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Sydney Clark

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Social Influence on Pick-Up Truck Purchase:

A Case Study

Sydney Clark

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Dr. Pablo Hernandez

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I.   Introduction

Behavioral economics, a leading branch in the science of economics, takes a psychological approach to the analysis of human cognitive limitations and how these limitations affect market performance. Although fairly new, behavioral economics has been heavily researched, most notably, by economists such as Richard Thaler, Daniel Kahneman, Herbert Simon, Amos Tversky, George Akerlof, and Robert Shiller. Thaler and Mullainathan (2000) have concluded that behavioral economics studies how humans deviate from the standard lens of economics- these deviations have been coined as bounded rationality, bounded will-power, and bounded self-interest.[1] This paper will delve into the topic of bounded rationality to discuss how social influence and income class tend to affect the decisions of the consumer. Once the consumer begins to act in interest of adhering to social norms, she is considered irrational, defined as choosing a suboptimal option and then using self-deception in order to "cover up such an act from [oneself]."[2]

According to mainstream economics, when income decreases, the demand for any given good should decrease, unless that good is an inferior good. This is a tenet under standard rational choice theory regardless of socioeconomic stratification. In other words, when observing low-income individuals, we should expect to encounter that same effect. In theory, the demand for low-cost items should be relatively higher for low-income individuals, according to rational choice theory.[3] According to a 2014 study conducted by the Pew Research Center, although

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[1] Sendhil Mullainathan and Richard Thaler, "Behavioral Economics," 2000, accessed October 13, 2018, doi:10.3386/w7948.

[2] Morris Altman, Real-world Decision Making: An Encyclopedia of Behavioral Economics (Santa Barbara, CA: Greenwood, 2015), 226-7.

[3] Robert H. Frank, Microeconomics and Behavior, 8th ed. (New York: McGraw-Hill, 2010), 56-7.

vehicles are typically considered to be a luxury good, approximately 88% of the Americans

surveyed owned a working vehicle. Compare this to the overall statistic the Pew Research Center

released, where out of all 44 countries researched (including data from poorer countries such as

those from sub-Saharan Africa and south and southeast Asia), only 35% of the citizens across

countries in the sample own a working car.[4] This is a much more anticipated result for such a

luxury good.

So why do typical assumptions governing the theory of demand not seem to apply to the

vehicle consumption in the U.S.? Further, why do low-income states have the same number of

motor vehicles per capita as some high-income states? According to 2016 data from the U.S.

DOT Federal Highway Administration, Mississippi, the state with the lowest median household

wealth, owns more motor vehicles per capita than Maryland, New Jersey, and New York (the

wealthiest, third wealthiest and fourteenth wealthiest states, respectively).[5][6][7] Given these

statistics, it is obvious that standard concepts such as normal goods or inferior goods cannot fully

capture purchasing behaviors of vehicles in America. Not even the Giffen good, an obscure good

that experiences an increase in quantity demanded as price rises, is a decent fit for this market.

Perhaps this could be a result of the lack of mass transportation in the United States, although

this would not explain why individuals have a broad preference for different makes and models

of vehicles. An alternative way that we can discuss the purchases of motor vehicles in America,

including purchases of these goods by low-income households, is by assuming individuals are

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[4] Poushter, Jacob. "Car, Bike or Motorcycle? Depends on Where You Live." Pew Research Center. April 16, 2015. Accessed October 13, 2018.

[5] "Highway Statistics Series," Federal Highway Administration, November 17, 2017.

[6] United States, Census Bureau, Household Income: 2016, by Gloria G. Guzman, September 2017, accessed October 13, 2018.

[7] "State Population Totals: 2010-2017," US Census Bureau, May 08, 2018, accessed October 13, 2018.

irrational in this market. A closer examination of the role of social norms and bounded rationality on these purchasing decisions may help to define individual habits and purchasing traits that do not conform to empirical regularities under the standard theory.

Through this paper, we will ask ourselves whether irrational behaviors such as anchoring, symbolic utility, and self-concept help explain low-income households' purchasing decisions concerning vehicle class or size. We will argue these behaviors do explain these purchasing decisions, and we will narrow this case study to pick-up truck ownership and purchases of the four lowest, median, and highest-income states in the United States from 1990-2015. We will use existing survey data to relate demographics to state data such as the nominal net farm income per capita and personality type, as a distinguishing proxy to capture purchasing traits. The period in our case study coincides with the United States' steady increase in oil reserves and its efforts to become a leading producer and exporter of oil following the Iran-Iraq War (1980-88).[8] Since oil and petrol-related products serve as underlying inputs in the market for automobiles, including the sales of pick-up trucks, this will aid the assumption that a main contributor to the widespread ownership of vehicles in the United States is partially related to the ease of access of oil in America.

