THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF ECONOMICS

Employing Economic Principles for the Benefit of Entrepreneurs: Assessing Added Value, Willingness to pay, and the Demand for the Keyper

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SPRING 2021

A thesis
submitted in partial fulfillment
of the requirements
for a baccalaureate degree
in Economics
with honors in Economics

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ABSTRACT

What is convenience worth to consumers? This is the question that many entrepreneurs have built their business around. This thesis will focus on how entrepreneurs can measure the added convenience of their product or service using a hedonic regression model and willingness to pay survey. This data can also be used to create a demand curve which is necessary for entrepreneurs to find the profit maximizing price. The hedonic regression and willingness to pay data in this research will focus on the Keyper as a proxy for convenience. The Keyper is a product designed to solve the problem of lost dorm keys by adding a key pocket to the existing regular phone wallet. The findings and methods of this research will draw on and add to the existing literature on measuring willingness to pay, the convenience economy, and efficient pricing. This thesis reveals that, after controlling for demographic variables, respondents are willing to pay 5.8% more than the regular phone wallet for the added convenience of a Keyper.

Acknowledgements

I would like to thank my friends, family, and advisors for their time, insight, and support in creating this thesis. Dr. Wooten, thank you for hosting me in your office almost every day before the pandemic and thank you for making your office the background for our meetings on Zoom. Thank you for pushing me to do my best work in this thesis but most of all thank you for noticing my passion and academic potential in class. Dr. Tybout, thank you for teaching me how to construct this thesis and for ensuring that I kept on pace. Thank you for a great thesis writing course.

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Introduction to Hedonic Pricing

Literature Review

Entrepreneurs often innovate by making existing products more convenient. Understanding the added value of this convenience is difficult so entrepreneurs are often left guessing the value of their product in terms of pricing. The author of this thesis created the Keyper to make regular phone wallets, which just hold cards, more convenient for college students with dorm keys by adding a key-holding pocket. Since its inception in 2018, the Keyper has helped thousands of students across the country avoid the unpleasant situation of being locked out of their dorm and forced to pay nearly $100 to replace a lost key. Although this simple innovation is helpful, it is difficult to quantify exactly how valuable it is to customers. It is all too tempting for entrepreneurs to simply guess the added value of their product in terms of pricing. Inaccurate guesses can lead to unsold inventory, a unnecessary limit to the amount of people the product helps, or even the demise of a business. This thesis will showcase Economists' methods for measuring willingness to pay, hedonic modeling, and assessing market power so that entrepreneurs without a background in Economics no longer need to guess the value of their innovations. To model this important process, this thesis will focus on the Keyper, and specifically it's added key pocket, as a proxy for convivence.

What exactly is convenience? Researchers from Manchester Metropolitan University and the University of Bedfordshire, set out to identify the six elements of convenience and create a contemporary definition for the word (Farquhar & Rowley, 2009). The first two elements, and most significant, classifications of convenience are the time and effort saving aspects of the product or service. The third aspect of convenience is appropriateness which refers to how well the product fits a consumer's specific needs. The fourth element is portability which literally means the ability to consume the product in any given location. The fifth class of convenience is 'avoidance of unpleasantness', which allows consumers to avoid a task that they prefer not to perform. The sixth and final element of convenience refers to accessibility of the product or

service meaning how easy it is for consumers to find and purchase or consume the product. The overall definition for convenience that the authors concluded on is:

> "The convenience of a product is a judgement made by consumers according to their sense of control over the management, utilization and conversion of their time and effort in achieving their goals associated with access to and use of the product" (Farquhar & Rowley, 2009, p. 434).

The intended purpose of the Keyper is to offer convenience to customers according to Farquhar and Rowley's six elements of convenience. First, the product is intended to save its customers time while looking for their key by attaching a room key to what is readily accessible at all times- a cell-phone. Secondly, effort is saved by eliminating the need for a lanyard or other key holder. The third element, appropriateness of the product, is entirely subjective to the consumer but the intention is to achieve appropriateness to students with designs and colors themed after their university. Fourth, portability is intended by designing the product to be as mobile as a mobile phone. The fifth element, and perhaps most important for the Keyper, is that it is intended to save consumers from the unpleasant situation of being locked out or having to pay to replace a lost key. Lastly, the Keyper is sold online and in student bookstores which is intended to make accessing the product very easy for students and parents of students. All of these key elements build to a product that better allows customers to better utilize their time, effort, and money.

Measuring Convenience through a Hedonic Model and Willingness to Pay

However, Farquhar and Rowley (2009) did not answer what consumers are willing to pay for convenience. In order to measure what consumers are willing to pay for the overall added convenience of a Keyper, relative to a standard card holding phone wallet, a hedonic regression model must be employed. Hedonic models separate the characteristics of a product and assign a value to those individual characteristics. Rosen (1974) pioneered the hedonic model as a means to display the implicit attributes that property owners pay a premium for like parks, beaches, views, and quality schools. Rosen measured the marginal economic contribution of each of these attributes to the overall price of the property with a regression model built on sales data from

areas with varying combinations of these positive attributes but with similar homes. Essentially, comparing the same house with two different sets of amenities to discover what the value of those amenities are based on what consumers are willing to pay. This is why the model is named "hedonic" which is derived from the Greek word for pleasure, "hedonikos". In the context of the property market, the hedonic model has been used to measure the utility, satisfaction, or pleasure one derives through the consumption of goods and services related to the purchase of property.

The core theory behind the hedonic model was articulated by Lancaster (1966). Lancaster argued that it is not the good itself that holds value but rather the aggregate utilities and characteristics of a good. For example, owning an expensive home does not come from the house itself but rather the neighborhood, bedrooms, bathrooms, parking spaces, history of the house, and status associated with the property that comprise the overall value. Consumers make purchasing decisions based on the number of characteristics a good possesses per unit cost (Lancaster, 1966). This is why the number of bedrooms correlates directly with the price of the house.

Hedonic modeling, as a means to assess value, has a wide array of practical applications. The first hedonic pricing index was published by Andrew Court in 1939 in his effort to assess the value of unique automobiles (Goodman, 1998). The consumer price index, which relies on hedonic regression as a control mechanism for differences in the quality of products over time, is probably the most useful and famous example (Sopranzetti, 2010). For example, in the consumer price index the change in price of a Cadillac from 1963 and a Cadillac from 2017 can not only be measured by inflation. There are real technological and safety improvements that add value to the newer car. Hedonic utility is used to measure these gains and allows economists to separate innovation value gains from inflationary price gains (Sopranzetti, 2010).

The purpose of this study is to establish a method of collecting and analyzing buyer responses so that entrepreneurs can measure the added value of their product and price their products optimally. In order to find the optimal price, consumer willingness to pay must be measured. According to authors Kloss and Kunter published in the *European Journal of Management* willingness to pay is defined as the monetary equivalent of the added utility that a

particular product offers a particular consumer (2016). In other words, a consumer's willingness to pay reveals the price at which that consumer is indifferent between purchasing the product or forgoing the transaction. Finding willingness to pay can either be measured through stated preferences, in a survey, or revealed preferences, consumer transaction records. The combination of willingness to pay analysis and hedonic regression analysis was famously covered in Bishop and Murphy's 2011 paper, "Estimating the Willingness to Pay to Avoid Violent Crime", which found that the average household is willing to pay $472 per year to avoid a 10 percent increase in violent crime. Bishop and Murphy were able to find this premium by regressing prices of similar homes- in terms of size, condition, and other attributes- in the Bay Area of California against each neighborhood's crime rate. Therefore, they relied on a hedonic regression which broke down the value of the home into smaller aspects and found the premium paid for similar homes in neighborhoods with less crime to be the willingness to pay. This willingness to pay research will be conducted similarly to the paper by Bishop and Murphy (2011) but, unlike real-estate prices and crime data, the willingness to pay for phone wallets and the Keyper is not publicly available. Instead of examining revealed preferences then breaking down the item (house) into the measured attribute (crime) to find a willingness to pay, this thesis will break down the item (Keyper) into its unique attribute (additional Key pocket) to then ask for stated preferences in a survey. Using the existing phone wallet, which only holds cards, as a baseline, a hedonic model that assesses the added value of a second pocket fit specifically for a key can be constructed.

