CARNEGIE MELLON UNIVERSITY

What’s the Deal with Free Shipping?

Are consumers incentivized to buy more goods under certain Shipping conditions?

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Contents

Abstract

E-commerce giants like Amazon Prime and Zappos are known for their offering of unconditional free shipping on purchases. However, while the results are clear, the reasons why this phenomenon occurs are not. We develop an experimental model based on Michael Lewis' and Yinghui Yang's findings which support that medium thresholds for free shipping incentivize consumers to buy higher quantities of goods more than low, high, and free shipping thresholds. In our model we also include a fixed shipping rate condition with no option to earn free shipping. We report the results of an experiment to test the effects of offering varied schedules for earning free shipping in a simulated online shopping environment. 34 Carnegie Mellon students participated in an experiment with a given endowment and shopping list, to purchase items across 3 periods, per 6 different conditions. The performance during the experiment was judged based on whether the participant performed optimally. Results are in agreement with the model, supporting that the medium threshold condition incentivizes participants to buy higher quantities of goods more than other conditions.

Introduction and Background

In our current society, the Internet is a ubiquitous part of life for many people where roughly 33% of the world population access the Internet (Miniwatts Marketing Group 2012). In the United States, we use the internet as a library, meeting place, storage device and as our own personal shopping mall. Many sources concur that the online shopping market is growing and free-shipping pricing models are a main artifact of this growth. However, it is also clear that the data evidence taken from most sources is based on limited person surveys and a few key case studies. Forrester estimates that the US and European online retail market will reach $279 billion by 2015 (see Wauters 2011 for details). Moreover, nearly 60% of respondents in a BIGresearch Survey said that free shipping was a “very important” factor in their decision to shop online and in an older 2008 Board Survey, 90% of respondents said free shipping offers would entice them to spend more online. (See Knowles 2012 for details).

In the scope of my study, I define the qualitative expression for spending more to mean buying higher quantity of goods. I assume that if consumers have typical preferences over time, some excess buying due to free shipping will not come from buying more expensive goods but from higher purchasing quantities by consumers who feel that they are getting a deal. Thus, while the statistics above support my hypotheses that certain free shipping offers will lead to an increase spending on higher quantity of goods they are limited by the biases that come with running surveys for a limited group of users.

Free Shipping online, is a very clear motivator for online users as it makes them feel as if they are saving or perhaps even competing with the prices offered in a traditional brick and mortar store. In another Forrester Research study, shipping costs proved to be the most common reason for online shopping cart abandonment. It can be argued that typically consumers may use the Amazon Prime paradigm and assume that free shipping will also imply faster shipping, but in the same study only 6% of online buyers abandoned their carts because they thought the product would take too long to arrive. Again, this isolates the effect of free shipping as the source and motivator for completing an online shopping trip. To support this data, comScore claims that in another study consumers claim that 40% of all ecommerce transactions include free shipping. (Fazekas 2012).

Among different experts in the field, free shipping is sometimes seen as a one-size fits all strategy for increasing revenue and bringing more customers to an e-commerce website. A simple Google search will lead to blogs and technology sites claim that free shipping is taking over. However, a lot of these speculations are based on case studies where Amazon.com is usually the main data source. Moreover, while some of them are written by academics in the field, most are speculative observations made by amateur bloggers who have influence over larger audience that reads their particular entries. While Amazon.com is one of the biggest success stories in the field of online shopping it is still just one brand that sells to particular customer segments and attracts a certain type of revenue stream. The fact that generalizations in studies come from Amazon.com data sets makes us question their reliability across the Internet and if we are missing any nuances that may differ between the various online e-tailers. The Free Shipping eBook, contains an extensive guide positing that free shipping will increase profits. It cites both Amazon's 38% growth in 2007, and Zappos' 127% increase in 2004 holiday sales as main results of free shipping offerings. It goes on to mention a few other sites and positive outcomes of offering free shipping. Again, while this success does come, it is a limited view to then conclude that all sites would benefit from offering free shipping. Nisan Gabbay of Startup Review, cites that the key factors to Zappos' survival was their overnight free shipping offering. This creates a confound of speed versus free shipping offering. This is similar to the Forrester Research statistics mentioned above which had stated that consumers are more sensitive to the offering than the speediness of delivery. The Channel Advisor Amazon Prime case study offers some valuable insight, taking on a more empirical approach than Gabbay and the Free Shipping ebook. According to this study, at the time Amazon Prime members accounted for roughly 2% of the users but spent 130% more than a non-Prime user (ChannelAdvisor 2009).

