

THE EFFECT OF DISTANCE DECAY: A STUDY OF AUTOMOTIVE RETAILING

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## ABSTRACT

Retail automotive literature that examines how the distance between a retail automotive facility and the prospective purchaser affects market performance is limited. Primary data for this study indicates that distance and purchase in the retail automotive sector move in opposite directions. This study examines similar goods that have high barriers of entry and proposes other methods of increasing market reach.

This is a study of the conditions that affect the market performance for imported luxury vehicles. First, is the effect of distance on purchase decisions. Vehicular sales drop the further away a customer is from a car dealership. We call this phenomenon distance decay. *Distance decay* is defined as: the interaction between two locations declines as the distance between them increases. Secondly, when similar brands are viewed as substitutes, the consumer will choose the brand with the closest automotive service department to their residence or place of employment. Thirdly, door-to-door selling can decrease distance decay. Lastly, pick-up and delivery service can decrease distance decay.

Data from 30,936 prospects and individuals who entered, phoned, or emailed a dealership inquiring about purchasing a new Audi were used in the study. These prospects will be categorized by who intended to buy and who actually purchased a car. In addition to the prospects, data from 6,153 individuals who purchased a new Audi from four Audi dealerships in the greater Philadelphia area and from the framed field experiment were used in the study. These categories will then be further labeled by ZIP code and city to determine the effects of distance. Then, possible solutions will be

performed on test groups to determine what alternatives from other industries can be used to improve market performance involving long distances.

**Keywords:** flagship, distance decay, Internet, market share, barriers to entry, luxury, pick-up and delivery, dealer code, manufacturer, retailer, experience center

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## CHAPTER 1

### INTRODUCTION

This is a study of the conditions that affect distance decay, with implications for how an automotive retailer can influence it. *Distance decay* is defined as: the interaction between two locations declines as the distance between them increases (Nekola & White, 1999). There are three elements of this study: the first is a study of distance decay, the second is a survey of individuals to determine the appeal of alternative methods of automotive retailing, and the third is a framed field experiment (FFE) of an alternative location. The framed field experiment began on 3/1/16 and ended 9/30/16. Data was collected during that time period and quantitatively analyzed. Analysis from the survey and FFE will aid in discovering methods to circumvent the effects of distance decay.

It has been 118 years since the first formal automotive franchise agreement in the United States (Biller et al., 2005). In that first agreement an automotive retailer was assigned an exclusive territory from the manufacturer and, in return, the retailer would provide “adequate service and suitable facilities” (2005). As the industry grew, state legislatures became wary of the automotive manufacturers and changes were made in the franchise agreement to protect automotive retailers. The most significant of these changes were two laws. One of the laws prohibited a manufacturer from selling directly to the retail public and the second law established proximity distances between same brands

(2005). To date, the prohibition of an automotive manufacturer selling directly to the retail public has remained an important element to an automotive retailer's success (it is important to note that Tesla has challenged this law by retailing vehicles without a retail organization). It is also important to note that this prohibition is consistent in all 50 states of the United States. The second prohibition has not been nearly as successful for a variety of reasons. Some of the problems with the second prohibition are the proximity laws are determined on a state by state basis. For example, Pennsylvania proximity law states that in a metropolitan area, same brands must be at least 10 miles apart (in Euclidian distance). In a non-urban area, same brands must be at least 20 miles apart. Florida has the most liberal proximity law; it does not have a defined distance in miles. Florida law allows any retailer of any brand to protest the entrance of a brand into the state. In most states, there are no proximity restrictions on competitive brands—creating difficulties for a retailer of a specific brand when there are a large number of luxury brands in a market area because of a consumer's willingness to substitute brands (Parker et al., 2010). In 2014, brand loyalty for luxury vehicles was 49% (Wernle, 2015). "Brand loyalty" is defined as a pattern of consumer behavior in which, over time, consumers show their commitment to a brand by making repeated purchases of the same brand (Bianchi et al., 2014). In this study, I argue that a large number of luxury brands (10) has a negative effect on brand loyalty, which intensifies distance decay. For this study, *distance decay* is defined as: the interaction between two locations declines as the distance between them increases (Nekola & White, 1999).

There are many journal articles regarding distance decay in the marketing literature (Drezner, 1996; Drezner & Drezner, 2004; Li & Liu, 2012; Iacono et al., 2008) and some of the literature discusses automotive service organizations (Birkin et al., 1999), but little has been written to the effect of distance decay on imported luxury vehicle retailers. To demonstrate the effects of distant decay in a metropolitan market area, primary vehicle sales data from two imported luxury retailers will be used. To test and confirm the hypotheses pertaining to distance decay multiple regression analysis will be employed. The sample will consist of an n of 1,400. The retailers are of the same brand (Audi) and are within nine miles of each other (Euclidian). There are a total of seven Audi retailers within a 30-mile radius of the center of these two retailers. There are also 47 competitive retailers in this 30-mile radius representing nine brands.

The next element of the study is to demonstrate that alternative automotive purchasing options can offset the effects of distance decay. Said differently, alternative automotive purchasing options can increase market reach. A literature review of goods purchased by luxury consumers aided in identifying alternative purchasing options that may be able to crossover to the imported luxury vehicle consumer. Some of the alternative purchasing options to be tested are: the internet channel (Dimoka et al., 2012; Okonkwo, 2009), door-to-door selling (Sanghavi, 1990), and pop-up stores (Hollwich, 2015).

To study the influences of the alternative purchasing options, choice experiments were employed. Surveys were emailed to 17,338 persons of driving age who initiated

contact with a luxury imported dealership in the greater Philadelphia, PA area. The units of analysis for those surveyed are a seven-point Likert scale, binary response, and multiple choice. The survey will consist of questions regarding the effect of distance decay as measured by time, alternative purchasing options, temporary/mobile locations, experience centers, and non-traditional facilities.

The third element of the study is a framed field experiment (FFE) to determine the viability of a non-traditional facility. It may appear that surveying individuals and then employing a framed field experiment to study non-traditional facilities is redundant. The logic behind this strategy is: a participant in a survey may indicate they prefer a particular alternative, but that does not mean they will actually act on that alternative (Tversky & Kahneman, 1981). Advantages of the FFE are that it is conducted in a natural environment, there are resources involved, and clients will accept or reject the concept of purchasing from a non-traditional facility (List, 2011).

The experiment was conducted for seven months. The facility for this experiment is a former automotive showroom. Except for senior management, the staff and the clients are not aware they are participating in an experiment. The rules of engagement with a client are different than a traditional dealership. Some of the unique elements of the customer experience at the non-traditional facility are: no vehicles on display, no new vehicle test drives, method or scenario selling as compared to vehicular selling, and that all vehicles must be leased and not purchased. Both consummated sales and lost sales were tracked.

This work makes several contributions to theory. First, while there is literature on the effects of distance decay in marketing, this study is the first to consider the effects of distance decay on luxury automobile sales. Second, the retail automotive industry has high barriers to entry in the form of state law, manufacturers' sales and service agreements, and high cost. Historically, these barriers have made it difficult to introduce alternative purchasing options. This study identifies and tests alternative purchasing options, which will increase in market reach. Third, the reduction of barriers to entry allows for the entry of pop-up and other alternative location solutions, which can create consumer surplus through lower cost, greater purchasing flexibility, and more choices.

### Research Motivation

Bicycle manufacturers and retailers were some of the first vendors to realize the automobile's potential in the United States. The first formal franchise agreement was signed in 1898 between a Pennsylvania bicycle dealer and the Winston Motor company (Biller, Chan, Simchi-Levi, and Swann, 2005). This first franchise agreement assigned car dealers exclusive territory; the dealers would provide "adequate service and suitable facilities." In exchange, the manufacturer sold discounted vehicles to the dealer who, using a price set by the manufacturer, would then sell vehicles to the consumer. In this agreement, the dealer would advance large sums of money to the manufacturer before the car was even produced (Biller et al., 2005).

The balance of power shifted as the industry grew, manufacturers became more powerful, and state legislatures passed laws to protect dealers from unfair manufacturer competition. One of the laws prohibited manufacturers from selling directly to the retail public; a second law established proximity distances between same brands (Biller et al., 2005). For example, in a metropolitan area in Pennsylvania dealers representing the same brand must be at least 10 miles apart (Pennsylvania Dealer Code, Section 26a. known as a “relevant market area”).

There are some exceptions to this rule. For example, a dealership can relocate within two miles of their current location without approval provided it is in their area of responsibility; also, a retailer can encroach in the 10-mile area if the existing retailer agrees. Most states do not limit the number of retail franchises of the same brand as long as there is not a conflict in relevant market areas. It is also important to note that relevant market areas only refer to the same brand. Competitive brands may be located in the same relevant market area (e.g., BMW and Audi).

To combat individual state franchise agreements, manufacturers require that all automotive retailers (dealers) sign a “Dealer Agreement,” sometimes called a “Sales Agreement,” that dictates terms between the manufacturer and retailer. The main elements of the agreement are facility representation (subject to change every 10 years), sales effectiveness, customer satisfaction, employee training, and others. A Dealer Agreement is different from franchise agreement and is not governed by any state. In the dealer agreement, a retailer is assigned an area of influence (AOI) or area of

responsibility (AOR). An automotive manufacturer assigns AOIs and their retail representatives (According to the Standard Dealer Agreement). As long as it is outside the relevant market area of a retailer of the same brand, the manufacturer will not violate state automotive franchise laws. Thus, a manufacturer is motivated to open as many AOIs as a market area can economically support. Once a market is mature, new AOIs are rarely added (i.e., “open points” in the industry) or existing retailers rarely relocate outside their current AOI. Due to market saturation and individual state’s laws, manufacturers rely on retail facility improvement to gain a competitive advantage in a mature market place.

Many manufacturers require significant facility upgrades every 10 years.

Upgrades range from remodeling to relocating in the same market area, which often includes purchasing land for a new facility. The manufacturer determines the design and the acceptable location. For example, there are seven Audi retailers representing the Philadelphia market. Four of the seven retailers must relocate to new facilities at a total estimated cost of \$52 million. A fifth retailer has two years to relocate to a new facility. The manufacturers hire design firms to determine which design best represents the brand, and also hire firms whose specialty is locating the best location in a market area.

It is critical to stress the importance, expense, and difficulty of finding the right location for a retail automotive operation in a market area. Presumably, a well-executed facility design and ideal location would guarantee competitive success; the data indicates otherwise.

This study focuses on imported luxury cars (i.e., import high group (IHG)). The leading brands in this segment are Mercedes Benz, BMW, Lexus, and Audi (Online WSJ, December 2, 2014). On average, 53% of their sales are from previous customers; the balance comes from other brands' customers who transfer their loyalties (Polk, 2013). As a group, they represent 68% of all the vehicles sold in the segment. This study will suggest increasing sales' effectiveness by reducing distance decay (i.e., increasing market reach) by using temporary retail facilities (pop-ups), remote service facilities, mobile dealerships, mobile maintenance, and home and/or office visits. The type of approach will depend on the situation. For example, in Pennsylvania a temporary retail facility must be within 20 miles of a retailer's existing location and there are a limited amount of days in a year that a temporary retailer can operate. If a potential market area is outside of the 20-mile limit, then it is not possible to serve this market with temporary facilities. This research studies temporary retail facilities, remote service facilities, and home and office visits.

As already noted, *distance decay* is defined as: the interaction between two locations declines as the distance between them increases (Nekola & White, 1999). A *prospect* is someone who has identified their interest in purchasing a car by inquiring via email, telephone, or physically entering a dealership and is qualified on the basis of his or her buying authority, financial capacity, and willingness to buy (According to the Business Dictionary). An *experience center* is a location that allows potential consumers

to interact with brands on their own terms without the pressure of hard-sell tactics that may be encountered in a traditional dealership (Elisano, 2016).

### Conceptual Model and Hypotheses

As has been described above, there is good reason to suppose that distance decay has a significant impact on luxury automobile sales. Further, because of this effect, and the low loyalty rates that have been observed, I believe that close substitutes for luxury vehicles are often purchased.

There are other factors strongly influence luxury automobile sales. Unlike other luxury goods, I believe there is no flagship effect in the auto market. The use of alternative sales techniques, such as concierge selling (door to door), pick-up and delivery services, and an Internet channel, can increase total sales. I summarize this argument with the following hypotheses below:

- Hypothesis 1a: As the distance in miles between an automotive facility and a consumer's residence increases the rate of sale decreases.
- Hypothesis 1b: As the duration in time between an automotive facility and a consumer's residence increases the rate of sale decreases.
- Hypothesis 2a: Selling and servicing by appointment at a prospect's home or office can decrease the rate of distance decay.

- Hypothesis 2b: The internet and experience centers can be a substitute for a dealership.
- Hypothesis 3: A Pop-up (temporary) facility can be a substitute for a dealership.
- Hypothesis 4: When one or more brands are seen as close substitutes, the consumer will choose the brand with the closest dealership to their residence.

## CHAPTER 2

### LITERATURE REVIEW

There is little research that addresses the effects of time and distance as it relates to an increase in owner loyalty and sales effectiveness in the automotive industry. Therefore, research for this study involved the review of articles that explored: automotive retail personnel, superior service and its relationship to loyalty, luxury brand flagship stores, GIS (geographic information system), luxury branding, street vendors, luxury brands on the Internet, dynamic pricing, virtual dealerships, eBay auctions, market barriers, brand identity, non-store retailing, and pop-ups.

#### Dealership Personnel

J.D. Power and Associates reported that more than a quarter of prospective customers who leave a dealership without buying do so primarily because they do not like the way the sales staff handled their business. About 50% of shoppers that leave a dealership unhappy with their sales experience do not buy from another dealer selling the same brand. Salespeople are an important link between the manufacturer and consumer; their attributes should increase influence customer satisfaction and future sales (Darley, Luethge, and Thatte, 2008). Darley et al. (2008) also note that dealership service provisions are positively related to customer satisfaction, which in turn, is positively related to repatronage intentions.

Customers that believe the service provider is acting in their best interest (caring about their well-being and desired outcomes) and supportive (offering meaningful resources) are more likely to respond in kind, and in doing so contribute resources and commit to the relationship (Karpena et al., 2011). A dealership's sales personnel is a key driver that determines if a consumer purchases a particular brand. If a customer perceives that a dealership has his or her best interest in mind they are likely to continue the relationship.

### Flagship Stores

Luxury fashion retailers share the same demographics as imported luxury vehicles. In addition to demographics, luxury fashion retailers also believe in the importance of flagship stores. Flagship stores are publicity vehicles; they are not required to show a typical return on investment (Doyle and Moore, 2004). Doyle and Moore describe this as the "Cinderella part of the international network" (2004). These stores are distinguished from the rest of the international luxury fashion network by their scale, design, location, set-up, and operating costs (Doyle and Moore, 2004). They specifically showcase the brand and support the whole network. Flagship stores justify their high costs by claiming that they contribute to the identity and prestige of the luxury brand (Doyle and Moore, 2004).