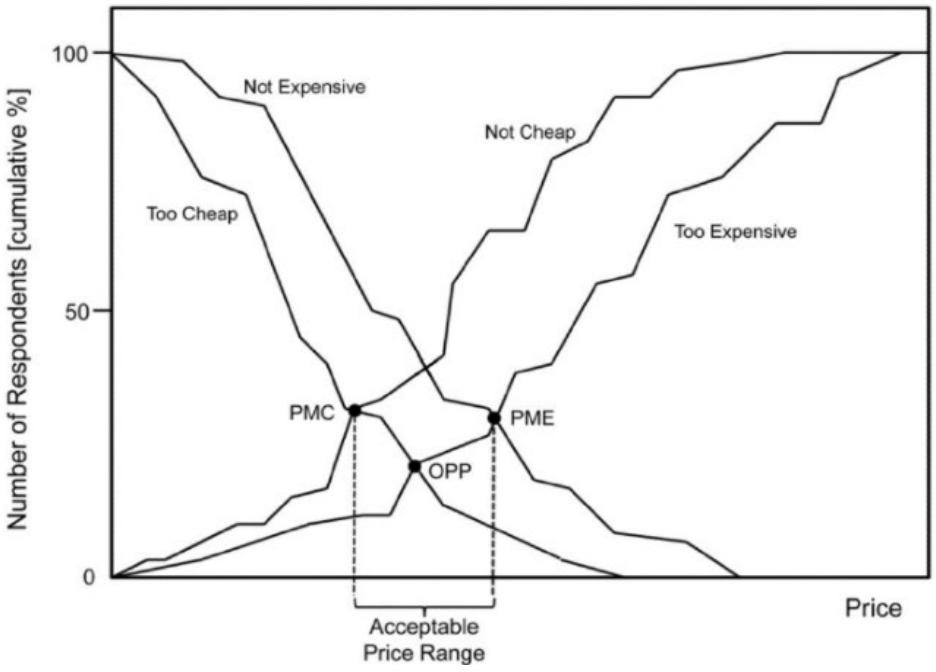
Survey Methodology

There are two best practice methods for finding willingness to pay through stated preferences. First, the Becker-DeGroot-Marschak (BDM) willingness to pay method creates an incentive for consumers to be honest but is a much more complicated than the Van Westendrop Price Sensitivity Meter (PSM) method (Kloss & Kunter, 2016). The BDM survey is designed as a lottery in which subjects are asked to name the maximum bid that they would be willing to pay for a product (Becker et al, 1964). Prices of the product are randomly generated and if the price is equal to or lower than the subjects bid subjects must buy at the randomly generated price. If the random price is greater than the subjects bid, the product cannot be purchased. With the BDM method, subjects have an incentive to reveal their true willingness to pay because the

higher their bid the greater their chances of obtaining the product, which essentially reveals their true demand for the product (Kloss & Kunter, 2016). The drawbacks of this method are that conducting the survey requires purchasing and delivering the products to each consumer that bids above or equal to the randomly generated price. Small businesses may not be able to afford to risk giving products away and respondents may not want to fill out a survey if it means they may need to spend money.

The Van Westerndrop Price Sensitivity Meter (PSM) offers a less complicated alternative to the Becker-DeGroot-Marschak willingness to pay method. The PSM method is often used for innovative products that consumers might not be familiar with yet (Kloss & Kunter, 2016). The Price Sensitivity Meter is conducted by asking consumers four questions which reveal the too inexpensive price point, bargain price point, getting expensive price point, and too expensive price point. Responses to these four questions are recorded as prices. Two of the price responses (so inexpensive and too expensive) are cumulated and plotted to form the lower and upper end of the acceptable price range. Two additional curves ("not inexpensive" and "not expensive") which are the inverse curves of "inexpensive" and "expensive" are also graphed bringing to total to four curves for analysis. From these four curves, critical price points are measured and displayed in the graph bellow.

Figure 1: Van Westendrop Price Sensitivity Meter



First, the Point of Marginal Cheapness (PMC) is the point at which the same proportion of respondents consider the product as "Too Cheap" and "Not Cheap". This point represents the lower bound of the acceptable price range. The Point of Marginal Expensiveness (PME) is point at which the same proportion of respondents consider the product as "Not Expensive" and "Too Expensive". This point represents the highest bound of the acceptable price point. The Optimal Price Point (OPP) the point at which smallest number of respondents consider the product "Too Cheap" and "Too Expensive". If the goal is to minimize the number of customers turned away by the price, this point is considered the optimal price point because the fewest number of customers are priced out by either too low or too high prices. Lastly, the Indifference Point (IP) which is not shown on the graph above is the point at which the same proportion of respondents consider the price of the product to be "Not Expensive" and "Not Cheap". The indifference price point is an indicator of the typical respondent's willingness to pay meaning that prices past this indifference point are beyond the typical respondent's willingness to pay. These four price points outline the "Acceptable Price Range" (Van Westendrop, 1976).

The “Not Expensive” curve represents the relationship between the proportion of customers willing to buy the product and the price of the product. The “Not Expensive” curve corresponds to the question: at what price would you think the item is getting expensive but would still consider it? This shows the point closest to where the monetary value of the item is equal to consumers added utility of the item. This point of indifference is the precise definition of willingness to pay according to research from Kloss & Kunter (2016, p. 48). Because it reveals the willingness to pay, as a percentage of customers, at each quantity of price, the “Not Expensive” curve is the demand curve.

Comparing Methods of Willingness to Pay

Researchers at the European University of Applied Sciences created a study to compare the results of employing the Becker-DeGroot-Marschak (BDM) verses Van Westendrop Price Sensitivity Meter (PSM) method to measure the willingness to pay of the same chocolate pistachio treat, the Kugel. With a group of 253 randomly selected German customers, the researchers asked 95 customers PSM questions, 68 customers BDM questions, and the remaining 90 customers were observed making purchases in a store (Kloss & Kunter, 2016). This study revealed that the Van Westendrop PSM produced a slightly higher predictive ability on consumer willingness to pay when compared to the buyer behavior at sores (Kloss & Kunter, 2016). The PSM survey produced a mean willingness to pay only .01 euros away from the actual willingness to pay (Kloss & Kunter, 2016, p. 8). The BDM method produced a mean willingness to pay .38 euros away from the actual willingness to pay (Kloss & Kunter, 2016, p. 8). The Van Westendrop PSM also required much less time, cost, and energy compared to the BDM which requires purchasing the items to sell to respondents at a randomly generated price. Because this research involves collecting data from hundreds of respondents during the Coronavirus pandemic, the Van Westendrop PSM, which does not require face-to-face interaction or any exchange of goods, is more feasible and less costly. Additionally, Kloss and Kunter proved the Van Westendrop PSM method to be sufficiently accurate at predicating willingness to pay (2016).

There are two specific types of Van Westendrop tests: a monadic test, where competition is not relevant, and a competitive test, where competition is relevant (Breidert et al., 2006). A monadic test would involve a specific set of questions that are only relevant to the single product in question, the Keyper. Monadic testing could be asking subjects to use the Keyper and give feedback on specific aspects of the product and its utility in person before reporting their pricing responses. A competitive test, on the other hand, would have a Keyper and a regular phone wallet side by side and the subject would be asked to compare specific attributes like the design and feel of the two items then report pricing. This survey will be a combination of both the monadic and competitive tests. However, this study will not ask customers to use either product because of the logistical difficulties of shipping products and the limited ability to meet in person due to the Coronavirus pandemic. Because this thesis is directly comparing the Keyper to its partial substitute- a phone wallet with no key pocket- and asking consumers for a fair price, the survey will be a competitive test that generates stated preferences. However, there is no perfect substitute to the Keyper because the Keyper is the only phone wallet that holds a key, so in that sense perfect competition is not relevant.

Market Power and the Learner Index

The reason the distinction between monadic and competitive is important is because the profit maximizing price differs between competitive and monopolistic markets. The Keyper is not in a perfectly competitive market for two reasons: it holds a key and the Keyper is patented. This grants the Keyper's firm market power which is defined as the power to raise prices above marginal cost without the fear that other firms will enter the market.

Abba Lerner's 1934 paper "The Concept of Monopoly and the Measurement of Monopoly Power" argued that the existence of monopolies contributes to social loss and allocative inefficiency. Learner's paper also proved the proper measurement of market power as based on the difference between price of the product and marginal cost rather than price and average cost. The values of the Learner Index range from 0 [perfect competition] to 1 [monopoly]. The beauty of the learner index is its simplicity. With just the knowledge of the

product's price and the marginal cost, an entrepreneur can solve for the market power of the product.

The economic literature on convenience, hedonic modeling, willingness to pay, and market power holds methods and theories that are useful to entrepreneurs but this research tends to focus on existing products with rich transaction data like the real-estate market or widespread consumer goods like the chocolate Kugel, not new products with less traction. This thesis aims to bring fundamental economic theories like the essential qualities of convenience, Learner's market power implications and established methods of surveying willingness to pay like the Van Westendrop Price Sensitivity Meter to the Keyper, an innovative product without rich transaction history.

Chapter 2 Data and Results

Survey Results

In order to construct an accurate demand curve, selecting the appropriate survey demographic to sample is essential. The population size is 310 respondents. Because the Keyper is a product designed to solve a problem of university students, the two Keyper customer segments are based on education level and age. Current undergraduate students (ages 17 through 22) and the parents of undergraduate students (ages 40 and older) are the targets of this survey. Reaching parents was achieved through requesting to survey the over 1300 parents who have visited the Keyper website and either subscribed or purchased a Keyper. This customer segment is self-separated because they have all individually expressed interest in the product before the time of the survey. However, this demographic which represents Keyper customers is the precise group in which measuring willingness to pay is most important.

