refers to as the malleability of environmental concerns leading to motivations. When asked to imagine themselves in the place of animals suffering from the consequences of environmental degradation, subjects presented significantly higher levels of environmental concern in comparison to individuals not submitted to the perspective-taking approach. Therefore, situational factors like the presence of others, involvement with a topic or object, and emotional states can influence concern and motivations to perform PEB.

The motivational items developed for this study were based on social-cognitive theoretical frameworks that have presented consistent results over the past two decades (Stern and Dietz 1994; Stern et al. 1999; Schultz 2000; Snelgar 2006). All reviewed studies have reported the clear differentiation among the three concern orientations, with each loading in a separate factor from the other. In contrast, factor analyses in this study did reveal three factors, but with Factor 1 being a balanced combination of altruistic and

biospheric motivations. Factor 2 holds the loadings for the egoistic items and so does factor 3. The difference between them is that egoistic items in factor 3 are related to affective, or indulgent motivations, while in factor 2 the egoistic motivations are of more practical tendencies.

In light of these results, it is imperative to discuss that the goals of this study are different from those of previous studies, and as a result, the findings are indeed relevant in terms of theoretical contribution. The foundations and development of the value-belief-norm (VBN) theory (Stern et al. 1993; Stern and Dietz 1994; Stern et al. 1995) and the subsequent development of concern/motivational orientations derived from values and valued objects (Schultz 2000) were attempts at categorizing values (Stern and Dietz 1994) and at clustering valued objects (Schultz 2000). The purpose of this study was to develop a scale measuring the relationship between personal values related to GHF's and GHF's as valued objects. Thus Schultz' and Stern and Dietz' theories and results provided the basis to develop the motivational items in this study.

Those differences in goals led to different factor results, simply because the factors underlying values in general are different from factors underlying motivational concerns in general. And both of those are inherently distinct from factors underlying the specific type of values associated with the proenvironmental behavior that is adoption of GHF's. With that in mind, it becomes easily arguable that this study is exploratory in nature.

The fact that both altruistic and biospheric motivations loaded on the same factor illustrates their commonalities. As explained by Schultz (2000), altruistic motivations exist "when a person judges environmental issues on the basis of costs to or benefits for

other people" (i.e., individuals, a community, or all humanity, p. 392). Similarly, biospheric motivations are based on the valuing of all living things. Therefore, both motivations share a "self-transcendent" factor, for they are based on goals that transcend the individual favoring the interests of others and the natural world (Schwartz' Model of Human Values, in Schultz and Zelezny 2003, p. 128).

The factorial distinction between different types of egoistic motivations also has a theoretical foundation, and it is linked to the concept of involvement. Like motivation to perform proenvironmental behavior, involvement is also based on values, or the extent to which individuals believe there is a connection between their self and certain objects or issues. And the same way that involvement with home features has a cognitive and an affective factor, one might argue that egoistic motivations in this study also demonstrate that duality.

Egoistic items such as: a) the goal of making GHF's match the interior and exterior aesthetics of the residence; b) the goal of achieving a return on investments; and c) whether GHF's are too expensive to adopt, are all highly cognitive in nature. For this reason, they are in accordance with the rational-choice model cited by Schultz (2000). The rational-choice model foresees that "environmental behavior is motivated by the perceived behavioral consequences associated with various actions" and argues it applies "more to egoists than to social-altruists" (p. 392). This model would explain more variability in behavior for individuals who place a higher value on the self (in comparison to the value placed to others and to nature) than for those who value more outside-of-the-self objects.

The attainment of comfort at home and the achievement of praise from society (survey items "GHF's provide me with better comfort" and "adopting GHF's makes me look good) are the classic example of affective motivations, for they are highly related to pleasure and the value of self-enhancement (Schultz and Zelezny 2003).

The duality of factors in the egoistic motivations suggests that Bloch and Banerjee's (2001) argument about the similarities between the constructs *environmental concern* and *involvement* is worthy of consideration for future research, which will be further discussed in the Conclusion section.

With regards to the predictive power of motivations to adopt GHF's, *Altruistic and biospheric motivations* were statistically significant when motivations were the only predictors, and when controlling for the effect of involvement with home features. The inclusion of involvement decreased the predictive power of *Altruistic and biospheric motivations*, but its effect was not statistically significant. Although lacking statistical power, the coefficient for cognitive involvement was negative, indicating that the relationship between the above-mentioned theory of rational choices and non-egoistic motivations might be worthy of study.

The main effect of *Altruistic and biospheric motivations* was also statistically significant in the prediction of importance of all categories of features separately (i.e., energy-saving, water-saving, indoor air, and recycled). This finding suggests that all categories have strong altruistic and biospheric appeal. Additionally, the coefficient of *Indulgent egoistic motivations* has a statistically significant effect in predicting importance of all categories but energy-saving features. Its effect on the prediction of importance of water-saving features might be related to Maller and colleagues' (2012)

findings about water-saving faucets being the most adopted features in green renovations including kitchens. This adoption may be attributable to the aesthetic appeal of modern faucets that also come with water-saving technologies.

A similar explanation might clarify the effect of indulgent egoistic motivations on the prediction of importance of features that improve indoor air quality. Many of those features incorporate the latest technological innovations, but their adoption is not as mainstream as the adoption of energy-saving features. Many modern HAVC features already provide improved indoor air quality, thus it is easy to see that the latter would be more associated with practical motivations, while the adoption of the latest technology on indoor air quality might seem more of a superfluous acquisition; hence the effect of the indulgence factor.

The effect of this factor on recycled, repurposed or refurbished materials is most likely associated with the adoption of antiques and repurposed items that end up customized to have functional and decorative qualities. One respondent's response to "other features" touches on the indulgence factor—*"Some trim was sawed by me personally from storm damaged trees, then dried, planned, and routered for base board etc"*. The quote illustrates how the repurposing of materials can become a hobby and generate features that contribute to the pleasantness of the residential environment.

The statistically significant effect of *Practical egoistic motivations* on predicting the importance of recycled materials and features implies the notion that, many times, repurposed materials are less expensive than new ones, especially if they are construction materials like wood and bricks. As long as the recycled or repurposed items are not

considered rare or antiques, they should allow for a faster return on investment in comparison to some new items.

In the model predicting the overall importance of features (i.e., the dependent measure was the composite measure of the weighted factor scores of the categories), all three motivations presented statistically significant results. The result comes at no surprise given that all motivations had a main effect in at least one of the predictions separated by categories.

5.2.5 Environmental concern orientations

The adapted Schultz (2000) scale was included in the survey to loosely serve as cross-validation for the newly developed "motivations to adopt GHF's" scale. The rationale was that the two scales should perform in similar ways if the new scale was developed in a sound manner. This was confirmed, because results from the factor analysis indicate a three-factor structure similar to the one found for the motivational factors. The two strongest similarities lie on the loading of *Altruistic and biospheric concerns* on the same factor, and the predominance of *Egoistic concerns* on the second factor.

The solutions differ with regards to "concern for children," which resulted in a one-item factor, and "my health," which loaded on the first factor along with the biospheric and altruistic items. The case of concern for children can be explained by the fact that children compose a different population from adults for the obvious age difference but also and more importantly, because of their ingenuity. Because of this, throughout human history children have been considered a fragile social category,

protected both legally and socially. Society as a whole has the perception that children are the personification of the future, or the certainty of continuation. Moreover, should environmental catastrophes strike, younger children would not be able to care for themselves and would inevitably succumb. That alone might be differentiation enough from the adult population to explain an exclusive place among environmental concern factors.

With regards to environmental concern for the consequences to "my health", its placement along with *Altruistic and biospheric concerns* might be due to the fact that, in the event of serious environmental problems, threats to one's health are ultimately threats to a form of life. The egoistic element was outweighed by the fact that, in face of environmental matters lives are lives. The factor *Altruistic and biospheric concerns* is based on a value for "all living things" (Schultz 2000, p.392).

Results of mean scores also present a similarity to results from the motivational scale, with an altruistic item scoring highest. As mentioned in the latter sub-section, that is an expected result and another indication that altruism is strongly associated with environmental concern and the practice of proenvironmental behavior (Mainieri et al. 1997; Straughan and Roberts 1999).

CONCLUSION

In terms of demographic variables, the study was successfully conducted with an overall diverse sample, with a higher variability when compared to typical college samples, which usually predominate in PEB studies. That is one of the study's strengths and a very relevant one, for recent studies have indicated that demographically profiling the green consumers has become increasingly difficult, with many presenting contradictory results (Mainieri et al. 1997; Straughan and Roberts 1999; Paço and Varejão 2010). This difficulty is also related to the dynamics of the green market. For instance, an original tendency of young adults to be more environmentally concerned (Leonard-Barton 1981) appears to have shifted as middle-aged adults were later on considered to compose the mainstream group of green consumers (Mainieri et al. 1997). Thus, the greater the demographic diversity the higher the chances to better understanding the phenomenon of PEB.

Notwithstanding, the fact that politically liberal individuals and households wealthier than the median American household were over-represented in the sample does constitute a limitation for generalization purposes. As mentioned in the previous section, it is imperative that care is taken when considering results directly and indirectly associated with the variables "income" and "political orientation". Especially in what concerns the main research question, it is possible that the lack of statistical significance in the effect of practical egoistic motivation on adoption is due to the over-representation of a wealthier sample. Differently from what would be expected from the average

consumer with an annual income of $51,000, the sample is this study appears to not be worried about economic benefits (i.e., benefits originated from practical egoistic motivations) stemming from adoption.

That only "income" and "respondent's age" presented statistically significant results is not considered a drawback. As explained by Mainieri et al. (1997) "demographics may not be as clearly tied as they were previously to environmental concern and behavior" (p. 191). The author further emphasizes that the positive relationship between education and proenvironmental attitudes has become weaker. In other cases, the study of relationships between demographics and PEB has presented contradictory results (Paço and Varejão 2010). With that being said, the results of this study appear to be another illustration of the difficulty in consistently profiling the green consumer.

The volume of information about green products that is available to different social groups (Owen 2011) might be an explanation for the above-mentioned trend. The argument made in the Discussion section pointing to society being overwhelmed and confused about environmental issues and products (Tanner and Kast 2003) appears to fit well here. As consumers' awareness of environmental issues increases, green products, such as organic, are seen even in traditionally more-for-your-money chains like Walmart. The chain has not only incorporated organic products into its inventory, but reportedly spends $500 million annually on the development and implementation of green technologies (Gleim et al. 2013). This means that not only information about green products is more accessible to more people, green products themselves are as well.

This scenario might suggest an expansion of the market, but at the same time an inconsistency in consumer behavior. On the one hand, higher education levels that have traditionally been associated with positive proenvironmental attitudes might be leading consumers to second-guess their choices due to suspicion about product claims (Gleim et al. 2013), somewhat decreasing their participation in the market. In contrast, less educated consumers might be willing to enter the market, but because lower education levels are generally associated with lower income levels, their consistent participation in the market might be hindered by income due to price premiums. Hence their under-representation in the study.

Another problem that might be associated with difficulties in demographic profiling is the fact that, in the past, many products' green claims were proven false (Ottman et al. 2006). This most likely increased consumer suspicions regarding green products and potentially may be reflected in decreasing behavioral consistency. In a society where news travel fast, it is possible that consumers change their minds everyday, with situational factors posing a challenge to the job of researchers aiming at demographically profiling the green consumer.

As for psychographic variables, they are also potentially affected by this social state of confusion. After all, variation in opinions might lead to behavioral inconsistencies. Thus, it is argued here that attempts at investigating predictors of PEB must rely on the combination of demographic and psychographic measures. As much as this combination generates inconclusive results like in this study, favoring one type of predictor over another is not a useful approach. Knowing the "why" without knowing the "who" is not going to move social research on the topic much further.

What this study clearly describes is an inclination to empathize with environmental issues. Although this is not surprising, given the opinions come from consumers who have practiced PEB, it does point to a few important aspects of the overall state of the green building market. First, contrary to what was believed, couples with children might no longer be the predominant target group in green building. The study shows that young adults without children and older adults who do not reside with children are also target markets to be reached by adoption of GHF's. Thus, the green building market appeals to people in a variety of life-stages.

Second, not only are GHF's adopters diverse with regards to household size but also show to be present throughout the 50 states. As recently as 2009, green building practices were believed to be concentrated in some portions of the country, especially the Pacific Northwest region (Murarolli 2012). This study illustrates the rapidly changing market tendencies and also points to the existence of different perspectives for looking at facts and numbers.

In 2014, the US Green Building Council released a list of top ten states in the US for LEED-certified projects, based on data from 2010. The list shows the square-footage of LEED buildings per capita in each state, with the District of Columbia leading the list at 25.15 square feet per capita. Looking at those numbers, one's first impression might be that results are disappointing; clearly not enough to significantly decrease the negative impact buildings have on the environment. But that list measures certified buildings only.

For the purposes of social-cognitive research on the adoption of GHF's, those data yield little to no information at all. That is because USGBC's data is commercially based in terms of focusing on numbers that can help increase adoption from a managerial

standpoint. But this study argues that there is a significant amount of green building occurring through the performance of green retrofit and the construction of energy-efficient residences; yielding the third conclusion drawn from this study—there is more to green building than LEED-certified projects.

The data from this study suggest a much more optimistic green building scenario, while USGBC's data release illustrates the choice of favoring easily measurable data over complex social-cognitive analyses. That is because the task of further understanding the demographic and psychographic variables that underlie the practice of this very specific type of PEB belongs to researchers. And it is strongly argued here that there is certainly much more to be uncovered, perhaps to reveal even more optimistic realities. It is the duty of empirical researchers to uncover the behavioral nuances of adoption of GHF's. After all, GHF"s are adopted by individuals belonging to many socioeconomic categories, age groups, and political orientations. In other words, virtually any American could be an adopter to a greater or lesser extent.

Adoption encompasses a wide range of different items, so when investigating the psychographic and demographic predictors of adoption, it is imperative that careful consideration be given to the study objectives. Different objectives will require the specification of which type of adoption to associate with which predictors, for results associated with a given type of adoption will most likely vary from results from another adoption type. This is because the cognitive and affective nuances of adopting five fluorescent bulbs are inherently different from those involved in the adoption of solar panels.

Psychological and consumer behavior research have long ago indicated that there are different levels of complexity to cognitive systems, depending on different objects and events (Lastovicka and Gardner 1978; Houston and Rothschild 1978; Petty, Cacioppo and Schumann 1983). Previous research has also referred to this phenomenon as different levels of commitment associated with different behaviors (Robertson 1976). Moreover, results from this study indicate that the main effect of different motivations does vary in the prediction of importance attributed to different features. It is likely then, that these effects also differ in the prediction of adoption of different features.

Researchers might benefit from clustering different features according to, for example, price points. Even though such approach has an inherent managerial basis, it is not equivalent to the above-mentioned USGBC list. Researchers are skilled at applying a social-cognitive approach to numbers, and in the case suggested, could uncover not only the demographic but also the psychographic characteristics of subjects clustered into the feature groups. It is possible that the same difficulties encountered in demographic profiling still exist in the case of clustering market groups. However, this study's results from motivations to adoption suggest that the addition of psychographic variables to market studies could be very beneficial to the literature.

One of the reasons why this study targeted adopters instead of non-adopters is the goal of learning from individuals who have adopted why they did so, so that insights could be gained towards encouraging non-adopters to become adopters. This approach was also taken instead of the reverse because there is existing literature about barriers (Hoffman and Henn 2008; Gleim et al. 2013). Thus taking the opposite approach seemed

like an opportunity to gain new insights. And it proved to be successful, leading to the fourth conclusion.

Although the study had limited success with uncovering the predictive power of demographic items, it did produce valuable information regarding prediction by psychographic items. The advantage of psychographic variables over demographic is that, regardless of level of education and income, all individuals present the same psychological components. It is true that variations in personality occur. But values-based research indicates that some psychological traits are inherent to humans, like the wish to succeed, or to attain certain life values (Lindberg, Garling and Montgomery 1983; Stern and Dietz 1994; Schultz 2000).

This is to argue that at the end of the day, and when considering home purchase or home features (Lindberg et al. 1987, 1988, 1989; Montgomery 1993), all subjects seek the options that seem to aid in the accomplishment of life values. The relationship between values, involvement, environmental concern and consequently PEB has been extensively discussed here. In summary, values lead individuals to seek certain objectives, and motives, in turn, "are defined as forces aimed at achieving an ultimate goal" (Schultz 2000, p. 393). The fact that these constructs are inter-related supports the argument that all types of motives are applicable to any type of population. Thus, knowing the specific weights of different motivations for a diverse population such as in this study is very helpful in terms of creating marketing strategies.

It is here concluded that efforts directed at drawing the attention of potential new green building consumers should focus on *Altruistic and biospheric motivations*, for this combination of motivations performed the best in the predictive models. However, its

predictive power was not sufficiently high to justify that marketing strategies devote efforts exclusively to this type of motivation. Alternatively, it is suggested that marketing efforts, environmental messages, and policymaking target mainly altruistic and biospheric values, as they are likely to appeal to a diversity of demographic groups.

As explained by Schultz and Zelezny (2003), environmental messages must be congruent with a specific population's core values in order to be appealing and affect behavioral outcomes. Their work concluded that self-enhancement values (i.e., egoistic in nature) predominate among Americans. But as this work demonstrates, the case is different with regards to adopters of GHF's, who are predominantly motivated by a combination of altruistic and biospheric values possibly due to higher income levels. Furthermore, this study reveals that, when income is not a barrier to adoption, consumers' use of affective mechanisms also plays an important role in adoption.

In summary, an increase in the adoption of more expensive and/or complementary GHF's (i.e., features adopted after other more basic features have been already adopted) is expected to result from environmental messages, marketing efforts, and policies that target homeowners with higher levels of income. An improvement in the adoption of more affordable features should result from messages and incentives appealing to the average homeowner's altruistic and biospheric motivations. The latter also implies that, because of the lower cost, these features are more likely to be adopted as first green features, or earlier than more expensive features, in the case of the average middle class homeowner. Thus, it is likely that, just as Maslow's (1943) hierarchy of needs suggests, the mainstream homeowners start by adopting simpler and less expensive features, or

features associated with higher financial incentives (e.g. appliances), and proceed to meeting higher end needs associated with self-enhancement.

Those conclusions compose an original contribution with implications for green consumer behavior and proenvironmental behavior studies, which have already been discussed here and in the Discussion section to some extent. There are also implications for the area of Environment and Behavior studies. A summary of these implications is presented below.

6.1 Implications for Domain Areas and Directions for Future Research

6.1.2 Green consumerism as proenvironmental behavior

This study is possibly the first one to investigate the adoption of GHF's as predicted by different motivations stemming from environmental concern. As an exploratory study many challenges were faced and limitations posed. But overall, results found here are supported by the literature. For example, the previously reported difficulty in demographically profiling the green consumer has been experienced in this work as well. This means that studies in green consumerism, or at least about the adoption of GHF's, must continue to explore the prediction of PEB with both demographic and psychographic variables.

Looking specifically at adoption of GHF's, some new insights emerge. It is useful to know that importance results replicate those found in the exploratory study (Murarolli 2012), mainly because those regard the opinions of non-adopters, and these of adopters. It is indeed useful to find that importance does not appear to vary among adopters and non-adopters.

Moreover, there appears to be more than one dimension to adoption. The dimensions associated with environmental concern have been discussed here. But in addition, Maller and colleagues (2012) explain that some green renovators found adoption to be a way of offsetting other choices that are not environment-friendly in nature, such as the addition of square footage to the residence. It is possible then that other than being motivated by self-benefit, environmental benefits, or altruistic benefits, homeowners adopt GHF's to not feel guilty about non-environmentally friendly choices made by the household.

In other words, a given individual might present the three motivations in question and as a consequence adopt GHF's. However, that does not prevent them from adding anti-environment features to the house at the same time that green features are added. This poses an intriguing question—as society feels the burden of guilt for environmental degradation, is there a coping mechanism where PEB serves as an offsetting behavior? A very interesting study could survey homeowners who have adopted GHF's and find out if other types of renovations were made at the same time, or if non-green features were also adopted. Maller and colleagues (2012) conducted such a study, but in a qualitative assessment of a small group of Australian homeowners. A larger scale, quantitative study could assess the presence of this same tendency in the United States.

Similarly, the employment of other statistical techniques to this study's data could uncover other nuances of adoption. For example, multidimensional scaling could demonstrate whether there is more than one dimension to adoption, as suggested in the previous paragraph. One could argue that the mentioned offsetting behavior would still fall into the egoistic motivations. However, it is inherently different from the motivations

studied here because the benefit expected is relief from guilt, which is not a direct benefit from GHF's. Ultimately, the homeowners practicing this compensatory behavior would be seeking the benefits of the non-green adoptions, with benefits from the green features occupying a secondary place in that scenario. It is then likely that there are other dimensions to the adoption of GHF's.