There is an important distinction between flagship stores in the automotive sector as compared to luxury fashion. In the automotive sector, all stores are flagship stores and are owned by the retailer. In general, they are not supported by less expensive satellite

stores in contiguous markets. In the luxury fashion network, there are few flagship stores, they are located in a few major cities, and they are owned by the manufacturer. It could be argued that a flagship store in automotive retailing is not considered a flagship store because nearly every automotive facility is a flagship and therefore there is not a halo or differential effect as in fashion retailing. In a study of shopping malls it was found that the attractiveness of shopping malls can reduce the effect of distance decay (Drezner, 2006). It is doubtful that attractiveness could have a similar effect on automotive retailing because of facility design is mandated by the respective automotive manufacturers. They could act as flagship stores in the sense that they generate publicity, but there are extenuating factors that diminish this effect. One extenuating factor is that all luxury dealerships are similarly luxurious. It is important to note luxury stores are differentiated from other (non-luxury) dealerships but not differentiated from other automotive luxury brands.

## GIS

The research motivation section noted that the manufacturer employs experts to calculate the optimal location for a dealership, and that the greater the distance, in time and mileage, a prospective consumer has to travel the less likely they are to make a purchase. Birkin, Clarke, and Clarke (1999) found that a vast majority of service organizations will struggle to provide market share estimates for major cities within regions. They go on to state the distance decay effect of each dealer is also evident. They studied this phenomenon in the U.K. and Puerto Rico, and found the same relationship

(distance decay) between market share and dealer location. The study performed by Birkin et al., refers only to service organizations. The present study adds to the existing literature because it encompasses the sales, service, and parts departments of imported luxury automobiles.

If there are more than two facilities in the area, the probability that a consumer will purchase from a particular dealership can be calculated by a multivariate normal distribution (Drezner, 1996). Drezner further recommends that one uses drive times when dealing with shorter distances, which enables more accurate modeling. While this may work for shorter distances it does not hold true for longer distances (1996). If longer distances are part of a data set then a hybrid approach is recommended (1996).

In greater Seattle, Toyota identified that the market was not being adequately served. Toyota added two dealerships in optimal locations; potential financial benefits were estimated to be in the hundreds of millions of dollars (Birkin et al., 1999). In this instance, a manufacturer added two more retailers into a growth market area. These two additions increased the market reach and the distance decay effect was reduced. For example, prior to opening two new locations, Toyota's market effectiveness began to decrease at a 12-mile radius from Seattle's city center; after opening of the stores, their market effectiveness does not begin to wane until 26 miles from the city center.

### Luxury Branding

In marketing literature, luxury goods are defined as goods such that the mere use or display of a particular product brings the owner prestige apart from any functional

utility (Han et al., 2013). Luxury goods can be conceptualized as different from normal or non-luxury goods by the extent to which they exhibit a distinctive mix of three important dimensions of instrumental performance in terms of functionalism, experientialism, and symbolic interactionism (Vickers and Renand, 2003). In economic terms: a luxury good has an upward sloping Engel curve indicating that as income increases, a greater proportion is spent on these goods (Vickers and Renand, 2003). Markets for luxury goods are attractive targets because of premium pricing. In the automotive sector, mass market manufacturers are attracted to the premium prices that are enjoyed (or perceived to be enjoyed) by luxury automotive manufacturers. In the last 40 years, Toyota entered the luxury segment by introducing the Lexus, Nissan marketed the Infiniti, Mazda attempted to enter with the Amati, and Hyundai is introducing more luxurious vehicles in the same name plate with their Genesis. Total vehicle sales in 2014 were 16.2 million; sales increased to 17.44 million in 2016, of which 1.63 million were imported luxury vehicles (NADA Market Beat, January 2016). In a speech by Scott Keogh, President of Audi of North America, at the 2017 national meeting for U.S. Audi franchise owners, he stated that in 2020 approximately 2 million imported luxury vehicles are expected to be retailed in the United States. Interestingly, while mass marketers are introducing new premium-priced vehicles, the luxury marketers are adding lower-priced vehicles to their portfolios (e.g., Audi A3, A Class Mercedes, and BMW 1 Series).

According to Keller (2009), luxury brands (as compared to other types of brands) are valued for their intangibles. It is also imperative that the more direct performance

considerations are of sufficiently high quality to match or exceed customer expectations. Luxury brands must not raise any doubts in customers' minds as to the merits of their purchase. Because of these high expectations, all aspects of purchase and consumption experiences impact the buying decision—pressuring marketers of luxury brands to achieve flawless value delivery. Atwal and Williams (2009) also speaks to the importance of experience when they write, “The marketing of luxury goods has become increasingly complex, being associated not only with conveying an image of quality, performance and authenticity, but also with attempting to sell an experience by relating it to lifestyle constructs of consumers.” Keller (2009) also notes that a strong brand can be viewed as a promise to consumers. If a brand is a promise, the luxury brand is a big promise, as expectations are typically high.

Luxury goods are regarded as sensory and emotional in nature—visuals, smells, touches, and feelings are imperative to selling luxury goods. These factors could imply that luxury goods are unsuitable to be retailed on the internet (Okonkwo, 2009). The reality is some luxury goods can be successfully positioned online. Several luxury brands have adopted e-Retail (retail online purchase) and identified this channel as one of their fastest growing distribution channels (Okonkwo, 2009). For example, Louis Vuitton launched the Sound Walk and Giorgio Armani reconstructed its Milan flagship store in the virtual world, Second Life (Okonkwo, 2009). Gucci has made Amazon.com its official authorized online retailer (Adams, 2013).

Amazon and Costco have turned the luxury world upside down. It is possible to buy a diamond ring online from Costco for \$429,999 (Costco.com, 6/25/15). Consumers can buy a Rolex from Amazon; there are 322 watches with a price range from \$4,800 to \$38,900 and get free shipping (Amazon.com 6/25/15). The average income of Costco's customers is \$100,000 (Ryssdal, 2015). Amazon customers with a household income of \$500,000 or more are likely to buy designer or luxury brands; 28% of them report they purchased a luxury product from one or more retailers (through Amazon) in the past year (Loechner, 2014).

#### Street Vendors, Pop-Up Stores, and Non-Store Retailing

It would appear odd to include street vendors and pop-up stores in a paper whose dominant theme is selling luxury vehicles. An informal sector is defined as workers and enterprises that are not under government regulation (e.g., not paying income taxes). Because the informal sectors successfully avoid control by the state they have more freedom and flexibility. Open-air markets have become more popular as luxury niche markets present problems for formal sectors (Cross, 2000). This paper does not condone illegal activity, rather, it explains the increase and viability of alternative sources of retailing luxury goods.

When discussing pavilions and pop-ups Hollwich (2015) writes,

Today the marketing teams behind both major and emerging brands use pavilions and pop-ups as a unique way to raise awareness, communicate with their audience, and ultimately generate sales. Pop-ups and pavilions allow commercial structures to occupy spaces that otherwise would be off limits. Temporary structures can inhabit public plazas, museum

courtyards, rooftops, and national parks. Depending on the project and as long as there is a safety strategy developed, the temporary building might not be required to comply with all building codes. A building that is used for a temporary period adds a sense of urgency—a fundamental ingredient in sales and marketing. Range Rover was exhibited for two days only, but was part of a social media campaign that lasted more than a month.

Every once in a while, entire temporal projects or elements thereof, live beyond their initially-planned period. The Eiffel Tower, is one such example, which was originally created for the sole use of the 1889 Exposition Universelle in Paris. Its expected lifespan was only 20 years. Yet, more than a century later, it has contributed more than \$558 billion to the national economy of France (Hollwich, 2015).

In Japan, non-store retailing is changing the function of retailing. It is perhaps introducing a new level of convenience into customers' lives, making a difference as to how retailers market their goods. Non-store retailing helps retailers diversify into, what is normally, non-retailing areas. The Japanese non-store retail sector reached nearly 3 three trillion yen in 1985. The dominant non-store retailing activities in Japan are catalog sales (mail order) and door-to-door selling (Sanghavi, 1990). In the United States, we use temporary facilities (farmers markets, street vending, and pop-ups) and selling door-to-door when a facility is not part of the sales process. Some of the advantages include: less restrictions in building codes, lower costs, and the ability to reach markets that are not normally economically feasible to reach.

## Barriers

Every state's automotive franchise laws restricts the location or relocation of a dealership in a defined market area. As earlier noted, in Pennsylvania's metropolitan areas, an automotive manufacturer cannot locate a dealership within 10 miles of an existing dealership selling the same brand. Infrequently, 2 dealerships are located in a 10-mile limit. With state approval, a dealership may relocate in the same area of responsibility, but must be more than 5 miles from the nearest dealership selling the same brand (Board of Vehicles Act, Pa.).

Parker, Don, and McLoughlin (2010) define a retail market barrier as, "any circumstance that gets in the way of the natural propensity individuals may have to purchase a desired brand. They further note that market barriers may dictate that brand-loyal behavior may be manifested toward *a* preferred brand rather than *the* preferred brand." (Parker et al., 2010). No matter how brilliant the marketing communications about a brand may be, even for a superior product or service, market barriers can still prevent a brand's success. Availability, price position, and product range make up 2/3rds of automotive market barriers (Parker et al., 2010). Parker et al., (2010) states that "about 90% of a brand's perceived barriers can be overcome by developing marketing strategies that explore and address what the consumer wants."

To buy a new vehicle via the internet, there are at least two barriers. One, is that the product cannot easily be described via internet interface (test drive) (Dimoka, Hong, and Pavlou, 2012); secondly, most retailers' websites do not offer an online purchase.

Parker's et al., (2010) findings refer to the effect of distance, in time or miles, and a consumer's willingness to substitute (manifesting toward *a* preferred brand rather than *the* preferred brand). We must remember that the phrase "location is everything" is misleading. Other factors need to be considered, such as close substitutes in a relative market area and that a consumer could perceive a location to be a reason to purchase or not to purchase.

#### Internet and Virtual Dealerships

Earlier Dimoka et al., (2012), discussed two barriers to purchasing new vehicles online. When discussing pre-owned vehicles they note that, "eBay motors has an annual volume of over 1 million pre-owned vehicles sold per year on the internet". They claim (at least, with pre-owned vehicles) that the internet enables buyers and sellers to overcome geographical and temporal barriers. Online markets can also improve social welfare with lower prices, greater product selection, and higher efficiency than offline markets.

The improvement of social welfare through lower prices is not available to new vehicle purchasers at this time because automotive retailers block direct selling by the manufacturers through legal and institutional barriers (Urban and Hoffer, 2003). Retailers would be at an economic disadvantage (on average the manufacturer would have a 15% price advantage) due to the costs of buying a vehicle from the manufacturer and of doing business. On average a high-performing luxury retailer earns only 3% return on sales (NCM 20 Group Composite, 2015). There are viable alternatives in luxury retail to

increase market performance: using the internet as a buying option and not as marketing (Louis Vuitton and Giorgio Armani); pick-up and delivery (Japanese door-to-door selling); and temporary retail locations have shown they can increase the market reach of traditional retailing.

## CHAPTER 3

### METHODOLOGY

To study the effect of distant decay on consumer preference for imported luxury vehicles (Hypotheses 1a and 1b), we consider one dependent variable and, as many as, six independent variables. The dependent variable is unit sales divided by the demographic group (number of households with family income greater than \$145,000) in the population of a ZIP code (Sales/Household demographic). This is to control for differing income distributions in the population of a ZIP code. This study examines why sales effectiveness is reduced as distance increases from the center of a ZIP code to a dealership. The first independent variable is driving distance from the physical location of the target import high group dealership (hereafter known as Wynnewood) to the center of a ZIP code. The second independent variable is driving time from the center of a ZIP code to the physical location Wynnewood. The third independent variable is a retailer's rank within the top 20 import high group to the center of a ZIP code by distance measured by miles. The fourth independent variable is an Audi retailer's rank amongst Audi retailers within the top 20 IHG retailers to the center of a ZIP code by distance measured in miles. The fifth independent variable is a retailer's rank within the top 20 import high group retailers to the center of a ZIP code as measured by time. The last variable is an Audi retailer's rank amongst the Audi retailers within the top 20 IHG to the

center of a ZIP code by time. The closest dealership to the center of ZIP code receives a ranking of “one.” The rankings in this variable are ordinal data.

In addition to prospects, unit sales, and ZIP codes, other data was collected, such as: driving distance from center of a ZIP code to Wynnewood. Google Maps was used to determine the miles driven from the center of a ZIP code to Wynnewood and from the center of a ZIP code to Wynnewood. U.S. census data was used to determine the number of households within a ZIP code. A household is defined as the number of unique families in a ZIP code as measured by the 2014 estimated U.S. census. The number of unique households in a ZIP code whose total income is \$145,000 or more is the targeted demographic in a ZIP code (household demographic). To normalize the effect of the number of prospects in a ZIP code, prospects are divided by the number of unique households with earnings of \$145,000 or more (sales/household demographic). To normalize the effect of the number of vehicular sales in a ZIP code, units sold are divided by the number of unique families with earnings of \$145,000 or more (sales/household demographic). Household demographic is the number of households that have earnings of \$145,000 or more.

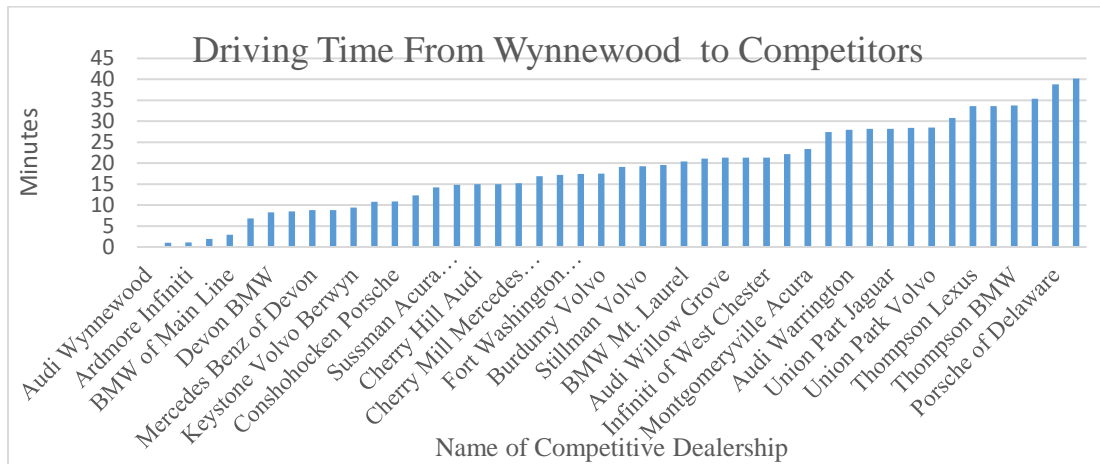
Data collected for sold vehicles, and ZIP codes came from Wynnewood’s contact management software. Data collected for driving distance and driving time came from Google Maps. Among the options presented by Google Maps to determine driving distance (DD) and driving time (DT), the shortest route and least time was selected. To determine Wynnewood’s proximity to a consumer’s ZIP code relative to an import high

group competitor, Google Maps was used. The number of import high group retailers within 50 miles of the data set ZIP code is 54 (see Figure 1) and was determined by a Google search.