The survey consists of two parts: the Van Westendrop price sensitivity questions, which reveal the willingness to pay for both regular phone wallets and the Keyper, and demographic questions. All respondents saw two phone wallets: the Keyper and the regular phone wallet. Under an image of the regular phone wallet and the image of the Keyper, respondents were asked each of the four price sensitivity meter questions:

Figure 2: The Keyper and Regular Phone Wallet

1) At what price would you begin to think the item is so inexpensive that you would question the quality and not consider it?
2) At what price would you think the item is a bargain?
3) At what price would you think the item is getting expensive, but you still might consider it?
4) At what price would you begin to think the item is too expensive to consider?

Respondents typed in a value between $1 and $50 for each question. This range is set because at a $1 price would not be feasible from a cost perspective. The maximum price is set at $49.99 to avoid taking data from respondents that are intentionally trying to skew the data. Beyond the Van Westendrop price sensitivity meter questions, the survey included demographic questions which categorize respondents based on whether they have purchased a Keyper before, age, parenthood, education level, employment status, income level or student expenses, marriage status, and gender. Each demographic question and the willingness to pay for the regular phone wallet serves as independent variables in a regression against their willingness to pay for a Keyper, the dependent variable. The descriptive statistics for each of the price sensitivity variables, relevant demographic variables, and the cumulated average willingness to pay for both the Keyper and regular phone wallet are shown in Table 1.

Descriptive Statistics

Table 1: Descriptive Survey Response Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Gift Card	300	.75	.434	0	1
So Inexpensive RPW	271	3.164	3.026	1	25
Bargain RPW	271	5.873	3.771	1	35
Getting Expensive RPW	206	10.323	5.517	1.2	45
Too Expensive RPW	271	14.754	7.829	2	50
So Inexpensive Keyper	231	3.627	3.13	1	30
Bargain Keyper	231	7.223	4.615	1.5	40
Getting Expensive Keyper	174	11.411	5.892	3	40
Too Expensive Keyper	231	16.64	8.219	3.5	50
Purchased Before	230	.422	.495	0	1
Age	231	31.58	14.507	18	86
Parent	64	.297	.46	0	1
Male	310	.255	.436	0	1
Higher Income	310	.6	.491	0	1
Age Squared	231	1206.844	1156.814	324	7396
Student	310	.255	.436	0	1
Married	310	.245	.431	0	1
High budget	310	.561	.497	0	1
Average Keyper	174	9.579	4.991	2.25	35
Average RPW	206	8.516	4.77	1.3	37.5

Note:
Categorical variables for Education Level, Employment Status, Marriage Status, Income Level, and Student expenses are outlined and explained in the appendix.

Comparing Average Willingness to Pay for the Keyper vs. Regular Phone Wallet

Before finding the willingness to pay for the convenience of a Keyper based on the demographics of the respondent, the overall willingness to pay for the Keyper is compared to the overall willingness to pay for the regular phone wallet. After averaging all three willingness to pay questions (too inexpensive, bargain, getting expensive, and too expensive) respondents reported an averaged willingness to pay of $9.59 for the Keyper and $8.53 for the regular phone wallet. Because the only difference between the Keyper and the regular phone wallet is the second key pocket, the added convenience of the key pocket can be measured through the difference in willingness to pay between the Keyper and the regular phone wallet. Therefore, the added convenience of the second key pocket is $1.06. Essentially, this means consumers are willing to pay an additional 12.4% as a premium for the convenience of a key-holding pocket. Equations in the Appendix display the methods used to aggregate the willingness to pay for both the Keyper and regular phone wallet. These aggregated values for willingness to pay are displayed as "Average Keyper" and "Average RPW" in Table 1. The difference between these two values does not account for differences in income, age, or any of the other demographic characteristics that might determine an individual's willingness to pay for the Keyper. In order to account for these demographic differences on the willingness to pay for a Keyper, a hedonic regression must be employed.

Hedonic Regression Analysis

The dependent variable in this regression is the willingness to pay for the Keyper. The ten independent variables are the willingness to pay for the regular phone wallet as well as each of the following demographic variables. Whether a respondent is male. If the respondent is higher income which is defined as all non-student respondents whose household earns more than $60,000 to $70,000 per year. This cut off is determined by the median household income in America of $68,703 as of 2019 (Semega & Kollar, 2020). The age of the respondent. Whether the respondent is a parent, student, or non-student. The marital status of the respondent. Whether respondents wanted to be added for a chance to win a $20 Amazon gift card. If the respondent

has purchased a Keyper before. And lastly, weather the respondent is a high budget student who spends more than $30,000 per year on university fees which is roughly the cost of instate tuition in Pennsylvania. Each of these demographic variables were chosen to gauge whether the Keyper would make a respondent life's, with that particular characteristics, more convenient. The hedonic regression bellow answers whether that variable was significant and the added willingness to pay for the convenience of a Keyper based on each variable.

Table 2: Keyper Hedonic Regression Model

Willingness to Pay Keyper	Coefficient	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Willingness to Pay RPW	1.058***	.098	10.73	0.000	.860	1.256
Male	-.926	1.065	-0.87	0.388	-3.065	1.212
High Income	.503	1.031	0.49	0.627	-1.566	2.573
Age	.560**	.2180	2.57	0.013	.1228	.998
Age Squared	-.005**	.0021	-2.50	0.016	-.009	-.001
Student	1.801	1.293	1.39	0.170	-.794	4.398
Parent	-3.278	2.376	-1.38	0.174	-8.050	1.492
Married	-1.894	2.527	-0.75	0.457	-6.969	3.180
Gift Card	.858	1.040	0.83	0.413	-1.230	2.947
Purchased Before	1.137	1.187	0.96	0.343	-1.246	3.520
High Budget Student	2.18**	.948	2.31	0.025	.282	4.092
Constant	-11.818**	4.371	-2.70	0.009	-20.593	-3.043

Note:

The * next to Willingness to Pay RPW, Age, Age Squared, and High Budget Student indicate that the variables are significant. * indicates significance at the 90% critical level. ** indicate significance at the 95% critical level. *** indicate significance at the 99% critical level.

After conducting the regression, the most significant independent variable is the willingness to pay for the regular phone wallet. This variable is statistically significant at the 99% confidence interval. The coefficient for this variable is 1.058 which indicates that for every additional dollar a respondent reported they are willing to pay for a regular phone wallet, the respondent adds $1.058 in their willingness to pay for the Keyper. This result answers the

question of how much the added value of the key pocket is worth: 5.8% more than the regular phone wallet controlling for all other variables.

The only other variables that are statistically significant at the 95% confidence interval is whether a respondent was fit into the income category of high budget. This was is a binary variable for the students that spend more than $30,000 per year on university related fees. The coefficient for this variable means that if a respondent reported spending more than $30,000 on university fees then they are willing to pay $2.18 more for a Keyper than someone who spends less than $30,000 per year on university fees. This makes sense because the Keyper, as a tool for not losing a dorm key, is most valuable to students. The students that already have more money to spend on tuition are likely to have more money to spend on other items at their disposal. Therefore, their budget constraint is higher and their willingness to pay is higher.

The last variables that are significant at the 5% critical value are age and age squared. Older people are willing to pay more for the Keyper. The age squared variable reveals that respondents are willing to pay more the Keyper with age at a decreasing rate. The age squared variable reveals that the peak age of willingness to pay is age 58. That is the age of current university student's parents. Although 58 year-olds are not concerned about losing their dorm keys, if they have children currently in college, they are often the ones who pay the bill for replacing lost keys. This means, according to Farquhar and Rowley's fifth classification of convenience the Keyper indirectly adds convenience to their life, even though they do not use dorm keys, because it avoids the unpleasant financial situation of replacing a lost key (2009).