By researching this topic, we will be able to examine behavioral traits which may complement the mainstream field in an attempt to more fully understand conditions orienting the demand for automobiles in the U.S. The author intends to provide a broader set of measures to help researchers better forecast consumer demand and behavior in this industry and aid in the marketing of vehicles to consumers. Additionally, this research can provide links to the

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[8] Steven Kettell, "Oil Crisis," Encyclopædia Britannica, May 27, 2016, accessed October 13, 2018, https://www.britannica.com/topic/oil-crisis.

interaction between economics and the environment, by examining the means and presuppositions in supporting the arbitrariness of the vast vehicle ownership in America and how it contributes to the accumulation of greenhouse gases in the atmosphere.

In this paper, we will first discuss relevant literature. We will focus on four streams of literature commonly found under behavioral economics, including: anchoring, symbolic utility, identity, and solidarity. The definition and analysis of these concepts is followed by a discussion concerning the relevant literature on the theoretical underpinnings and applications of the aforementioned concepts, among others, to explore irrational behaviors in general. A methodology section precedes our empirical analysis and interpretation of data. Our essay concludes with a limitations section, followed by a discussion of how various traits affect decisions in the industry and the future outlook in the industry. Lastly, we draw a set of recommendations for future lines of research.

II. Literature Review

Throughout this section, we discuss leading views pertaining to our topic. Our first subsection under the present literature review will define anchoring bias and examine its impact on the purchasing decisions of consumers, particularly low-income consumers. In the second subsection, we define symbolic utility in relation to pick-up truck ownership in America and the feeling of individual pride in purchasing these seemingly 'luxury good'-type vehicles. In the third subsection, identity economics is discussed in connection with symbolic utility. Finally, our literature survey ends with a subsection on solidarity and group behaviors.

Anchoring Bias

Anchoring refers to a cognitive bias that is often used by consumers to dictate decision making. The term refers to the tendency of a consumer to solely rely on only one trait or piece of

information when making a decision.[9] Ariely, Loewenstein, and Prelec (2003) studied the effect

of anchoring bias on individual purchasing decisions and valuation behaviors and were able to

provide empirical support that anchoring has a large impact on these decisions.[10] The authors

conducted their study by offering fifty-five students six products, and then asking the students if

they would purchase each good for the worth that is equal to the last two digits of his/her social

security number. This anchored the student to this dollar amount and students in their sample

were then asked to value what (s)he would be willing to pay for the product. Their findings

show that students with "above-median [last two digits of] social security numbers stated values

from 57% to 107% greater than did subjects with below-median numbers (76)." This supports

the conjecture that even an arbitrary anchor creates a bias in purchasing decisions among

consumers. The authors of this study conclude that consumers tend to choose purchases that

mimic previous purchases, though these decisions may not reveal true preferences.

So there is a fair argument that, not only does anchoring bias exist, but this bias has a

clear impact on purchasing decisions. This can be further illustrated by a study on the impact of

confidence and product familiarity on the anchoring effect. Wu, Cheng, and Yen (2009)

conducted research that determined that the anchoring effect is more prominent in individuals

that have a low level of familiarity with a product and in individuals that have a low level of

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[9] "Anchoring Bias in Decision-making." ScienceDaily. Accessed October 31, 2018.
[10] Ariely, Dan, George Loewenstein, and Drazen Prelec. ""Coherent Arbitrariness": Stable Demand Curves Without Stable Preferences." *The Quarterly Journal of Economics*, February 2003, 73-103.

confidence.[11] A potential reason for this trend in confidence given by the authors is that less

confident individuals may tend to look for additional resources to serve as an anchor.

Additionally, less confident individuals tend to have lower levels of earnings. In 2008,

Francesco Drago conducted a cross-sectional wage regression analysis to determine the impact

of self-esteem on wage earnings. The National Longitudinal Survey of Youth gauged the same

participants in 1980 and 1987 using the Rosenberg Self-Esteem Scale which measured self-

esteem over time. Drago summed these two numbers for this analysis, and only focused on white

males to avoid possibly confounding data. Then Drago compared the wages of these men to their

self-esteem over time. The findings show that white men with higher self-esteem also had higher

wages. This study cannot determine the direction of the relationship, as in whether self-esteem

causes low wages, or if the participants have low wages because of low self-esteem and cannot

display a definite causal relationship. In spite of this, Drago's findings do suggest that there is a

direct relationship between wages and self-esteem.[12]

Using these studies, we can infer that lower income individuals most likely tend to have

lower confidence levels. Individuals with lower confidence tend to display a higher tendency

towards the anchoring effect. Finally, when the anchoring effect is real, and prominent,

individuals tend to make irrational purchasing decisions. In order to compensate for low levels of

self-esteem, while cognitively biased, consumers may purchase goods that will artificially and

temporarily raise their self-esteem and pride, which leads to the concept of symbolic utility.