**Figure 1: Imported Luxury Car Dealerships within 50 Miles of Wynnewood**

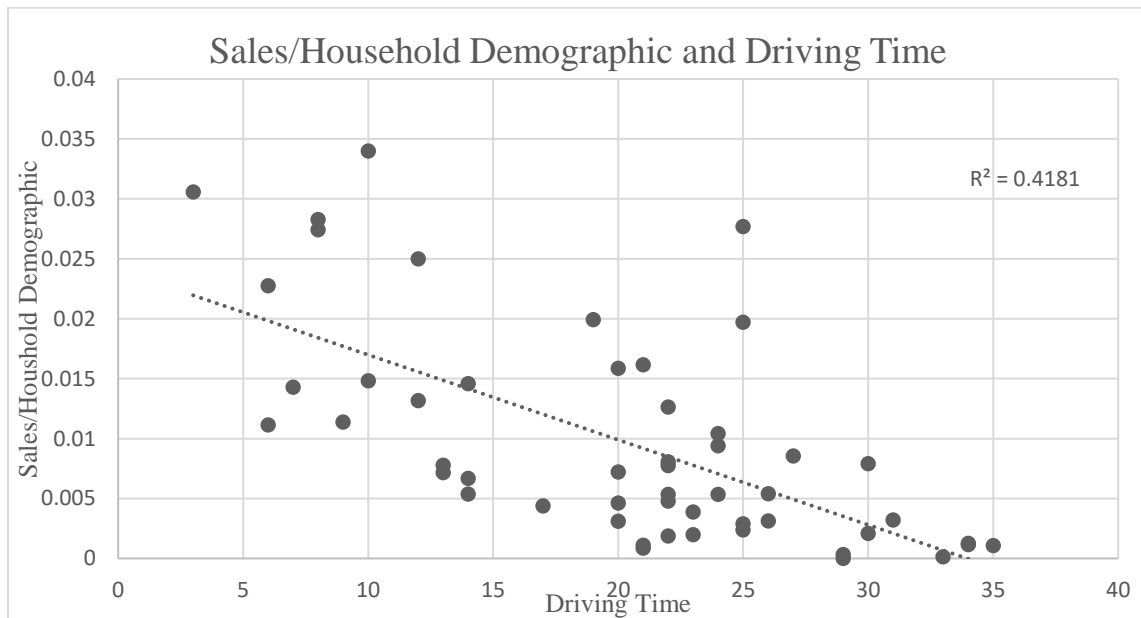
Figure 2 illustrates the distance traveled by time from the location of Wynnewood to the dealerships in the competitive set. All of the retailers are within 45 minutes of driving time to Wynnewood.



**Figure 2: The Driving Times from Wynnewood to its Competitors in the Study**

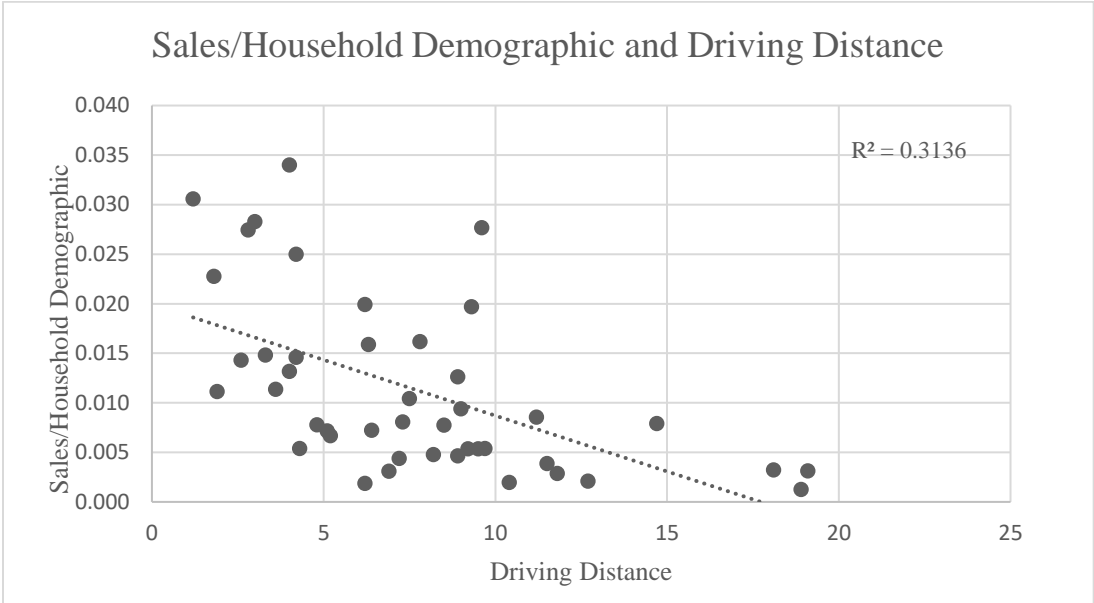
To control for the variability of a demographic population in a ZIP code (the lowest was 96 and the highest was 6,644), unit sales were divided by the demographic population.

Figure 3 is a scatterplot of Sales/Household demographic on the y axis and driving time on the x axis. The sample population is 51 and has an  $r^2$  value is 0.4181



**Figure 3: Scatter Plot of Sales/Household Demographic versus Driving Time**

Figure 4 is a scatterplot of Sales/Household demographic on the y axis and driving distance on the x axis. The sample population is 51 and has an  $r^2$  value is 0.3136



**Figure 4: Scatter Plot of Sales/Household Demographic versus Driving Distance**

The analysis of the data for Wynnewood is least squares regression (OLR). In this analysis the independent variable is Sales/Household demographic and the independent variables are driving distance and driving time. The results are below in Table 1.

Wynnewood's Summary Output

<i>Regression Statistics</i>	
Multiple R	0.7559729
R Square	0.5714950
Adjusted R Square	0.5536406
Standard Error	0.0054967
Observations	51.0000000

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	0.001934193	0.000967097	32.00868226	1.46873E-09
Residual	48	0.001450251	3.02136E-05		
Total	50	0.003384445			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Sales/Household Demographic	0.02209209	0.002350646	9.398303772	1.8554E-12	0.017365797	0.026818379	0.017365797	0.026818379
Driving Distance	0.00025447	0.000296612	0.857927933	0.395195976	-0.000341907	0.00085085	-0.000341907	0.00085085
Driving Time	-0.00070077	0.000219024	-3.199537655	0.002440342	-0.001141151	-0.000260398	-0.001141151	-0.000260398

***Table 1: Distance Decay Effect for Sales/Household Demographic for Wynnewood with the Independent Variables, Driving Distance and Driving Time***

The  $r^2$  value is 0.571, which is larger than the critical value at the 5% level of 0.24 ( $n = 51$  and  $k = 6$ ) indicating that the model is significant. The intercept is significant because of its very small p-value (Siegel, Table 12.1.8, 2012). It could be concluded that driving distance (DD), driving time (DD), import high group rank in distance (IHGRD, Audi rank in distance (ARD), import high group rank in time (IHGRT, and Audi rank in time (ART) explain about 57.1% of the variation in vehicle sales of a ZIP code. In addition to the  $r^2$  value the F statistic is 32.008 which is higher than the F table value (between 5.122 and 4.372). Therefore, the F statistic also confirms that the model is significant. The independent variable, driving time is very significant with a p-value of 0.002. The independent variable, driving distance is not significant with a p-value of 0.395. In figures 3a and 3b it can be observed that there is a negative relationship between sales/household demographics (intercept) and both independent variables (driving time

and driving distance). This appears to indicate that driving distance does have an effect on sales/household demographic. To further test the relationship 4 more independent variables will be added to a new Wynnewood analysis. Those independent variables are: Wynnewood's import high group rank in distance from the center of a ZIP code, Wynnewood's rank in distance amongst other Audi dealerships from the center of a ZIP code, Wynnewood's import high group rank in time driven from the center of a ZIP code, Wynnewood's rank in time driven amongst other Audi dealerships from the center of a ZIP code. Table 2 identifies the dependent and independent variables and a description of each variable.

Variables	Description of Variables
Sales/Household Demographi (DV)	Sales divided by the households in the demographic population
Driving Distance (IV)	The distance in miles driven from the center of a ZIP code of acustomer of WW
Driving Time (IV)	The distance in driving time from the center of a ZIP code of a customer of WW
IHG Rank by Miles (IV)	WW's rank among the top 20 IHG retailers to the center of a ZIP code by miles
Audi Rank by Miles (IV)	WW rank within Audi retailers to the center of a ZIP code by miles
IHG Rank by Time (IV)	WW's rank among the top 20 IHG retailers to the center of a ZIP code by time
Audi Rank by Time (IV)	WW's rank within Audi retailers to the center of a ZIP code by time

***Table 2: Wynnewood's Description of the Variables for the Regression Analysis***

Table 3 is the regression analysis for Wynnewood when independent variables increase to 6 as identified in Table 2.

Wynnwood Summary Output

<i>Regression Statistics</i>	
Multiple R	0.794455064
R Square	0.631158849
Adjusted R Square	0.580862328
Standard Error	0.00532644
Observations	51

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	6	0.002136122	0.00035602	12.54875768	3.41736E-08
Residual	44	0.001248322	2.8371E-05		
Total	50	0.003384445			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.021404756	0.002452984	8.726006657	3.75022E-11	0.016461091	0.02634842	0.016461091	0.02634842
DD	-0.000041377	0.000369915	-0.111854392	0.911447584	-0.000786891	0.000704138	-0.000786891	0.000704138
DT	-0.000254429	0.000296206	-0.858959794	0.395018224	-0.000851394	0.000342535	-0.000851394	0.000342535
IHG Rank Miles	0.000217721	0.000528308	0.412110611	0.682259295	-0.000847014	0.001282457	-0.000847014	0.001282457
Audi Rank Miles	0.001345687	0.00215824	0.623511448	0.536167536	-0.003003959	0.005695333	-0.003003959	0.005695333
IHG Rank Time	-0.000516154	0.000464585	-1.111000086	0.272602666	-0.001452464	0.000420156	-0.001452464	0.000420156
Audi Rank Time	-0.002274286	0.002302871	-0.987587073	0.328754857	-0.006915418	0.002366846	-0.006915418	0.002366846

***Table 3. Distance Decay Effect for Sales/Household Demographic for Wynnwood with 6 Independent Variables***

The  $r^2$  value is 0.631, which is larger than the critical value at the 5% level of 0.24 ( $n = 51$  and  $k = 6$ ) indicating that the model is significant. The intercept is significant because of its very small p-value (Siegel, Table 12.1.8, 2012). It could be concluded that driving distance (DD), driving time (DD), import high group rank in distance (IHGRD), Audi rank in distance (ARM), import high group rank in time (IHGRT, and Audi rank in time (ART) explain about 63.1% of the variation in vehicle sales of a ZIP code. In addition to the  $r^2$  value the F statistic is 12.55 which is higher than the F table value (between 5.122 and 4.372). Therefore, the F statistic also confirms that the model is significant. It could be concluded that these independent variables have a very high impact on the dependent variable. It can also be concluded that none of the independent variables are significant.

To test the model a series of predictive equations will be used to further test the effects of distance decay.

The regression equation is  $\text{Sales/Household demographic} = 0.021404756 - 0.000041377(\text{DD}) - 0.000254429(\text{DT}) + 0.000217721(\text{IHGRM}) + 0.001345687(\text{ARM}) - 0.000516154(\text{IHGRT}) - 0.0002274286(\text{ART})$ .

Two examples of distance decay's effect on sales, include: (1) Retailer 1 is nearer and dominant for a particular ZIP code (19096). For this example, this research will use the following values:  $\text{DD}=1.5$ ,  $\text{DT}=6$ ,  $\text{IHGRM}=1$ ,  $\text{ARM}=1$ ,  $\text{IHGRT}=1$ ,  $\text{ART}=1$ . Entering these values into the regression equation,  $\text{Sale/Household demographic} = 0.018588966$ .

This indicates that the example dealership sells 1 vehicle for every 54 households annually in the demographic group (households whose annual income exceeds \$145,000) of a ZIP code. (2) Retailer 2 is farther away and not dominant for a particular ZIP code (19096). The values are:  $\text{DD}=10$ ,  $\text{DT}=22$ ,  $\text{IHGRM}=8$ ,  $\text{ARM}=2$ ,  $\text{IHGRT}=11$ ,  $\text{ART}=3$ .

Entering the new values into the regression equation,  $\text{Sales/Household demographic} = 0.007325901$ . This result indicates that Retailer II retails 1 vehicle for every 136 households annually in the demographic group of the ZIP code. These examples illustrate the nature and practicality of the model.

Above, I used the regression equation to predict the sale value based on miles driven, driving time, import high group rank in miles, Audi retailer ranking in miles, import high group rank in time, and Audi rank in time for a retailer similar to those in Wynnewood's data set. The standard error for Wynnewood is 0.00532644. This indicates that most

values should be within 0.00532644 of the predicted Sales/Household demographic. The standard error estimate indicates the approximate size of the prediction errors. By comparing the standard error to the degree of the predicted Sales/Household demographic it can be observed that the standard error is a significant proportion of the predicted Sales/Household demographic. This indicates there is a large amount of variability in the data, though not an unmanageable amount. Below, in Table 4, are the actual, predicted, and residual values (residual values are the difference between the actual sales and predicted sales).

<b>ZIP</b>	<b>Sales/Household Demographic (actual)</b>	<b>Sales/Household Demographic (predicted)</b>	<b>Prediction Error (residuals)</b>
19096	0.028315946	0.019364784	0.0089512
19072	0.027624309	0.017728001	0.0098963
19041	0.025125628	0.017122861	0.0080028
19003	0.023750000	0.017681372	0.0060686
19123	0.023668639	0.008934394	0.0147342
19035	0.022696929	0.016055491	0.0066414
19106	0.019249278	0.009680682	0.0095686
19131	0.018927445	0.016660631	0.0022668
19010	0.01691240	0.018338809	-0.0014264
19103	0.015843998	0.012148919	0.0036951
19004	0.01470588	0.017714608	-0.0030087
19066	0.011566772	0.018274099	-0.0067073
19083	0.010752688	0.017492749	-0.0067401
19428	0.010512484	0.008502837	0.0020096
19146	0.008576329	0.011358977	-0.0027826
19145	0.008391608	0.013299114	-0.0049075
19147	0.008354756	0.004455873	0.0038989
19130	0.008094187	0.009124738	-0.0010306
19085	0.007829978	0.011872776	-0.0040428
19107	0.007490637	0.010178639	-0.0026880

***Table 4: Sample of Prediction Error for the Top 20 Sales/Household Demographic (51 in total)***

Examining the difference from the actual results and the predicted results for the 51 ZIP codes it can be observed that 74% of the residuals are within the standard error of 0.00532644. This means that the expected normal rate of 66.67% is exceeded and the error distribution is normal. Another way to discover the effectiveness of the prediction is to measure how far off are the predictions in terms of a relative value. This is known as the percentage error. For each data point the residual error is divided by actual Sales/Household demographic. For ZIP code 19096 the data point is 0.316 (0.0089512/0.028315946). For this data point the predicted Sales/Household demographic is off by 31.6%. For this analysis the top 20 ZIP codes are used and they represent 70.50% (350/496) of total sales within the 51 ZIP codes. By averaging the percentage error of the 20 ZIP codes a mean percentage error is calculated. The mean percentage error for this analysis is 35.4%.

To further test Hypotheses 1a and 1b a second and third analysis of the ZIP codes are carried out. The second analysis is performed using the same ZIP codes as Wynnewood, but using the data from an Audi dealership that is 7.31 miles in Euclidian distance, 9.8 miles in driving distance, and 23 minutes in driving time from Wynnewood. They both have similar sales in the time period measured, have the same ownership, and have the same systems and procedures. This dealership will be identified as Conshohocken. In Table 5 the third analysis will combine data from Wynnewood and Conshohocken and analyze the data for confirmation of hypotheses 1a and 1b.