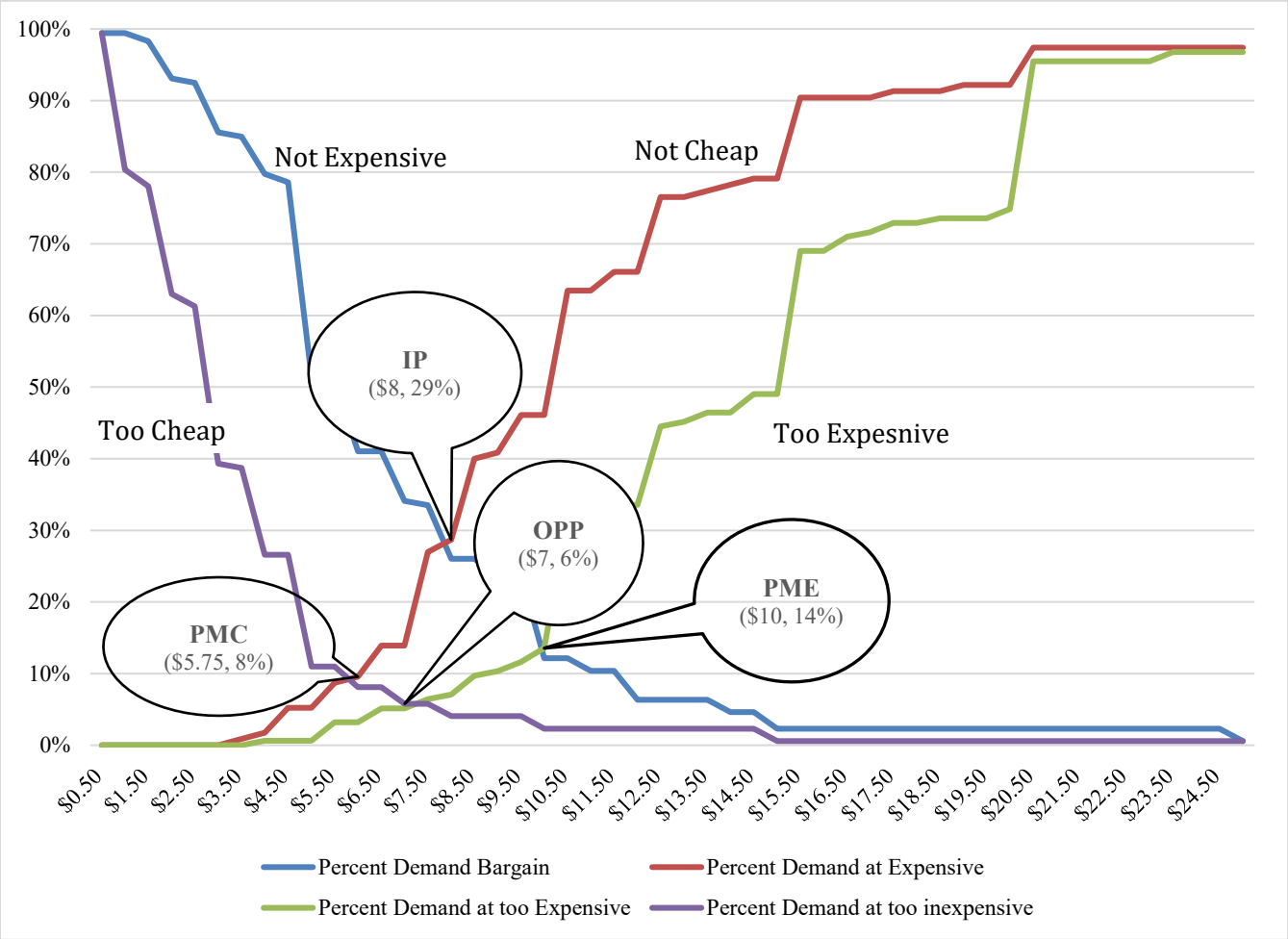
The insignificant variables are whether the customer is male or non-male, whether they are of high income, whether the respondents reported interest in gift cards, whether they are single or married, and whether they have purchased a Keyper before. Seeing that the willingness to pay if someone has previously purchased a Keyper is not significantly different from someone who has not purchased a Keyper before is important. The insignificance of the Purchased Before variable shows that this study's method of finding respondents, in part by surveying those who have visited the Keyper website, has not biased the results. The overall R-Squared value indicates a relatively strong predictive ability of 80%.

Chapter 3 Price and Demand Implicaitons.

Acceptable Price Range

The hedonic regression analysis reveals the added value of the Keyper which is intended to make the regular phone wallet more convenient. The increased willingness to pay of 5.8% proves that respondents believe that the Keyper is worth more than the regular phone wallet. However, this does not inform an entrepreneur of the specific price to charge for the Keyper. The Van Westendrop Price sensitivity meter graphs the willingness to pay data from 310 respondents and displays the acceptable price range.

Figure 3: The Keyper Van Westendrop Price Sensitivity Meter



At each price the corresponding cumulative percentage of the population that believed the product was too inexpensive, a bargain, getting expensive, and too expensive is displayed according to each price point. The Van Westendrop Price Sensitivity Meter graph displays the

distance between the PMC and the PME and reveals the acceptable range of prices in which customers are not deterred by too low or too high of a price. The Keyper's acceptable price range spans from $5.75 to $10.05.

The lower bound of the acceptable price range is set by the Point of Marginal Cheapness (PMC). The intersection between the purple and red lines displays the PMC. The PMC represents where the same proportion of respondents consider the product as "too inexpensive" and "expensive". The Keyper's PMC is ($5.75, 8%). At the price of $5.75 only 8% of customers would be priced out because the price is so low that they question the quality of the product but only 8% of customers see the Keyper as expensive at that price point. This point represents the lowest price for which the product should be listed because all prices to the left of this intersection would increasingly signal that the product is lacking in quality to customers (Van Westendrop, 1976).

The intersection between the green and blue lines displays the upper bound of the acceptable price range, the Point of Marginal Expensiveness (PME). The PME is where the same proportion of respondents consider the product as "too expensive" and "bargain". The Keyper's PME is ($10, 14%). This point represents the maximum price for which the product should be charged because the tolerance for higher prices past this point is extremely low. At a price of $10.05, 14% of customers are priced out because the Keyper "too expensive" and 14% of customers still see the Keyper as a bargain. Essentially, prices between $5.75 and $10.05 price out the least number of customers due to "too inexpensive" and "too expensive" prices.

In the middle of the acceptable price range is the Optimal Pricing Point (OPP) which is referred to as optimal because it minimizes the proportion of respondents consider the product "too inexpensive" and "too expensive". At $7 only 6% of respondents believe that the price of the Keyper is "too expensive" and 6% of respondents believe that the price of the Keyper is "too inexpensive". Essentially, at a $7 price point, 94% of all respondents do not believe the Keyper is either "too expensive" or "too inexpensive."

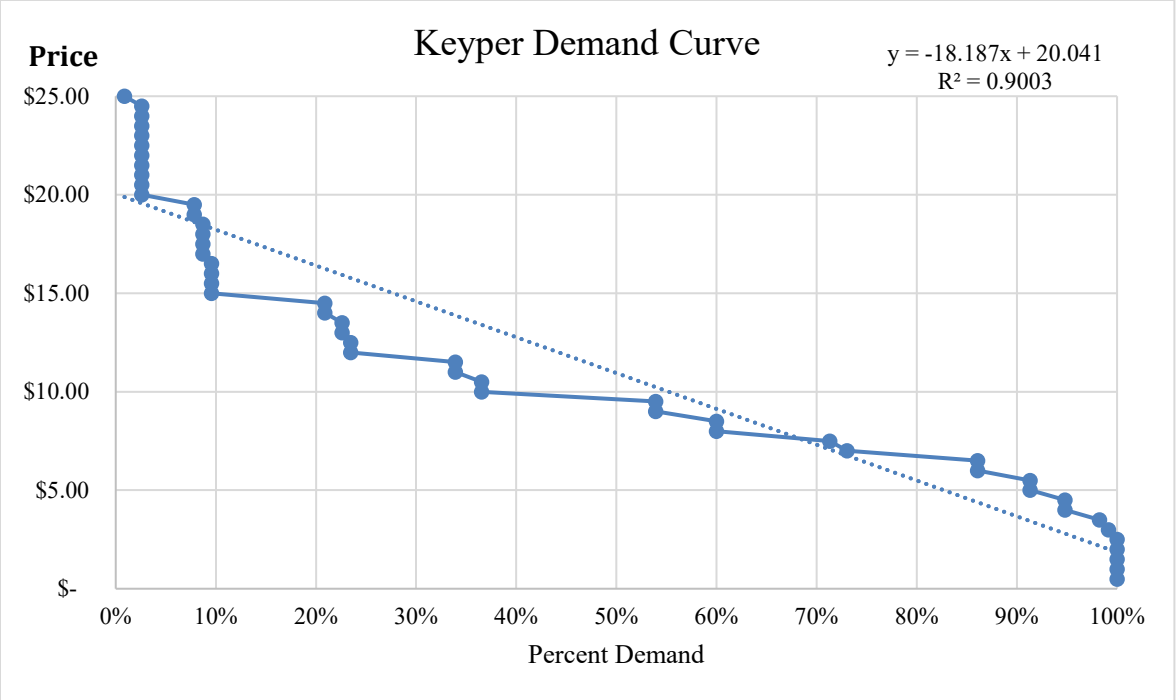
Also, in the middle of the acceptable price range but at a higher population percentage is the Indifference Point (IP)- at which the same proportion of respondents consider the price of the product to be “bargain” and “expensive”. The Keyper’s Indifference Price Point is found at ($8, 29%). Essentially, prices to the right of this point are increasingly too expensive because the IP represents the point at which consumers are near indifferent between the utility of the Keyper and the utility of the money spend on anything else. This is also referred to as the normal price point. Van Westendrop argued that the Indifference Price Point represents either the median price actually paid by consumers of the product, or the price of the product of an important market leader (1976).