Another interesting approach would be to further investigate motivations associated strictly with energy-saving features. But not using simply a category, using an inclusive list of features. This could be worthwhile because financial energy-savings continue to emerge as the flagship of green building, but this study found that importance attributed to energy-saving features is predicted by altruistic and biospheric motivations but not by egoistic motivations. It would then be interesting to find whether homeowners who have adopted these features find more benefits from the economic savings or from the reduced environmental impact.

With regards to environmental concern, values and motivations as relating to PEB, the study has also confirmed previous findings that altruism is a strong predictor of PEB (Straughan and Roberts 1999), and that different environmental concern orientations are also predictors. Most importantly, this study shows that the theories and findings about other types of PEB extend to the adoption of green housing features.

Bloch and Banerjee's (2001) argument that environmental concern should be studied as involvement with environmental issues received support in this study. The situational character of environmental concern, or in Schultz' (2000) words the "malleability" of the construct, emerges as a possible explanation for the inconclusive findings about egoistic motivations (i.e., in addition to the previously discussed income

issue). It has been discussed that some individuals might appear biospherically or altruistically motivated in the presence of others but would lack such motivations in private. Those cases might be related to the situational character of environmental concern, which also leads people to have an increased level of environmental concern while directly experiencing consequences from environmental issues. A decrease in level of concern follows when that issue is resolved. Similarly, if one does not perform recycling behavior at the office and is reprimanded as a consequence, they are likely to start showing the behavior. But the lack of the reprimand in other environments prevents them from acting pro-environmentally.

In light of that, empirical testing of the author's arguments might help clarify a few issues associated with environmental concern and PEB, including the value-action gap. This gap is defined as positive attitudes toward environmental issues that do not translate into actual proenvironmental behavior (Barr 2006). It might be a simple case of situational environmental concern—when responding a survey about environmental attitudes, one's level of involvement with the issue increases and responses are possibly inflated. Once the survey is over, the situational concern fades and the individual does not demonstrate concern through the practice of PEB. It is even possible that the empirical testing of this theory brings other clarifications to the topic, especially when considering that adoption of GHF's is remarkably understudied.

The state of confusion and doubt that possibly permeates society (Owen 2011) and its relationship to green products and environmental issues also appear worthy of investigation. It has been concluded that messages that are altruistic and biospheric in nature should appeal to some homeowners as means of increasing adoption of GHF's.

However, before significant increase in adoption is achieved, there must happen an evaluation of homeowners' perception of the green building market. It is important to empirically investigate whether confusion about jargons and other terminologies actually exist (most previous studies about this being a barrier are conceptual in nature). And if they do (as specialists in the area suspect) stakeholders in the green building market need to find a way of standardizing nomenclature for the sake of the homeowners'. This would most likely translate into greater clarification and increased adoption.

Involvement theory comes into play once more when communication barriers are considered. This theory argues that information-seeking behavior is performed, to different extents, by individuals involved with an object, product, or topic. At the same time, Schultz and Zelezny (2003) argue that seeking information about environmental issues is dependent on the information's ability to appeal to personal values. The authors cite environmental organizations that are reframing their messages to become less guilt eliciting and to appeal to personal values such as personal conviction in order to draw attention to solving issues instead of just letting individuals feel gloomed by the issues. Thus, the relationship of environmental information and messages with involvement appear worthy of study, as the application of involvement theory to the study of adoption of GHF's may shed new light on the nuances of PEB in general.

Finally, qualitative assessments of the adoption of GHF's could allow for new insights with regards to the dimensionality and motivational factors. While this study did collect data of qualitative nature, they were used more as supporting data and were not included in the main analysis. Data from items such as "other environmental concerns" or "I am not concerned about the environment" may allow for a better understanding of

environmental concern. To admit to not being environmentally concerned takes a strong character, and it would be useful to assess a point of view that falls further from environmental concern.

6.1.2 Environment and Behavior Studies

This domain recognizes that man, as a component of the total environment, has both a cognitive and an affective psychological side. Thus, a great implication of this research to Environment and Behavior (EB) studies is the finding that not only do involvement with home features and egoistic motivations present both components, but also each component presented distinct results in the prediction of adoption.

With regards to involvement, *affective involvement* emerged as a predictor of adoption in two models, along with income, and also when age was added as a control variable. EB theories argue that affective processes are based on emotions, and comprise the development of meaning attributed to products and objects in general (Lastovicka and Gardner 1978). The emotional impact of physical stimuli of the environment on behavior is one of the central concerns of EB studies. With that being said, it is important to consider what types of affective responses GHF's cause homeowners to have and, most importantly, how they affect adoption.

Cognitive involvement, which emerged as a predictor of the overall importance of GHF's along with affective involvement, did not figure as a statistically significant predictor of adoption. One could conclude that in terms of reaction to stimuli, the affective portion appears to play a greater role in the context of adoption of GHF's.

This might be due to the fact that residences, or homes, are traditionally associated with great levels of symbolism, according to EB theories (Després 1991; Somerville 1997). The meaning of home as relating to housing has been extensively explored by EB researchers, with conclusions pointing that homes can be seen in many different ways. One possible interpretation is a territorial one that sees the home as a place of shelter that separates the self from others. But germane to this study is the notion that the home is the reflection of one's ideas and values (Després 1991).

It cannot be stressed enough that the concept of values is deeply rooted in the basis of this research. And similarly to studies about residential preference (Lindberg et al. 1987, 1988, 1989), EB researchers agree that homes are used to express tastes, interests, and character "through furniture, decoration, as well as by the objects and meaningful possessions contained in the home" (Després 1991, p. 98). Green housing features can be easily placed among objects contained in the home, and as such might also be subject to symbolic interpretations.

An alternative to asking "why" people adopt GHF's would be to ask what the features mean to them. That might provide further clarification as to where GHF's stand in the affective context—are their meanings any different from those of other features due to the green component? If yes, how so? Are green features associated with a greater sense of security, or a greater representation of the self? Although a thorough examination of the concept of home is beyond the scope of this study, it is suggested that many research questions could emerge from such an endeavor. The respective findings from those questions would undoubtedly aid in the understanding of the practice of adoption of GHF's. Moreover, the indulgent and practical aspects of adoption could be

more thoroughly studied in proportionally stratified samples with regards to income and political orientation.

In terms of environmental attributes, one that is closely related to this research is *preference*. By definition, environmental attributes are qualities that humans confer to the environment through perceptive and cognitive processes, as a consequence of the person-environment interaction (Weisman 2001). As an environmental attribute, preference is created when affect and cognition meet to indicate aesthetic judgment (Kaplan 1988). That is, the use of cognitive and affective mechanisms gives origin to environmental qualities that are aesthetic in nature and can be positive or negative.

This definition is very pertinent to GHF's in the context of aesthetics. This study has pointed out that, in the past, respondents have expressed concerns about whether green components would make a home look too differently from neighboring residences (Murarolli 2012). That is in itself an aesthetic concern that showed to be in a neutral state in the present study.

Questions were raised as to whether homeowners perceive that greenness enhances aesthetic or decreases aesthetic qualities. For example, the study showed that the importance of water-saving features was predicted by indulgent egoistic motivations. The discussion pointed out results from a previous study where water-saving faucets were among the most adopted features in kitchens. That choice is likely to have been made due to the aesthetic appeal of modern water features. But would that be the case with photovoltaic (PV) systems that can seriously impact the aesthetics of the exterior façade of a house?

Cognitively, PV systems would tend to be preferred for their environmental and technological appeal and also for the potential economic savings. But affectively, they could not only affect but even compromise a façade in aesthetic terms. So does this mean that preference also has a situational component to it? If the decision was made to thoroughly study preferences for different GHF's, trade-offs between the cognitive and affective components of preference should be taken into account.

Another environmental attribute closely related to the research is *perception*. As explained earlier, preference itself is a result of perceptual process, as are other environmental attributes and this is because perception is a core environmental attribute. Along with cognition, the mechanism of perception is responsible for the processing, storage and retrieval of information coming from environmental stimuli. In other words, perception is intimately linked to the thought process. Given the argument that society now finds itself confused with regards to environmental issues and green products, this attribute is of great relevance. One pertinent question is: how much information can our perceptual and cognitive process handle before we feel overwhelmed?

Gleim et al. (2013) and Schultz and Zelenzny (2003) both argue that lack of information is not hindering green consumption, but the way the information is transmitted is. The notion that environmental messages should be more congruent with personal values has already been discussed. But one's information-processing limit remains to be mentioned.

Economic theory explains that the thought process is part of the decision-making process (Schmid 2004). Furthermore, Neoclassical economic theory posits that, in a given context where options for increased welfare are available, man rationally analyses them

and chooses the one that affords more benefits. Institutional economics, on the other hand, calls attention to man's bounded rationality, a result of limited information processing capabilities. Thus, bounded rationality is intrinsically related to the fact that everyday a growing number of individuals from all over the world are voluntarily or involuntarily exposed to the topic of environmental issues. It is here argued that, possibly, overworked perception mechanisms are hindering the performance of PEB.

It has been cited elsewhere in this manuscript that consumers feel suspicious of green claims. Moreover, many good intentions toward the environment have proven to be not environment-friendly at all (Owen 2011). One simple question that might permeate the thought process of homeowners is: when recycling food containers, should they be washed? After all, by recycling one is trying to reduce the waste of resources. But if recycling requires something to be thoroughly washed implicating the use of water, then is it best not to recycle?

This type of conundrum is also present in the adoption of GHF's. For example, is it best to keep an older appliance that consumes more energy or to use more natural resources by purchasing a new one that reduces energy consumption? These types of questions point to the need to further understand homeowners' perceptions of green housing features. Not only is it important to know why they adopt those features, but as in a post-occupancy evaluation, it would be useful to find their opinions after using the features for some time. Are they useful? Are there compromises to convenience? Do they live up to the manufacturer's environmentally friendly claims?

It is clear that there are several avenues for research to be pursued in the context of adoption of green housing features. A combination of methods (i.e., quantitative and

qualitative), an assessment of new scales' reliability, and the exploration of new techniques of data analysis are encouraged if the area is to produce an improved understanding of the green building market and of the homeowner as a key actor in the road to increased adoption.

Appendix A

A.1 Survey instrument – Convenience sample

Screening section

Do you currently own a home?
( ) **Yes** – directed to next question
( ) **No** – directed to error message*
Have you added any type of green feature to your current home?
( ) **Yes** – directed to next question
( ) **No** – directed to error message*
Are fluorescent light bulbs the *only* green features at your home?
( ) **Yes** – directed to next question
( ) **No** – directed to survey
How many fluorescent light bulbs would you say there are at your home?
( ) There are ***less than five*** fluorescent bulbs at my home – directed to error message*
( ) There are ***more than five*** fluorescent bulbs at my home – directed to survey

***Error message text:**
Unfortunately you do not qualify to participate. Please close the survey and forward the link to your contacts. Thank you!

With advances in technology, today there are many new residential features that provide several benefits to homeowners. Examples are stainless-steel appliances, smart/robot vacuum cleaners and steam sweepers. There are also other prestigious and durable features like granite countertops and skylights. Some features are also environmentally friendly, such as non-toxic paint.

Modern features allow for reduced maintenance around the home, quicker housekeeping, improved health, savings in utility bills, and healthier, aesthetically pleasing environments. Given the large variety of features available for home improvement, please indicate your involvement with home features and your general interest in them.

We need you to judge home features against a series of descriptive scales according to how YOU feel about them. Here's how you are to use the scales below:

If you feel that home features are *very closely related* to one end of the scale, you should place your check mark as follows:

important _X_:___:___:___:___:___:___ unimportant

OR

important ___:___:___:___:___:___:_X_ unimportant

If you feel that home features are *quite closely related* to one or the other end of the scale (but not extremely), you should place your check mark as follows:

appealing ___:___:___:___:___:_X_:___ unappealing

OR

appealing ___:_X_:___:___:___:___:___ unappealing

If you feel that home features seem *only slightly related* to one or the other end of the scale (but not really neutral), you should place your check mark as follows:

involving __:___:_X_:___:___:___:___ uninvolving

OR

involving ___:___:___:___:_X_:___:__ uninvolving

To me, home features in general are:

1) important __:___:___:___:___:___:___:___ unimportant
2) boring ___:___:___:___:___:___:___:___ interesting
3) relevant ___:___:___:___:___:___:___:___ irrelevant
4) exciting ___:___:___:___:___:___:___:___ unexciting
5) mean nothing ___:___:___:___:___:___:___:___ mean a lot to me
6) appealing ___:___:___:___:___:___:___:___ unappealing
7) fascinating ___:___:___:___:___:___:___:___ mundane
8) worthless ___:___:___:___:___:___:___:___ valuable
9) involving ___:___:___:___:___:___:___:___ uninvolving
10) not needed ___:___:___:___:___:___:___:___ needed

Some residences have features that make them more energy-efficient, and consequently more environmentally friendly. They also become friendlier to your well being. These are called green features. They provide reduced consumption of resources such as water and energy, healthier indoor air, and higher aesthetic qualities associated with landscaping and natural light. Next to each feature below, choose "**Yes**" **if it is present** in your current home. Choose "**No" if it is not present** in your home.

Green feature	**YES**	**NO**
11) Energy-efficient appliances, with Energy Star seal		
12) Energy-efficient heating/cooling systems (furnaces, boilers, a/c units and central a/c, heat pumps)		
13) Programmable thermostat		
14) Tank-less water heater (heats water as you need it)		
15) System or device that enhances indoor air quality (examples: high-efficiency attic vents and HEPA filters)		
16) Salvaged or recycled materials (examples: wood, hardware, tiles, bricks, furniture including antiques and heirlooms)		
17) Environmentally friendly floors (examples: bamboo, recycled fiber carpet, cork floor, biodegradable linoleum)		
18) Non-toxic finishes (like in cabinets and furniture), adhesives and/or paint.		
19) Double or triple-insulated windows		
20) Abundant natural light		
21) Five or more fluorescent light bulbs		
22) Appropriate sealing and weather-stripping (examples: caulk around windows and doors, inside and outside; foam gaskets in exterior wall outlets, etc.)		
23) Native, low-maintenance outdoor turf and plants (require less irrigation)		
24) Fiberglass-free or recycled wall insulation		
25) Reduced water consumption systems or water reuse systems (examples: dual-flush toilets; rain water collection; grey water system)		

26) Is(are) there any other green feature(s) in your home? Which one(s)?

_____

_____

_____

27) Please indicate the year when you added the green features you marked "Yes"

_____

Now please rate the following categories of green features according to the level of importance they have for YOU. The scales range from **not important at all** to **extremely important,** and work the same way as the previous one. Please place your checkmark in the position that best describes your view of each item in relation to the two ends of the scale.

28) water-saving appliances and features
Not important at all ___:___:___:___:___:___:___ extremely important

29) energy-saving appliances, heating/cooling systems and devices
Not important at all ___:___:___:___:___:___:___ extremely important

30) finishes, devices and features that improve indoor air quality
Not important at all ___:___:___:___:___:___:___ extremely important

31) recycled, refurbished and repurposed construction materials, features and furniture
Not important at all ___:___:___:___:___:___:___ extremely important

As mentioned earlier, green features are beneficial to people in addition to helping the environment. Because of this, it is possible that people adopt green features because of health or even financial concerns, and not primarily because of concerns with the environment. With that in mind, please rate the following statements according to how they represent your view of green features. The scale ranges from **strongly disagree** to **strongly agree**. Again, please place your checkmark in the position that best describes your view of each item in relation to the two ends of the scale.

32) A home that uses natural resources in a more efficient manner provides me with better comfort.
Strongly disagree ___:___:___:___:___:___:___ strongly agree

33) In a home, aesthetics should not be traded for "greenness".
Strongly disagree ___:___:___:___:___:___:___ strongly agree

34) Pollution generated at the home harms people in the entire community.
Strongly disagree ___:___:___:___:___:___:___ strongly agree

35) Perhaps the strongest reason to implement green features is some of them help decrease utility costs.
Strongly disagree ___:___:___:___:___:___:___ strongly agree

36) Pollution generated at homes harms the planet.
Strongly disagree ___:___:___:___:___:___:___ strongly agree

37) Reducing my home's resource consumption is important to guarantee good quality of life for future generations.
Strongly disagree ___:___:___:___:___:___ strongly agree

38) The adoption of green features can help protect animals and plants.
Strongly disagree ___:___:___:___:___:___ strongly agree

39) Adding green features to the home is beneficial to my health.
Strongly disagree ___:___:___:___:___:___ strongly agree

40) Having green features at home makes me look good.
Strongly disagree ___:___:___:___:___:___ strongly agree

People around the world are generally concerned about environmental problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most. Below, please rate the following items from **strongly disagree** to **strongly agree,** in response to the sentence:

I am concerned about environmental problems because of the consequences for_____
41) My future
Strongly disagree ___:___:___:___:___:___ strongly agree
42) Children
Strongly disagree ___:___:___:___:___:___ strongly agree
43) Animals
Strongly disagree ___:___:___:___:___:___ strongly agree
44) People in the community
Strongly disagree ___:___:___:___:___:___ strongly agree
45) Humanity
Strongly disagree ___:___:___:___:___:___strongly agree
46) My health
Strongly disagree ___:___:___:___:___:___ strongly agree
47) Future generations
Strongly disagree ___:___:___:___:___:___ strongly agree
48) Plants and trees
Strongly disagree ___:___:___:___:___:___ strongly agree
49) My prosperity
Strongly disagree ___:___:___:___:___:___ strongly agree

50) What is the approximate age (in numbers) of your current residence?
_____

51) How long do you intend to stay in your current residence?
a) For less than one year
b) For more than one year*
*If option b is chosen, directed to question: You intend to stay at your current home for more than one year. How many years more would you say, approximately? _____

52) Which statement best represents your current parental status?
a) I have no children
b) I have a child or have children, but none resides with me
c) I have a child or have children, and some or all reside with me

53) Please mark your gender
a) Female
b) Male

54) Do you consider yourself:
a) Democrat
b) Republican
c) Independent
d) Other

55) What is the highest level of education that you have completed?
a) Did not complete high school
b) High school graduate
c) Some College (including Associates Degree)
d) Bachelor's Degree
e) Master's Degree or other professional degree
f) Doctoral Degree

56) Which category best represents your age?
a) 18 - 35 years old
b) 36 - 45 years old
c) 46 - 65 years old
d) 65 or older

57) Which category best represents your annual household income?
a) less than 29,999
b) 30,000 – 49,000
c) 50,000 – 69,999
d) 70,000 – 99,999
e) 100,000 or more

Thank you so much for your participation!

A.2 Survey instrument – MTurk sample*
*denotes additional screening items

Screening section
Do you currently own a home?
( ) **Yes** – directed to next question
( ) **No** – directed to error message*
Have you added any type of green feature to your current home?
( ) **Yes** – directed to next question
( ) **No** – directed to error message*
Are fluorescent light bulbs the *only* green features at your home?
( ) **Yes** – directed to next question
( ) **No** – directed to survey
How many fluorescent light bulbs would you say there are at your home?
( ) There are ***less than five*** fluorescent bulbs at my home – directed to error message*
( ) There are ***more than five*** fluorescent bulbs at my home – directed to survey

***Error message text:**
Unfortunately you do not qualify to participate. Please close the survey and forward the link to your contacts. Thank you!

With advances in technology, today there are many new residential features that provide several benefits to homeowners. Examples are stainless-steel appliances, smart/robot vacuum cleaners and steam sweepers. There are also other prestigious and durable features like granite countertops and skylights. Some features are also environmentally friendly, such as non-toxic paint.

Modern features allow for reduced maintenance around the home, quicker housekeeping, improved health, savings in utility bills, and healthier, aesthetically pleasing environments. Given the large variety of features available for home improvement, please indicate your involvement with home features and your general interest in them.

We need you to judge home features against a series of descriptive scales according to how YOU feel about them. Here's how you are to use the scales below:

If you feel that home features are *very closely related* to one end of the scale, you should place your check mark as follows:

important _X_:___:___:___:___:___:___ unimportant

OR

important ___:___:___:___:___:___:_X_ unimportant

If you feel that home features are *quite closely related* to one or the other end of the scale (but not extremely), you should place your check mark as follows:

appealing ___:___:___:___:___:_X_:___ unappealing

OR

appealing ___:_X_:___:___:___:___:___ unappealing

If you feel that home features seem *only slightly related* to one or the other end of the scale (but not really neutral), you should place your check mark as follows:

involving __:___:_X_:___:___:___:___ uninvolving

OR

involving ___:___:___:___:_X_:___:__ uninvolving

To me, home features in general are:

1) important __:___:___:___:___:___:___:___ unimportant
2) boring ___:___:___:___:___:___:___:___ interesting
3) relevant ___:___:___:___:___:___:___:___ irrelevant
4) exciting ___:___:___:___:___:___:___:___ unexciting
5) mean nothing ___:___:___:___:___:___:___:___ mean a lot to me
6) appealing ___:___:___:___:___:___:___:___ unappealing
7) fascinating ___:___:___:___:___:___:___:___ mundane
8) worthless ___:___:___:___:___:___:___:___ valuable
9) involving ___:___:___:___:___:___:___:___ uninvolving
10) not needed ___:___:___:___:___:___:___:___ needed

Some homes have features that make them more energy-efficient, and consequently more environmentally friendly. They also become friendlier to your well-being. These are called green features. They provide reduced consumption of resources such as water and energy, healthier indoor air, and higher aesthetic qualities associated with landscaping and natural light. Next to each feature below, choose "**Yes**" **if it is present** in your current home. Choose "**No" if it is not present** in your home.