## CA SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.53211828
R Square	0.28314986
Adjusted R Square	0.18539757
Standard Error	0.00572795
Observations	51

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	6	0.000570216	9.5036E-05	2.896605912	0.018153758
Residual	44	0.001443616	3.2809E-05		
Total	50	0.002013833			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Sales/Household Demographic	0.0162758	0.003301342	4.93005545	1.21434E-05	0.00962238	0.0229292	0.00962238	0.02292921
Driving Distance	0.00055404	0.00046905	1.18118664	0.24387395	-0.00039127	0.0014993	-0.0003913	0.00149934
Driving Time	-0.0004849	0.000356295	-1.3610623	0.180424484	-0.001203	0.0002331	-0.001203	0.00023313
Import High Group Rank Distance	-0.0007771	0.000560055	-1.3876045	0.172245329	-0.00190585	0.0003516	-0.0019059	0.00035158
Audi Rank Distance	0.00063741	0.002341118	0.27226539	0.786691589	-0.00408081	0.0053556	-0.0040808	0.00535562
Import High Group Rank Time	0.00026531	0.000417181	0.63595291	0.528101363	-0.00057547	0.0011061	-0.0005755	0.00110608
Audi Rank Time	-0.0013249	0.001763666	-0.7511972	0.456533094	-0.0048793	0.0022296	-0.0048793	0.00222957

**Table 5: Distance Decay Effect for Sales/Household Demographic for Conshohocken**

For Conshohocken the  $r^2$  value is 0.28, which is smaller than the  $r^2$  for WW.

Nevertheless the model for Conshohocken is still significant (but not as significant as the Wynnewood value) since it is greater than 0.24 which is the minimum critical value for the  $R^2$  Table Level 5%. The intercept is significant because of a p-value of .000012. The regression equation is Sales/Household demographic=0.016275797+0.000554035 (DD) – 0.000484939(DT) -0.000777135(IHGRM) + 0.000637405 (ARM) – 0.000265307 (IHGRT) – 0.001324861 (ART).

Three examples of distance decay's effect on a sale, include: (1) Retailer Conshohocken is nearer and dominant for a particular ZIP code (19428). For this example, this research will use the following values: DD=2.1, DT=6, IHGRM=1, ARM=1, IHGRT=1, ART=1. Inserting these values into the regression equation,

Sales/HD. The predicted Sales/HD for this equation has a value of 0.01333035. In terms of sale per household it is 1 sale for every 75 households. In the second example Conshohocken is farther in distance driven and time traveled (DD=10.7, DT=21) and dominant (IHGRM=1, ARM=1, IHGRT=1, ART=1). The predicted sales value decreases to 0.010821. In terms of sales per household, it is 1 sale for every 92 households. This represents a 23% decrease in Sales/Household demographic per year. If driving distance and driving time remain the same as the previous example (10.7, 21) but becomes less dominant (IHGRM=13, ARM=3, IHGRT=12, and ART=2) the predicted Sales/Household demographic for this most recent equation becomes 0.0037263. This last result is 357.74% worse than the initial scenario and 290.4% worse than the second example. In terms of sales per household, it is 1 sale for every 273 households. Table 6 demonstrates the effect on annual sales (Sales Effect is calculated as Sales/Household demographic x Average Household demographic) for the three examples.

		Sales/Household Demographic	Average Household Demographic	Effect on Annual Sales
Example 1	Nearer & Dominant	0.013330	1793	24
Example 2	Farther & Dominant	0.010821	1793	19
Example 3	Farther & Not Dominant	0.003726	1793	7

**Table 6: The Effect of Distance on Annual Sales**

In the second regression analysis, it was noted that the ZIP codes used were identical for both Conshohocken and Wynnewood. It was also noted that Wynnewood and Conshohocken are 7.31 miles in Euclidian distance apart, 9.8 miles in driving distance apart, and Conshohocken is 23 minutes in driving time from Wynnewood. In addition to using the data gathered for regression analysis an opportunity arose to

compare the results of two close competitors. For each ZIP code the categories examined were ZIP code, Sales/Household demographic, driving distance, driving time, import high group rank in distance, Audi rank in distance, import high group rank in time, and Audi rank in time. The data was sorted by ZIP code and then each pair of ZIP codes (19525 and 19473) was sorted by driving time. Then the retailer (Wynnewood or Conshohocken) with the lower driving time was subtracted from the retailer with the higher driving time (Wynnewood or Conshohocken). An example (ZIP codes 19525 and 19473) of this effect is illustrated in Table 7.

ZIP		Sales/ Household Demographic	Driving Distance	Driving Time	Import High Group Rank Driving Distance	Audi Rank Driving Distance	Import High Group Rank Time	Audi Rank Time
19525	Con-shohocken	0.003096	21.9	40	6	1	15	3
19525	Wynnewood	0.001032	32.8	47	20	4	20	4
19525	Change	0.002064	-10.9	-7	-14	-3	-5	-1
19525	Percentage	300%	67%	85%	30%	25%	75%	75%
19473	Wynnewood	0.004959	14.7	33	3	1	10	2
19473	Con-shohocken	0.000826	22.5	39	18	3	20	3
19473	Change	0.004132	-7.8	-6	-15	-2	-10	-1
19473	Percentage	600%	65%	85%	17%	33%	50%	67%

**Table 7: Example of the Effect of Driving Time on Predicted Sales Performance**

In the first example Conshohocken has the lower driving time by 7 minutes and it reflects in a 300% higher Sales/Household demographic. In the second example Wynnewood has the lower driving time by 6 minutes and it reflects a 600% higher Sales/Household demographic.

In Table 8, the dealership, (Wynnewood or Conshohocken) whose driving time is closest to a ZIP code, sold vehicle performance is compared to the dealership who is further away by time. Using ZIP code 19355 it can be observed that the dealership that sold the most vehicles (133% more) had a DT that was 32% closer (1%–68%). Overall, there were 51 ZIP codes in this analysis. Only 36 of the 51 ZIP codes are displayed in Table 7. The areas highlighted in yellow indicate the instances in which the driving distance and Sales/ demographic were higher. The four areas highlighted in green indicate the instances in which the driving time was lower and Sales/Household demographic was lower. Further discussion of this phenomenon follows Table 8.

ZIP	Sales/ Household Demographic	Driving Distance	Driving Time	Import High Group Distance	Audi Rank Distance	Import High Group Time	Audi Rank Time
19382	350%	130%	84%	105%	133%	95%	75%
19380	140%	119%	77%	105%	133%	80%	50%
19355	133%	93%	68%	90%	67%	80%	67%
19342	120%	72%	74%	105%	133%	90%	75%
19341	200%	93%	71%	85%	67%	80%	67%
19333	125%	102%	81%	108%	150%	65%	67%
19147	325%	55%	100%	44%	50%	93%	75%
19146	143%	52%	71%	27%	67%	28%	50%
19145	600%	54%	87%	10%	25%	33%	33%
19144	300%	145%	95%	75%	50%	75%	50%
19131	600%	27%	63%	12%	25%	33%	50%
19130	367%	43%	92%	13%	33%	54%	67%
19128	250%	84%	65%	50%	50%	14%	50%
19123	80%	52%	100%	40%	67%	100%	100%
19119	900%	112%	95%	140%	200%	64%	50%
19118	240%	71%	62%	45%	33%	25%	33%
19107	100%	52%	96%	47%	67%	71%	67%
19106	500%	50%	100%	47%	67%	82%	67%
19103	520%	46%	95%	13%	33%	50%	33%
19096	5700%	11%	14%	8%	33%	9%	50%
19087	85%	83%	59%	57%	67%	39%	67%
19085	114%	113%	69%	133%	200%	63%	50%
19083	1350%	28%	59%	7%	33%	11%	50%
19073	56%	152%	95%	143%	150%	95%	67%
19072	700%	30%	47%	25%	50%	33%	50%
19066	367%	17%	26%	20%	50%	33%	50%
19064	233%	43%	85%	6%	33%	50%	50%
19063	58%	170%	95%	250%	300%	87%	50%
19041	667%	33%	47%	31%	50%	31%	50%
19035	189%	56%	86%	50%	50%	67%	50%
19020	500%	97%	71%	90%	75%	75%	50%
19010	300%	47%	83%	42%	33%	50%	50%
19004	1700%	32%	71%	29%	50%	50%	50%
19003	1900000%	19%	30%	31%	33%	33%	33%
19002	1500000%	57%	45%	60%	75%	45%	50%
18966	50%	71%	60%	95%	75%	95%	75%

**Table 8: Effect of Driving Time on Two Close Competitors**

A comparison of the performances of between Wynnewood and Conshohocken yields the following information: in only 4 of the 51 ZIP codes (19087, 19063, 19073, and 18966) the retailer with the higher Sales/Household demographic was farther in driving time for the purchaser (7.84%). In three of those instances (19342, 19063, and 19073), Sales/Household demographic was higher and driving time was lower, driving distance was significantly higher (125%, 152%, and 170%). In 7 of the 51 ZIP codes driving distance was higher (13.73%) and Sales/Household demographic was higher. In 7 of the 9 ZIP codes in which driving distance was higher, driving time was lower and Sales/Household demographic was higher. For the last analysis in Table 9 Wynnewood and Conshohocken are combined.

WW & CA

<i>Regression Statistics</i>	
Multiple R	0.656532556
R Square	0.431034997
Adjusted R Square	0.395100365
Standard Error	0.005714391
Observations	102

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	6	0.002350123	0.00039169	11.9949746	0.000000001
Residual	95	0.003102156	0.000033		
Total	101	0.005452278			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Sales/Household Demographic	0.017143161	0.001780089	9.63050606	1.0181E-15	0.013609237	0.0206771	0.01360924	0.02067709
Driving Distance	0.000064	0.000268546	0.23862073	0.81191367	-0.00046905	0.0005972	-0.0004691	0.00059721
Driving Time	-0.000215773	0.000214291	-1.0069139	0.31653399	-0.0006412	0.0002096	-0.0006412	0.00020965
Import High Group Rank Distance	-0.000577246	0.000371138	-1.555342	0.1231899	-0.00131405	0.0001596	-0.001314	0.00015956
Audi Rank Distance	0.000860699	0.001562938	0.55069326	0.58313666	-0.00224212	0.0039635	-0.0022421	0.00396352
Import High Group Rank Time	0.000168264	0.000305537	0.55071648	0.58312081	-0.0004383	0.0007748	-0.0004383	0.00077483
Audi Rank Time	-0.001538236	0.001386953	-1.1090757	0.27019725	-0.00429169	0.0012152	-0.0042917	0.00121521

***Table 9: Distance Decay Effect on Sales Wynnewood and Conshohocken Combined***

The combination of Wynnewood and Conshohocken has an  $r^2$  value is 0.431, which is larger than the critical value at the 5% level of 0.122 ( $n = 102$  and  $k = 6$ ) which indicates that the model is significant. The intercept is also significant because of a low p-value. The regression equation is  $\text{Sales/Household demographic} = 0.017143161 + 0.000064(\text{DD}) - 0.000215773(\text{DT}) - 0.0000577246(\text{IHGRM}) + 0.000860699(\text{ARM}) + 0.000168264(\text{IHGRT}) - 0.001538236(\text{ART})$ . Four examples will be used. In the first example, WW's data for 19096 will be used which is nearer and dominant. There are 2013 households in 19096. The values for this equation are  $\text{DD}=1.2$ ,  $\text{DT}=3$ ,  $\text{IHGRM}=1$ ,  $\text{ARM}=1$ ,  $\text{IHGRT}=1$ ,  $\text{ART}=1$ . Inserting these values into the regression equation,  $\text{Sales/Household demographic}$ . The predicted  $\text{Sales/Household demographic}$  for this equation has a value of 0.01548622. The retailer in this example requires 65 households to sell one vehicle annually or annual sales of 31 vehicles ( $2013 \times 0.01546822$ ).

In the second example, driving distance and driving time remain the same (nearer) but are less dominant. The values for this equation are  $\text{DD}=1.2$ ,  $\text{DT}=3$ ,  $\text{IHGRM}=10$ ,  $\text{ARM}=2$ ,  $\text{IHGRT}=12$ ,  $\text{ART}=2$ . In this new equation the predicted value is 0.0114637. The retailer in this example will need 87 households to sell 1 vehicle annually or have annual sales of 23 vehicles. This is a 34.7% drop in sales because of a change in the competitive landscape of the market.

In the third example, we will use Conshohocken's data for 19096 which is farther and less dominant. The values for this equation are  $\text{DD}=10.7$ ,  $\text{DT}=21$ ,  $\text{IHGRM}=13$ ,  $\text{ARM}=3$ ,  $\text{IHGRT}=11$ ,  $\text{ART}=2$ . After insertion of the new values the predicted

Sales/Household demographics is 0.00714992. The retailer in this example will need 140 households to sell 1 vehicle (14 vehicles annually).

The fourth example uses Conshohocken's data for 19096. Driving distance and driving time remains the same (farther), but they are now dominant. The values for this equation are DD=10.7, DT=21, IHGRM=1, ARM=1, IHGRT=1, ART=1. The changes in values for the equation yields a predicted value of 0.01221107. Annual sales will be now 25. This is an increase in annual sales of 78%.

To determine what variables are important/predictive, five regressions from Wynnewood's database were executed. The initial regression included all six original independent variables. In each subsequent regression, one independent variable was removed. The order of removal was Audi ranking in driving time, import high group ranking in driving time, Audi ranking in driving distance, and import high group ranking in distance driven. The last regression run consisted of only 2 independent variables, driving distance, and driving time. The  $r^2$  values and the adjusted  $r^2$  values were checked after each regression. With the original 6 independent variables, the  $r^2$  was .631; the adjusted  $r^2$  was .58. The regression that consisted of driving distance and driving time has an  $r^2$  value of .57, which is larger than the critical value of 0.117 at the 5% level, indicating the model is significant (Siegel, Table 12.1.8, 2012). The adjusted  $r^2$  value is .553, which is slightly lower than the adjusted  $r^2$  value of .58 at 6 independent variables. The effects of a reduction in independent variables can be observed below in Table 10.

Regression Statistics	6 Independent Variables	5 Independent Variables	4 Independent Variables	3 Independent Variables	2 Independent Variables
Multiple R	0.794	0.789	0.774	0.773	0.756
R Square	0.631	0.623	0.600	0.597	0.571
Adjusted R Square	0.581	0.581	0.565	0.571	0.554
Standard Error	0.005	0.005	0.005	0.005	0.0055
Observations	51	51	51	51	51

**Table 10: Effect of a Reduction in Independent Variables on  $R^2$  and Adjusted  $R^2$**

The predictive model was tested using the same two sets of values used in the Wynnewood predictive model with 6 independent variables, (DD=1.5, DT=6, IHGRM=1, ARM=1, IHGRT=1, ART=1 and DD=10, DT=22, IHGRM=8, ARM=2, IHGRT=11, ART=3). The result for the 6 independent variables in the first set of variables is 0.0186 or one vehicle sold for every 54 households. The result for driving distance and driving time is 0.0183 or 0.986 vehicle sold for every 54 households. The result for the 6 independent variables in the second set of variables is 0.0073 or 1 vehicle sold for every 136 households. The result for driving distance and driving time is 0.0092 or 1.26 vehicle sold for every 136 households. By narrowing down the independent variables to just driving distance and driving time it can be observed that all of the predictive power and precision (in the sense of sales prediction) is similar to the original set of six variables. In Table 11, driving time is significant when the independent variables consist of driving distance, driving time, import high group rank in distance, and Audi rank in distance.