The results of the Keyper’s Van Westerndrop price sensitivity meter match the real prices of the Keyper in stores and online. The Keyper currently costs $7.50 online and $5.99 in campus bookstores. The price online is directly between the Optimal Price Point and the Indifference Price Point. Nearly 90% of the customers purchasing Keypers online and paying this higher price are parents of college students. This demographic revealed a significantly higher willingness to pay based on age in the hedonic regression model above. Most of the customers paying the lower price of $5.99 in campus bookstores are students. Although students do not display a significantly higher willingness to pay, the bookstores purchase the Keyper before they are resold to students. Bookstores have an interest in selling all their inventory faster which could explain why the price per Keyper at bookstores is very near the Point of Marginal Cheapness and very near the lower bound of the acceptable price range.

The Keyper Demand Curve

At each price point, the demand curve reveals the percentage of customers willing to purchase the product. In other words, on the demand curve the utility of having the product is equal to the utility of that amount of money spent on something else. To construct this curve, price responses to the survey response question: 'at what price do you think the item is getting expensive but you still might consider it?' were graphed because it measures the maximum that customers are willing to pay for the Keyper.

Figure 4: The Keyper Demand Curve

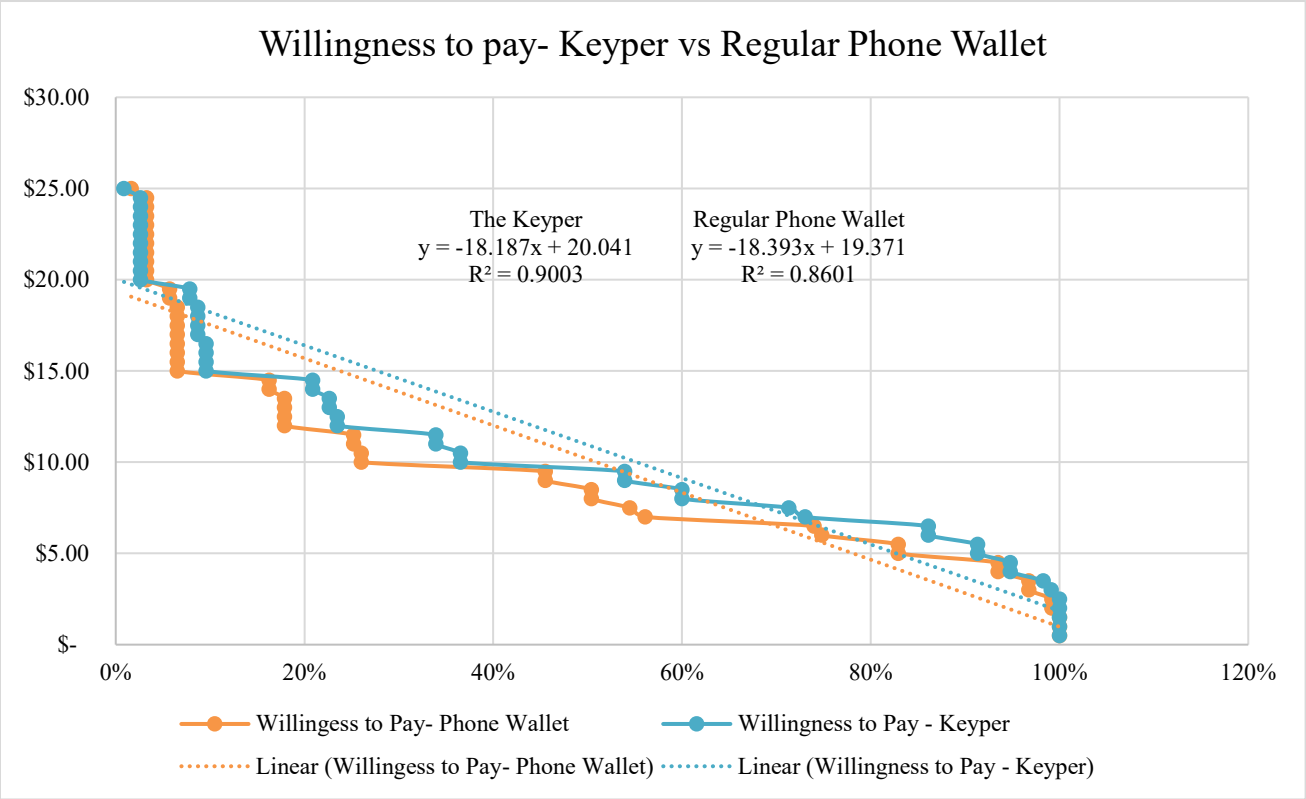


The linear trend line is not perfect. However, it does predict that a price drop of $0.18 will add a one unit, or percentage point, increase in the proportion of customers to buy a Keyper. This equation has an R squared value of .9003 which means that the trend line of predicted data points fits the actual data points with 90% accuracy. Creating this demand curve might be the goal of entrepreneurs reading this thesis because the demand curve allows entrepreneurs to calculate the total revenue curve by multiplying the quantity demanded by price at each point on the demand curve. The derivative of the total revenue curve is the marginal revenue curve which must be used to solve for the profit maximizing price.

Comparing Keyper Demand Curve vs. Regular Phone Wallet Demand Curve

The following graph displays the numeric answers to the question "at what price do you think the item is getting expensive but you still might consider it?" for both the Keyper and the regular phone wallet. As mentioned in the literature review, the answers to this question reveal the point at which a customer is indifferent between the added utility of the Keyper or regular phone wallet and the utility of the money that could be used for something else. Therefore, the results of this question display point on the demand curve.

Figure 5: Comparing Keyper vs. Regular Phone Wallet Demand Curve



Comparing the demand curves for the Keyper and the regular phone wallet reveal that, on average, customers are willing to pay more for the Keyper at the middle range of prices but not at the extremes. For instance, it is visually evident that the largest difference in willingness to pay is when both the Keyper and the regular phone wallet are priced between $5 and $10. There is nearly no difference in willingness to pay at prices above $20 and bellow $5. This disparity in the middle but convergence at the ends makes sense because the Keyper is measurably different

and adds value but is still similar to the regular phone wallet in terms of materials, size, quality, and ultimately price.

Elasticity of Demand

After comparing the price-point elasticity for the Keyper and the regular phone wallet at the Van Westendrop Optimal Price Point, the Keyper was found to be more elastic. The Optimal Price Point is referred to as optimal because it minimizes the proportion of customers who believe the price is "too inexpensive" or "too expensive." The Optimal Price-Point elasticity of demand is -.537 for the Keyper and -.397 for the regular phone wallet. This means that demand for the Keyper is more responsive to a change in price than for the regular phone wallet at the Optimal Price Point for both products. Essentially, a one-unit price increase would decrease the amount of Keypers demanded slightly more than a one-unit price increase for the regular phone wallet. The full equations and methods of calculating the Optimal Price Point elasticity of the Keyper and the regular phone wallet are in the Calculating Price Point Elasticity section of the Appendix.

The Keyper's higher point elasticity of demand makes intuitive sense for two reasons. First, the Keyper is a more niche product because it is designed for a specific demographic-college students who use a dorm key. For the people purchasing within or for this demographic, the demand for this product would be relatively inelastic or less responsive to a price change because it solves a particularly painful and familiar problem. However, for the people not affected by the problem of lost dorm keys, the demand for the Keyper would be more elastic or responsive to a price change. Because the Keyper already offers little convenience to people not affected by the problem of lost keys, a change in the price should dramatically influence demand. The regular phone wallet on the other hand is designed for a less niche market because more people use credit cards than there are students and parents worried about losing a dorm key. Therefore, this broad appeal would yield a more inelastic response from a price change because the product is still useful to many people.

The second reason for the Keyper's higher price-point elasticity is because people are generally more familiar with the regular phone wallet. It can be hard to answer willingness to pay at various prices for a product that the respondent has never used. For that reason, when the price of an unfamiliar product increases the demand for that product would fall even further because, intuitively, people are not willing to pay more when they don't know what the item is.

The revenue implications based on these elasticity calculations are that the markup can be higher for the relatively less elastic product- in this case the regular phone wallet. This is true because as prices increase, the less elastic product will lose less quantity demand and therefore less revenue. However, the demand curves for the Keyper and the regular phone wallet are not identical. The Keyper commands a higher price than the regular phone wallet at each point on the demand curve. Therefore, the regular phone wallet can yield a higher percentage markup because demand for the product is relatively less elastic. Even though the percentage markup for the Keyper is lower, the total markup could be higher because the willingness to pay for the Keyper is higher at all points on the demand curve.

Market Power

Abba Learner established the Learner Index to measure the market power of a firm. The Learner Index measures the market power of a particular firm on a scale from 0 [perfectly competitive] to 1 [monopoly] (Learner, 1934). The Learner Index subtracts the price of the product from the marginal cost and divides that result by the price of the product (Learner, 1934). Assuming the marginal cost for the Keyper is $0.71 and the price of the Keyper is the Van Westendrop Optimal Price Point of $7, the Learner Index value for the Keyper is .899. These equations are displayed in the Market Power section of the Appendix. A learner index value of .899 proves the Keyper has significant market power.