Green feature	**YES**	**NO**
11) Energy-efficient appliances, with Energy Star seal		
12) Energy-efficient heating/cooling systems (furnaces, boilers, a/c units and central a/c, heat pumps)		
13) Programmable thermostat		
14) Tank-less water heater (heats water as you need it)		
15) System or device that enhances indoor air quality (examples: high-efficiency attic vents and HEPA filters)		
16) Salvaged or recycled materials (examples: wood, hardware, tiles, bricks, furniture including antiques and heirlooms)		
17) Environmentally friendly floors (examples: bamboo, recycled fiber carpet, cork floor, biodegradable linoleum)		
18) Non-toxic finishes (like in cabinets and furniture), adhesives and/or paint.		
19) Double or triple-insulated windows		
20) Abundant natural light		
21) Five or more fluorescent light bulbs		
22) Appropriate sealing and weather-stripping (examples: caulk around windows and doors, inside and outside; foam gaskets in exterior wall outlets, etc.)		
23) Native, low-maintenance outdoor turf and plants (require less irrigation)		
24) Fiberglass-free or recycled wall insulation		
25) Reduced water consumption systems or water reuse systems (examples: dual-flush toilets; rain water collection; grey water system)		

26) Is(are) there any other green feature(s) in your home? Which one(s)?

_____

_____

_____

27) Please indicate the year when you added the green features you marked "Yes"

_____

28) Do you currently own a home or have you ever owned one?
a) Currently own a home
b) Have owned a home in the past
c) Have never owned a home – skip to question 57

Now please rate the following categories of green features according to the level of importance they have for YOU. The scales range from **not important at all** to **extremely important,** and work the same way as the previous one. Please place your checkmark in the position that best describes your view of each item in relation to the two ends of the scale.

29) water-saving appliances and features
Not important at all ___:___:___:___:___:___ extremely important

30) energy-saving appliances, heating/cooling systems and devices
Not important at all ___:___:___:___:___:___ extremely important

31) finishes, devices and features that improve indoor air quality
Not important at all ___:___:___:___:___:___ extremely important

32) recycled, refurbished and repurposed construction materials, features and furniture
Not important at all ___:___:___:___:___:___ extremely important

As mentioned earlier, green features are beneficial to people in addition to helping the environment. Because of this, it is possible that people adopt green features because of health or even financial concerns, and not primarily because of concerns with the environment. With that in mind, please rate the following statements according to how they represent your view of green features. The scale ranges from **strongly disagree** to **strongly agree**. Again, please place your checkmark in the position that best describes your view of each item in relation to the two ends of the scale.

33) A home that uses natural resources in a more efficient manner provides me with better comfort.
Strongly disagree ___:___:___:___:___:___ strongly agree

34) In a home, aesthetics should not be traded for "greenness".
Strongly disagree ___:___:___:___:___:___ strongly agree

35) Pollution generated at the home harms people in the entire community.
Strongly disagree ___:___:___:___:___:___ strongly agree

36) Perhaps the strongest reason to implement green features is some of them help decrease utility costs.
Strongly disagree ___:___:___:___:___:___ strongly agree

37) Pollution generated at homes harms the planet.
Strongly disagree ___:___:___:___:___:___ strongly agree

38) Reducing my home's resource consumption is important to guarantee good quality of life for future generations.
Strongly disagree ___:___:___:___:___:___ strongly agree

39) The adoption of green features can help protect animals and plants.
Strongly disagree ___:___:___:___:___:___ strongly agree

40) Adding green features to the home is beneficial to my health.
Strongly disagree ___:___:___:___:___:___ strongly agree

41) Having green features at home makes me look good.
Strongly disagree ___:___:___:___:___:___ strongly agree

42) For the green features you marked "Yes" in the beginning of the survey, were they already in the house when you moved in, or did you add them?
a) Feature(s) was(were) already there.
b) I added feature(s).

People around the world are generally concerned about environmental problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most. Below, please rate the following items from **strongly disagree** to **strongly agree,** in response to the sentence:

I am concerned about environmental problems because of the consequences for_____
43) My future
Strongly disagree ___:___:___:___:___:___ strongly agree
44) Children
Strongly disagree ___:___:___:___:___:___ strongly agree
45) Animals
Strongly disagree ___:___:___:___:___:___ strongly agree
46) People in the community
Strongly disagree ___:___:___:___:___:___ strongly agree
47) Humanity
Strongly disagree ___:___:___:___:___:___ strongly agree
48) My health
Strongly disagree ___:___:___:___:___:___ strongly agree
49) Future generations
Strongly disagree ___:___:___:___:___:___ strongly agree

50) Plants and trees
Strongly disagree ___:___:___:___:___:___ strongly agree
51) My prosperity
Strongly disagree ___:___:___:___:___:___ strongly agree

52) What is the approximate age (in numbers) of your current residence?
_____

53) How long do you intend to stay in your current residence?
a) For less than one year
b) For more than one year*
*If option b is chosen, directed to question: You intend to stay at your current home for more than one year. How many years more would you say, approximately? _____

54) Which statement best represents your current parental status?
a) I have no children
b) I have a child or have children, but none resides with me
c) I have a child or have children, and some or all reside with me

55) Please mark your gender
a) Female
b) Male

56) Do you consider yourself:
a) Democrat
b) Republican
c) Independent
d) Other

57) What is the highest level of education that you have completed?
a) Did not complete high school
b) High school graduate
c) Some College (including Associates Degree)
d) Bachelor's Degree
e) Master's Degree or other professional degree
f) Doctoral Degree
58) Which category best represents your age?
a) 18 - 35 years old
b) 36 - 45 years old
c) 46 - 65 years old
d) 65 or older

59) Which category best represents your annual household income?
a) less than 29,999
b) 30,000 – 49,000
c) 50,000 – 69,999
d) 70,000 – 99,999
e) 100,000 or more

For you to be compensated, please enter in the box below a **random 5-digit number** as a **completion code**. You may use, for example, the 5 first digits of your telephone number. Please do not use "12345". **Write down your number so you can enter it again on MTurk after closing this survey.**

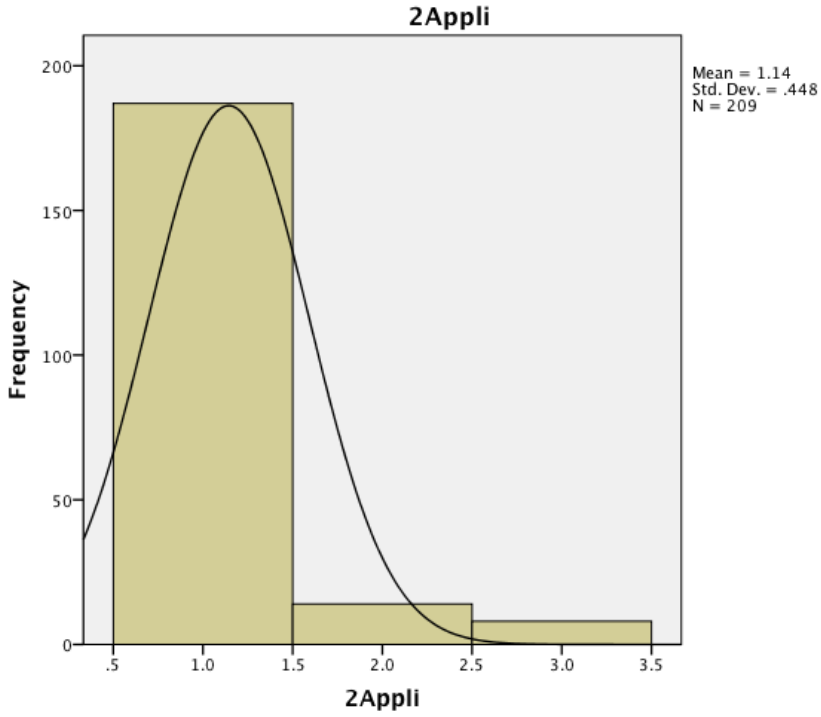
60) Enter 5-digit completion code and **hit submit**.

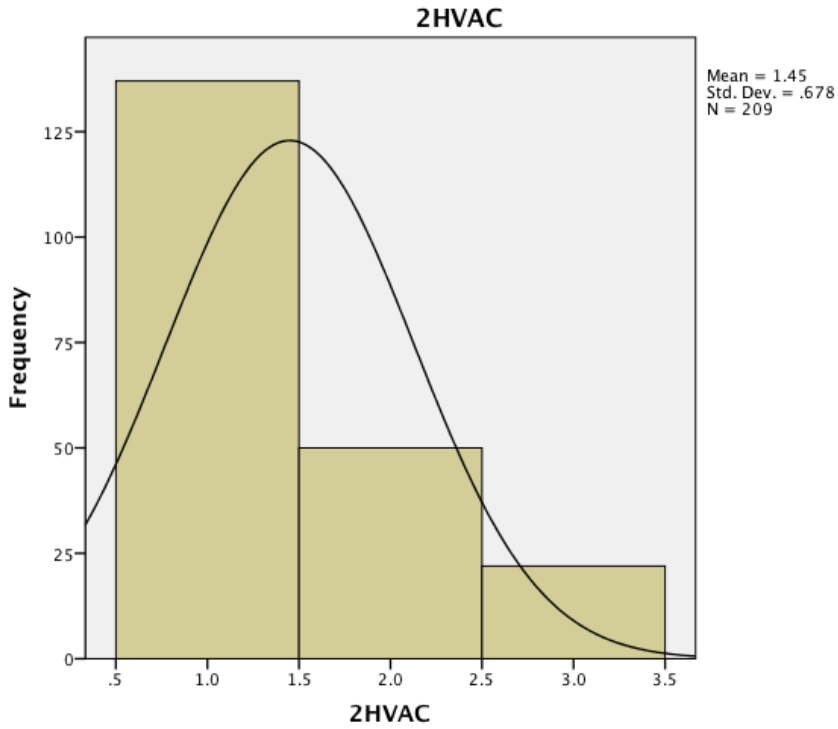
_____

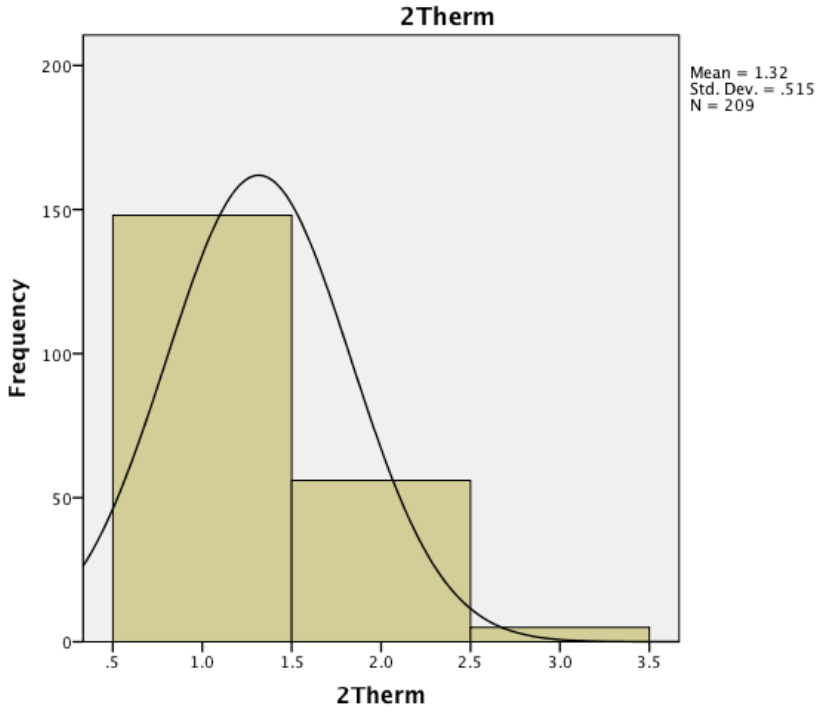
Thank you for your participation!

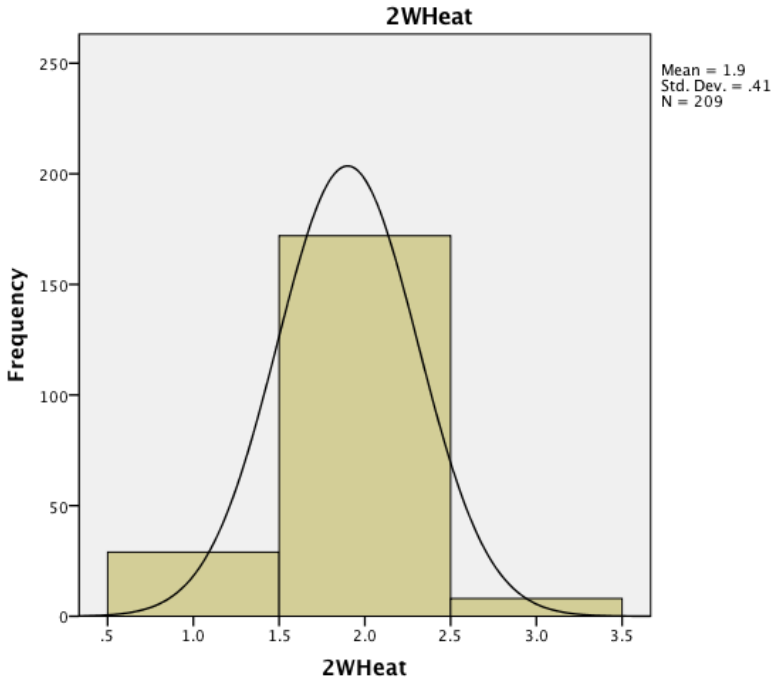
Appendix B

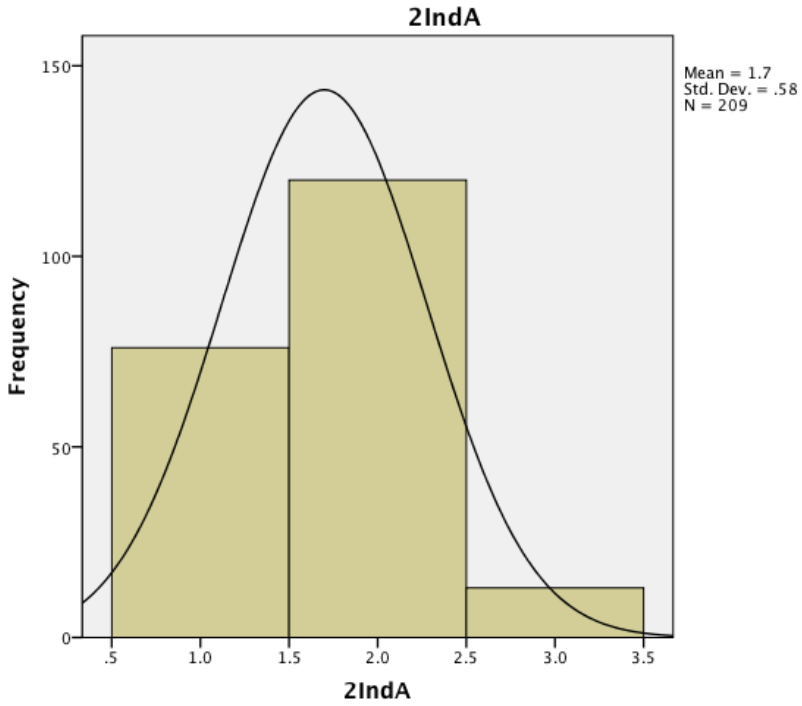
B.1 Histograms - Dependent variables, non-dichotomous

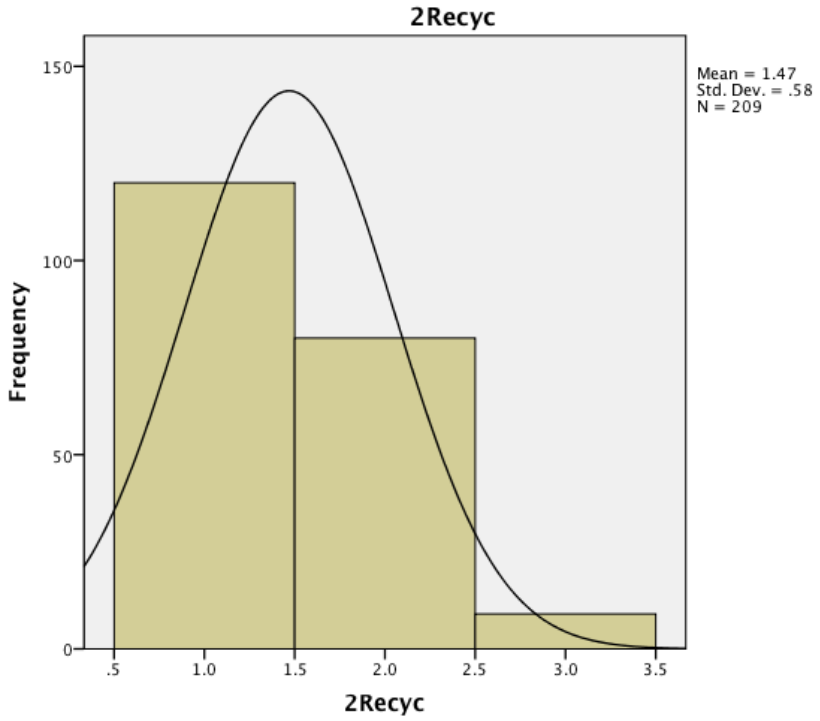





2Therm
Mean = 1.32
Std. Dev. = .515
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Therm


2WHeat
Mean = 1.9
Std. Dev. = .41
N = 209
Frequency
250
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2WHeat


2IndA
Mean = 1.7
Std. Dev. = .58
N = 209
Frequency
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2IndA