	Coefficients	Coefficients	Coefficients	Coefficients	Coefficients
Sales/Houshold Demographic	0.021404756	0.020984187	0.021256713	0.021725646	0.022092088
Driving Distance	-4.13766E-05	-2.84346E-06	0.000357102	0.000370815	0.000254472
Driving Time	-0.000254429	-0.000304721	-0.000605393	-0.00057864	-0.000700775
Import High Group Rank Distance	0.000217721	0.000254023	-0.000485581	-0.000381629	
Audi Rank Distance	0.001345687	0.000199782	0.001075535		
Import High Group Rank Time	-0.000516154	-0.000700588			
Audi Rank Time	-0.002274286				

	P -Values	P -Values	P -Values	P -Values	P -Values
Sales/Houshold Demographic	3.75022E-11	3.50346E-11	3.18246E-11	2.33502E-12	1.8554E-12
Driving Distance	0.911447584	0.993864975	0.241963641	0.220131712	0.395195976
Driving Time	0.395018224	0.30179698	0.012113858	0.013730322	0.002440342
Import High Group Rank Distance	0.682259295	0.632054288	0.090506754	0.090862335	
Audi Rank Distance	0.536167536	0.913046468	0.546864555		
Import High Group Rank Time	0.272602666	0.106451811			
Audi Rank Time	0.328754857				

Predicted Near	0.018589082	0.018904816	0.018749966	0.0184284	0.018269147
Predicted Far	0.007326135	0.008977185	0.009775522	0.009650689	0.009219762

per 54 households	1.003810448	1.02086007	1.01249814	0.995133624	0.986533951
per 136 households	0.996354294	1.220897195	1.329471044	1.312493728	1.253887596

**Table 11: Predictive Model Results on a Decrease in Independent Variables**

In all three regressions (Wynnewood, Conshohocken, and Wynnewood and Conshohocken), the independent variable driving time had a negative effect on Sales/Household demographic. In two of the three regressions, the independent variable driving distance had a positive effect on Sales/Household demographic. In testing the predictive model, it was found that as time and distance increased, Sales/Household demographic decreased and the converse was true. This result is consistent with Drezner and Drezner's (1996) recommendation of using driving times when dealing with shorter distance, which enables more accurate modeling. In testing, it was also found that competitors had a moderating effect, relative to respective rank, on the overall effect of

distance decay. In the comparison of the performance of Wynnewood and Conshohocken in Sales/Household demographic for the same ZIP code 90.19% (46 of 51) of the time the retailer with the higher Sales/Household demographic was nearer in driving time. When driving distance for both Wynnewood and Conshohocken was compared and driving distance was less, 82.35% of the time Sales/Household demographic was higher. Lastly, the predictive model that consists of the independent variables of driving distance and driving time is consistent with the results of the predictive model with six IVs. Therefore, hypotheses 1a and 1b are supported.

## CHAPTER 4

### CHOICE EXPERIMENTS

Choice experiments originated from conjoint analysis (Adamowicz et al., 1998). It is often confused with conjoint analysis, yet, they are not the same. A Choice experiment is different from conjoint analysis because when an individual participates in a Choice experiment, they are choosing from a group of attributes (here, purchasing options); in conjoint analysis, an individual rates or ranks the attributes (Adamowicz et al., 1998). Choice experiment is similar in multiple ways to discrete choice variant. Both methods share an almost indistinguishable theoretical basis (random utility theory) and survey design process (Blamey et al., 1999). The most significant characteristic is that a choice experiment attempts to relate choices through the use of attributes and repeated scenarios; discrete choice variant relies on a single trade-off (Blamey et al., 1997). A significant strength of a choice experiment is that it offers consumers a set of alternatives that changes by a series of purchasing options and asks potential consumers to indicate their preferred alternative purchasing options (Kanninen, 2002). A choice experiment was also selected because of the number of purchasing options in the study. Choice experiment's elicitation techniques are widely used by market research to evaluate purchasing options that are under consideration (Lee & Yoo, 2014).

There are other advantages to using choice experiments, the first is the respondents' ability to systematically evaluate their trade-offs among a variety of attributes. Secondly, the process of trading-off could potentially lead to more introspection from the respondent and this could allow consistency checks on the respondents' response pattern (2014). There are also potential disadvantages to choice experiments. Choice experiment models that are based on observations in the choice experiment can generate inaccurate projections of choice outcomes if a respondent's choice behavior fluctuates systematically within different conditions (Dellaert et al., 2012). This flaw is critical because the survey will introduce purchasing options that are not normally observed in a market (2012).

In constructing a choice experiment, it is important that one or more of the choices in the set does not dominate the choice set. A dominant profile could skew the respondent's choice and therefore be of minimal value to the research (Chitturi et al., 2010). To prevent choice set dominance, the choice sets will not have dominating sets or dominated profiles (2010). Dominance is defined as, one option is better than another in one alternative, and at least as good in all other alternative (Tversky & Kahneman, 1986). To control for dominance, choice sets will be designed using the Pareto optimal subset method (Chitturi, et.al, 2010). Pareto optimal subsets are defined as: "Each option is first assessed under multiple criteria and then a subset of options is identified with the property that no other option can categorically outperform any of its members" (2010).

The potential effect of framing should be considered when developing survey questions. A *framing effect* is defined as, “When two ‘logically’ equivalent (but not *transparently* equivalent) statements of a problem lead decision makers to choose different options (Druckman, 2001).” A frame adopted by the individual surveyed may be controlled, in part, by the formulation of the questions in the survey and the personal habits, experiences, and preferences of the survey taker (Tversky & Kahneman, 1981). In real-world choices (as is this survey) it may be difficult to avoid framing effects because real-world frames can often convey information that people may and should pay attention (Bruine de Bruin, 2011). To avoid framing issues with the respondent of the survey questionnaire, there will be a general introduction of the survey and each group of purchase options will be framed so the respondent is aware of the context of each purchase option. A frame that is well constructed can help the respondent understand the context of the question. A purchaser’s driving time to a retailer was one of the variables identified in the study. The frames for this survey is to have the respondent answer the questions based on how they make decisions regarding an automotive purchase based on time traveled to a retail location, purchasing on the internet, experience centers, and home or office visits for purchase and servicing.

### Research Design

Each of the persons surveyed will have expressed interest in purchasing a vehicle from Conshohocken and/or Wynnewood. Conshohocken and Wynnewood’s client

management system software will be used to identify the qualified email addresses that will be sent to those to be surveyed.

Each survey question will use words that are simple to read and easy to interpret (Bruine de Bruin, 2011). Qualitative pilot interviews have been performed to test for ease of question's interpretation and to insure alignment with hypotheses. Research participants may be affected by the number of options and each additional option can provide ease of decision (Huber, Payne, & Puto, 1982; Tversky et al., 1986). The number of options per question will be consistent (seven per question) because changing the amount of options offered to a responder can affect evaluations positively and negatively (2015). Framing will be controlled by the verbiage of the choice question (1986).

The survey will consist of an introduction, multiple questions, and seven alternatives for each purchasing option. A reproduction of the survey is in the Appendix section under Item 1. Institutional Review Board approval was given on 10/21/16.

#### Survey Instrument

The survey data were amassed using a self-administered questionnaire. The questionnaire was administered via email on three different occasions beginning on 11/3/16–12/11/16. All questions for Hypotheses 2a, 2b, and 4 are measured based on well-established scales from prior studies of retailing using a 7-point Likert scale ranging from “1—strongly disagree” to “7—strongly agree”(Klein et al., 2016). To test for ease of understanding the survey, 30 individuals responded to the survey on three occasions

from 10/28/16—11/1/16. After each survey, the participants were interviewed.

Grammatical, content, and verbiage corrections were made after all three iterations.

### Respondents

The initial email was sent to 11,174 individuals on 11/3/16. The individuals were from Conshohocken's database, of which 1,984 emails were opened and 111 of those individuals responded to the survey. There was no financial reward for the respondents in the initial email request. A second email from the same database was sent on 11/15/16. The second email was re-sent to 10,969 (net amount after initial respondents, unsubscribed, and hard-bounced) from Conshohocken's database. Individuals that responded to the second survey request were offered the opportunity to win a \$100 Amazon gift card (three gift cards were offered). An additional 1,610 emails were opened and 66 of those individuals responded to the survey. On 12/2/16, the last email request was sent to 6,164 individuals from WW's database requesting a response to the survey. The opportunity to win a \$100 Amazon gift card was offered to this group. As in the previous email, three Amazon gift cards were offered (a total of six). In the last email request, 1,411 emails were opened and there were 87 responses. In total, 17,338 individual email requests were sent and a total of 5,005 were opened (open rate of 28.87%). Of those who opened the email requests, 265 took the survey (response rate of 5.29%). Overall, 1.53% of the individuals who were emailed a survey responded (265/17,338). Not all responders completed all the survey questions. There were responses from 22 different states (four responses were not identified by state or ZIP

code), 166 different ZIP codes and four countries (USA, UK, Portugal, and South Korea). Of the 265 responses, 156 were from Pennsylvania (59.77% of the total states) and of those responses there were 80 different ZIP codes (47.06% of the total ZIP codes). Below in Table 12 are the number of responses by country, state and ZIP code.

State/Country	Responses	% of Total	Zip Codes	% of Total
PA	156	59.77%	80	47.06%
NJ	21	8.05%	20	11.76%
MD	13	4.98%	10	5.88%
DE	8	3.07%	7	4.12%
NY	8	3.07%	6	3.53%
FL	7	2.68%	7	4.12%
VA	7	2.68%	5	2.94%
CA	6	2.30%	5	2.94%
DC	5	1.92%	4	2.35%
NC	4	1.53%	4	2.35%
Unknown USA	4	1.53%	4	2.35%
GA	3	1.15%	2	1.18%
MA	3	1.15%	3	1.76%
IL	2	0.77%	1	0.59%
OH	2	0.77%	1	0.59%
TX	2	0.77%	1	0.59%
AL	1	0.38%	1	0.59%
CO	1	0.38%	1	0.59%
CT	1	0.38%	1	0.59%
IA	1	0.38%	1	0.59%
NM	1	0.38%	1	0.59%
UT	1	0.38%	1	0.59%
VT	1	0.38%	1	0.59%
UK	1	0.38%	1	0.59%
Portugal	1	0.38%	1	0.59%
Korea	1	0.38%	1	0.59%

***Table 12: Responses by Country, State, and ZIP Code***

Before introducing luxury automotive alternative purchasing methods, individuals were surveyed (n=264) regarding their preference to purchase through traditional methods (purchasing through a dealership). Almost 80% of people indicated they would prefer to purchase through a dealership that offers sales and service. Table 13 has a breakdown of responses for the seven potential answers.

	Responses	Percentage
Definitely Not Purchase	13	4.98%
Not Purchase	12	4.60%
Possibly Not Purchase	8	3.07%
May or May Not Purchase	67	25.67%
Possibly Purchase	89	34.10%
Purchase	45	17.24%
Definitely Purchase	27	10.34%
Total	261	100%

**Table 13: Traditional Method Preferences**

Seven alternative purchase options were surveyed to determine their feasibility to potential consumers. The initial alternative option offered was a satellite servicing location. Respondents were asked the following question: if a dealership, which was not the closest to your home or office, had a satellite service department near your home or office, would you buy a vehicle from the dealership with the satellite service department?

Overall, 61.68% of the respondents (n=261) indicated they would potentially purchase from a dealership that was not proximate to their home or office if that dealership had a satellite service department. Only 12.65% of people indicated they

would potentially not purchase under the same circumstances. The number of responses for each question is below in Table 14.

	Responses	Percentage
Definitely Not Purchase	13	4.98%
Not Purchase	12	4.60%
Possibly Not Purchase	8	3.07%
May or May Not Purchase	67	25.67%
Possibly Purchase	89	34.10%
Purchase	45	17.24%
Definitely Purchase	27	10.34%
Total	261	100%

**Table 14: Distant Dealership with Local Satellite Service Department**

In the second alternative purchase option, the respondents were asked if they would consider buying a vehicle online. This was the first of five questions that had an internet purchase element. Four of the five questions had a different attribute. The initial question did not offer an attribute, but framed the question by suggesting to the respondents: “they never visited a dealership before buying online.” The purpose of this frame is to contrast with the attribute of purchasing through a dealership that offers sales and service (traditional method). When the respondents were asked if they preferred a dealership that offered sales and service, but not offered an alternative method, 79.54% of people responded they preferred to purchase at a dealership that offered sales and service. When the respondents (n=263) were asked if they *did not visit* a dealership that offered sales and service, but had the option to purchase a luxury vehicle online, 30.26% said they would possibly choose the alternative method (purchasing online). This result

compares to the 54.75% who potentially would not purchase a vehicle online from an entity that did not offer sales and service of imported luxury automobiles (see Table 15).

	Responses	Percentage
Definitely Not Purchase	81	30.80%
Not Purchase	40	15.21%
Possibly Not Purchase	23	8.75%
May or May Not Purchase	22	8.37%
Possibly Purchase	53	20.15%
Purchase	16	6.08%
Definitely Purchase	10.6	4.03%
Total	263	100%

***Table 15: Purchasing Online Without Dealership Visit***

As in the previous question, the respondents were asked if they would purchase a vehicle online. In this question, the introduction identifies Amazon as the largest retailer in the world and three of the benefits of purchasing a product online from Amazon (choice of delivery location, lenient return policy, and ease of website navigation). The Amazon buying experience is the frame. The attribute for this question was, “if you could get delivery at the location of your choosing.” Overall, 53.59% of the individuals who responded to this question (n=265) would potentially purchase a vehicle online if they could receive a vehicle at a location of their choosing. The respondents who potentially would not purchase were 29.81% of the total sample. The results from the survey question is below in Table 16.

	Responses	Percentage
Definitely Not Purchase	47	17.74%
Not Purchase	14	5.28%
Possibly Not Purchase	18	6.79%
May or May Not Purchase	44	16.60%
Possibly Purchase	81	30.57%
Purchase	23	8.68%
Definitely Purchase	38	14.34%
Total	265	100%

**Table 16: Purchasing Online with Delivery at Location of Choice**

The attribute in the next question asks the respondent if they would purchase online if they were offered a three-day return policy. This question has the same contextual element as the previous question in that the frame's three-day policy is a variant of Amazon's lenient return policy. The percentage of individuals that responded (n=265) positively were 59.26% of the sample; 27.55% responded negatively to purchasing online. The respondents were 46.49% more likely to purchase online if they were offered the return policy.

	Responses	Percentage
Definitely Not Purchase	35	13.21%
Not Purchase	22	8.30%
Possibly Not Purchase	16	6.04%
May or May Not Purchase	34	12.83%
Possibly Purchase	82	30.94%
Purchase	36	13.58%
Definitely Purchase	40	15.09%
Total	265	100%

**Table 17: Purchasing Online with a Three-Day Return Policy**

In an earlier question the respondents (n=264) were asked if they preferred to purchase an imported luxury vehicle from a dealership that offered sales and service. The responses indicated that 79.5% of the sample preferred to *purchase* from a dealership that offered sales and service (traditional dealership). The attribute in the next question re-introduces the traditional dealership. The respondents were then asked to *visit* a traditional dealership *before* they considered an online purchase. Only 13.64% of the respondents (n=264) were potentially not interested in purchasing online after they visited a traditional dealership; 74.62% of the respondents would potentially purchase online. Overall, individuals from the sample were 5.47 times (74.62%/13.64%) more likely to purchase through the alternative method. Only 11.74% of the respondents were not sure of their answers (May or May Not Purchase). The respondents' choices for visiting a traditional dealership before purchasing online are in Table 18.