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[11] Wu, Chin-Shan, Fei-Fei Cheng, and David C. Yen. 2012. "The Role of Internet Buyer's Product Familiarity and Confidence in Anchoring Effect." Behaviour & Information Technology 31 (9): 829–38. doi:10.1080/0144929X.2010.510210.

[12] Drago, Francesco. "Self-esteem and Earnings." *Journal of Economic Psychology* 32, no. 3. June 2008. Accessed November 2, 2018. doi:10.1016/j.joep.2011.03.015.

If low income individuals tend to have a lower self-esteem, lower self-esteem may nudge these consumers to search for anchors in their purchasing decisions. Upon searching for vehicles online, numerous social media posts, blogs, and commercials will display statements such as, "We love our trucks here in the U.S.A," "Trucks are loved by millions of Americans," "When it comes to trucks, American drivers are willing to splurge," among many others.[13][14][15] Statements and online advertisements like these are likely to create an anchor in these consumers, which would lead them to a strong tendency towards purchasing pick-up trucks.

Symbolic Utility

Rational Consumer Theory discusses utility and its relation to consumer decisions. Utility refers to the present or future satisfaction of wants that a rational consumer feels when she consumes a good or service. Irrational consumers also feel some sort of utility over their purchases, or lack thereof. This can be called symbolic utility, or the maintenance of self-image through consumption.[16] Given this, we can make the assumption that all irrational consumers are equally as concerned with symbolic utility as they are with their traditional utility, as consumers tend to purchase items that correspond to their self-image and ideal self-image.[17] According to Elias Khalil (2000) there are three types of symbolic products: prestige, pride, and identity.[18]

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[13] "The Pros and Cons of Owning a Truck Vs. a Car," Camera Source, March 09, 2017.

[14] Madi McLellan, "Top 10 Reasons Why You Should Buy a Truck," ShearComfort Automotive Blog, May 25, 2018.

[15] Danielle Muoio, "Americans Are Obsessed with $80,000 Pickup Trucks - Here Are the Most Luxurious Ones on the Market," Business Insider, October 16, 2017.

[16] Altman, Morris. Real-world Decision Making: An Encyclopedia of Behavioral Economics. Santa   Barbara, CA: Greenwood, 2015.

[17] E. Laird Landon, Jr., "Self Concept, Ideal Self Concept, and Consumer Purchase Intentions," *Journal of Consumer Research* 1, no. 2 (September 1974): , doi:10.1086/208590.

[18] Khalil, Elias L. "SYMBOLIC PRODUCTS: PRESTIGE, PRIDE, AND IDENTITY GOODS." *Theory and Decision* 49 (2000): 53-77.

Those who purchase prestige-related goods have the intent of receiving admiration; whereas, individuals who purchase pride-related goods have the intent of receiving respect. Finally, individuals who purchase identity-related goods have the intent of receiving dignity, and the preferences for these goods are typically separate from sociocultural tastes. Symbolic goods must also be a prominent piece of the agent's daily livelihood. For instance, vehicles play an important role in the everyday life of citizens of the United States, as vehicles provide transportation that is necessary for consumers to provide labor and receive goods and services (Khalil, 57).

In an earlier work (1997), Khalil also defines the purchase of a luxury good as a gift to oneself, which intends to satisfy and sustain symbolic utility (508). This gift to oneself can be seen as a status symbol and/or a means of self-aggrandizement, of which the consumer primarily cares about gaining the respect of peers. Shin and Biocca (2018) further this concept by researching the impact of social influence and the 'perception of coolness' on the purchase of smartwatches, which are considered a luxury good.[19] The authors explain that consumers tend to replace their current smartwatch with a new one, even though the current smartwatch works, and measure switching intention, perceived usefulness of a new watch, social influence, desire for coolness, and identity formation to determine the purpose of this irrational behavior. Their study also featured means to account for confounding data through measuring age, annual income, marital status, and level of education. The findings showed that only identity formation and similarity avoidance were positively associated "with smartwatch upgrade intention (887)." The findings were odd, because humans are typically influenced by their social environment, but in

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[19] Shin, Donghee, and Frank Biocca. "IMPACT OF SOCIAL INFLUENCE AND USERS' PERCEPTION OF COOLNESS ON SMARTWATCH BEHAVIOR." *Social Behavior and Personality* 46, no. 6 (2018): 881-90.

this case, the participants were more swayed to avoid similarity with others and to purchase up-to-date models as a means of identity formation. The inconsistency with the results can be attributed to the difference between adoption, purchasing something that one does not already own, and upgrading, replacing an owned product with a 'cooler version (888).' So, when a product is upgraded, the symbolic utility produces a sense of identity, as one feels not only different than others, but feels 'cooler' than others, which can be attributed to pride.