2Recyc
Mean = 1.47
Std. Dev. = .58
N = 209
Frequency
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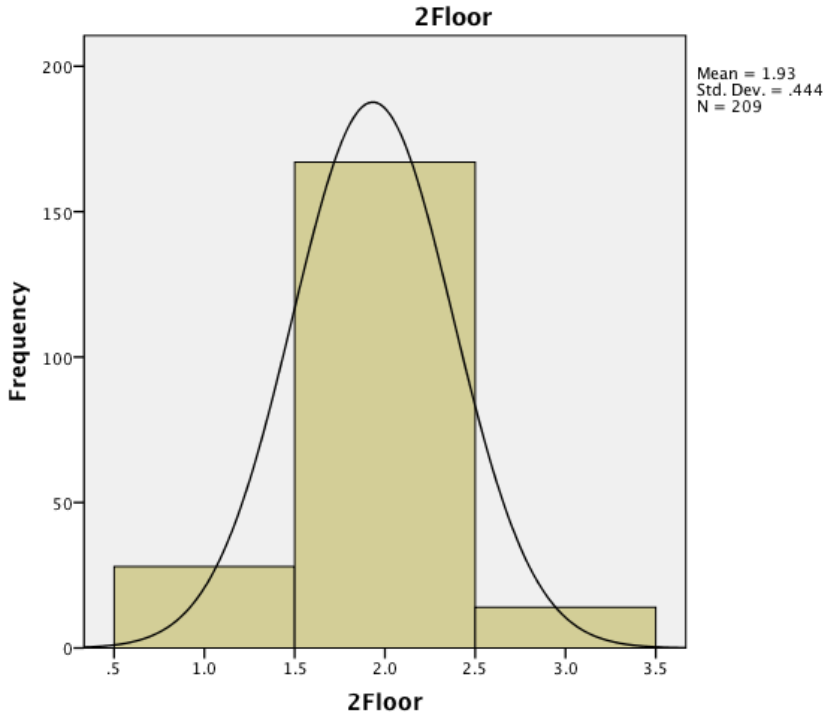
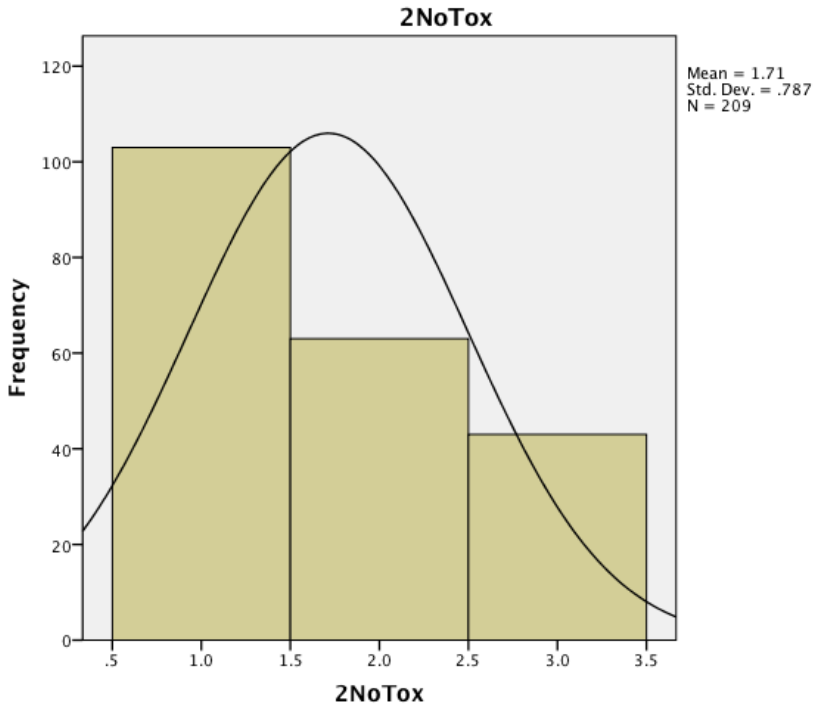
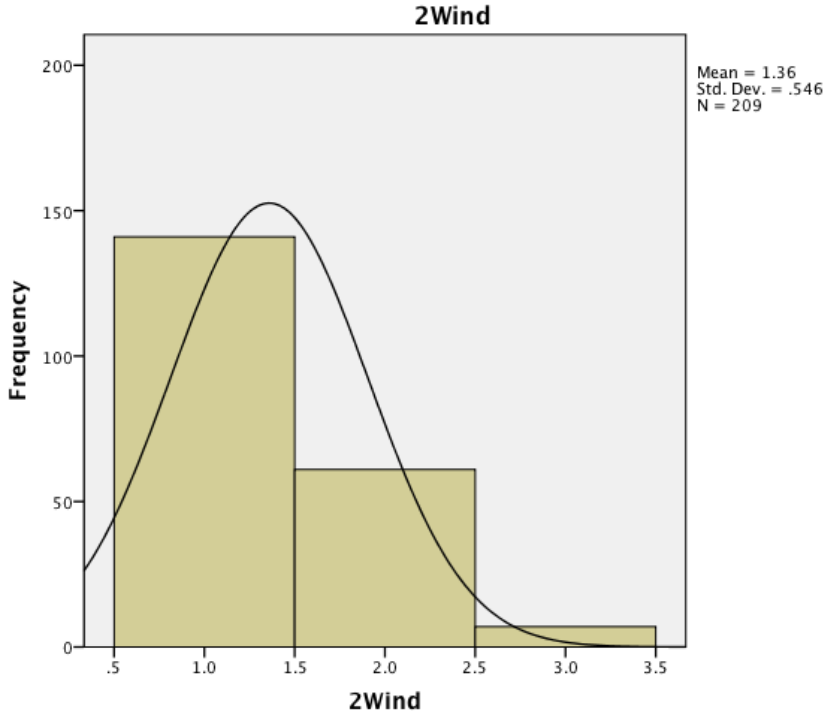
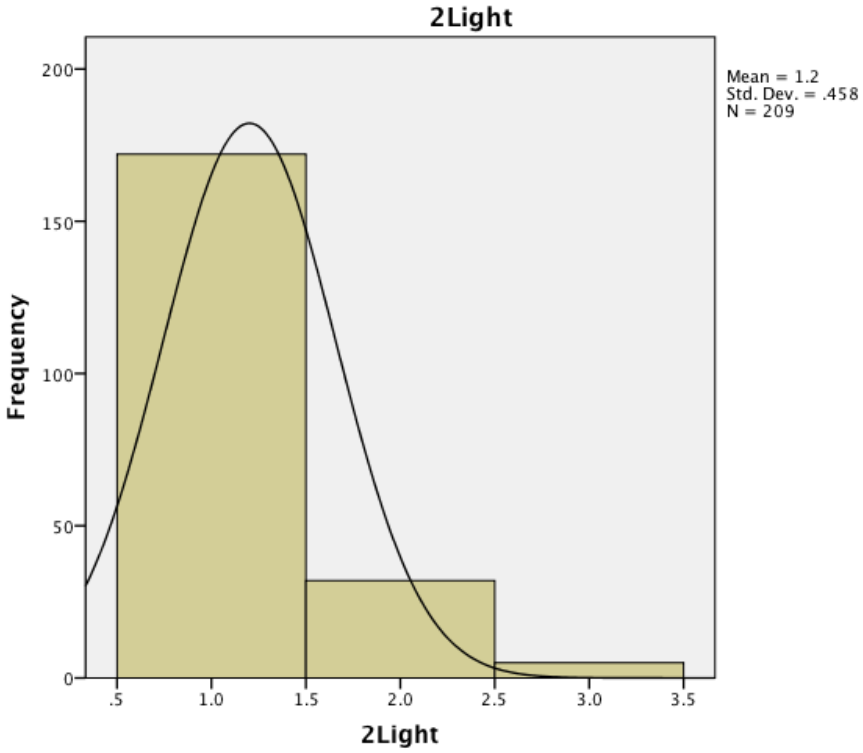
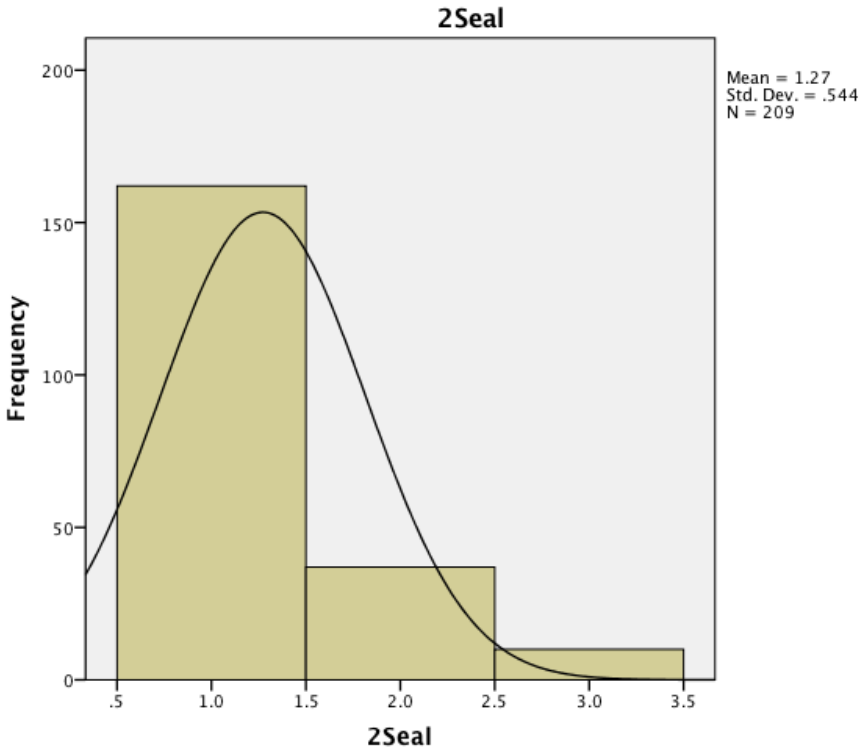
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Recyc

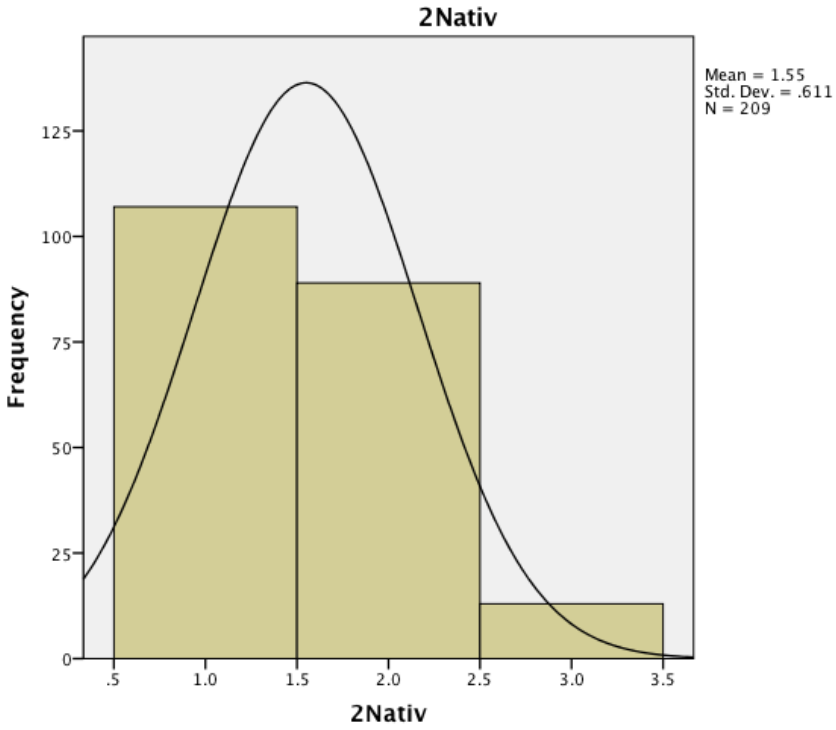

2Floor
Mean = 1.93
Std. Dev. = .444
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Floor

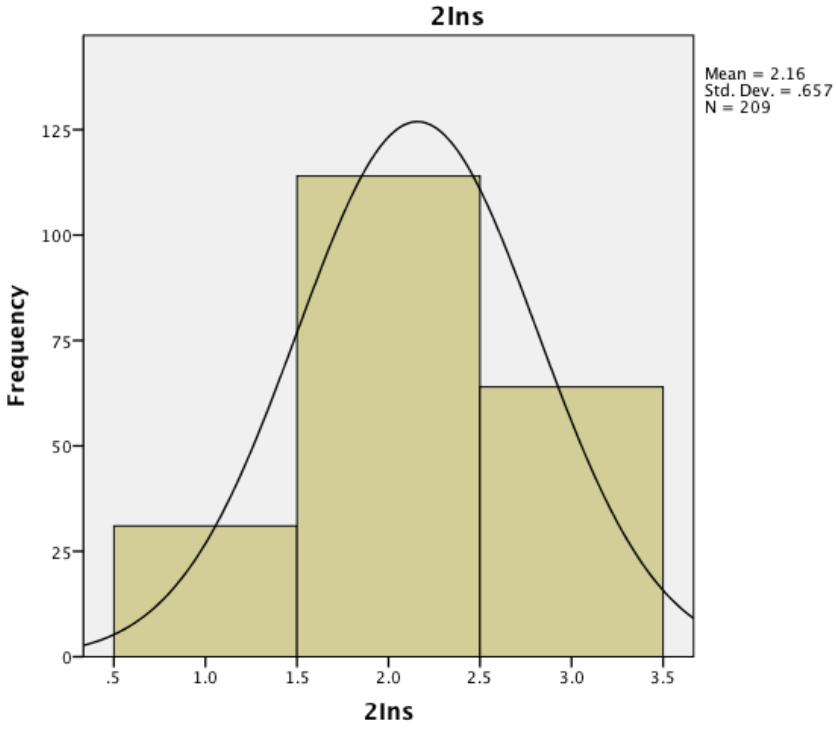

2NoTox
Mean = 1.71
Std. Dev. = .787
N = 209
Frequency
120
100
80
60
40
20
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2NoTox

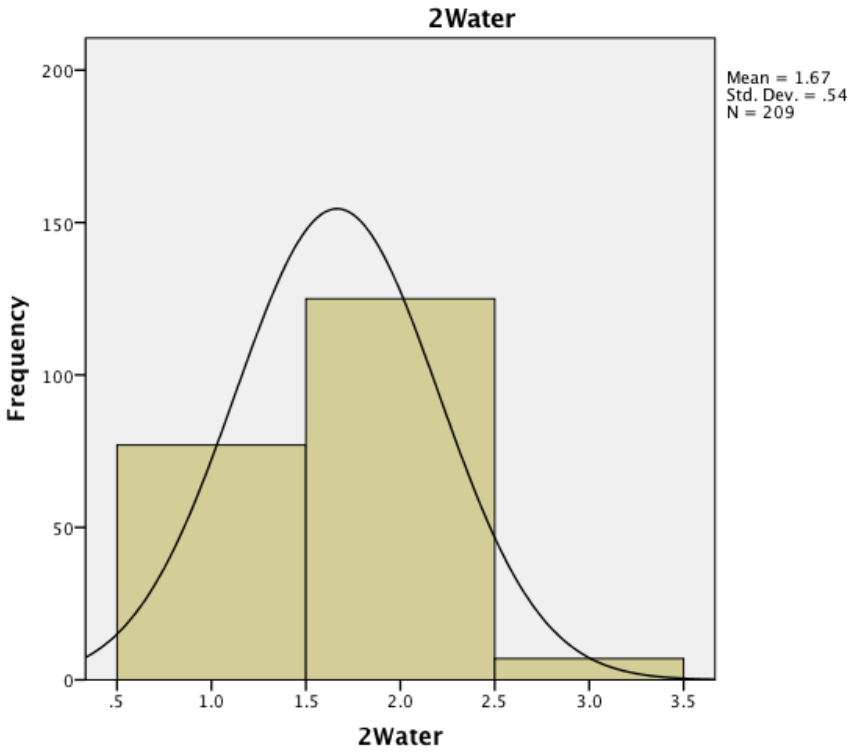

2Wind
Mean = 1.36
Std. Dev. = .546
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Wind


2Light
Mean = 1.2
Std. Dev. = .458
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Light


2Seal
Mean = 1.27
Std. Dev. = .544
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Seal

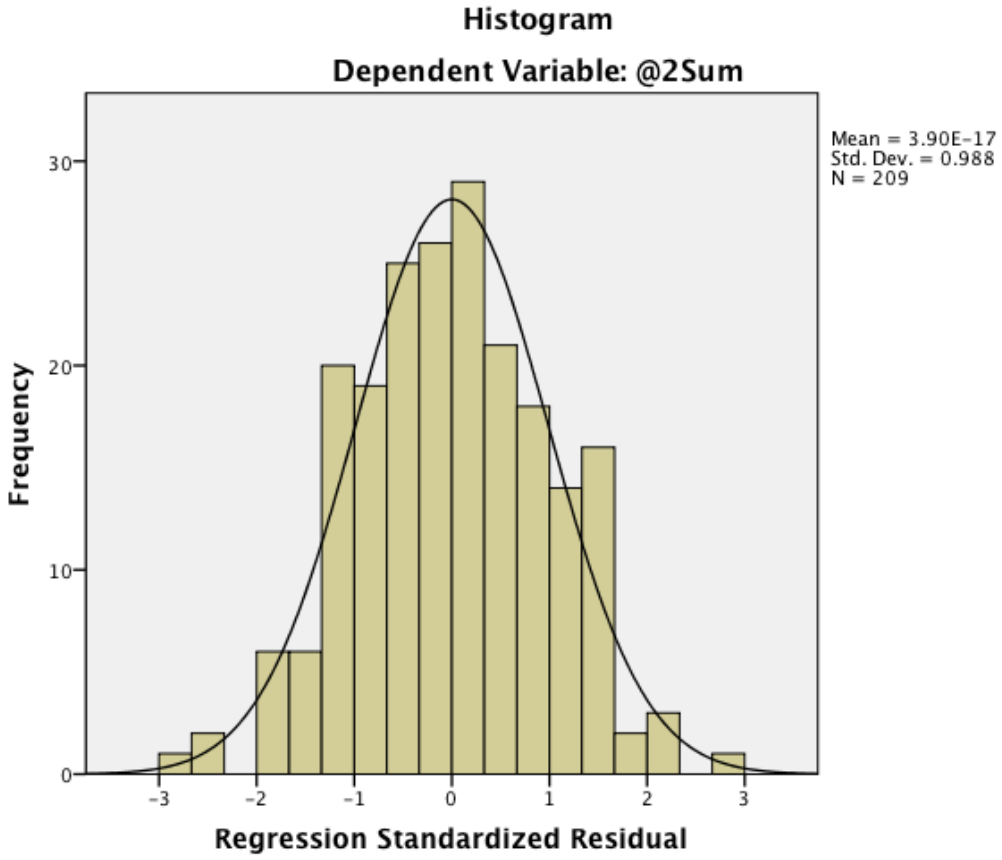

2Nativ
Mean = 1.55
Std. Dev. = .611
N = 209
Frequency
125
100
75
50
25
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Nativ

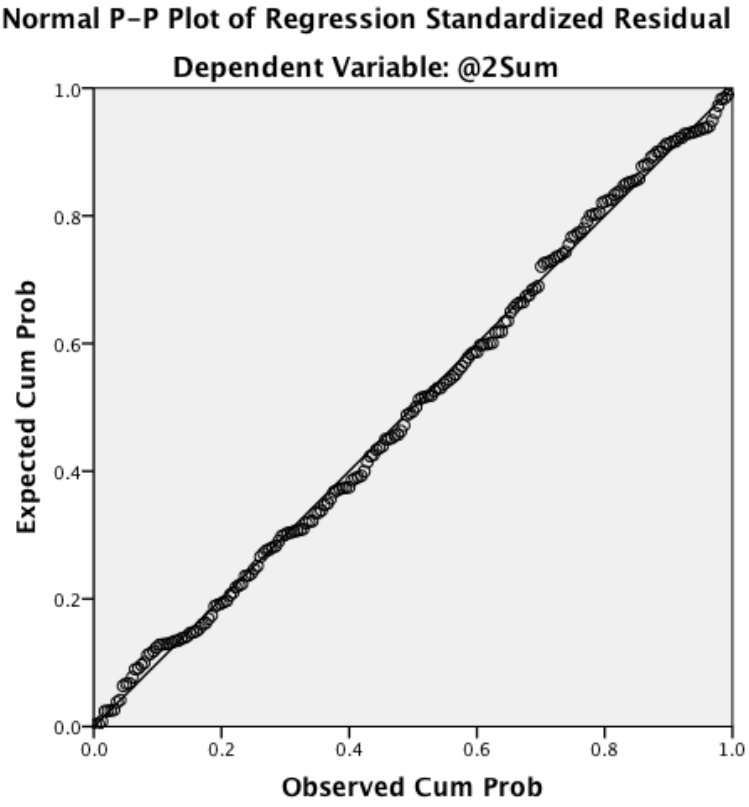

2Ins
Mean = 2.16
Std. Dev. = .657
N = 209
Frequency
125
100
75
50
25
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Ins


2Water
Mean = 1.67
Std. Dev. = .54
N = 209
Frequency
200
150
100
50
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
2Water

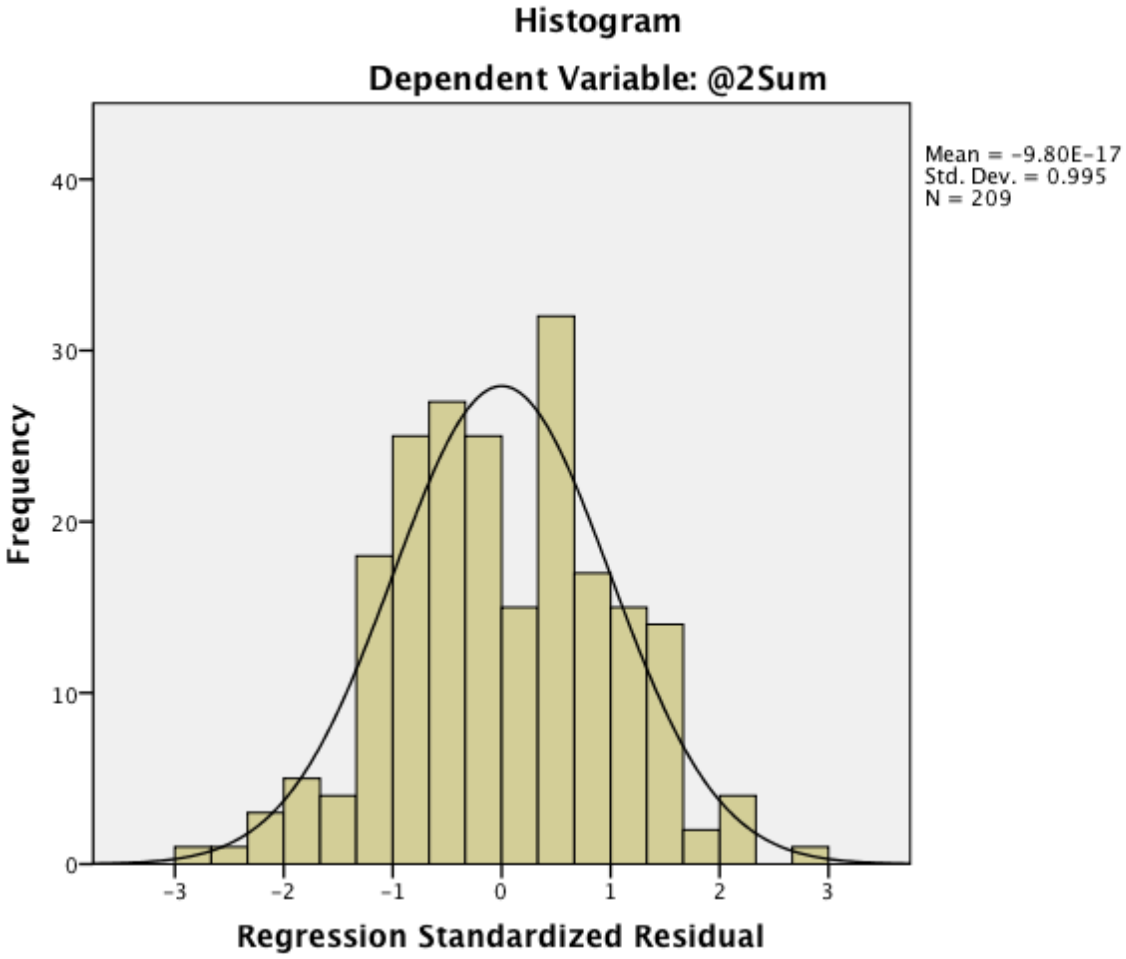
B.2 Regression residuals' histograms, plots, and scatterplots