The implications of the Learner Index are limited because they were derived when the concept of a monopoly was in terms of industrial commodities like steel and not software related. Measuring market power as a difference between the products price and the marginal cost of production is more applicable when it comes to commodity products. For example, if a steel mill

producers one ton of steel for $100 but it can sell one ton for $200 that would indicate that there is no coemption bringing the price back down to marginal cost and therefore the mill has market power. However, modern products that might have a learner index of .899 or higher would be streaming services like Netflix which have a monthly subscription price of $5 and a marginal cost near zero because there is no additional cost to adding a user to the existing platform. Although the Learner Index would indicate that Netflix has near absolute market power, it would also indicate that each of Netflix's competitors has near absolute market power because each steaming service has a near zero marginal cost. The Learner Index is an appropriate measurement for market power with commodity goods but not software-based products. The Keyper is a commodity good with utility patent protection which ensures competition cannot legally produce Keypers and sell them closer to marginal cost; therefore, the learner index for market power is an appropriate measurement of market power.

Chapter 4 Conclusion

Limitations

The greatest underlying assumption in this study is attributing a higher willingness to pay for the Keyper as added value of convenience. The survey only asked respondents for four price points and required no information on whether the Keyper would make some aspect of the respondent's life more convenient. This limits to extent to which the results that reveal a greater willingness to pay can be interpreted as the value of added convenience. Consumers may have reported a higher price for the Keyper because they like the idea of it or they like the fact that they are asked to participate in the survey, not because it is necessarily more convenient for them. Overall, however, the Keyper was created to add convenience to the existing regular phone wallet for people using a dorm key. The volume of responses from both students and parents allow for the implications of this study to rest on the reason the product exists- to add convenience according to researchers Farquhar & Rowley's six characteristics of convenience (2009).

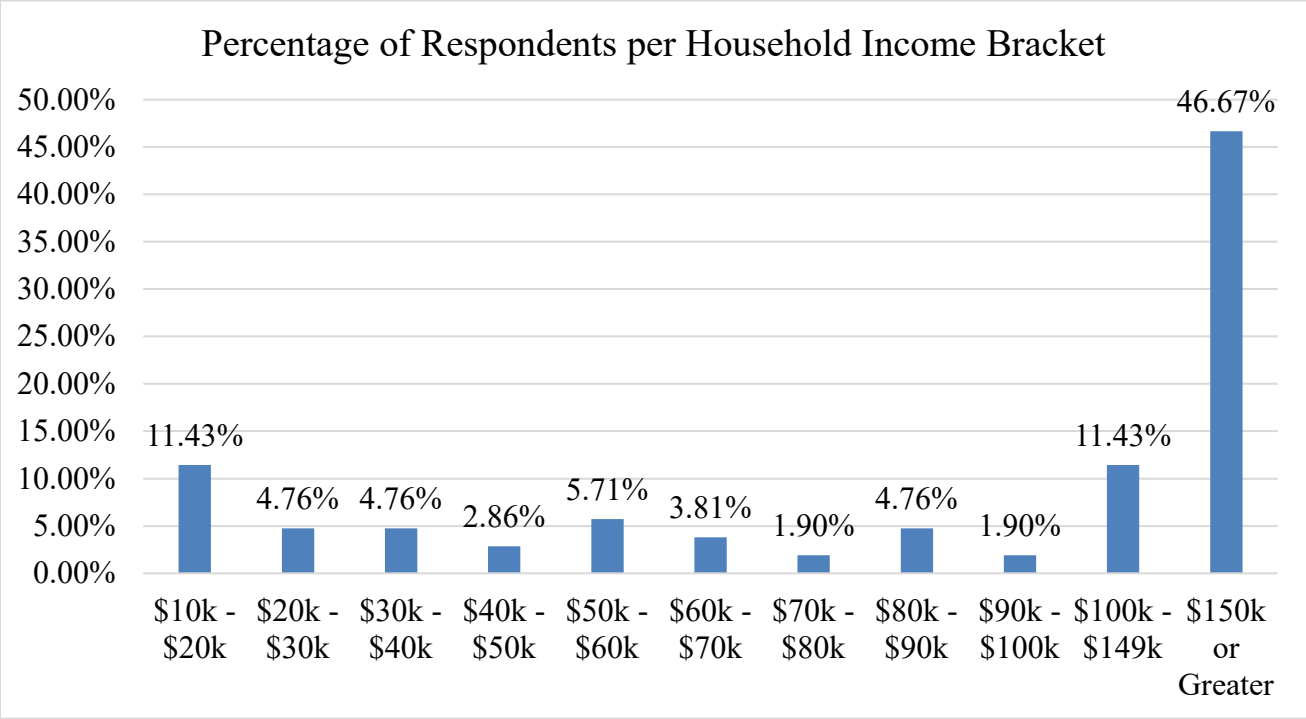
There are a few key limitations on the inferences that can be accurately drawn as a result of the survey methods in this study. In general, revealed preferences are generally more accurate than stated preferences. Stated preferences suffer from the issue of not offering any incentive for respondents to be honest. This issue is mitigated by gathering responses from larger population sizes. The sample population of 310 was not gathered randomly. Survey respondents were notified and asked to fill out the survey from the author's personal social media accounts and an email was sent to people that had visited the Keyper website. The people who clicked on the link to the survey from social media all had familiarity with the author. This is a potential source of bias. Perhaps this familiarity would encourage respondents to list higher prices because they thought the author would appreciate their feedback more if they valued his invention higher. This familiarity also gathered responses from people that had previously spoken to the author about the product and had an idea of what it costs to produce. Therefore, another source of bias could be form people entering willingness to pay values based on their awareness to the Keyper's costs

to produce. Neither of these biases skew the data significantly in one particular direction because of the more than 300 people who filled out the survey less than 10 people, or 3 percent, are close friends and family that might know cost information or have a strong desire to alter their responses to flatter the author.

Visitors to the Keyper website were surveyed which does bias their willingness to pay responses because they have seen the prices that the Keyper sells for online. One positive aspect of this is that the Van Westendrop Price Sensitivity Meter does require that consumers have some sense of what the product or service is worth (Van Westendrop, 1976). Therefore, soliciting responses from people who have visited the Keyper website and have established their familiarity with the product would produce data that is appropriate. It is also essential that some share of the respondents use the Keyper so that they can draw on their experience to quantify their willingness to pay for the utility of the Keyper. If no one in the study used the product the findings would be entirely theoretical. The demographic question asking “have you purchased a Keyper before?” determined the share of the sample population that might suffer from this bias. The results were that 60.47% of respondents had never purchased a before. The 39.53% of people who responded that they have purchased a Keyper before have used the product and can draw on experience to better quantify the added convenience and value of using a Keyper versus a regular phone wallet.

Additionally, the offer of a random change to win a $20 Amazon gift card to all survey respondents could bias the results. This incentive is probably stronger with college students that do not yet have an income than it is with the parents of college students. There is a potential for bias because college students who are sufficiently motivated to fill out this survey solely for the chance to win a $20 gift card might have very low disposable income and therefore a lower willingness to pay because they have very low disposable income. However, with 310 respondents the effect of a few financially desperate students is diluted by the majority of respondents that are less financially desperate or have an income. In fact, a larger source of bias is probably a skew towards people in the highest household income bracket. The histogram bellow reveals the frequency of household income by $10,000 brackets.

Figure 6:Survey Respondents by Household Income Brackets



The revealed income and expenses of the survey respondents reveals a clear skew towards higher income people. There were more respondents who reported living in a household that earns more than $150,000 than all other income brackets combined. Because students do not yet have income, the higher income respondents are most likely the parents of college students who previously visited the Keyper website. But, because they are likely parents, this does not necessarily bias the results because high income customers are the demographic able to send their children to college and therefore Keyper customers. According to the *US Census Bureau*, the median household income in America in 2019 was 68,703. Only 3.17% of American households make more than $150,000 per year (Semega & Kollar, 2020). A majority of the respondents to the survey have a higher income which makes the results representative of only a small portion of the general population. However, this small portion of the general population, which can afford to send their children to college, is the demographic in which willingness to pay for the Keyper is most relevant to this study. The median household income reported in this survey was in the bracket of $100k to $150K. These results are consistent with the New York Times (2017) finding that the median household income for students at Penn State was $101,800.

Conclusion

This thesis is intended to employ the existing literature on the convenience economy as well as the processes of creating a willingness to pay survey and a hedonic regression model so that entrepreneurs can answer this question: what is value of the added convenience of this product worth to consumers?