Identity Economics

As individuals attempt to make decisions in a world full of physical constraints they also face social constraints. According to Altman[20], "Identity economics is the study of economic behaviors that are shaped by social norms (212)." As mentioned previously, the purchase of certain goods or services can play a role in identity, and identity formation. Certain goods are also considered identity goods when the symbolic products originate from backward-looking evaluation, meaning the feeling of identity is found from the history of the consumer. This good can be more specifically defined as a good which enhances dignity, and, when intentions are distorted and aggrandizing, can be considered a 'reification good,' which gratifies reverence. Identity goods are especially useful in analyzing identity politics and changes in culture. The identity good creates symbolic utility in the form of self-love, as in the product creates some form of self-acceptance, to which the extent of can depend on biology, sociocultural factors, and personal history. Additionally, there are two breeds of identity good, personal identity and group identity, where group identity is a personal identity shared by multiple people.[21]

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[20] Altman, Morris. Real-world Decision Making: An Encyclopedia of Behavioral Economics. Santa   Barbara, CA: Greenwood, 2015.

[21] Elias L. Khalil, "SYMBOLIC PRODUCTS: PRESTIGE, PRIDE, AND IDENTITY GOODS," *Theory and Decision* 49 (2000): 53-55.

On top of symbolic utility, one can find identity utility, which should not be confused with the identity good. Identity utility refers the positive feeling one receives when conforming to the social norms and ideals of one's social category.[22] So, could we imagine that Americans receive pleasure from purchases that are innately considered a product of American culture. It seems apparent that truck ownership is considered to be an important aspect of American culture, as the mainstream media focuses on the average American as loving trucks. Additionally, two of the largest automobile manufacturers in the United States, the Ford Motor Company and General Motors, manufacture the Ford F-Series and Chevrolet Silverado, which were the two best-selling light trucks in the United States in 2017, which would lead to the conclusion that not only are trucks important in America, but American-made trucks are particularly important.[23] In fact, according to highway data provided by United States Department of Transportation, as of 2015, 54% of motor-vehicles privately owned in the United States were pick-up trucks.[24]

So, it seems as though being American culturally includes owning a pick-up truck. This should mean that, according to identity economics, Americans should receive pleasure from owning a light truck, and may make their purchasing decisions based on this identity utility.

Solidarity

While identity economics focuses on how a consumer views herself, the concept of solidarity takes this a step further by adding a component of sociology. Solidarity is defined by Fireman and Gamson (1979) as "the configuration of relationships linking the members of a group to each other… in ways that generate a sense of common identity, shared fate, and general

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[22] Andreas P. Kyriacou, "George A. Akerlof and Rachel E. Kranton: Identity Economics. How Our Identities Shape Our Work, Wages, and Well-being," July 13, 2010, 325.

[23] "Light Trucks in the U.S. - Best-selling Models 2017," Statista, 2018.

[24] "Highway Statistics Series." Federal Highway Administration. November 17, 2017.

commitment to defend the group (22)." We can then further define solidarity through five different factors that suggest the reasoning for a consumer to be attached to their group. The five factors that create solidarity are kinship, participation in organizations, similarity in lifestyle, subordinate and superordinate relationships, and no means for exit from said group.[25] Given these definitions, we can assume that Americans tend to feel solidarity towards other Americans, and subsections of Americans feel solidarity to their own subsection. Therefore, these groups will maintain a sense of common identity, which may lead to a shared set of purchasing decisions and norms.

This can be shown by empirical case studies conducted by Richard Coughlin (1990). In support of his solidarity hypothesis, and through analyses of two different races, Caucasian and African-American, Coughlin discovered that regardless of education and income, African-American individuals support government welfare programs significantly more than Caucasian individuals. Coughlin attributes this to the assumption that African-Americans support welfare even though they personally will not benefit, because they "perceive welfare to be a benefit to [African-Americans] as a group (8-9)." In the same study, Coughlin also found that 74.3% of African-Americans and 45% of Caucasians support government efforts to decrease income differences, even at high income levels where the individuals are likely hurt by such actions.[26] This clearly shows the solidarity effect, because we would expect to see a significantly lower number when judging the situation in terms of economic self-interest.

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[25] Bruce Fireman and William A. Gamson, "Utilitarian Logic in the Resource Mobilization Perspective," *The Dynamics of Social Movements*, 1979, 22-3.

[26] Coughlin, Richard M. 1990. "The Economic Person in Sociological Context: Case Studies in the Mediation of Self-Interest" 19 (2).