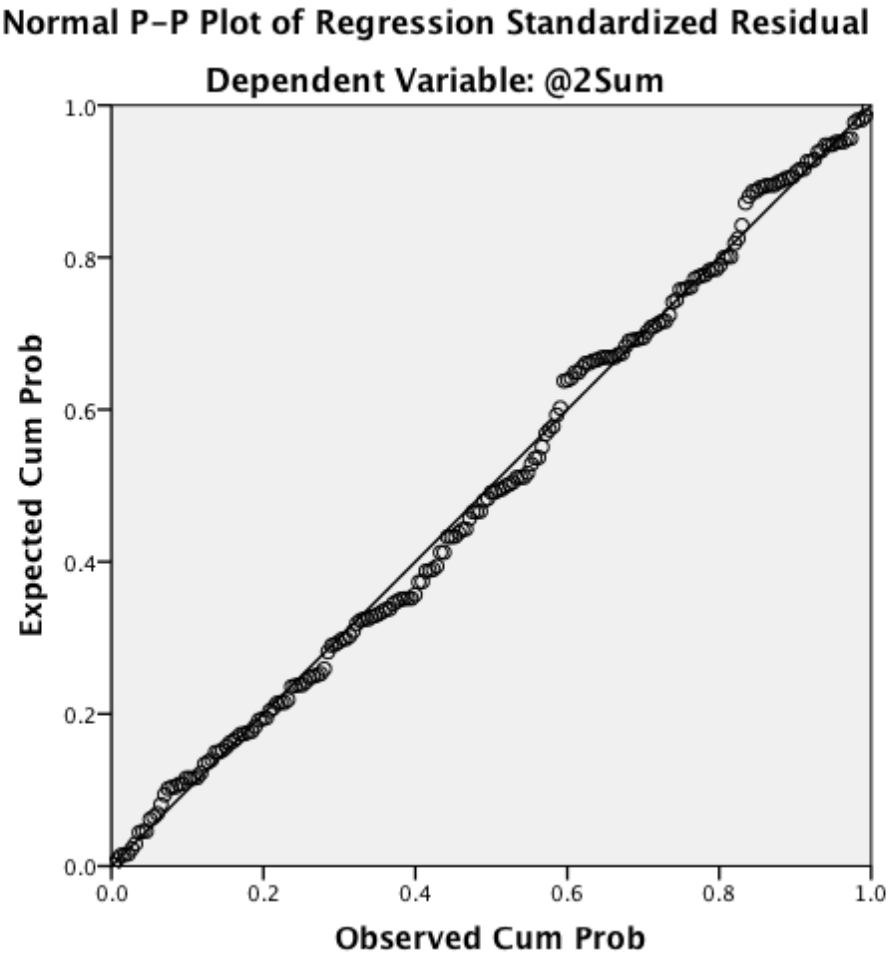
B.2.1 Regression of adoption of green housing features on motivations to adopt GHF's controlling for involvement with home features



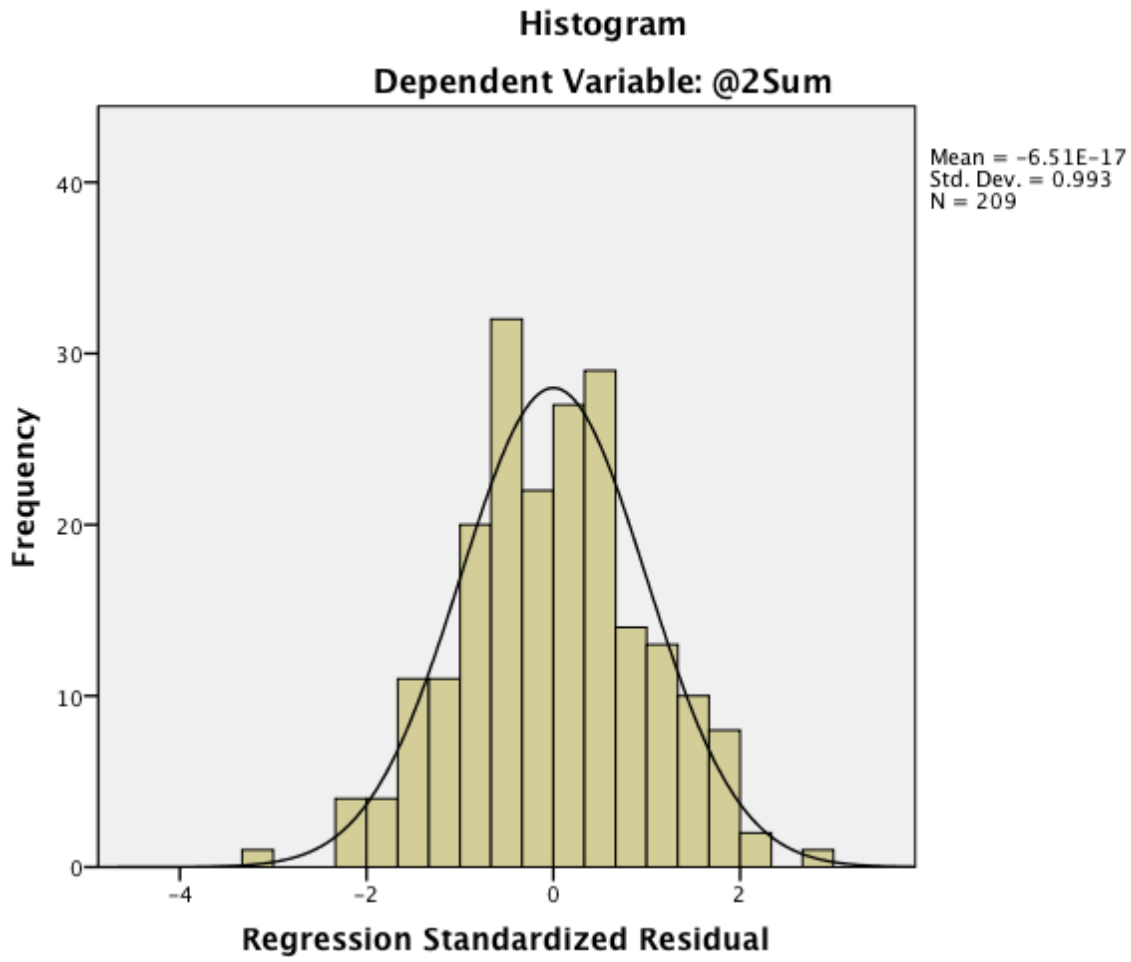

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

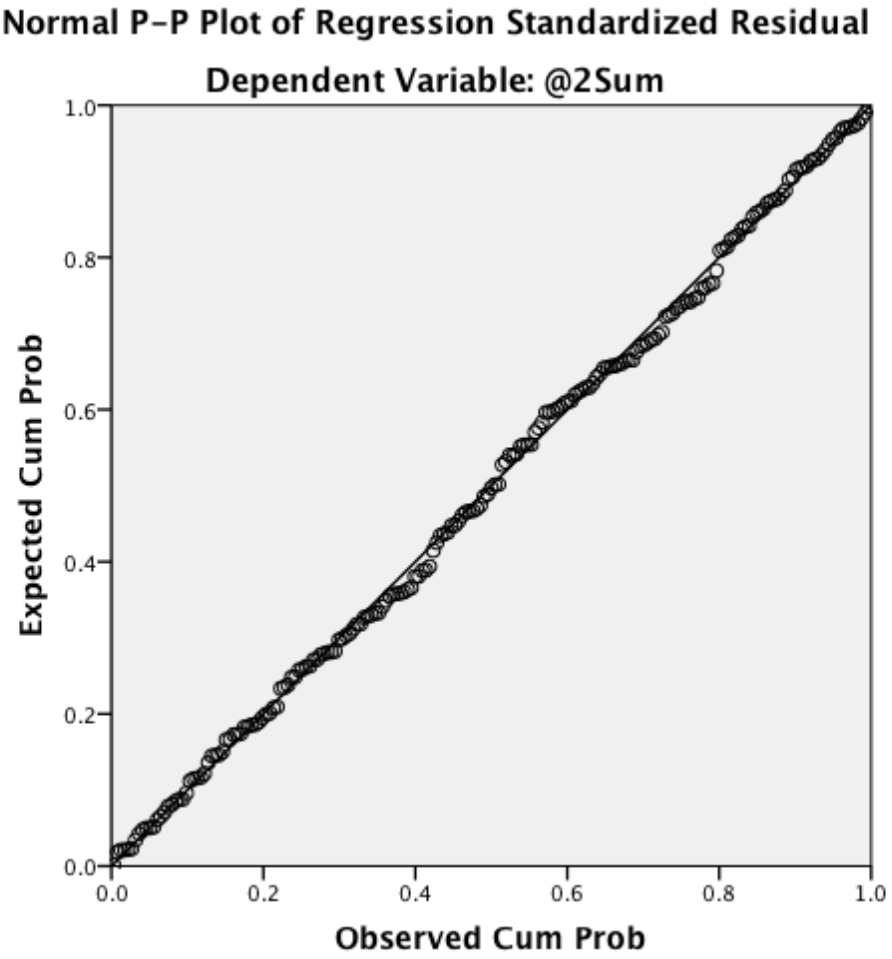
B.2.2 Regression of adoption of green housing features on involvement with home features



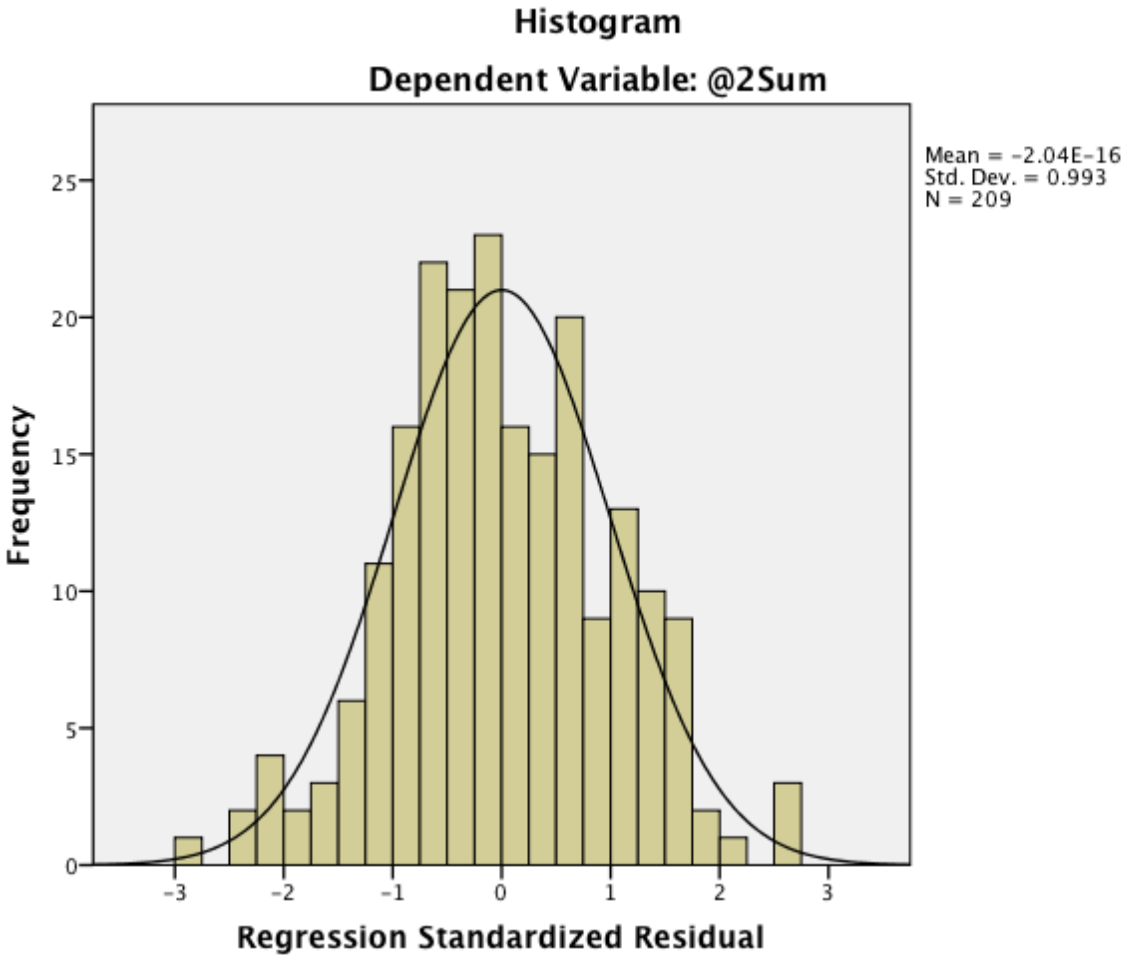

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

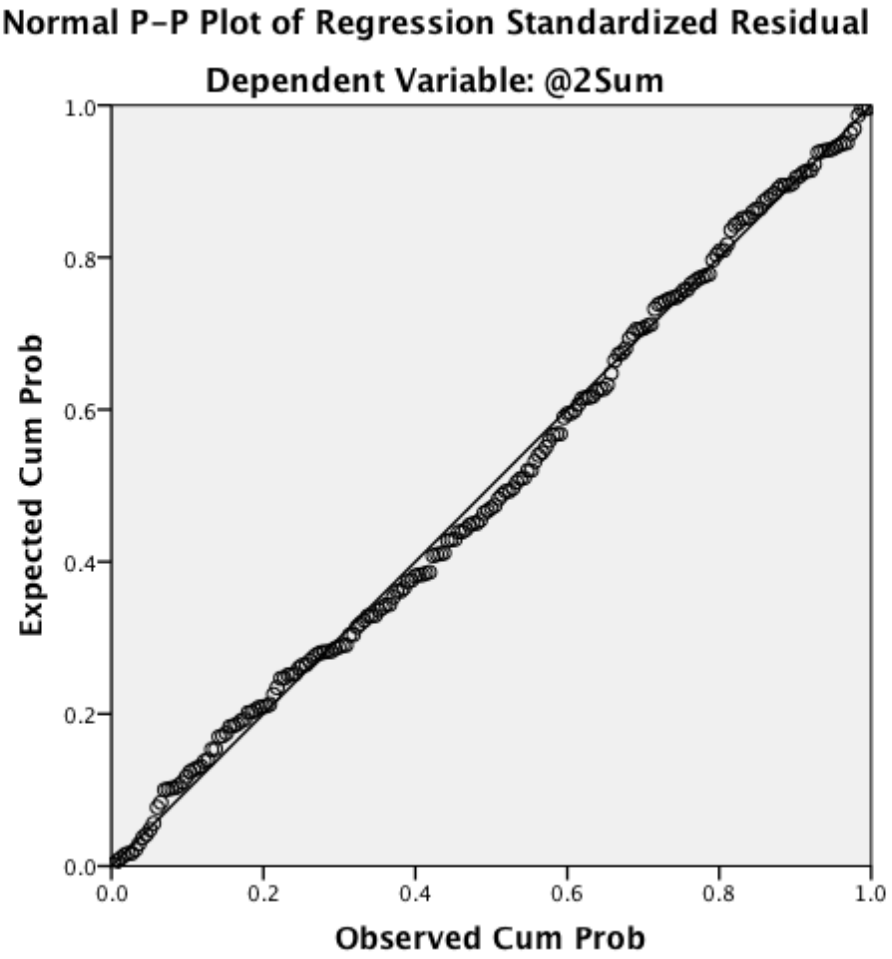
B.2.3 Regression of adoption of green housing features on involvement with home features controlling for income



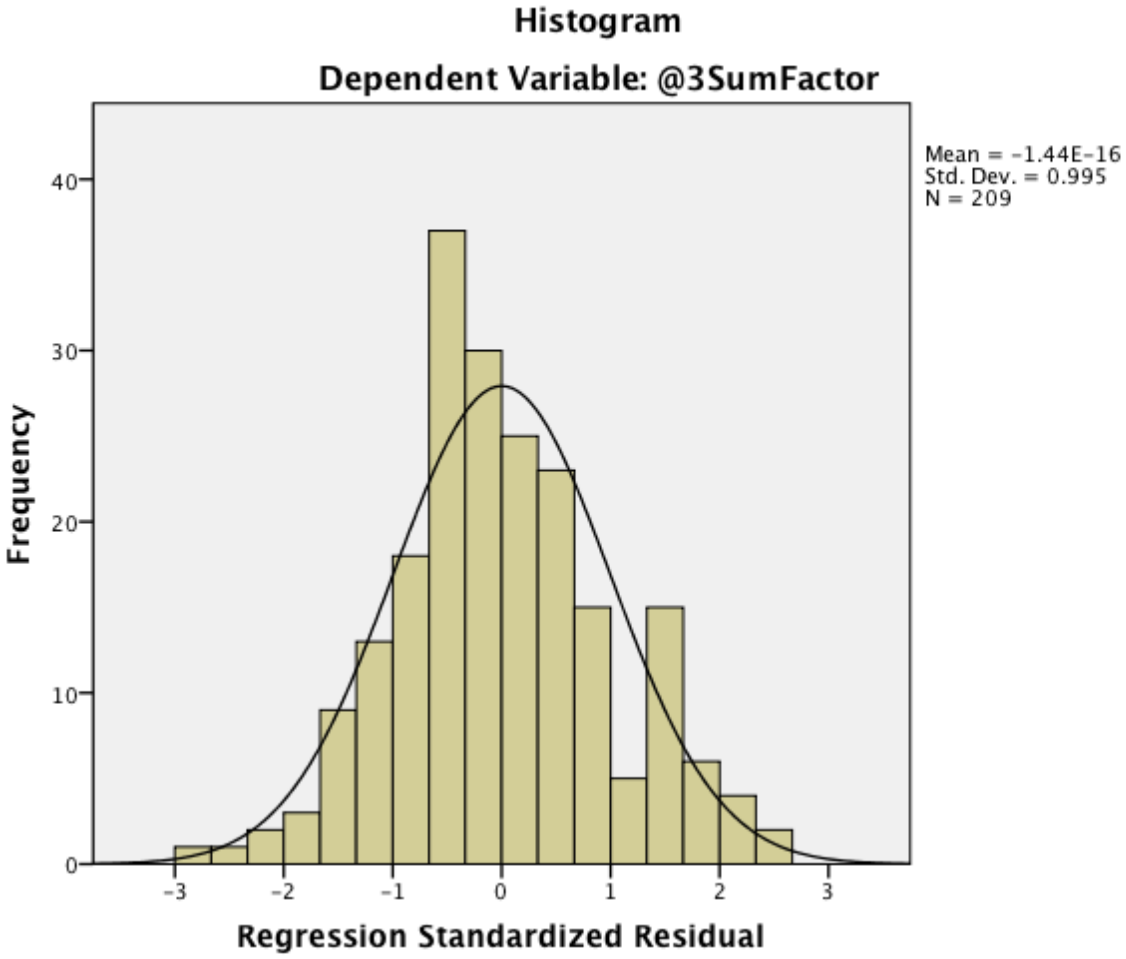

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

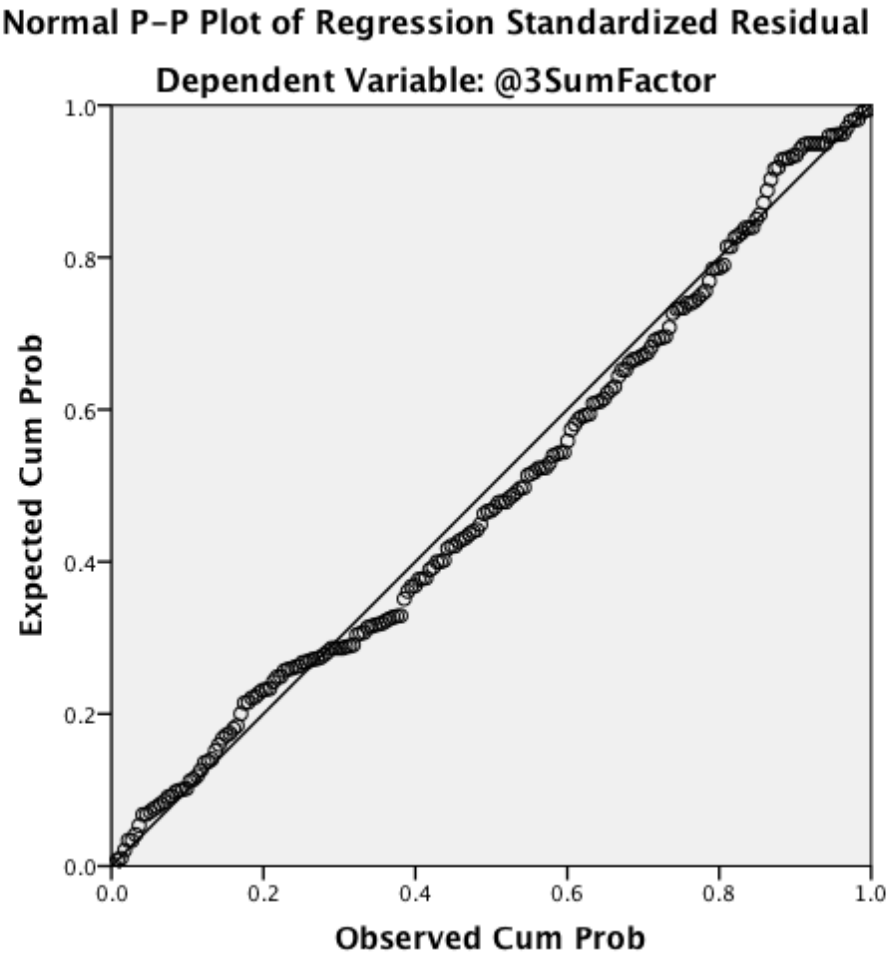
B.2.4 Regression of adoption of green housing features on involvement with home features controlling for importance of groups of features