	Responses	Percentage
Definitely Not Purchase	20	7.58%
Not Purchase	10	3.79%
Possibly Not Purchase	6	2.27%
May or May Not Purchase	31	11.74%
Possibly Purchase	91	34.47%
Purchase	69	26.14%
Definitely Purchase	37	14.02%
Total	264	100%

**Table 18: Visiting a Dealership Prior to Online Purchase**

The attribute that is being tested in the last question pertains to a consumer's interest in purchasing online *after* visiting an automotive experience center. An automotive experience center is defined as: a center that allows consumers to connect with automotive brands without the hard-sell tactics of a traditional dealership (Elisano, 2016). The frame is the experience is an Apple store. This question and the previous question offer different experiences that could aid in the respondents' decision making. The purpose of the Apple frame was for the respondent to consider an online purchase without their experience coming from a traditional dealership. The respondents (n=265) who indicated they potentially would not purchase if the attribute was an automotive experience center were 16.22% of the sample. Those that responded they would potentially purchase were 67.17% of the sample. Those that would consider purchasing were 4.15 times greater ( $67.17\%/16.22\%$ ) than those who potentially would not purchase. Of the respondents, 16.6% answered they "May or May Not Purchase." Responses for visiting an automotive experience center before purchasing online is in Table 19.

	Responses	Percentage
Definitely Not Purchase	25	9.43%
Not Purchase	9	3.40%
Possibly Not Purchase	9	3.40%
May or May Not Purchase	44	16.60%
Possibly Purchase	73	27.55%
Purchase	49	18.49%
Definitely Purchase	56	21.13%
Total	265	100%

**Table 19: Purchasing Online After Visiting an Experience Center**

Each of the previous five questions asked the respondents if they would purchase online. The final question did not ask the respondent to consider purchasing online. The question did have an experience element. The attribute being considered is an offer of concierge service (vehicles would be brought to a potential consumer's home or office to experience a vehicle before making a purchase decision and in the event of a purchase having pick-up and delivery at their home or office). Part of this question was a frame. In this question the respondents were not asked if they would or would not purchase. They were asked if their decision to purchase would or would not be influenced by the opportunity to experience an automobile at their home or office. In the event of a purchase, their vehicle would be picked up and delivered for all service needs. Overall, 75% of the respondents (n=264) indicated they were potentially influenced to purchase through this alternative method. This compares to the 38 respondents (14.39% of the sample) who were potentially not influenced. The respondents indicated (Table 20) they were 521.2% more influenced to purchase because of the alternative method, compared to the traditional method of vehicular purchasing.

	Responses	Percentage
Definitely Not Influenced	9	3.41%
Not Influenced	21	7.95%
Possibly Not Influenced	8	3.03%
May or May Not Be Influenced	28	10.61%
Possibly Influenced	77	29.17%
Influenced	64	24.24%
Definitely Influenced	57	21.59%
Total	264	100%

***Table 20: Home or Office Sales and Service Experience***

In the section above, individuals were tasked to respond regarding their purchase intentions if offered a series of alternative purchase methods. Those methods were:

1. Purchasing from a dealership that was not near their home or office, but had a service satellite that was near to their home or office.
2. Buying a vehicle online without visiting a traditional dealership.
3. Purchasing online if they received delivery of their new vehicle at the location of their choosing.
4. Buying online if they received a three-day return policy.
5. Buying online after visiting a traditional dealership.
6. Buying online after visiting a vehicle experience center (Apple store).
7. Influenced to purchase, if a vehicle was demonstrated at their home or office. If they did purchase, having their vehicle picked up and returned for servicing (concierge service).

The responses for these seven questions (Table 20) indicate that the individuals surveyed prefer to purchase through an alternative purchasing method. Comparing the responses of those who responded “Definitely Not Purchase” (DNP) and “Not Purchase” (NP) to those that responded “Purchase” (P) and “Definitely Purchase” (DP), the respondents preferred a satellite service department (288.00%). When they were asked if the choice of delivery locations would inspire them to purchase online, they did not have a preference (100%). When offered a three-day return policy they were 1/3 more likely to purchase online. If they experienced a vehicle at a traditional dealership, they were 3.53 times more likely to

purchase online. If they experienced a vehicle at a non-traditional experience center, they were 3.09 times more likely to purchase online. They were less likely to purchase online (36.36%) if they did not experience an imported luxury vehicle in advance. Lastly, if they were offered the opportunity to have a vehicle brought to their home or office for demonstration purposes, combined with pick-up and return of their vehicle for service, they were 4.03 times more likely to purchase.

	n	No	%	Yes	%
1. Buy a vehicle from dealership w/ the satellite service dpt	261	25	9.58%	72	27.59%
2. Buy a vehicle online, if you <i>never</i> visited any dealership	263	121	46.01%	44	16.73%
3. Buy a vehicle online, if you could get delivery location	265	61	23.02%	61	23.02%
4. Buy a vehicle online, if a 3 day return policy	265	57	21.51%	76	28.68%
5. Buy a vehicle online, if you 1st visited a dealership	264	30	11.36%	106	40.15%
6. Purchase online, visit an auto exp center	265	34	12.83%	105	39.62%
7. Concierge service for both sales and service	264	30	11.36%	121	45.83%

**Table 21: Comparison of Respondents Preferences**

In summary, the respondents were presented with seven alternative purchase offers. In all cases but the alternative offer of buying a vehicle online and never visiting a dealership, the respondents indicated they were at least as favorable as the traditional or alternative methods (choosing the delivery location of their vehicle) of vehicle purchase. In five of the seven questions, the ratios were 1.33:1, 2.88:1, 3.09:1, 3.53:1, and 4.03:1 in favor of an alternative purchase method. Based on this research, Hypotheses 2a and 2b are supported.

A choice experiment is also the method used to assess whether a consumer will choose the brand with the closest dealership to their residence when there are one or more

brands that are seen as close substitutes. The respondents are asked to respond to six questions. Questions 1, 2, and 3 focus on the potential reasons respondents *did not* purchase their preferred brand. Questions 4, 5, and 6 focused on the reasons the respondents *did* purchase their preferred brand. Question 1 asked the respondents (n=207) if the reason they did not buy was because of the time it took to drive to the dealership. The second and third questions asked the respondents if the reason they did not purchase their preferred brand was because of the miles driven and if there were other brands nearer to their home or office. In the first question (driving time), 52.17% of the respondents disagreed (this percentage includes those that responded “strongly disagreed” (SD) and “disagreed” (D) that travel time was the reason they did not purchase their preferred brand, compared to 5.8% of those that responded they did agree (this statistic includes those that responded the “strongly agreed” (SA) and “agreed” (A)) time was the reason they did not purchase. In the second and third questions, the results were similar. In the second question, 52.71% of the respondents (n=203) disagreed that miles driven was the reason they did not purchase, compared to 6.86% who agreed that miles driven was the reason they did not purchase. In the third question, 48.77% of the respondents (n=203) disagreed that the proximity of other brands was the reason they did not purchase their preferred brand, compared to 8.83% who agreed that proximity was the reason they did not buy (Table 22).

If you did not buy your preferred brand, was it because:	n	No	Yes
1. <u>Time</u> it took to drive to the dealership?	207	52.17%	5.80%
2. <u>Miles</u> you had to drive to a dealership?	203	52.71%	6.86%
3. <u>Other</u> brands nearer to your home or office?	203	48.77%	8.83%

***Table 22: Decision Not to Buy Based on Time, Miles, and Proximity of***

***Competition***

Each of the first three questions began by asking the respondents, “Why they *did not* purchase?” The last three questions began by asking the respondent, “Why they *did* purchase?” Each element of questions four, five, and six involves proximity to home or office. In the fourth question, the respondents are asked, “If they did purchase their preferred brand, was it because the brand was closest to their home?” In the fifth question, the respondents were asked, “If they purchased their preferred brand was it because it was closest to their office?” Lastly, they were asked, “If they purchased their preferred brand, was it because it was the only dealership within 15 miles of their home or office?” In each of these three questions, the respondents disagreed that these were not the reasons they purchased their preferred brand. In question four, 63.74% of the respondents (n=262) disagreed, compared to 11.07% who agreed. In the sixth question, 67.83% of the respondents (n=258) disagreed, compared to 5.04% who agreed this was the reason they purchased. In the last question, 66.8% of the respondents (n=259) disagreed they did buy because it was the only dealership with 15 miles, compared to 10.81% who agreed. The results are below in Table 23.

If you did buy your preferred brand, was it because:

4. It was closest to your home?
5. It was closest to your office?
6. No other dealership within 15 miles

n	No	Yes
262	63.74%	11.07%
258	67.83%	5.04%
259	66.80%	10.81%

**Table 23: Decision to Buy Based on Proximity**

In summary, if we compare the responses of those who “strongly disagreed and disagreed” to those who “strongly agreed and agreed” for questions one, two, and three, it can be observed that most of the respondents disagreed that they *did not* purchase because of the time it took to drive to the dealership, the miles it took to drive to the dealership, or the influence of other brands nearer to their home or office. The ratio between those that disagreed to those that agreed was 9:1, 7.69:1, and 5.52:1 respectively (Table 24).

If you did not buy your preferred brand, was it because:

1. Time it took to drive to the dealership?
2. Miles you had to drive to a dealership?
3. Other brands nearer to your home or office?

No	Yes	No/Yes
52.17%	5.80%	9.00
52.71%	6.86%	7.69
48.77%	8.83%	5.52

**Table 24: Respondents Preference for Not Buying the Preferred Brand**

Comparing the responses for questions four, five, and six (Table 25), it can be observed that most individuals *did not* purchase their preferred brand because it was closest to their home, closest to their office, or the only dealership within 15 miles of their home or office. The ratio between those that did not purchase (strongly disagree and

disagree) versus those that did purchase (strongly agree and agree) was 5.76:1, 13.46:1, and 6.18:1.

If you did buy your preferred brand, was it because:

4. It was closest to your home?

5. It was closest to your office?

6. It was the only dealership within 15 miles of your home or office?

	No	Yes	No/Yes
4. It was closest to your home?	63.74%	11.07%	5.76
5. It was closest to your office?	67.83%	5.04%	13.46
6. It was the only dealership within 15 miles of your home or office?	66.80%	10.81%	6.18

***Table 25: Respondents Preference for Buying the Preferred Brand***

Based on these results, consumers will often not choose a dealership that is closest to their residence. Hypothesis 4 is not supported.

## CHAPTER 5

### FRAMED FIELD EXPERIMENT

Experimenters can become concerned about the extent to which a laboratory setting can influence results. A framed field experiment (FFE) offers experimenters an alternative by allowing a test to be conducted in the natural environment of the subject (List, 2011). The word “framed” signifies that the subjects of the experiment are aware of the context of the study and their participation.

To test Hypothesis 3, I will use the framed field experiment method to control the specific treatments, variables, and location of the experiment. In this experiment, only senior staff members were aware of the experimental aspect. Clients were not made aware they were part of an experiment so that they could make purchase decisions based on their exposure to a non-traditional method of retailing. This approach allows for the measurement of the level of interest in the offerings. Since framed field experiments are conducted in a natural environment of the subject, there will be an organization that has significant resources involved, including: personnel, sunk cost, and organizational reputation. Studies have shown that when an organization invests in an experiment it is most likely to be completed (List, 2011). Framed field experiments correspond well with actual retail results (Lusk et al., 2006).

## Background

This study postulates that distance decay decreases the rate of sales for retailers of imported luxury vehicles. It also posits that the effect of distance decay can be offset (meaning market reach can increase) by alternative methods, such as a variation of door-to-door selling, pick-up and delivery for customer service, Internet buying, and non-traditional automotive facilities (pop-ups, tents, trailers, service center, etc.). To test these alternative methods of automotive retailing, a framed field experiment was conducted at 1312 Ridge Pike, Conshohocken, PA 19428. The previous occupant of this facility was an Audi retailer that relocated 26.8 miles to West Chester, PA. The framed field experiment occupies approximately 2,500 square feet of the facility and has 75 feet of frontage. In addition to the framed field experiment, there is an Audi Wynnewood service and parts satellite. That satellite is called “Audi Service Conshohocken.” The service satellite is managed by Audi Wynnewood and is located at 1223 Industrial Way, Conshohocken, PA.

## Barriers

### *State Barriers*

There are many barriers to selling new vehicles. For this study, we are using the state of Pennsylvania’s motor vehicle laws (Pennsylvania Dealer Code). Pennsylvania’s motor vehicle laws are neither the most flexible, nor the most restrictive. Hereafter, Pennsylvania will be referred to as “the state.” The state restricts the location of a

dealership based on the proximity of another franchise of the same make. State law demands all new franchise dealerships must be licensed, which requires a letter of authorization from a manufacturer. Without this license, a dealership in the state is not allowed to sell new vehicles in any state; a new vehicle cannot be demonstrated, stocked, nor displayed, and salespersons cannot engage in any vehicular selling activities. All salespeople of vehicles (new or pre-owned) must be licensed. Therefore, a new vehicle cannot be sold at an unlicensed dealership, nor can an unlicensed salesperson sell a new or pre-owned vehicle. An out-of-state manufacturer-approved dealership can sell a vehicle in Pennsylvania without a Pennsylvania license.

#### *Manufacturer Barriers*

For this study, Audi will be known as the “manufacturer.” A manufacturer will not allow a dealership to sell their vehicles, receive warranty work payments, or receive warranty parts payment unless a dealership has an active dealer agreement (According to the Audi Dealer Agreement). An applicant for a dealership must supply an approved facility in an approved location; have an approved executive manager; and sell, stock, and source only the manufacturer’s brand of vehicles and parts. The manufacturer determines the necessary amount of working capital and requires a monthly financial statement. There are other formal and non-formal manufacturer barriers that are not germane to this study.

## The Experiment

The experiment is coded as “Carcierge.” To test hypotheses regarding alternative approaches to overcoming the effects of distance decay, the method of a framed field experiment was selected. A framed field experiment allows the experimenter to choose, in a natural setting, the specifics of the treatment, variables, and location.

The experiment was run from 3/1/2016 to 9/30/2016. For this experiment, the facility at 1312 Ridge Pike was used. This facility serves as a proxy for a non-traditional facility because it does *not* comply with state or manufacturer requirements and therefore cannot sell new vehicles under traditional methods.

There is a limitation to using this location and its results as a field experiment. The limitation is that this address is the site of Conshohocken, the retailer whose data was included in the distance decay study. It could be argued that this renders the study somewhat imperfect because many visitors to the location might have expected they were visiting an actual traditional dealership. Therefore, some participants in this study may not have arrived at Carcierge (name used in framed field experiment) expecting to experience a non-traditional method of luxury automotive retailing. We believe the opposite because we are able to measure the behavior (purchase or not purchase) of individuals expecting a traditional method of retailing when exposed to non-traditional retailing.