So, given the meaningfulness of solidarity to a given group, and the context of group identity, we can say that any member of the group will act in the interest of the group, and will portray similar preferences as their group members. So, if an individual who is low-income considers herself to be a member of the lower class, she may feel a sort of solidarity to the group and start acting with the group and following the roles and anchors of those around her. These actions and anchor will result in skewed purchasing behaviors that will be irrational, as the consumer will be acting in an irrational manner and will use the reasoning of solidarity as a means of acting in this way. Another phrase for this effect is 'peer pressure.'

From a young age, most of us experience peer pressure and experience the social cost of failing to maintain a particular identity, specifically the identity that is associated with the group that one feels solidarity.[27] This concept will follow us into adulthood. In terms of continuing solidarity, and maintaining group identity, one will consume the adequate products that the group sets as the status quo. In America, if the status quo is driving a truck, then people will bend to peer pressure and continue to own and purchase trucks to feel as a part of the group. This way even low-income Americans, who cannot afford luxury items, can feel as though they have some status and can be included in the American culture group.

So, looking at these terms, social influence seems to have a large impact on consumer behavior. As America is considered to be a very nationalistic country, where American nationalism may be defined by the connection that Americans feel through common citizenship, sovereignty, culture, and ideals, purchasing behavior is a zenith of American culture and

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[27] Rosaleen Croghan et al., "Style Failure: Consumption, Identity and Social Exclusion," *Journal of Youth Studies* 9, no. 4 (2006): , doi:10.1080/13676260600914481.

consumerism.[28] Furthermore, American purchasing behavior is rooted in the American identity and the desire to adhere to the group identity that is defined by American nationalism. Additionally, one will find anchors in what she considers to be an American purchase, or from what she has seen or heard others to consider to be American purchases. Though none of these studies are anticipating the idea of American culture to be a factor in decision-making, we can find connections between the previous research and begin to build new research on these concepts.

III. Methodology

In this study, we examine whether pick-up trucks may be classified as goods that conform to a group identity. We consider the time period of 1995-2015. We offer an analysis based on basic descriptive statistics prior to conducting a longitudinal linear multivariable regression analysis to offer insights on how predicted parametric changes impact the decision to own/register pick-up truck vehicles. To fully determine if income has an effect on pick-up truck ownership, we will examine data for three separate groups. These groups are defined as 'low income,' 'median income,' and 'high income.' The low-income group (LI) consists of the four lowest median household income U.S. states (Mississippi, West Virginia, Arkansas, and Louisiana), the middle-income (MI) group consists of the four median household income states (Wisconsin, Texas, Iowa, and Nevada); whereas, the high-income (HI) group consists of the highest median household income states (Maryland, Alaska, New Jersey, and Massachusetts). By comparing the different levels of income wealth for states across each income group, we determine whether low levels of household income tend to result in a higher purchase of pick-up

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[28] Rich Lowry, "Trump's Unifying Nationalism," POLITICO Magazine, January 31, 2018, accessed November 18, 2018.

trucks, as compared to states under mid- and high household income groups. We also examine the three groups in order to note the effect of farming on different income levels. We hypothesize that a large farming industry should be the primary cause of truck ownership in low-income households. This obeys the following conjecture: as pick-up trucks are more expensive than other household vehicles, the only purpose for having a truck for low-income individuals should be for the utility of hauling goods, under the rational choice assumption. Hauling farm equipment and crops is one of the main uses for owning a pick-up truck, so we expect a stronger relationship between farming and truck registration across the states in the low-income groups as compared to the higher income groups.

Our variables of interest include median state household income, state pick-up truck registration per capita, state nominal net farm income per capita, and the most commonly found personality type per household in each state, according to the Meyers-Briggs taxonomy. Due to the nature of historic data, pick-up truck registration must be proxied in place of purchases. The proxy accounts for the required annual or biennial registration of already owned pick-up trucks along with the registration of newly purchased pick-up trucks. The state nominal net farm income per capita measures the annual income that each state provides to the agricultural GDP of the U.S. We use this data to measure the consumption of pick-up trucks that is due to use in everyday life. Arguably, a primary reason for paying more money in order to have a truck is to haul large items. Farming will be a key indicator to haul-usage in trucks and this will be used to account for uses that are not necessarily related to social interaction of income.

The personality data is separated into four traits, as defined by the Meyer-Briggs Type Indicator, each with two possible variables, which will be given a dummy code of either (0) or (1). These personality-characteristic groups will be described in greater detail in the following

section and dummy variables for these categories can be found below under Exhibit III.1. We will have to limit the analysis by assuming that personality remains unchanged over time, though the data was collected in 2015.

We predict that low median income states tend to own more pick-up trucks per state capita and that income and pick-up truck ownership have a positive and direct relationship. These findings would suggest that low-income individuals tend to purchase more pick-up trucks, other things equal, and could point to the existence of anchoring biases, symbolic utility, and solidarity effects. To further analyze the effect of social influence, we will compare the personality test data with these quantitative findings.