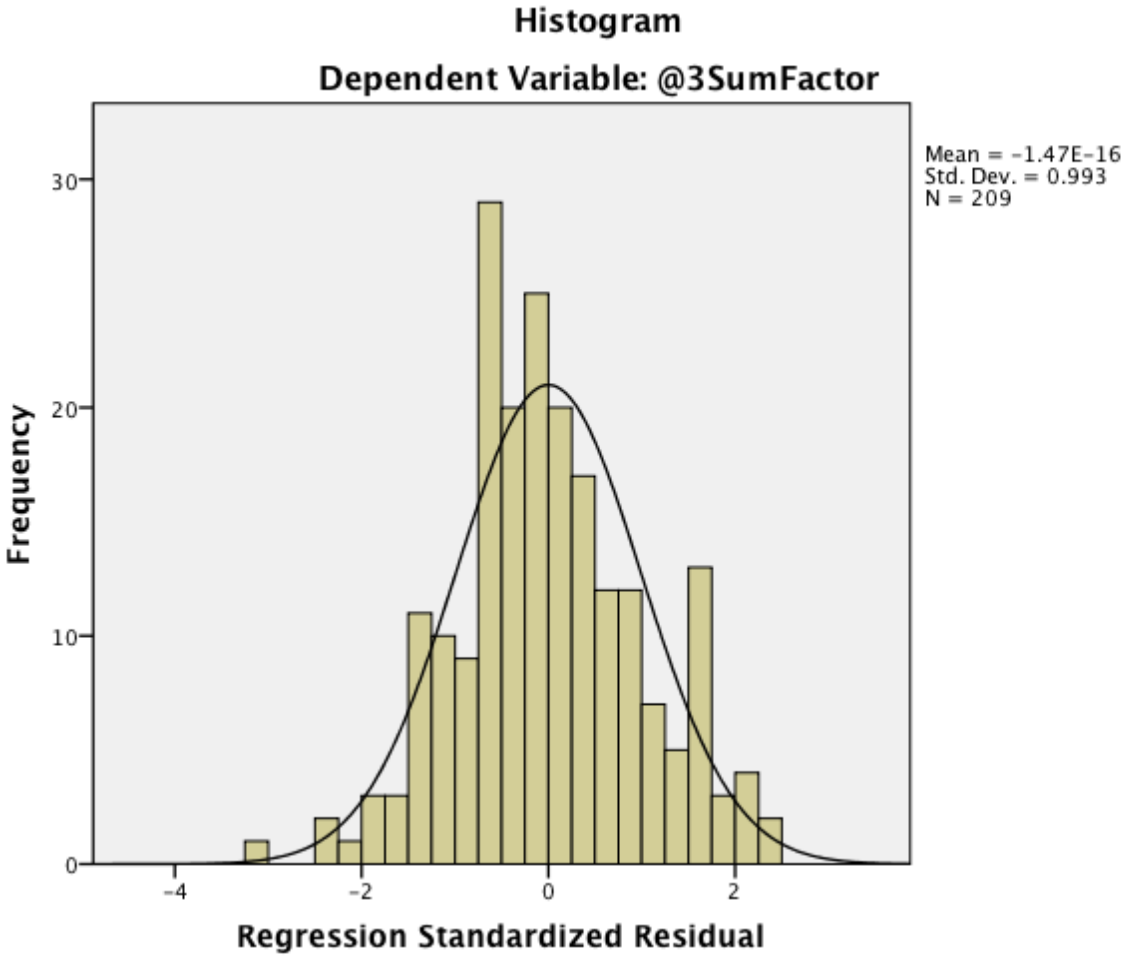

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

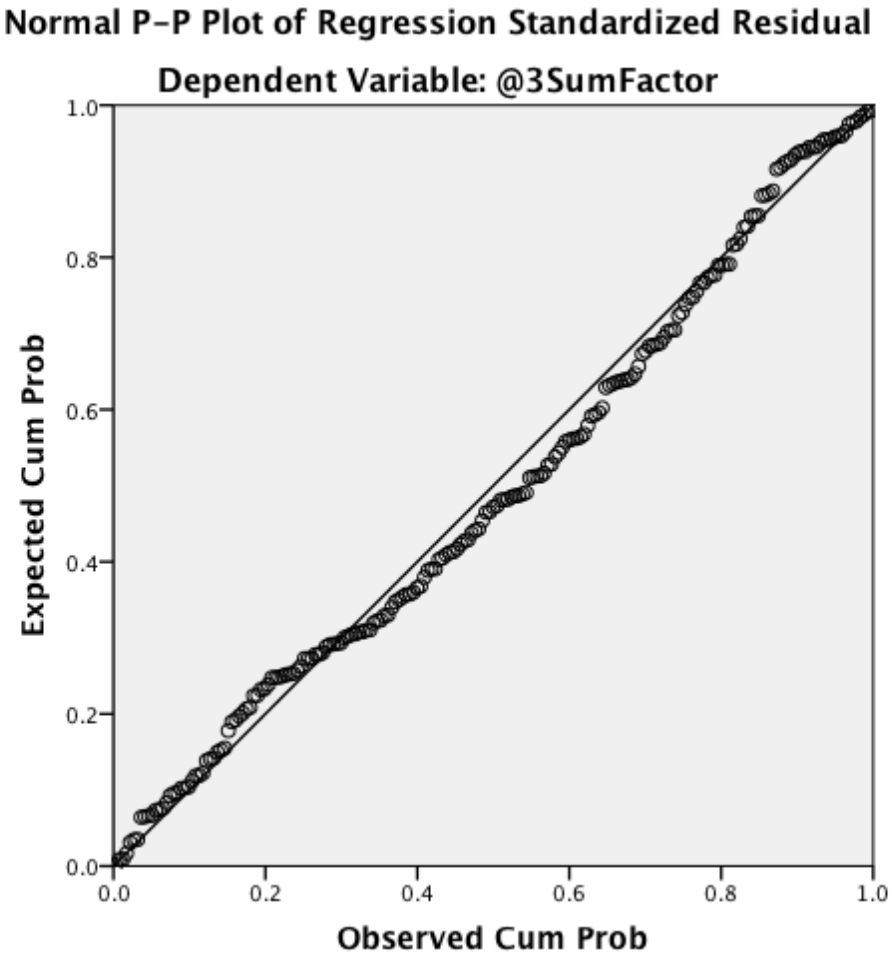
B.2.5 Regression of overall importance of green housing features on involvement with home features



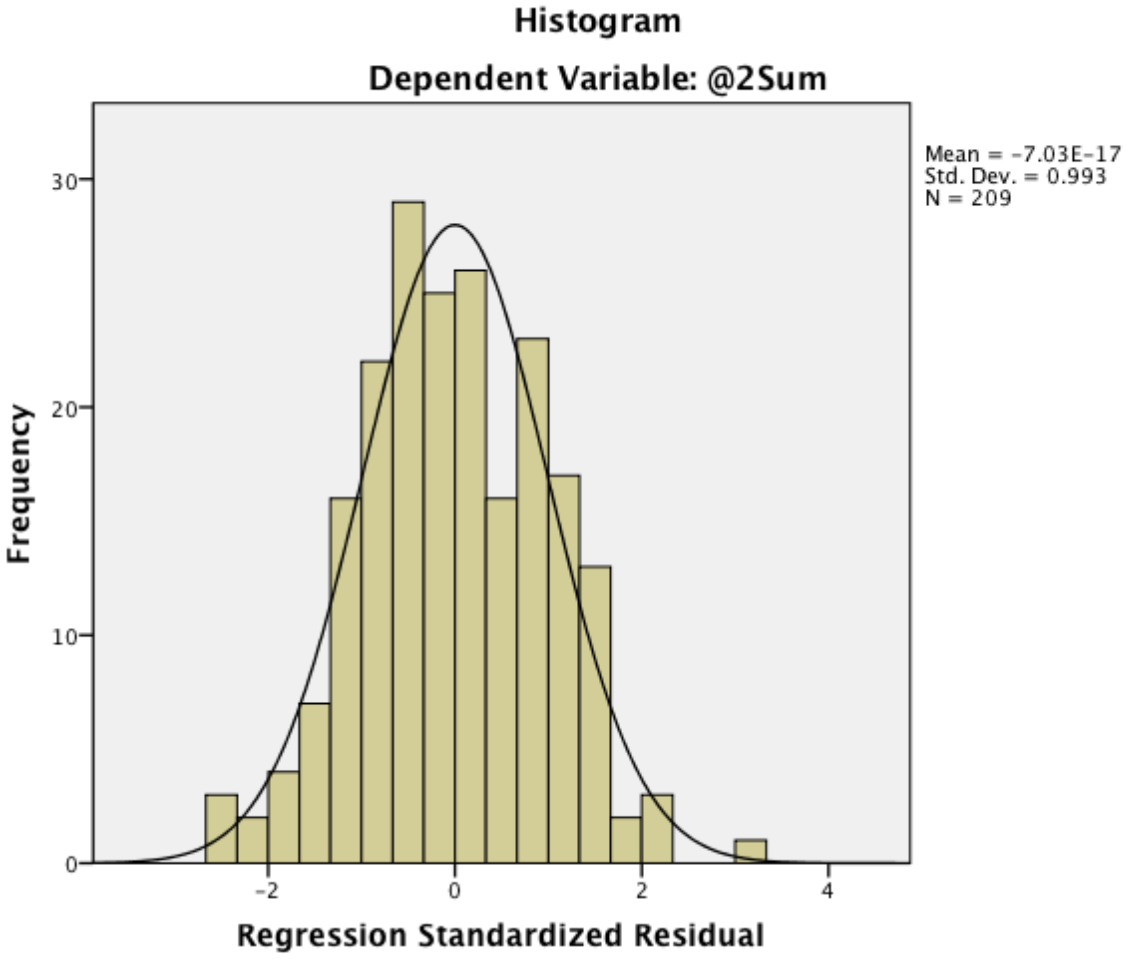

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @3SumFactor
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

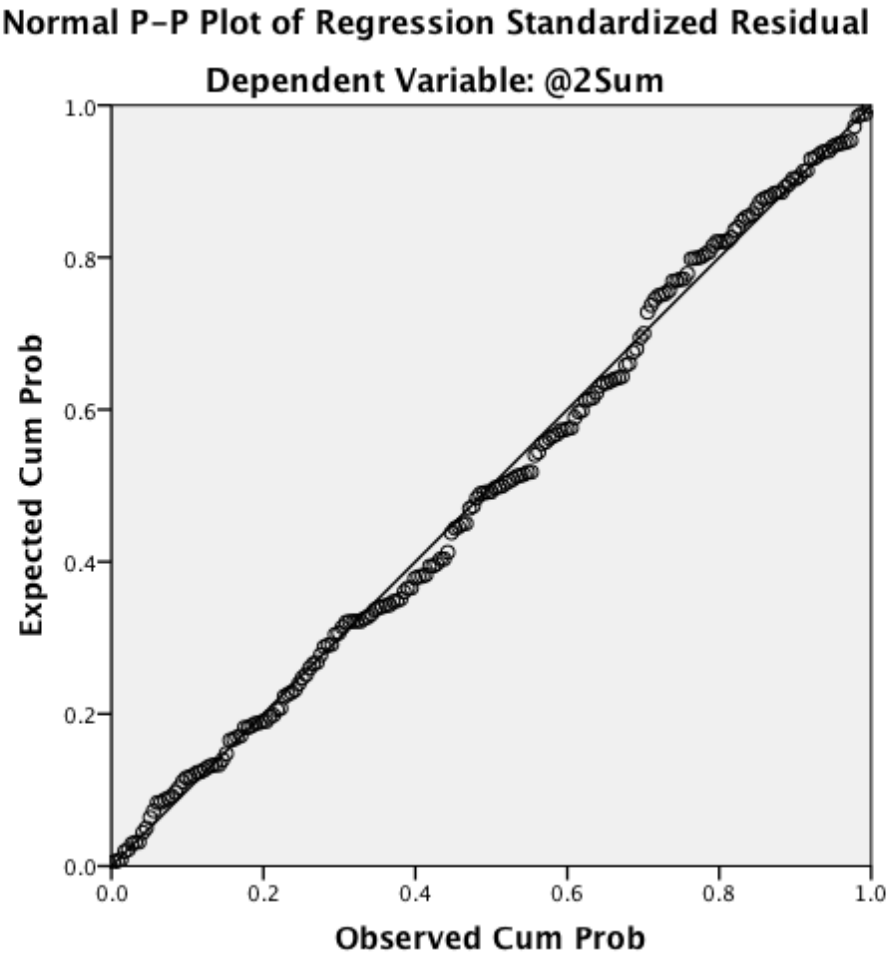
B.2.6 Regression of overall importance of green housing features on involvement with home features, controlling for income



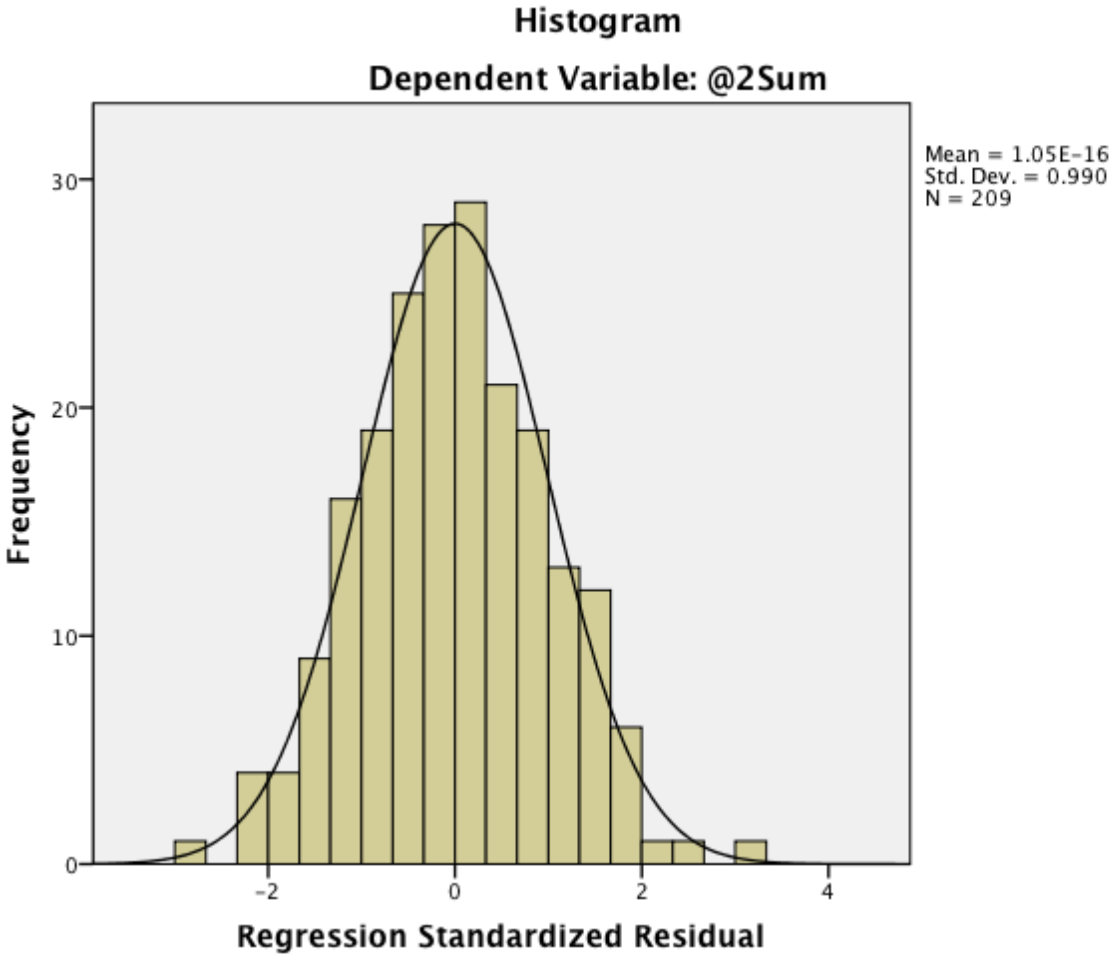

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @3SumFactor
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

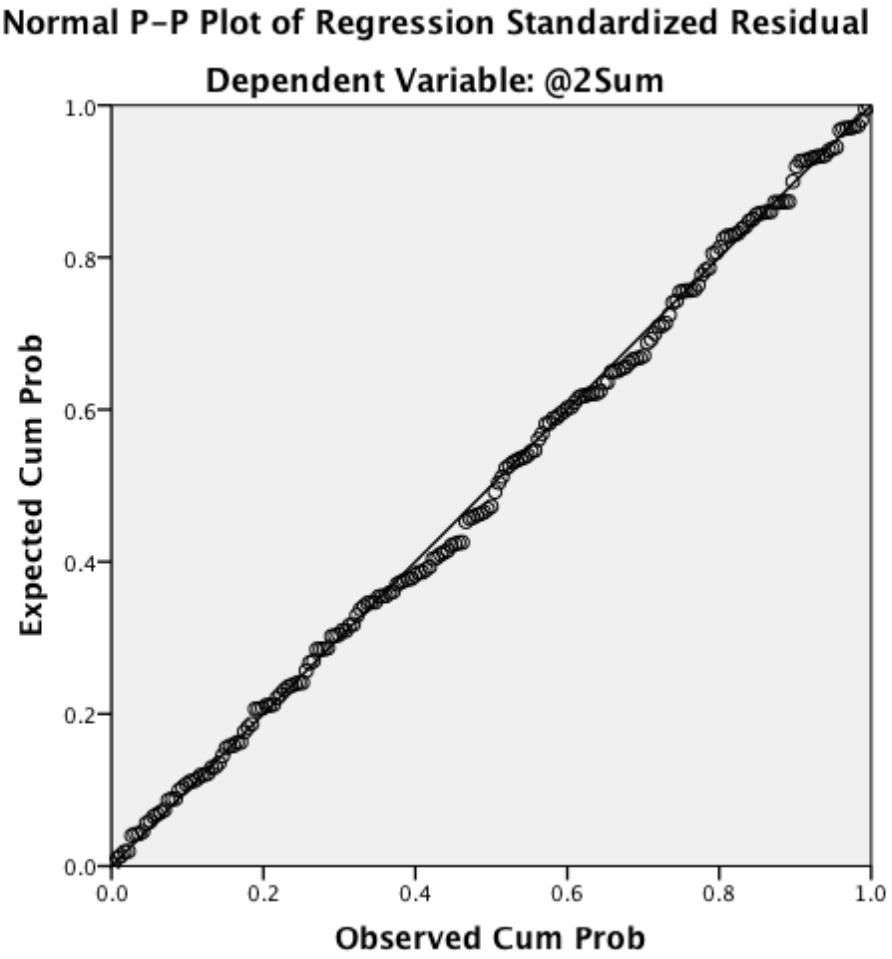
B.2.7 Regression of adoption of GHF's on motivations to adopt GHF's