### *Structure of the Experiment*

Under state law, new vehicles cannot be displayed, demonstrated, or sold at an unlicensed dealership. The framed field experiment cannot have new inventory in the facility nor can it be displayed outside of the facility. Unlike traditional dealerships, Carcierge does not have desks; all client interaction is at a table with stools; and instead of displayed vehicles, there are four instruction areas with 58” monitors for product information. Figure 4 is the actual alternative showroom and Table 25 compares the attributes of a traditional dealership showroom with the attributes of an alternative showroom (non-traditional). Figure 5 and Table 25 are shown below.



***Figure 5: Framed Field Experiment Alternative Dealership Showroom***

Traditional Dealership Attribute	Carcierge Alternative
New Car Showroom Display	58" Monitors
New Vehicle Test Drives	No test drives of new vehicles. Test drives of "like new" pre-owned vehicles
New Vehicle Dealership Transactions	No new vehicle transactions at Carcierge.
Cash, Loan and Lease Transactions	Leasing transactions only at Carcierge.
New Vehicle Inventory	No new vehicle inventory. New vehicle purchased from a traditional dealership
Specific Brand Signage	No brand signage. Carcierge logo
Manufacturers Website	Carcierge Website
Single Brand	All brands offered
Manufacturer Support	No manufacturer support
Manufacturer Brand Identity	Carcierge brand identity
State Licensed to Sell New Cars	Not eligible for state license. Operates as a leasing company

***Table 25: Traditional Dealership Attributes versus Carcierge Alternatives***

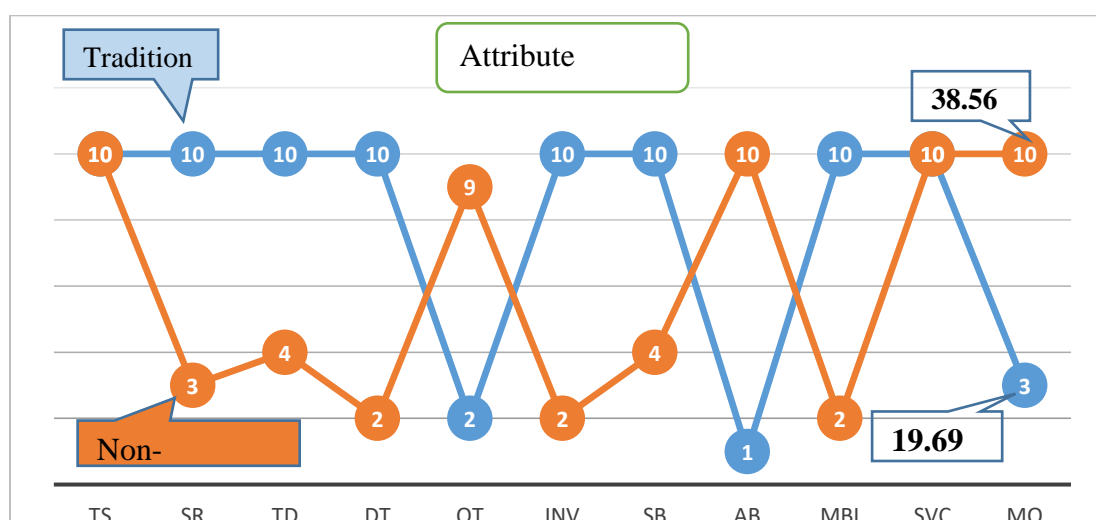
While Carcierge cannot offer vehicles for purchase it can offer vehicles for lease because the state does not require a license for a leasing company. A leasing company can display, demonstrate, and lease vehicles that are titled (pre-owned). A leasing company cannot sell a vehicle for retail purchase, but it can compare the differences between leasing a vehicle and purchasing the same vehicle. New vehicles can be displayed and demonstrated at any location by a licensed salesperson from a licensed dealership of any brand. The personnel at the framed field experiment (Carcierge) are licensed at Wynnewood. If a potential consumer enters Carcierge to purchase a new vehicle, the staff will explain that Carcierge is not a licensed dealership and cannot facilitate a *retail purchase*.

Attribute	Description of Attributes	TD	CAR
TS	Traditional Selling	10	10
SR	Showroom	10	3
TD	New Vehicle Test Drive	10	4
DT	In-Dealership Transactions	10	2
OT	Outside Transactions	2	9
INV	Inventory in Stock	10	2
SB	Single Brand Selling	10	4
AB	All Brand Selling	1	10
MBS	Manufacturer Brand Support	10	2
SVC	Service Department	10	10
MO	Monitors	3	10

***Table 26: Attributes and Respective Ranking on a 10 to 1 Scale***

In Table 26, the value given to each attribute is based upon the degree in which each method, Traditional or Non-Traditional, embodied the attribute. Traditional (TD) denotes the traditional method of selling vehicles and Non-Traditional (CAR) is the alternative method of retailing within the framed field experiment. Rating of 10 indicates the attribute is followed completely. A rating of 5 indicates the attribute is followed half of the time. A rating of 1 indicates the attribute is not followed. All other ratings are a gradation of adherence to the attribute. Examples of this are Traditional Selling (TS) in which both a dealership and Carcierge sell traditionally. Therefore both the traditional dealership and Carcierge receive a rating of 10. A second example is single brand selling. Traditional dealerships can only sell one brand and because of this they get a rating of 10. Carcierge can sell all brands, but can also sell just a single brand. Carcierge receives a score of 4 because they do not receive manufacturer brand support. The last example is

the use of monitors as a demonstration tool. Carcierge receives a 10 because their 58” monitors and large displays dominate the showroom and it is their only method of product demonstration. The traditional dealership receives a 3 because their dominant method of product demonstration is the use of a vehicle. Similar to Carcierge they do have monitors but they are less significant (24”) and are used for other purposes. In Figure 6 (below), the rating scale for Traditional and Non-Traditional retailing is charted. The score for traditional selling is 10 for the Traditional and Non-Traditional methods. As can be observed in only one instance was the rating for an attribute identical. This was because both the sales staffs were trained under the traditional method of selling. In the chart, the Traditional score of 10 is obscured by the Non-Traditional score. In all other instances the ratings for the attributes were diverse. The 38.56% is the conversion rate of prospects to sales for the Non-Traditional method and the 19.69% is the conversion rate of prospects to sales for the Traditional method.



**Figure 6: Attribute Rating Traditional and Non-Traditional**

The staff consists of a general manager; sales manager; two salespeople (initially one, the second started 4/1/16); and a business manager. The staff is unaware they are participating in an experiment. They are aware that their rules of engagement with a client are different than that of a conventional automotive dealership and that they have to model their behavior accordingly. While the experiment is 7 months in duration, the organization intends to continue to do business in this manner after the experiment is completed. The organization has requested from the experimenter the possibility of additional staff in the event business increases. The request has been accepted.

The clients are not aware they are participating in a framed field experiment. Previous clients of the Audi dealership at 1312 Ridge Pike may visit Carcierge. It is possible that these clients shopped Carcierge because of their previous affiliation—not because of the unique offerings. All clients will be introduced to the alternative selling concept on initial contact (physical visit, telephone query, or email). All staff were trained traditionally. Elements to be introduced by the experimenter are: method or scenario selling; leasing of all makes and models (to date they have only leased Audi products); and internet purchasing. At the end of the experiment period (9/30/16) the results of the framed field experiment were tallied and compared to the performance of a traditional dealership.

### *Results*

For the results to have validity, Carcierge's performance was measured against traditional dealership performance. Three independent variables were selected to

determine their effect on unit sale performance. The independent variables are new vehicle prospects, sales staff size, and phone calls to prospective customers. Prospects are defined as individuals who contact a dealership regarding the possible purchase of a vehicle. An individual contacts a dealership via three methods. The first method is when an individual sends an email request for information regarding the purchase of a vehicle. The second method is when an individual calls a dealership and requests information regarding the purchase of a vehicle. The third method is when an individual physically visits a dealership to investigate the purchase of a vehicle. Sales staff size is defined as the total number of individuals whose primary responsibility is to sell vehicles. For this paper, a “phone call” is defined as a salesperson making a follow-up phone call to a prospect. The dependent variable is vehicle sales. Data was pulled from four traditional IHG dealerships in the greater Philadelphia area (Audi Wynnewood, Audi Conshohocken, Audi West Chester, and Reading Audi) to determine the correlations between the three IVs and sales performance. Each salesperson in the databases was traditionally trained in automotive selling. This training was carried out for both the vehicular sellers at the traditional dealerships and Carcierge. The data for the traditional dealerships was collected during a 32-month period beginning 1/1/14 and ending 9/30/16. Not all dealerships were in existence the entire time of the study. Audi Conshohocken was in the data base 1/1/14 through 2/12/16 and Audi West Chester was in the data base 10/1/15 through 9/30/16. During data collection, 6,030 IHG new vehicles were sold; the average monthly sales staff size was 20 (19.91); 30,617 unique prospects inquired about

an IHG vehicle from the 4 participating dealerships; 19.69% of the time a prospect purchased a vehicle; and 221,077 follow-up phone calls were made to prospective purchasers. Table 27 represents the vehicles retailed (dependent variable), sales people (independent variable), prospects (independent variable), and calls to prospects per month (independent) during a 32-month period. This data was collected to create a predictive model of traditional retailers to compare with the actual results of Carcierge. Table 28 describes the variables for the regression analysis. Table 29 summarizes output for the regression.

	Units	Sale Staff	Prospects	Calls	Closing %
Jan `14	77	18	565	4512	13.63%
Feb `14	89	19	532	4473	16.73%
Mar `14	175	21	1090	7007	16.06%
Apr `14	170	19	918	5243	18.52%
May `14	199	17	851	5101	23.38%
June `14	172	17	796	4887	21.61%
July `14	168	14	834	5571	20.14%
Aug `14	128	15	839	6227	15.26%
Sept `14	164	19	868	6524	18.89%
Oct `14	149	21	951	7036	15.67%
Nov `14	185	18	927	5685	19.96%
Dec `14	213	19	796	6859	26.76%
Jan `15	117	18	712	6337	16.43%
Feb `15	90	15	888	5489	10.14%
Mar `15	215	19	994	8792	21.63%
April `15	215	19	997	7583	21.56%
May `15	211	21	1002	7009	21.06%
June `15	221	19	939	7113	23.54%
July `15	233	20	1059	7881	22.00%
Aug `15	251	21	1082	5961	23.20%
Sept `15	183	21	834	4007	21.94%
Oct `15	210	23	947	7529	22.18%
Nov `15	210	25	1170	8411	17.95%
Dec `15	268	25	1119	9121	23.95%
Jan `16	141	24	919	6730	15.34%
Feb `16	128	23	775	5809	16.52%
March `16	212	20	1057	12247	20.06%
April `16	218	20	1116	7355	19.53%
May `16	201	20	715	9693	28.11%
June `16	240	22	924	8729	25.97%
July `16	194	22	1068	6705	18.16%
Aug `16	214	23	1285	9451	16.65%
Sept `16	169	20	1048	6808	16.13%

**Table 27: Traditional Method Dealerships' Prospect, Staff Size, New Unit Sales, and Calls**

Variables                      Description of Variables

Unit Sales (DV)	The number of import high group vehicles sold from 1/1/14 to 9/30/16
Sales Staff (IV)	Sales staff for the 4 import high group stores in the data base
Prospects (IV)	Individuals who contacted the 4 import high group stores by physical visit, email, or telephone
Calls (IV)	Telephone calls made to prospects

**Table 28: Description of Variables**

Regression Statistics	
Multiple R	0.73063809
R Square	0.533832018
Adjusted R Square	0.483885449
Standard Error	34.36917238
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	3	37875.49847	12625.16616	10.68806174	7.45294E-05
Residual	28	33074.72028	1181.24001		
Total	31	70950.21875			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-26.48668782	47.78543561	-0.554283695	0.583785111	-124.3707154	71.39733975	-124.3707154	71.39733975
Sales Staff #	1.25569936	2.665976124	0.47100923	0.641283187	-4.205305171	6.716703892	-4.205305171	6.716703892
Prospects	0.148025625	0.047746481	3.100241569	0.004377093	0.050221392	0.245829857	0.050221392	0.245829857
Phone Calls	0.006928463	0.004310313	1.607415435	0.119182993	-0.001900812	0.015757738	-0.001900812	0.015757738

**Table 29: Effect of Sales: Staff Size, Number of Prospects, and Follow-Up Calls**

The  $r^2$  value is 0.533832, which is larger than the critical value at the 5% level of 0.240 ( $n = 32$  and  $k = 3$ ) indicating that the model is highly significant (Siegel, Table 12.1.8, 2012) and the independent variable prospects is also significant ( $p < 0.01$ ). It could be concluded that sales staff size, prospect count, and follow-up phone calls to prospects explain about 53.38% of the variation in vehicle sales. In addition to the  $r^2$  value the F statistic is 10.688 which is higher than the F table value (between 7.054 and

6.171). Therefore, the F statistic also confirms that the model is highly significant. It could be concluded that these independent variables have a very high impact on the dependent variable.

The regression equation for a traditional method of selling is:  $\text{Sale} = -26.48668782 + 1.25569936 (\text{Sales Staff}) + 0.148025625 (\text{Leads}) + 0.006928463 (\text{Phone Calls})$ . The actual values for the 32 month period are: Sales Staff = 637, Prospects = 30,617, Phone Calls = 221,077. Inserting these values into the regression equation the predicted number of sales for this equation is 6682 (6682.09). The actual number of sales for the 32 month period were 6030. The predicted equation is 10.81% higher than the actual result for the average month. The chart below were the month-by-month unit IHG sales, number of sales people, prospects, and closing percentage (IHG Sales/Prospects) for Carcierge.

	Units	Sale Staff	Prospects	Closing %
March `16	13	1	20	65.00%
April`16	17	2	48	35.42%
May `16	25	2	43	58.14%
June`16	19	2	40	47.50%
July`16	9	1	42	21.43%
Aug`16	28	3	87	32.18%
Sept`16	12	2	39	30.77%
Totals	123	13	319	38.56%
Ave Per Mo.	17.57	1.86	45.57	38.56%

**Table 30: Carcierge's Prospect, Staff Size, New Unit Sales, and Closing Percentage**

During the seven-month test period for the framed field experiment, Carcierge sold 123 vehicles, had 13 salespeople, and 319 leads. There were intermittent problems

with the software that counted the number of phone calls made by a salesperson at Carcierge during the 7 months of the study. For this paper, the average number of phone calls made by a salesperson from the group in the tradition method data set was 347 (347.05) per person per month. Using the 347 calls per month as a proxy for phone calls made by a Carcierge sales person the total is 4512 ((347 x 1.86) x 7)) for the seven-month period. The values used for the predictive analysis for Carcierge will be the actual number of salespeople, the actual number of leads and the average number of phone calls made by the traditional method set. Therefore, the values are: Sales Staff = 13, Leads = 319, Phone Calls = 4,512. Inserting these values into the regression equation the predicted number of sales for Carcierge is 68 (68.32). The actual number of sales for Carcierge for the seven-month period was 123 sales. Carcierge sales of luxury vehicles is 80.05% higher than predicted based on the data of the traditional method of luxury vehicular retailing. In the Table31 below, we will see the predicted versus actual results for the traditional method and Carcierge method of retailing.