Meyer-Briggs Type Indicator

The Meyer-Briggs Type Indicator (MBTI) is an inventory based on psychiatric research conducted by Carl Jung to categorize individuals into 16 different personality types in order to find consistency and direction in human behavior and personality. According to the Meyer & Briggs Foundation, each person is given a set of four traits. The first trait determines whether one prefers to focus on the outside or inside world, and if one is can be either extrovert or introvert, respectively. The second trait depends on if one prefers to focus on basic information (sensing) or to focus on interpretation of information (intuition). The third trait focuses on decision-making. If one prefers to use logic when making decisions, then she is thinking, and if she prefers to look at people and the circumstance, then she is feeling. The final trait deciphers how one deals with the outside world. If an individual is judging, then she prefers to make a decision and stick to it, while if she is perceiving then she prefers to stay open to new information.

Certain traits may exhibit a higher tendency towards behavior that is geared towards social interaction. The difference between extroversion and introversion will be the trait of most

interest, as we hypothesize that those who are extroverted will not only be more social but be more likely to make decisions based on group affinity. Additionally, those who are sensing may be more likely to fall into the anchoring trap, as these individuals are less likely to further examine potential purchasing decisions and will go with their first instinct, or anchor. When making purchasing decisions, we can infer that those who have the feeling trait may be more likely to adhere to symbolic utility, as decisions are made from emotions rather than logic. Finally, individuals who are judging may tend to stick to anchors more, as they are less likely to change their mind or look for conflicting purchasing information.

16Personalities, a MBTI testing service, conducted a survey that tested the personality types of Americans in 2015. With this data, they were able to determine the primary trait displayed in each state. Using this data, we create a personality type to represent the state that features the majority personality. We use this data to predict the social behavior of the 12 state populations according to our sample.

Exhibit III.1: MBTI Variables

Favorite World	Information Processing	Decisions	Structure
Introverted (0)	Intuitive (0)	Thinking (0)	Prospecting (0)
Extroverted (1)	Sensing (1)	Feeling (1)	Judging (1)

Source: "MBTI Basics." The Myers & Briggs Foundation. Accessed November 18, 2018.

Notes: Shown are the eight potential traits that one can be tested for. Each trait has two possible options, that are either coded with a (0) or a (1). The trait coded with (1) are the traits that are hypothesized to show significance in truck registration behavior.

IV. Summary and Interpretation of Results

In this section, we display data collected and make inferences based off of this data. Initially, we summarize observations under our key variables using basic descriptive statistics

techniques. Each set of descriptive statistics will be followed by a short analysis. Descriptive

statistics are followed by a linear multivariable regression analysis with an in-depth summary

and interpretation of results.

Descriptive Statistics

Exhibit IV.1: Median Household Income

	Low Income (LI)	*Median Income (MI)*	*High Income (HI)*
Mean	43288.0	56913.4	71072.7
Standard Error	342.8	423.8	458.8
Median	43507.5	56892	71134.5
Standard Deviation	3496.08	4322.4	4679.1
Sample Variance	12222547.5	18682999.1	21894114.1
Skewness	-0.3	0.02	0.1
Range	17950	19392	21308
Minimum	34085	48007	61640
Maximum	52035	67399	82948
Count	104	104	104

Source:"Income Data Tables." Census Bureau QuickFacts. May 19, 2016.

As expected, Exhibit IV.1 shows that the three groups have different median and mean

incomes. During the time period, the LI group has a median income of $43,507, the MI group

has a median income of $56,893, and the HI group has a median income of $71,134. Standard

deviation rises with income, which indicate that higher income states tend to have a wider range

of median income found in each household. There are no notable outliers.

Because of the clear differences between the three groups in their mean, median, range,

and standard deviation, we can expect to see a notable effect of median household income on

truck registration. Particularly, we hypothesize that there will be a positive correlation between truck registration and median household income.

Exhibit IV.2: Truck Registration per Capita

	Low Income (LI)	*Median Income (MI)*	*High Income (HI)*
Mean	0.199	0.169	0.144
Standard Error	0.003	0.006	0.018
Median	0.201	0.158	0.085
Standard Deviation	0.029	0.046	0.183
Sample Variance	0.001	0.002	0.033
Skewness	-0.055	0.155	5.226
Range	0.150	0.230	1.500
Minimum	0.119	0.039	0.039
Maximum	0.268	0.269	1.539
Count	104	104	104

Sources: "Highway Statistics Series." Federal Highway Administration. November 17, 2017.

"Population and Housing Unit Estimates." Census Bureau QuickFacts. June 07, 2018.