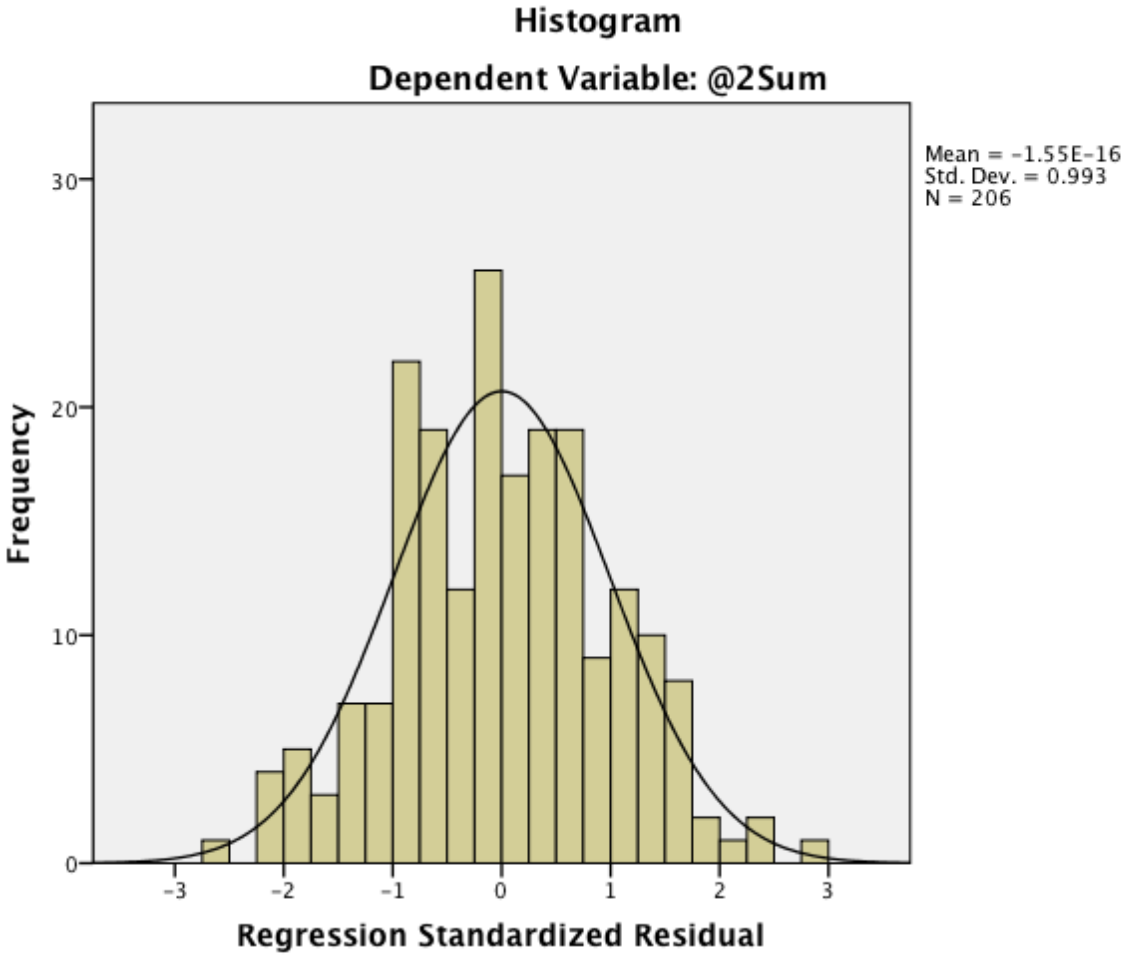

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

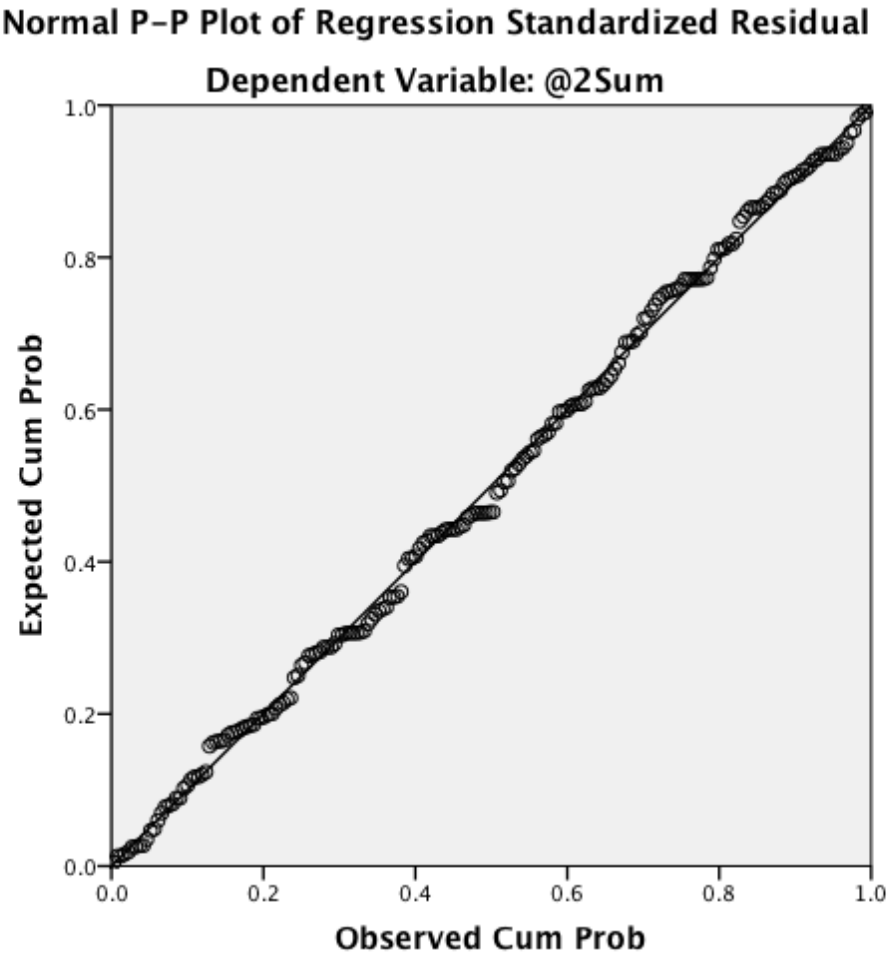
B.2.8 Regression of adoption of GHF's on motivations to adopt GHF's, controlling for income



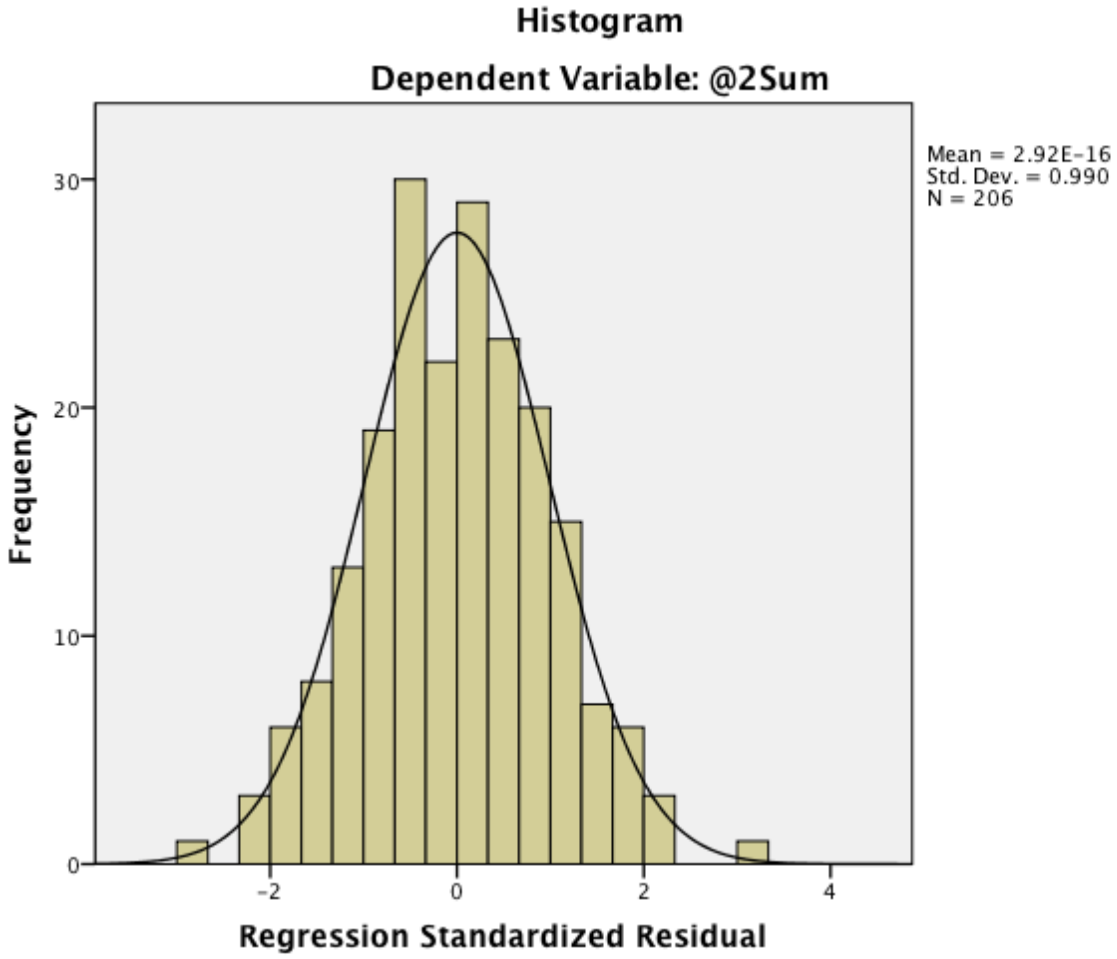

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

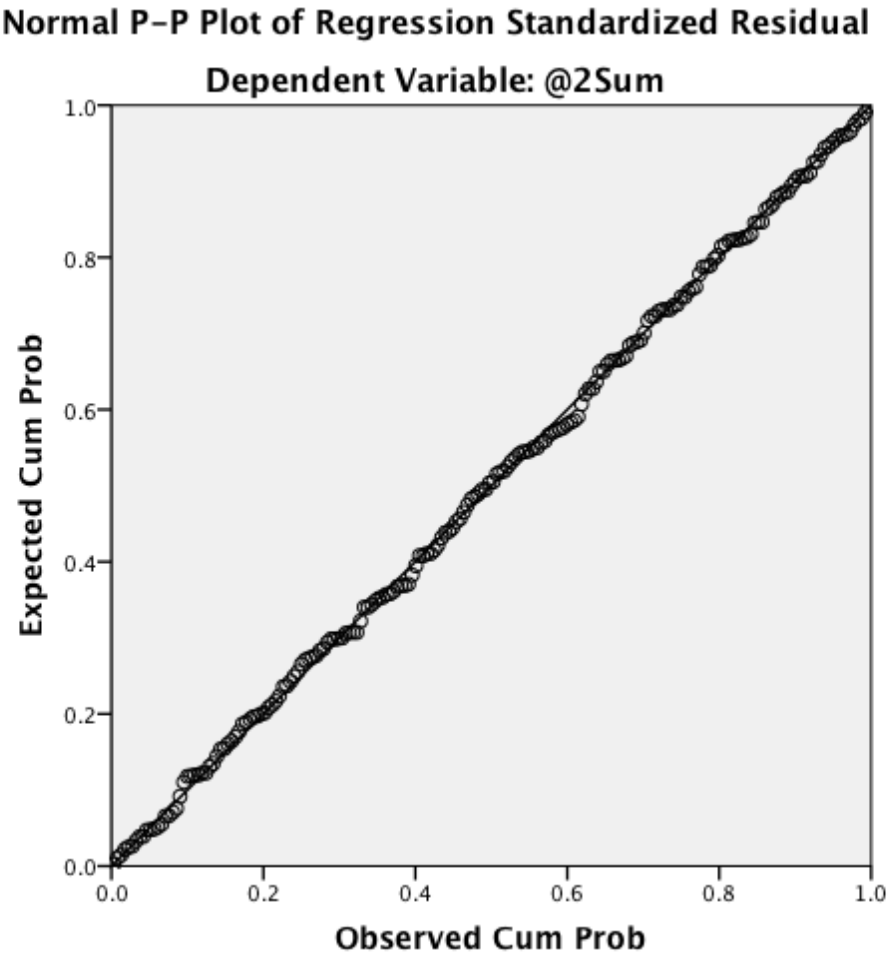
B.2.9 Regression of adoption of GHF's on environmental concern orientations



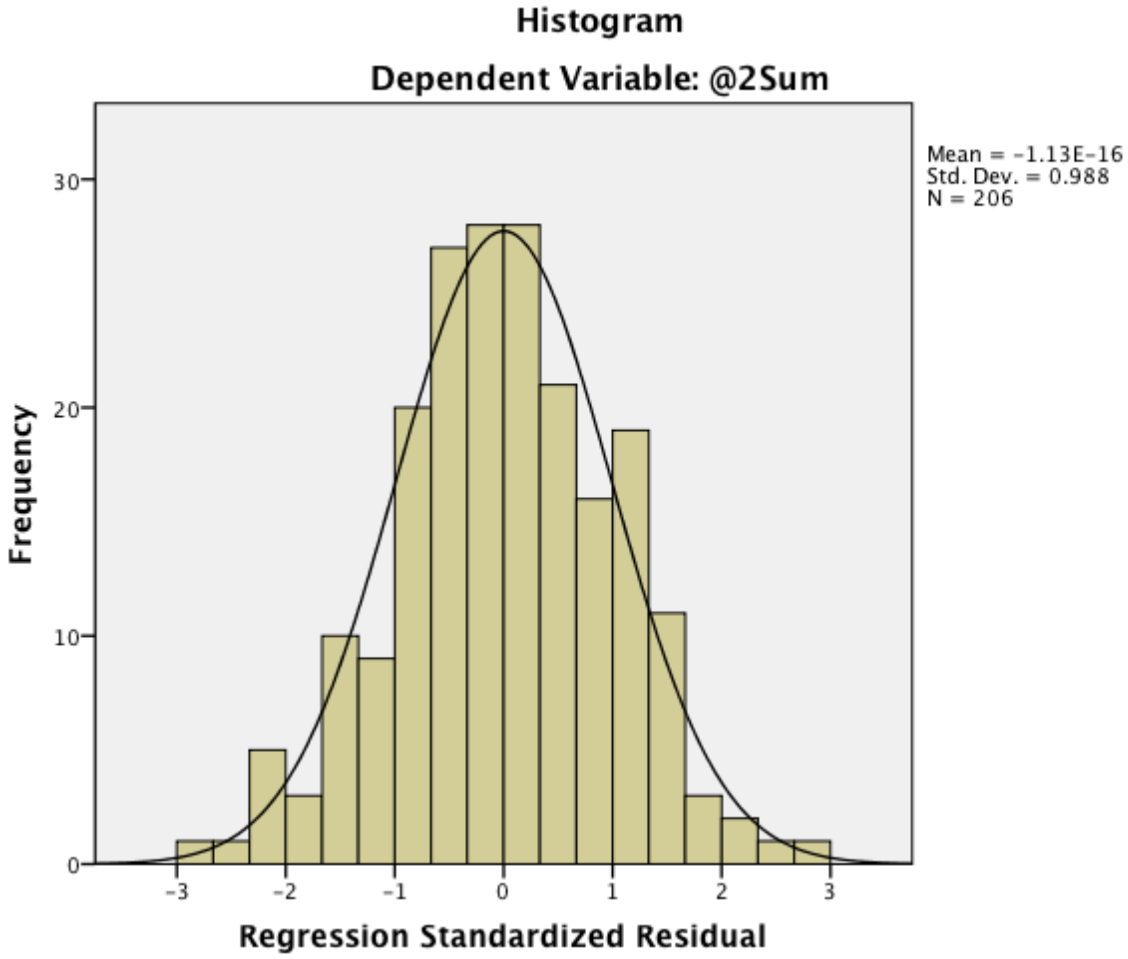

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

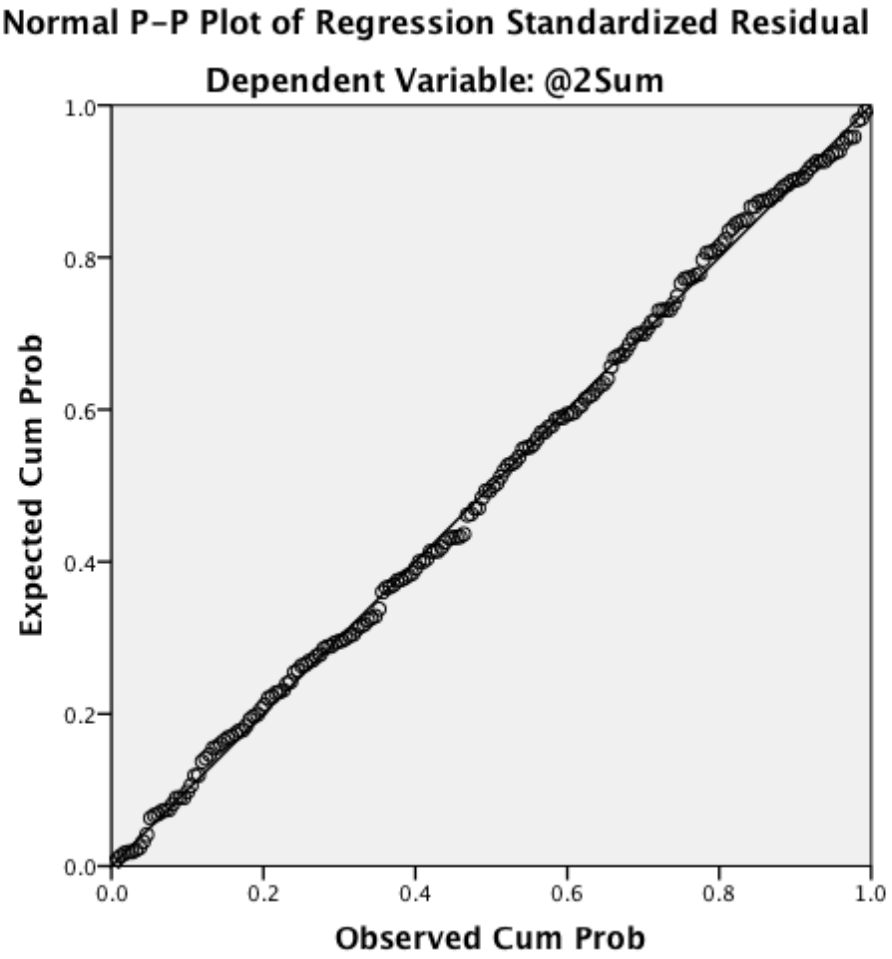
B.2.10 Regression of adoption of GHF's on environmental concern orientations controlling for income