The six key attributes of convenience, as outlined by Farquhar and Rowley, are time saving, effort saving, appropriateness, portability, 'avoidance of unpleasantness' and accessibility (2009). The Keyper is identical to a standard card-carrying phone wallet expect for the addition of a second pocket fit specifically for a key. The Keyper adds convenience by eliminating time spent looking for keys and the added effort of carrying a lanyard or other key holder. The Keyper ensures portability because it is as mobile as a mobile phone. Most importantly, the Keyper prevents the unpleasant situation of being locked out or having to pay to replace a lost key. For each of these reasons, the Keyper is used as a proxy for convenience in this thesis.

To discover what consumers are willing to pay for the Keyper, a survey of the Van Westendrop Price Sensitivity Meter questions was sent to people who visited the Keyper website and people within the author's network. The 310 survey responses were used to compare the average willingness to pay for the Keyper vs. the regular phone wallet, to create the hedonic regression model, graph the acceptable price range, and finally create and graph the Keyper demand curve. This process is valuable because it can be replicated by other entrepreneurs to inform their pricing decisions.

The average willingness to pay for the Keyper was $1.06 more (an additional 12.4% more) than the regular phone wallet. Because the Keyper and the regular phone wallet are identical besides the additional key pocket, this difference can be interpreted as the average willingness to pay for the added convenience of the additional key pocket. However, the regression model found that after controlling for all demographic variables, the willingness' to pay for the Keyper was an additional $1.058 cents for every dollar spent on the regular phone

wallet or 5.8% more than the regular phone wallet overall. The hedonic regression model held willingness to pay for the Keyper as the dependent variable and willingness to pay for the regular phone wallet, gender, income, age, marital status, interest in a gift card, weather the respondent purchased a Keyper before and university related fees of the respondent as dependent variables. The most significant predictor of willingness to pay for the Keyper was willingness to pay for the regular phone wallet at more than a 99% critical level.

As proven by the results of this study, consumers are willing to pay a premium for convivence with certain demographics of age and spending levels willing to pay more than others for convenience. The results of the hedonic regression reveal that the extent to which people are willing to pay for convenience depends on how much money they have to spend. Students who already spend more than $30,000 on university related fees each year were willing to pay $2.15 more for the Keyper. This could be because higher budget students have more money to spend writ large and they have directly experienced the inconvenience of holding a dorm key. However, despite not being in university, the specific age with the highest willingness to pay for the Keyper was 58 years old. This is the precise age of the parents of current college students. This could be because when students lose their keys their parents are often the ones who have to pay to have them replaced.

The methods employed in this thesis end at finding willingness to pay through the Van Westendrop Price Sensitivity Meter, assessing the added value of convenience through a hedonic regression model, and measuring the market power of a firm with the Learner Index. This thesis enables entrepreneurs who might want to take these methods further and discover the profit maximizing price of their product. If entrepreneurs would like to find the profit maximizing price, five different curves are needed. First, the demand curve is needed to create the total revenue curve by multiplying price by quantity at each point on the demand curve. Then the marginal revenue curve is found by taking a derivative of the total revenue curve. The marginal cost curve is the equation that represents the additional cost to the firm of creating a new item. The average cost curve is created dividing the fixed and variable costs of production by the number of items produced. For a firm with market power, the profit maximizing price is found

where price meets quantity demand above the intersection of marginal revenue and marginal cost.

To better understand the convenience economy, and the willingness to pay for convenience of specific products, further research could be conducted to assess whether the probability of an inconvenient event occurring effects the willingness to pay for added convenience. The overarching assumption is that creating a product that increases convenience will create demand for that product. However, neglected in this assumption is the probability of that inconvenient event occurring and the degree of financial and emotional stress caused by the inconvenient event. For example, losing a key is inconvenient but it is not as financially and emotionally inconvenient as losing a laptop. However, the probability of losing a key might be higher than the probability of losing a laptop. Research could be conducted on how the probability of an inconvenient event effects the willingness to pay for added convenience.

Appendix

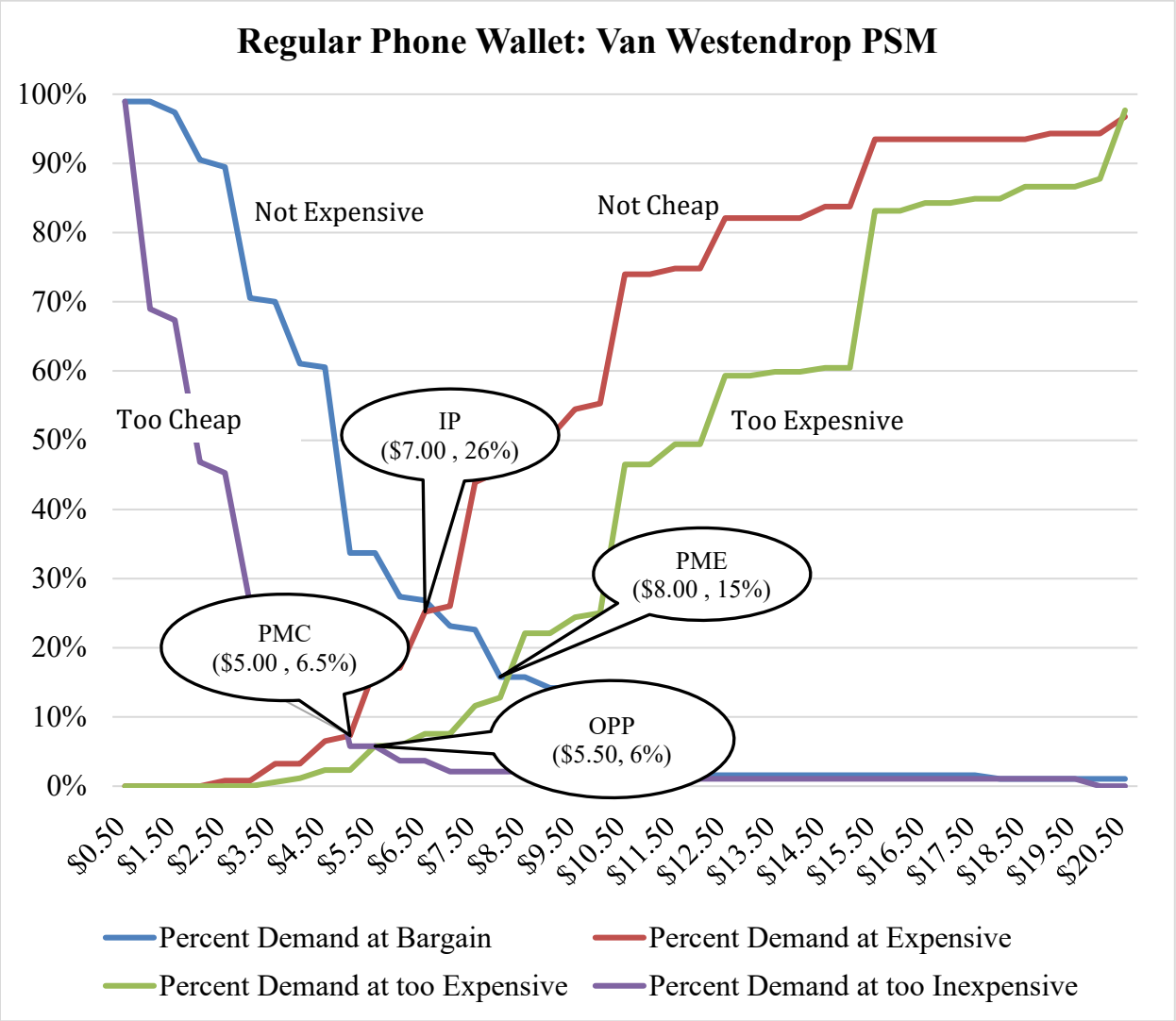
Demographic Questions and Variable Assignments

1. Have you ever bought a Keyper before?
    a. (1 = yes)
    b. (0 = no)
2. What is your age?
3. Do you have children in college?
    a. (1 = yes)
    b. (0 = no)
4. What is your highest level of education?
    a. (9 = high school)
    b. (10 = college)
    c. (11 = associates)
    d. (12 = bachelors)
    e. (13 = masters)
    f. (14 = doctorate)
    g. (15 = post doctorate)
5. Which statement best describes your current employment status?
    a. (1 = working)
    b. (4 = self-employed)
    c. (6 = not working)
    d. (7 = retired)
    e. (9 = not applicable)
    f. (10 = student)
6. How do you identify? Male or Female?
    a. (0 = female)
    b. (1 = male)
    c. (3 = other)

7. Are you now married, widowed, divorced, separated, or never married?
    a. (1 = married)
    b. (4 = widowed)
    c. (5 = divorced)
    d. (6 = separated)
    e. (7 = never married)
8. What is your annual household income?
    a. (1 = not applicable)
    b. (2 = 10 – 20k)
    c. (3 = 20 – 30k)
    d. (4 = 30 – 40k)
    e. (5 = 40 – 50k)
    f. (6 = 50 – 60k)
    g. (7 = 60 – 70k)
    h. (8 = 70 – 80k)
    i. (9 = 90 – 100k)
    j. (11 = 100 – 150k)
    k. (12 = 150k +)
9. If you are a student, what are your annual expenses?
    a. (1 = not applicable)
    b. (2 = 5-8k)
    c. (3 = 8 – 15k)
    d. (4 = 15 – 20k)
    e. (5 = 20 – 30k)
    f. (6 = 30 – 40k)
    g. (7 = 40 – 50k)
    h. (8 = 50k +)