In Exhibit IV.2 data was compiled on pick-up truck registration and population for all 12 states throughout the time period of 1995-2015. Pick-up truck registration was then divided by population in order to get an analysis that accounts for population differences between states. Of particular interest is the mean and the median of all three groups. We can see that both the mean and the median of the LI group are larger than the other two groups, so on average, low-income individuals tend to register more pick-up trucks than individuals in the MI and HI groups. The LI

group reveals the lowest standard deviation, suggesting individuals under this income category tend to stay fairly consistent in their registration behavior.

Given these data, we will assume that income does have an effect on truck registration behavior, as the LI group shows that the four lowest income states tend to have 12% more pick-up trucks than individuals that reside in the states in the HI group. This data may show that median household income and truck registration have a negative correlation, which would offer a counter-argument against our conjecture, so further analysis must be performed before making any conclusions.

Exhibit IV.3: Nominal Net Farm Income per Capita

	Low Income (LI)	*Median Income (MI)*	*High Income (HI)*
Mean	0.299	0.458	0.037
Standard Error	0.025	0.057	0.003
Median	0.218	0.226	0.028
Standard Deviation	0.259	0.585	0.033
Sample Variance	0.067	0.343	0.001
Skewness	0.885	2.275	1.119
Range	1.111	3.092	0.179
Minimum	-0.008	0.024	-0.029
Maximum	1.104	3.11	0.150
Count	104	104	104

Sources: "Value Added Years by State." United States Department of Agriculture

Economic Research Service. August 30, 2018. Accessed November 18, 2018.

"Population and Housing Unit Estimates." Census Bureau QuickFacts. June 07, 2018.

Research Service. August 30, 2018.

Note: Negative values exist in this data in order to indicate a year where any given state incurred more expenses than the state received in revenues.

In Exhibit IV.3, data was compiled on the state nominal net farm income and divided by its respective state population. This is to account for any possible differences that may be considered to be caused by any increase or decrease in population growth. In this data we have three outliers from particularly good farming years for Iowa from 2011-2013. So, while the MI group tends to have a higher median nominal net farm income per capita, we will observe the median data only to eliminate the effects of the outlying good haul years. When eliminating outliers, the LI and MI groups appear to perform on a similar level, with the median individual contributing about 22 cents of the total nominal net farm income of their state. High income states seem to perform much worse, with the median individual contributing less than 3 cents to the total nominal net farm income of their state.

Given these observations, we expect to find that the LI and MI groups will show a much stronger positive correlation between truck registration and nominal net farm income. Evidence under the HI group, on the other hand, should show that there is not much correlation between truck registration and nominal net farm income, as net farm income, under this category of income, is very low relative to the population.

Regression Analysis

Exhibit IV.4: Regression Results- Low Income (LI) Group

Regression Statistics	
Multiple R	0.979
R Square	0.958
Adjusted R Square	0.956
Standard Error	0.006
Observations	104

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.197	0.008	23.5	8.97E-42
Median Household Income	4.31E-06	2.21E-07	19.5	2.73E-35
Nominal Net Farm Income per capita	-8.36E-07	2.19E-08	-38.2	3.13E-60
Extravert/ Introvert	-0.001	0.002	-0.558	0.578
Intuitive/ Sensing	N/A	N/A	N/A	N/A
Thinking/Feeling	N/A	N/A	N/A	N/A
Judging/ Perceiving	N/A	N/A	N/A	N/A

Source: The above analysis is the author's own.

Note: Above shows longitudinal multivariable regression analysis results with pick-up truck registration per capita as the dependent factor.

The regression results in the LI group of states show some very interesting results. We can say, with 95% confidence that median household income and nominal net farm income per capita do have an impact on truck registration per capita. Personality, though, has no impact of statistical significance. Interestingly, though, farming seems to be more of an indicator of pick-up truck registration than median household income. The results also show that state farming and pick-up truck registration are strongly and negatively correlated. This is very different to the hypothesized results, and different from what intuition may suggest. Pick-up trucks are known to be more expensive than the average car[29], so one might believe that the purchase of a truck in low- income households may be for uses above and beyond transportation. Hauling is a primary benefit of pick-up trucks, and farming requires a large amount of hauling, so we would expect that as farming income from the state increases, so would pick-up truck registrations. Oddly though, in these LI states, we can see that the negative correlation between these two statistics indicates that some other factor is at work here. Perhaps social influence is increased when less time is spent on farming, or maybe there is less time to purchase a new vehicle or to re-register a

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[29] "The Pros and Cons of Owning a Truck Vs. a Car," Camera Source, March 09, 2017.

vehicle during the busy season. Additionally, we find that none of the MBTI traits have significant effect on pick-up truck registration.