	Traditional		Carcierge		
Intercept			-26.486688		-26.486688
Sales Staff #	1.25569936	637	799.880492	13	16.3240917
Prospects	0.14802562	29569	4376.96969	319	47.2201742
Phone Calls	0.00692846	221077	1531.72383	4511.65	31.2588003
Predicted Total			6682.08732		68.3163784
Actual			6030		123
Difference			-652		55

***Table 31: Traditional Method and Carcierge Predicted vs. Actual***

The results in this table predict that dealerships using traditional method of retailing should sell 6,682 import high group vehicles during the period under analysis (32 months). In fact, they retailed 6,030 vehicles. The actual result was 652 *less* vehicles sold than was predicted. The prediction for Carcierge was to retail 68 import high group vehicles (7 months). Carcierge's actual sales for the 7 months during the experiment was 123 new import high group vehicles. Carcierge delivered 55 more vehicles than was predicted.

By dividing the total number of import high group sales by the total prospects at Carcierge for the seven-month period we calculate that 38.56% ( $123/319$ ) of all prospects purchased an import high group vehicle. In the industry this is known as the closing percentage or the conversion rate. To determine the significance of Carcierge's closing percentage, the prospects and import high group sales for the dealerships in the traditional method set was calculated. The dealerships in the traditional method had a closing percentage of 19.69% ( $6,030/30,617$ ). To determine if closing percentages (Table 32) could be influenced by the number of sales people on a staff the data from Audi Reading was extracted from the TM data set.

	Units	Sale Staff	Prospects	Closing %
Feb `14	10	3	78	12.82%
Mar `14	16	3	264	6.06%
Apr `14	31	2	187	16.58%
May `14	24	2	120	20.00%
June `14	33	2	163	20.25%
July `14	22	2	128	17.19%
Aug `14	12	2	102	11.76%
Sep `14	21	3	116	18.10%
Oct `14	17	3	161	10.56%
Nov `14	29	3	175	16.57%
Dec `14	26	3	115	22.61%
Jan `15	17	3	120	14.17%
Feb `15	12	2	178	6.74%
Mar `15	21	2	156	13.46%
April `15	33	2	133	24.81%
May `15	22	3	153	14.38%
June `15	26	3	157	16.56%
July `15	33	4	201	16.42%
Aug `15	26	4	142	18.31%
Sept `15	30	4	89	33.71%
Oct `15	19	2	71	26.76%
Nov `15	17	4	131	12.98%
Dec `15	27	4	103	26.21%
Jan `16	14	3	83	16.87%
Feb `16	18	4	150	12.00%
March `16	26	3	174	14.94%
April `16	21	2	147	14.29%
May `16	15	2	75	20.00%
June `16	27	2	142	19.01%
July `16	15	2	134	11.19%
Aug `16	33	2	191	17.28%
Sept `16	21	2	142	14.79%
Totals	714	87	4481	15.93%

***Table 32: Audi Reading's Prospect, Staff Size, New Unit Sales, and Closing***

***Percentage***

Note: January 2014 was eliminated from this table because of incomplete data collection.

For the 32-month period that Audi Reading was studied they converted prospects at a rate of 15.93% (714/4481) and during the months of the experiment (3/1 to 9/30)

their closing rate was 15.72% (157/1005). The Carcierge method was 94.55% more effective than the traditional dealership with traditional method in converting prospects into customers and 142.06% better than Audi Reading. To normalize for seasonality or other factors germane to the time period of the framed field experiment, traditional method, and Audi Reading closing percentages for 3/1 to 9/30 were calculated. The traditional method's closing percentage rose from 19.69% to 20.07% and Audi Reading's closing percentage *declined* from 15.93% to 15.62%. Table 33 compares Carcierge, traditional method, and Reading Audi's prospects closing percentages.

	Unit Sales	Prospects	Closing %
Carcierge (3/1 to 9/30)	123	319	38.56%
TM (32 mo.)	6,030	30,617	19.69%
RA (32 mo.)	714	4,481	15.93%
TM (3/1 to 9/30)	1,448	7,213	20.07%
RA (3/1 to 9/30)	157	1,005	15.62%

***Table 33: Closing Percentage Comparisons between Carcierge, Traditional Method (32 Mos), Reading Audi (32 Mos), Traditional Method (7 Mos), and Reading Audi (7 Mos)***

Note: There was concern regarding some of the data. In August, the prospect count was 87 unique individuals. In the other six months of the test, the prospect count was an average of 38.67. The manager of Carcierge was asked about the August discrepancy. He indicated that in August they acquired prospect information from a data base and this caused the increase in prospects. This

behavior is consistent with traditional automotive retailers and the August prospect count was accepted as reported.

There are two key elements that support Hypothesis 3. The first element is the rate in which Carcierge converted prospects into unit sales. During the 7-month period of the framed field experiment, Carcierge converted prospects 38.56% of the time. The four stores that represented the traditional method of retailing converted prospects 19.69% of the time. The second key element is the performance of Carcierge when their data was plugged into the regression equation for traditional method. The equation predicted that Carcierge would sell 55 vehicles during the 7-month period. In actuality, Carcierge sold 123 vehicles during that period. Therefore, Hypothesis 3 is supported because of Carcierge's higher conversion rate of prospects to sales (38.56% as compared to 19.69% for the traditional method) and selling more vehicles than was predicted by the traditional method of retailing (123 actual sales as compared to 55 predicted sales).

## CONCLUSION

The findings in this study demonstrate that distance decay affects the market performance of imported luxury vehicles and that there are alternative purchasing methods that can mitigate distance decay. The data and subsequent analysis indicates, that given the choice between two dealerships selling the same brand, the consumer is more likely to purchase from the dealership that is nearer in driving time and driving distance from their home. The data also indicates that as the number of substitutes and their location in a market area increases, the rate of distance decay increases (a decrease in market effectiveness) (Drezner, 1996). According to our results, if one dealership is 1.6 miles in driving distance and 6 minutes in driving time and the next closest dealership offering the same products and services is 10 miles in driving distance and 22 minutes in driving time from the same consumer, that consumer is on average 2.52 times more likely to purchase from the dealership that is more proximate. If a dealership relocates approximately 8 miles further from its original location, but is still the closest dealership of a particular brand, it can expect its sales to drop 23% per year (all other factors being equal). If that dealership moves the same 8 miles, but to a more competitive area (one or more of the same brand and 12 or more of a substitute brand), it can expect a 357.74% decrease in annual sales in that market. Based on this study, when opening or relocating a dealership, the optimal location would be a site that is proximate in time and miles driven to the intended consumer; the competitors would be less proximate in time and miles to the marketed consumers. Yet, state laws and manufacturer contracts almost always make

this choice of location infeasible through traditional methods (Parker et al., 2010; Pennsylvania Dealer Code, Section 26a. known as a “relevant market area”).

The findings in the study of alternative purchasing methods that *are not* restricted by manufacturer contracts and individual states’ laws allow a dealership to lessen the effects of distance decay. Okonkwo writes, “Luxury goods are perceived to be sensory and emotional in nature—visuals, smells, touches, and feelings are imperative to selling luxury goods. These factors could imply that luxury goods are unsuitable to be retailed on the internet” (2009). The first sentence of this quote is accurate as it pertains to imported luxury automobiles. The second sentence is not necessarily accurate as it pertains to imported luxury vehicles. Our survey results show that luxury automotive consumers are willing to make purchases via non-traditional methods if they are able to experience an imported luxury vehicle prior to purchasing. It appears that the experiences they most desire before buying online, but not limited to, are: a visit to a traditional dealership, a visit to a no-pressure automotive experience center, or the opportunity to experience a vehicle at their home. When the experience was at a dealership or an experience center they were, at a minimum, 3 times more likely to purchase via an alternative method. The opportunity to have the experience at their home had the greatest influence on the respondents.

Before research was collected and analyzed it was thought that consumers purchased the brand that was the nearest to their home or office when one or more brands were believed to be close substitutes (Hypothesis 4). The response from survey

respondents indicated this was not the case. The research indicated the respondents were five times less likely to purchase from the brand that was closest to their home or office. This information should be compared to the findings for hypotheses 1a and 1b. When coupled with the analysis on the effects of driving time and driving distance, it could be posited that: consumers do not purchase from the closest dealership, but may choose to purchase amongst dealerships that are most proximate to their home or office.

This survey data is compelling, but there needs to be some caution when basing decisions on responses to a survey. A participant in a survey may indicate a preference for a particular alternative, but that does not mean they will actually act on that alternative (Tversky & Kahneman, 1981). It is also important to consider the effect of framing on questions. Questions were framed so that the respondents understood the context of the question. It may be difficult to avoid cognitive biases because real-world frames can often convey information that people may and should pay attention to (Bruine de Bruin, 2011).

The analysis of the data from the framed field experiment suggests that when prospective consumers experience a non-traditional dealership they are potentially, twice as likely, to purchase compared to prospective consumers that visit a traditional dealership. This analysis was collected from actual prospect and purchase data, not from survey data. There are two factors that need to be considered regarding a non-traditional dealership. The first factor is if the facility for the framed field experiment was a former traditional dealership that had a robust client base. It is possible and probable that many

of the individuals who visited the now, non-traditional dealership, were unaware of the change in dealership status. This relationship could have influenced their decision to purchase. Data for this study indicated that prospects ( $n=30,617$ ) visiting traditional dealerships purchased 19.62% ( $6,030/30,617$ ) of the time (32 months). In contrast, prospects that now experienced a non-traditional dealership purchased at a rate of 38.56% ( $123/319$ ). The second factor is that prospect counts for the framed field experiment were lower than the historical prospect counts of the previous occupant. This statistic could mean that individuals never became prospects because they rejected the concept prior to entering the non-traditional dealership. It could also mean that individuals were not aware of the concept because of a lack of marketing support. By not knowing the individuals who rejected the concept, purchase conversion (sales/prospects) could have been artificially high. This statistic was not measured in the analysis and could be a topic for future research.

This research will benefit scholars and managers. There is a dearth of literature concerning the automotive sector, especially as it pertains to distance decay and the ability to navigate barriers to entry. For managers of imported luxury vehicle dealerships, this research demonstrates how location can have a positive or negative affect on market performance and describes alternative ways to increase market performance. Barriers to entry are considered to be a benefit to existing dealerships. This study posits that that barriers to entry in the retail automotive sector are easily defeated—negatively affecting

traditional dealerships but a boon for those that embrace the alternative methods of retailing.

## FUTURE RESEARCH AND LIMITATIONS

The results from this research provide a number of new insights into the effects of distance decay and alternative purchasing methods for imported luxury automobiles. It is important to note that research in this area is still at a basic level. The research identified the importance of customer experience and queried respondents regarding their purchase interest of a selection of purchase experiences. A framed field experiment would further enhance the research. Field work for this research involved visiting a luxury watch flagship store. Interviews with the staff indicated there appears to be a parallel amongst the consumers of luxury watches and imported luxury automobiles. A study of the luxury watch industry could offer important insights into imported luxury automobiles. While collecting data for this research one of the dealerships in the study left the market. Prior to this dealership leaving the market, it was anticipated by the close competitors of the same brand that their vehicular sales would increase. The opposite happened. In the fourteen months since the dealership left the market, sales for the nearest two competitors of the same brand fell by 8% and 12% (the entire market rose by 4%). Research in this phenomenon could offer valuable insight into the potential of a positive effect on market performance caused by competitor location. This research found that distance as measured by time and miles driven had an effect on market performance. The scatterplots in Figures 3a and 3b could lead one to believe that there is a directional element that could lead to better placement of a dealership location because of the variance in market

performances of ZIP codes that are similar in time or miles from a dealership. This study provides a basis for future research into the imported luxury retail industry.

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## APPENDIX

*Survey 1*

## Alternative Purchasing Options

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### A Survey of Luxury Automotive Purchasing Options

**1) When deciding to purchase, do you prefer to visit a dealership for both sales and service?**

- Definitely Not Prefer       Not Prefer     Possibly Not Prefer       May or  
May Not Prefer  
 Possibly Prefer       Prefer       Definitely Prefer

**2) There is evidence that people seeking to purchase an imported luxury vehicle will select a dealership nearest in driving time, to their home or office. There is also evidence they will change from the brand they want to buy to the brand they will buy because of the travel distance to a dealership. There are two reasons for this survey. First, is to identify the reasons why individuals do *not* always buy their first brand choice. Second, is to determine if there are alternatives, not currently offered by a dealership that would influence a purchase decision.**

**Have you ever or would you ever purchase an automotive brand that wasn't your first choice?**

- Yes  
 No

**3) How many brands did you consider before you purchased your most recent vehicle?**

**Please choose one**

- One  
 Two  
 Three  
 Four or more

**4) Was the brand you most recently purchased, your****Please choose one**

- 1st Choice  
 2nd Choice  
 3rd Choice  
 4th Choice

**5) Was the dealership where you most recently purchased, your**

- 1st Choice  
 2nd Choice  
 3rd Choice  
 4th Choice

**6) If you did *not* buy your preferred brand. Was it because the time it took to drive to the dealership?**

- Strongly Disagree    Disagree    Possibly Disagree    Neither Agree or Disagree  
 Possibly Agree    Agree    Strongly Agree

**7) If you did *not* buy your preferred brand. Was it because the miles you had to drive to a dealership?**

- Strongly Disagree    Disagree    Possibly Disagree    Neutral    Possibly Agree  
 Agree    Strongly Agree

**8) If you did *not* buy your preferred brand. Was it because there were other brands nearer to your home or office?**

- Strongly Disagree    Disagree    Possibly Disagree    Neither Agree or Disagree  
 Possibly Agree    Agree    Strongly Agree

**9) If you did buy your preferred brand. Was it because it was closest to your home?**

- Strongly Disagree    Disagree    Possibly Disagree    Neither Agree or Disagree  
 Possibly Agree    Agree    Strongly Agree

**10) If you *did* buy your preferred brand. Was it because it was closest to your office?**

- Strongly Disagree    Disagree    Possibly Disagree    Neither Agree or Disagree  
 Possibly Agree    Agree    Strongly Agree

**11) If you *did* buy your preferred brand. Was it because it was the only dealership within 15 miles of your home or office?**

- Strongly Disagree  Disagree  Possibly Disagree  Neither Agree or Disagree  
 Possibly Agree  Agree  Strongly Agree

**12) If a dealership, which *was not* the closest to your home or office, had a satellite service department near your home or office. Would you buy a vehicle from the dealership with the satellite service department?**

- Definitely Not Purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**13) Would you buy a vehicle online? If you *never* visited any dealership.**

- Definitely Not Purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**14) Amazon has become the largest retailer in the world by offering consumers delivery at the location of their choosing, a lenient return policy, and an easy to navigate website. Would you buy a new imported luxury vehicle online? If you could get delivery at the location of your choosing.**

- Definitely Not purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**15) Would you buy a vehicle online? If a 3 day return policy was offered?**

- Definitely Not Purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**16) Would you buy a vehicle online? If you first visited a dealership.**

- Definitely Not Purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**17) Would you purchase online? If you could visit an automotive experience center that is similar to the experience at an Apple store.**

- Definitely Not Purchase  Not Purchase  Possibly Not Purchase  
 May or May Not Purchase  Possibly Purchase  Purchase  Definitely Purchase

**18) The demands of employment and quality of family life can make it difficult for many clients of imported luxury vehicles, to dedicate their valuable time buying a car. Would you be more influenced to buy a vehicle? If a dealership offers to bring vehicles to your home or office for demonstration and also offers to pick-up your vehicle for all servicing.**

Definitely Not Influenced    Not Influenced    Possibly Not Influenced  
 May or May Not Be Influenced    Possibly Influenced    Influenced     
Definitely Influenced