Regular Phone Wallet Van Westendrop Price Sensitivity Meter

Figure 7: Regular Phone Wallet: Van Westendrop PSM



Generating and Calculating Average Willingness to Pay

Generating average_Keyper varibale. This variable represents the average willingness to pay across all four willingness to pay sections. To average for the difference in prices between the Keyper and regular phone wallet, I created two new variables in Stata: average_Keyper and average_RPW. These variables were created by generating the average across each four of the willingess to pay questions with this code:

$$Generate\ average_{Keyper} = \frac{(GettingExpensive_{Keyper} + Bargain_{Keyper} + SoInexpensive_{Keyper} + TooExpensive_{Keyper})}{4}$$

Essentially, this code added all four of their Keyper price responses and divided by 4 for each respondent to get their average price for the Keyper. Then this code added all four of the regular phone wallet responses and divided by 4 for each respondent to get their average price for the regular phone wallet.

$$Generate\ average_{RPW} = \frac{(GettingExpensive_{RPW} + Bargain_{RPW} + SoInexpensive_{RPW} + TooExpensive_{RPW})}{4}$$

Once these variables were created, I was able to compare the average price responses for the Keyper with the average price responses for the regular phone wallet by employing the summarize function in Stata to create this table:

```
. summarize average_Keyper, detail
```

average_Keyper

	Percentiles	Smallest		
1%	2.75	2.25		
5%	4	2.75		
10%	5	3	Obs	176
25%	6.4375	3.25	Sum of Wgt.	176
50%	8.25		Mean	9.597031
		Largest	Std. Dev.	4.980387
75%	11.375	26.75		
90%	15	31.25	Variance	24.80425
95%	18.75	32.5	Skewness	2.18946
99%	32.5	35	Kurtosis	10.27283

```
. summarize average_RPW, detail
```

average_RPW

	Percentiles	Smallest		
1%	2.25	1.3		
5%	3.75	1.8125		
10%	4.25	2.25	Obs	208
25%	5.5	2.375	Sum of Wgt.	208
50%	7.5		Mean	8.539832
		Largest	Std. Dev.	4.767305
75%	10	21.25		
90%	14	26.25	Variance	22.72719
95%	16.25	32.5	Skewness	2.388712
99%	26.25	37.5	Kurtosis	12.27908

The mean of the averaged price responses across all four questions (so inexpensive, bargain, getting expensive, and too expensive) for the Keyper is $9.60. For the regular phone wallet, the mean of these averaged prices is $8.54. These numbers are only a way to compare the overall difference in willingness to pay and therefore value of the Keyper and the regular phone wallet. The median averaged price for the Keyper is $8.25 and the median averaged price for the regular phone wallet is $7.5. However, this average difference does not account for demographic differences in willingness to pay like weather the respondent is a parent or a student or the income of the respondent. In order to isolate for those differences a regression is required.

Calculating Point-Price Elasticity of Demand

The point-price elasticity of demand for is calculated by dividing price by quantity at a particular point and multiplying by the change in quantity over change in price. However, the Keyper's demand curve is in terms of percent demand on the horizontal axis. Therefore, the slope coefficient relates a one-unit change in price to a one percentage point change in quantity. The linear slope of the demand curve for the Keyper is -18.187 and -18.393 for the regular phone wallet. The Van Westendrop Optimal Price Point was chosen as the point to measure elasticity of demand. This point is considered the optimal price point because it minimizes the proportion of customers believe the product is "too inexpensive" and "too expensive". The optimal price point for the Keyper demand curve is at $7.00 and the optimal price point for the regular phone wallet demand curve is $5.50. The quantity for each of those prices is calculated by solving for x in the slope equations shown below and displayed in Figure 5.

Keyper Demand Curve: $P = -18.187Q + 20.041$

Quantity Demand at Optimal Price Keyper: $7 = -18.187Q + 20.041$

Quantity Demand at Optimal Price Keyper: $Q = .717$

Regular Phone Wallet Demand Curve: $P = -18.393Q + 19.371$

Quantity Demand at Optimal Price Regular Phone Wallet: $5.5 = -18.393Q + 19.371$

Quantity Demand at Optimal Price Regular Phone Wallet: $Q = .754$

$$Point\ Elasticity\ of\ Demand = \frac{P}{Q} * \frac{\Delta Q}{\Delta P}$$

$$Slope\ of\ Demand\ Curve = \frac{\Delta P}{\Delta Q}$$

$$Point\ Elasticity\ of\ Demand = \frac{P}{Q} * \frac{1}{\frac{\Delta P}{\Delta Q}}$$

$$Point\ Elasticity\ of\ Demand = \frac{P}{Q} * \frac{1}{Slope\ of\ Demand\ Curve}$$

$$Point\ Elasticity\ of\ Demand\ Keyper = \frac{\$7}{.717} * \frac{1}{-18.187}$$

$$Point\ Elasticity\ of\ Demand\ Keyper = -.537$$

$$Point\ Elasticity\ of\ Demand\ Regular\ Phone\ Wallet = \frac{\$5.5}{.754} * \frac{1}{-18.39}$$

$$Point\ Elasticity\ of\ Demand\ Regular\ Phone\ Wallet = -.397$$

Calculation of Market Power

The Learner Index calculates market power on a scale of 0 [perfect competition] to 1 [monopoly]. Using the Van Westendrop Optimal Price Point as price and an assumed marginal cost of $0.71 the learner index output is .899 which indicates that the Keyper has strong market power.

$$Learner\ Index = \frac{P - MC}{P}$$

$$Learner\ Index\ Keyper = \frac{\$7 - \$0.71}{\$7}$$

$$Learner\ Index\ Keyper = .899$$

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Academic Vita

Ezra Gershanok

Education

The Pennsylvania State University, *Schreyer Honors College*

- Bachelor of Science in Economics
- Paterno Fellow in The College of the Liberal Arts — Graduating May 2021

The London School of Economics — **September 2019 – May 2020**

- Accepted as one of 300 students to the 2019-2020 General Course- a yearlong immersion program at LSE- to study Macro-Economics, Statistics, and Behavioral Science

Relevant Experience

COVID Response Network — **April 2020 – Present**

President

- Founded the COVID Response Network (501c3 non-profit) with three other students to achieve the goal of donating 100,000 surgical masks to the people most at risk of contracting COVID-19
- Collected $40,868 in donations to distribute 102,000 surgical masks to homeless shelters in New York and Pittsburgh, elderly homes in Florida, the Children's Hospital of Philadelphia, and prisons across Pennsylvania and Alabama

The Keyper — **August 2018- Present**

Co-founder, Co-President

- Assembled a team to create the "Keyper"- a phone wallet designed to solve the problem of lost keys
- Pitched The Keyper to a panel of entrepreneurs on Penn State's televised pitch competition ("The Investment") and won the $25,000 Grand Prize for our business strategy and communication skills
- Sold over 5,000 Keypers to Penn State, Harvard, Georgia Tech, and Michigan State University and built an on-line store with over 900 customers and $13,000 in sales at www.thekeyper.com
- Negotiated with a producer in Fuzhou, China to create the mold and ship 50 samples for $800
- Used Tableau to visualize the market size data as a map highlighting key-usage across United States

Presidential Leadership Academy — **April 2018 – Present**

Fellow

- Accepted as one of 30 students to a three-year leadership course led by the Penn State University President with case studies ranging from Penn State's response to COVID-19 and Greek life
- Crafted a policy proposal to reform University Greek life based on economic principals
- Selected to be interviewed by President Barron on his October 2018 YouTube episode of 'Digging Deeper' for my ideas on incentivizing fraternities to reform (link bellow)

Interfraternity Council Case Competition — **October 2018**

1st Place Finalist

- Proposed incentivized reform that transfers the energy that fraternities spend on to community service hours in tutoring, safe walk, and CPR training in exchange for additional socials

Obstacles to Peace, American Donations to Israel — **February 2018 – May 2018**

Researcher

- Collaborated directly with professors from Penn State's Jewish Studies department to collect and analyze data on the effects that American donations to Israeli settlements have on the peace process
- Selected by my Israel-Palestinian Conflict professor based on leadership and passion for the topic

FORM Consulting — **February 2019 – May 2020**

Volunteer

- Assisted underprivileged high school students in editing and revising their college applications

Featured in:

♦ Student Change Maker ♦ COVID Response Network- Trib Total Media ♦ Speech at Penn State Vigil ♦ The Investment ♦ The Collegian ♦ Penn State News ♦ Digging Deeper with President Barron