Exhibit IV.5: Regression Results- Median Income (MI) Group

Regression Statistics	
Multiple R	0.804
R Square	0.646
Adjusted R Square	0.624
Standard Error	0.028
Observations	104

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.183	0.047	3.88	0.000
Median Household Income	-9.15E-07	7.96E-07	-1.15	0.253
Nominal Net Farm Income per capita	0.019	0.008	2.26	0.026
Extravert/ Introvert	0.022	0.009	2.38	0.019
Intuitive/ Sensing	0.035	0.012	2.94	0.004
Thinking/Feeling	N/A	N/A	N/A	N/A
Judging/ Perceiving	N/A	N/A	N/A	N/A

Source: The above analysis is the author's own.

Note: Above shows longitudinal multivariable regression analysis results with pick-up truck registration per capita as the dependent factor.

The regression analysis of the MI group shows a correlation between pick-up truck registration and nominal net farm income per capita and the MBTI traits of extraversion and sensing, while showing no evidence of a significance of median household income of the MBTI traits of feeling and judging. We can see that farming behavior of the state has a much lower correlation than in the case of the LI group but is also positively correlated as we would expect to see. Surprisingly, income has no statistically significant impact on pick-up truck registration, so we may conjecture that the extra costs of a pick-up truck may mean less to individuals with higher household incomes. Additionally, social norms seem to play a wider role in the behavior of pick-up truck registration, as those who show a tendency towards extraversion and/or sensing

seem more likely to register a pick-up truck. This may be because those who are extraverted and/or sensing would be impacted more by a need to adhere to group norms and to anchoring biases.

Exhibit IV.6: Regression Results- High Income (HI) Group

Regression Statistics	
Multiple R	0.671
R Square	0.450
Adjusted R Square	0.408
Standard Error	0.138
Observations	104

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.459	0.237	1.94	0.056
Median Household Income	-1.45E-06	3.28E-06	-4.43E-01	0.659
Nominal Net Farm Income per capita	0.060	0.764	0.078	0.938
Extravert/ Introvert	-0.293	0.037	-7.88	4.24E-12
Intuitive/ Sensing	0.023	0.053	0.439	0.662
Thinking/Feeling	N/A	N/A	N/A	N/A
Judging/ Perceiving	N/A	N/A	N/A	N/A

Source: The above analysis is the author's own.

Note: Above shows longitudinal multivariable regression analysis results with pick-up truck registration per capita as the dependent factor.

In the HI group, we can see that the only factor that appears to have a statistically significant impact on pick-up truck registration is the MBTI trait of extraversion. Contrary to our hypothesis, farming and income have no correlation on pick-up truck registration. We can conjecture that social bias may be a primary reason for truck ownership, although introversion has more of an impact on truck ownership. This may be because introverted individuals may be more comfortable relying on anchors, as opposed to conforming to social norms.

Altogether, the results are fairly surprising, as we see that median household income only has an effect on truck ownership for low median household income states. Considering the

definition of normal goods, we would expect demand to increase as income increases, though we would expect to see that income plays a significant role across all levels of income. This seems to support the conjecture that social influence has a larger impact on truck ownership than income alone, a confounding piece of evidence under rational consumer theory. Farming has a statistically significant impact on farming in the LI and HI groups, but oddly has a negative relationship in the LI group. Further research must be conducted to find possible causes of this relationship, though some sort of social influence could be a cause, as those busy farming may have less time for social interaction that would result in a truck purchase.

V. Limitations and Potential Avenues for Future Research

We encountered several limitations throughout this study that could have impacted the findings. One major limitation was the use of a proxy variable in place of pick-up truck purchases. This could result in skewed data, as the pick-up registrations also account for vehicles already owned. Another important limitation was the use of the MBTI. The MBTI was intended to be a proxy for distinguishing potential irrational purchasing traits, and this may not capture these irrational traits. Additionally, the index only indicated what the most predominant trait across each state and was only studied in the year 2015. We had to make the large assumption that this aggregate measure of personality remained constant, and that the most predominant trait was an appropriate description for the entire state population. Another major limitation of this study is that we assume that the states account for the behavior of all low, middle, and high-income individuals. Because of this, we can only say that the findings are generalized towards the three groups of four states each. Finally, this study was not meant to capture all of the variables related to irrational or rational behaviors. Since behavioral economics is in its infancy,

this type of study is experimental and may not fully encompass the human decision-making process in respect to purchasing behavior.

In the future, further research should be conducted to discover if these findings can be generalized to other groups of states in America. Additionally, other variables should be used to discover any other possible causes of pick-up truck purchases. These variables may include data on other industries that result in hauling, potentially hunting and industrial, and the observation of age cohorts over time and how different groups of generations may change social and purchasing behavior. Finally, a future study should randomly survey qualitative data from American pick-up truck owners to determine the purpose of pick-up truck purchase. This will further solidify the hypothesis that social influence has an impact on purchasing behavior.

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