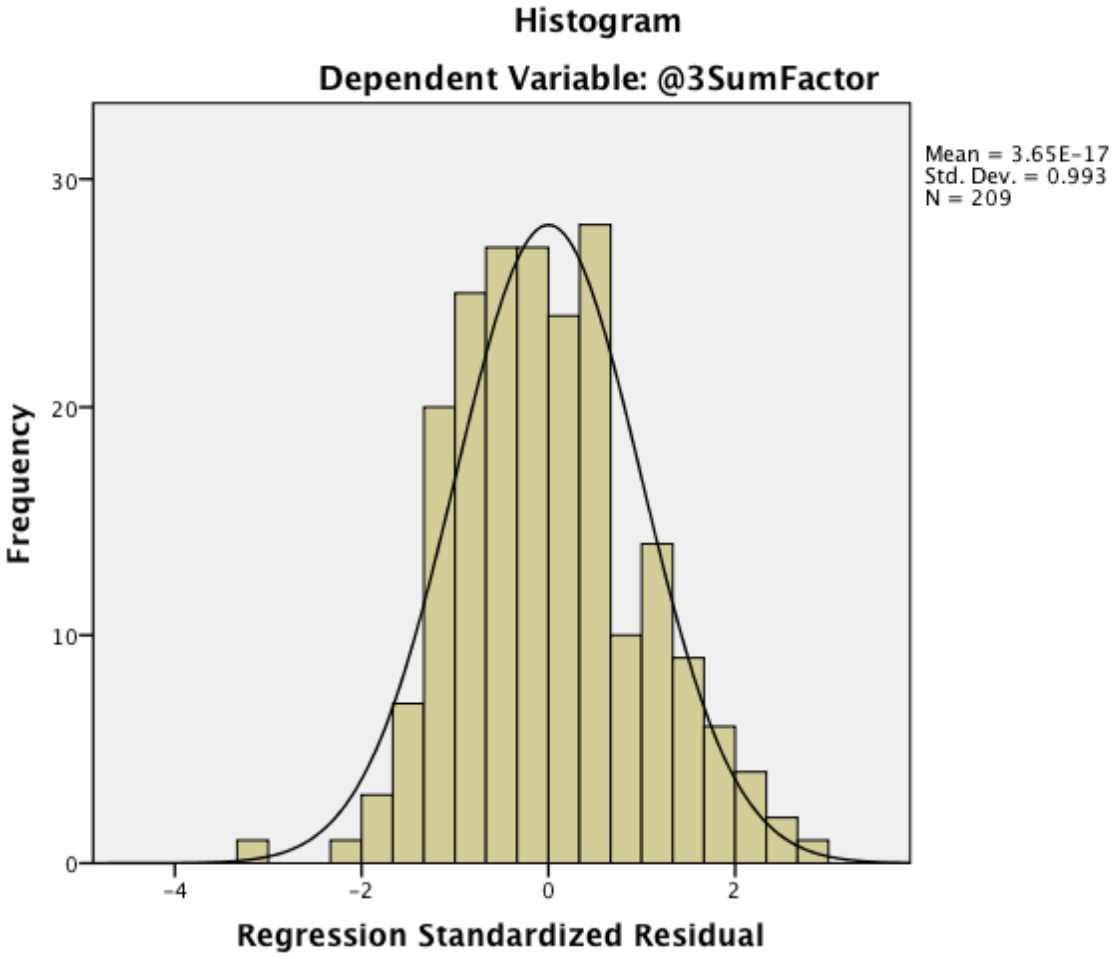

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

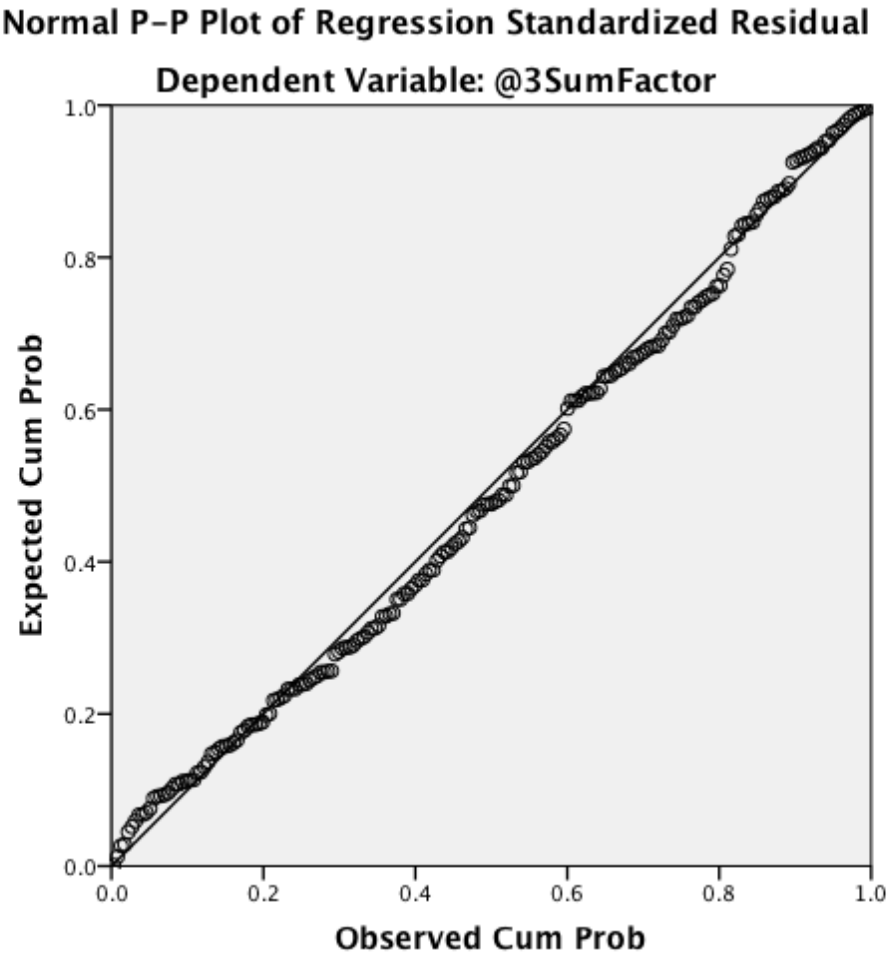
B.2.11 Regression of adoption of GHF's on environmental concern orientations controlling for involvement with home features



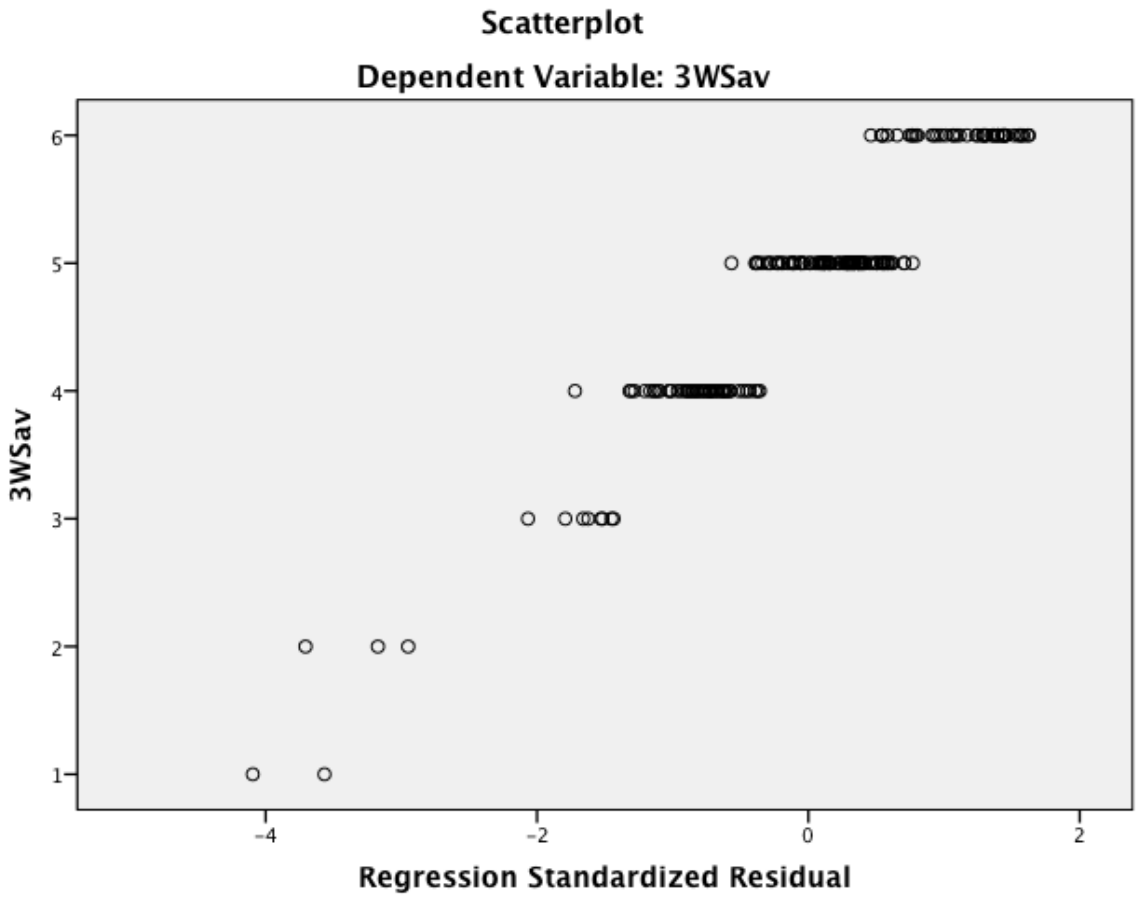

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @2Sum
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

B.2.12 Regression of overall importance of GHF's on motivations to adopt GHF's

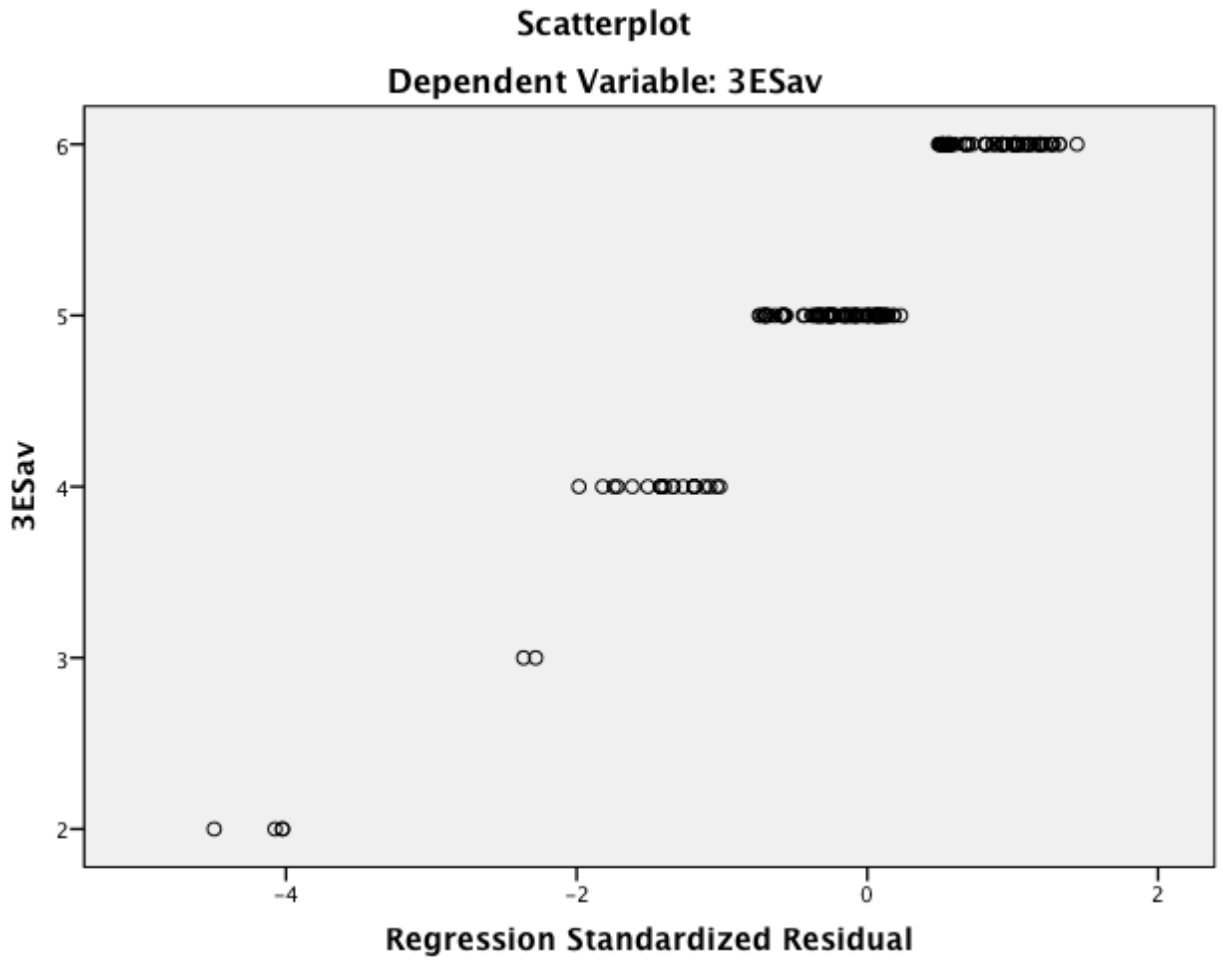



Normal P-P Plot of Regression Standardized Residual
Dependent Variable: @3SumFactor
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0

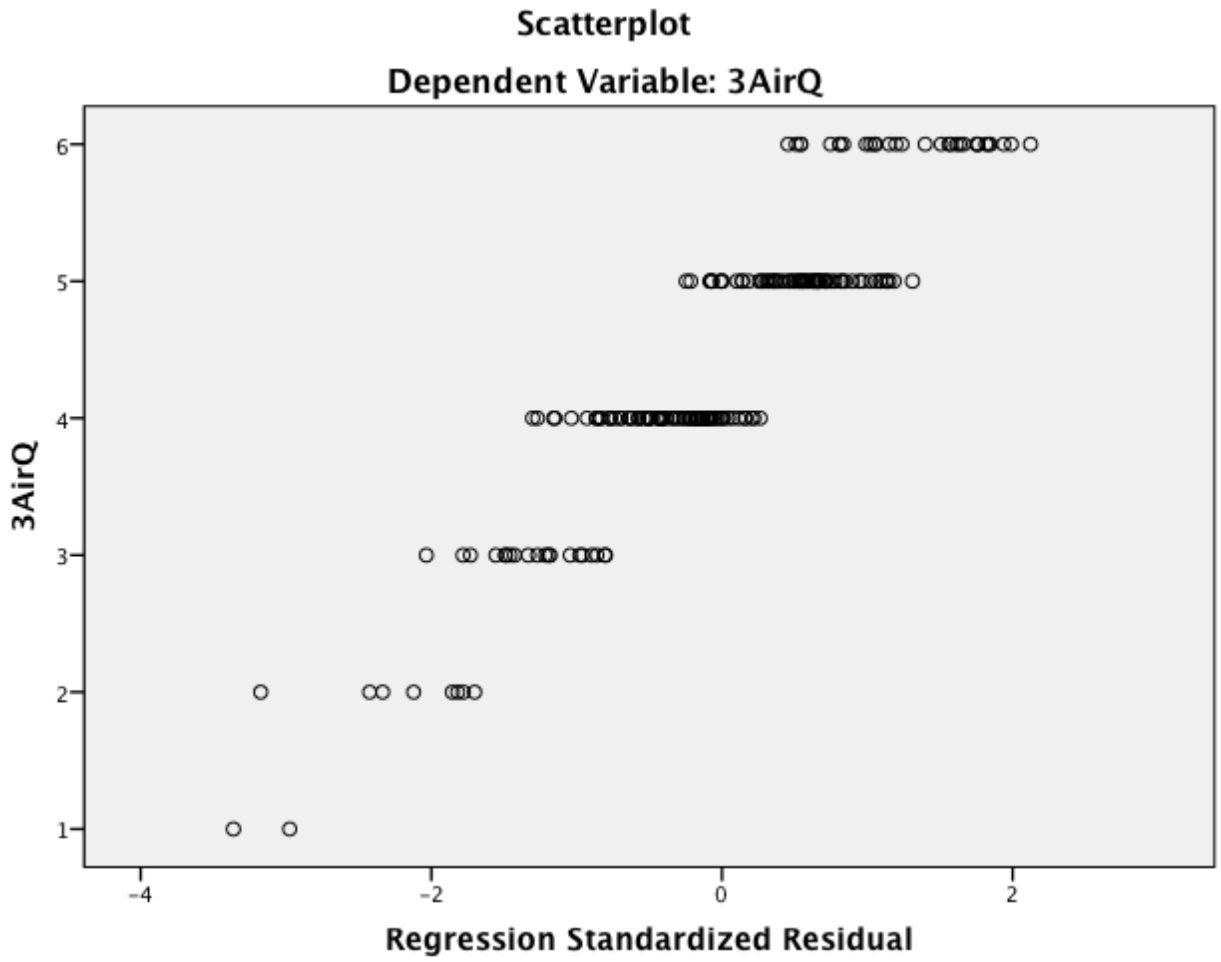
B.2.13 Regression of importance of water saving features on motivations to adopt GHF's



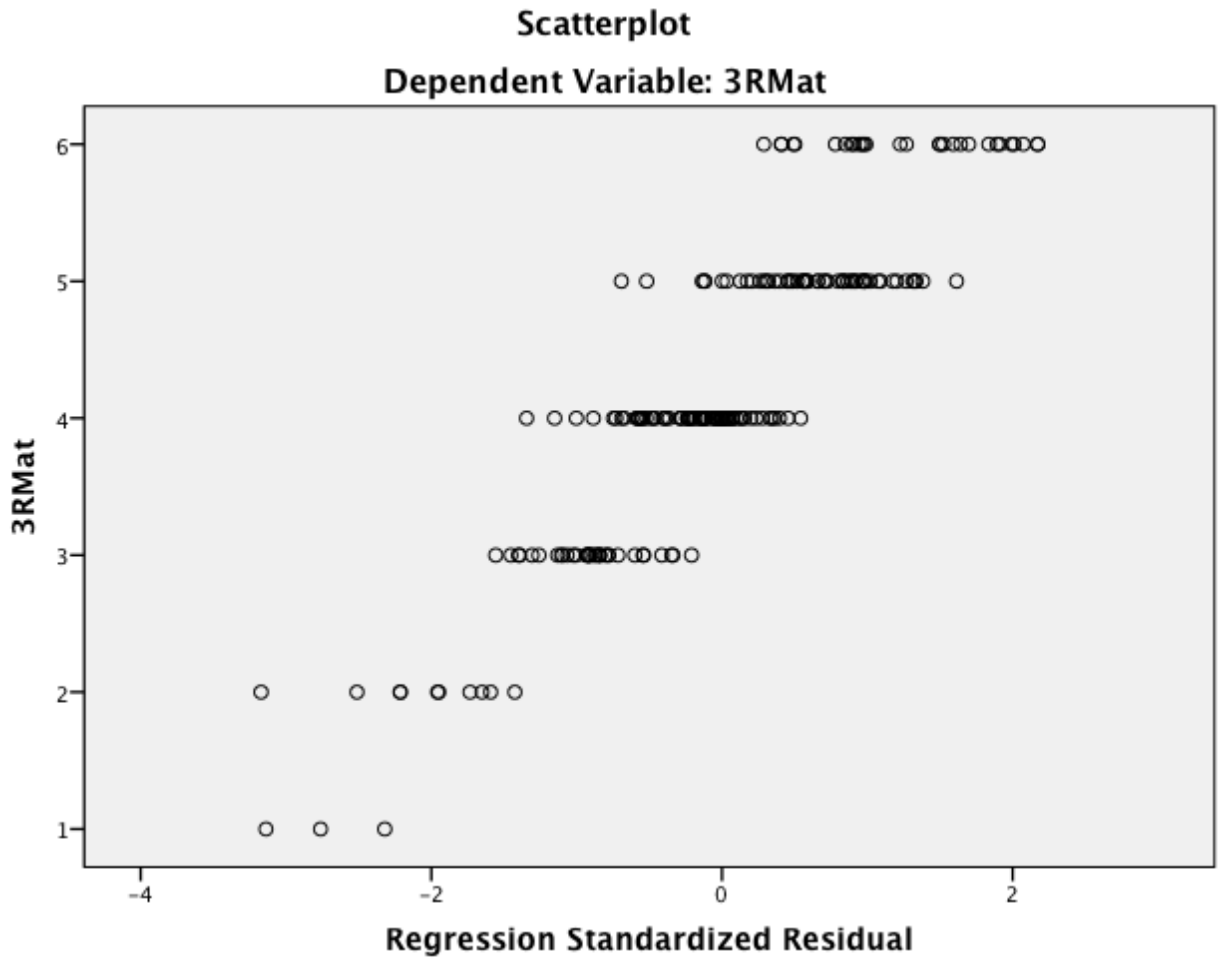
B.2.14 Regression of importance of energy saving features on motivations to adopt GHF's



B.2.15 Regression of importance of features that improve indoor air quality on motivations to adopt GHF's



B.2.16 Regression of importance of features made from recycled materials on motivations to adopt GHF's



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VITA

Marina Scatolin Murarolli began to pursue research in sustainability and environmental issues during her undergraduate career in Tourism Management at Pontifícia Universidade Católica de Campinas in Brazil. After graduating, she taught disciplines related to environmental issues at a technical level school, and proceeded to pursue an MBA in Economics and Management of Natural and Cultural resources at Faculdade de Tecnologia, Ciências e Letras in Pirassuninga, Brazil. Meanwhile, as a volunteer she developed, implemented and lead for two years a program of environmental and historic heritage education for children under social risk at her native hometown.

Marina came to the US in 2008 to pursue a doctoral degree. Interested in human-environment interactions and the dimensions of proenvironmental behavior, she engaged in research efforts inside and outside the department of Architectural Studies. After teaching Spanish at the University for four years, in 2012 she started working as a graduate research assistant for the University of Missouri Extension during the course of a rural residential energy-efficiency program funded by the US Department of Energy. Prior to concluding her studies, Marina worked as an editor for UM Extension incorporating energy-efficiency and sustainability curriculum items to educational materials about homeownership and home maintenance. Her Master's thesis investigated the most important residential green features according to homeowners in Columbia, Missouri, as well as their level of environmental concern and perceptions of residential

green features' aesthetic characteristics, premium cost and associated risks. Her current research interests include proenvironmental consumer behavior and consumer response to retail façades in historically preserved neighborhoods and revitalized downtown areas.