The supporting evidence is clear in its main conclusions, but why is it that the evidences are so homogenous in their approach and executions? More widespread studies and solutions may be hard on a couple of accounts. First, the Internet is large and thus there are copious amounts of e-commerce websites that range from the most simple html page to the giants of online shopping that we have discussed earlier. As such, even if we narrow our scope, it will still be hard to pinpoint exactly what it is about the shopping experience that is so unique and relevant to shoppers. A controlled environment is hard to come by when the design of the site, pricing and other factors can vary so greatly. Moreover, there is a whole psychology to buying behavior that is both social and cognitive. In our American culture, for example, we almost feel entitled to free shipping because of Amazon and other similar sites. Moreover, cost saving consumers may feel that free shipping is a deal, and are then more likely to buy. In Chung-Hoon Park's 2003 study, results of an online survey with 602 Korean customers indicated that information quality, user interface quality, and security perceptions affected information satisfaction and relational benefit, that were significantly related to the consumers' site commitment and purchasing behavior (Park and Kim 2003).

Under such constaints, the main studies in the body of literature focus on the quantities bought online, the free shipping threshold, and frequency of repeat buying. In the Empirical Study of the Impact of Nonlinear Shipping and Handling Fees, Micheal Lewis and his colleagues' empirical results demonstrate that shipping fee schedules influence the frequency of orders. They find that "free-shipping" promotions can greatly increase order incidence rates however they encourage the smallest order amounts. In one segment a "free-shipping" promotion was predicted to increase order incidnce by at least 10% for all customers, but was over 35% for the most responsive segment (2006, 62). Both David Bell and Alexandru Degeratu et. al take a look at grocerry shopping online as a way to measure online shopping using neutral and repeat buying goods. Degaratu and his collegues conclude that brand names beocme more important in online enviornments where there are little attritubes to describe a product. Also sensorty search attributes such as visual cues about a producty have lower impact on online choice than factual information. Third, price sensitivity is higher online, but it is due to online promotions being stronger signals of price discounts (Degeratu et al. 2000). David Bell, focuses more on quanity bought with the average purchase quantity increasing with the level of the free shipping threshold which is similar to the Lewis study. Furthermore, the threshold for free shipping is an imporatnt part of seeing such results. When the threshold is set too low, consumers are not affected as they were planning to purcahse a certain quantity that already qualifies them. When the threshold is too high, consumers do not see the value in buying higher quantities as it is not cost efficient and they may be very aware that they do not need the extra products. However, when the threshold is in a good middleground, consumers are incentivized to buy higher quantiy of goods. Again, while this is a strong study it uses Amazon as the data source thus limiting it's conclusions (Yang et al. 2005).

Taking into consideration the consensus of information found in this literature while acknowleding the limitations such as homogenous data sets, little experimental evidence, and noise such as site design in affecting the conclusions, my current research proposes a lab study to better isolate the quantity purchasing decision of shoppers who are offered various schedules for getting free shipping. Furthermore, I examine whether the consumer feels and actual or perceived benefit from free-shipping schedules by creating a possible environment where getting free shipping leaves the consumer worse off in the long run. This aspect of my experiment is something that has not been addressed by any of the other studies I review. I aim to support the findings of Lewis and Bell while addressing the issue of using static data sets. By creating a lab enviornment and strictly controlling for the quanity of items bought in an economic game I can better tease apart the exact behaviors that are driving consumer decisions that would not be affected by exogenous variables such as site design, or the type of product. Each participant is endowed with income for the duration of the game to spend under key constaints that are relevant to the real world, such as holding costs of having items sit in the pantry while not in use. Moreover, the grocery list uses neutral items that shoppers would need to buy on a repeat basis, hoping to eliminate the brand identiy bias. Lastly, by not engaging in a data set, I support that Free, Low, High,and Fixed Shipping Schedules do not incentivize consumers to buy higher quantities of goods. However, I also see an effect on spending on higher quantities of goods in the medium threshold condition. This experimental economic game aims to create a limited but noiseless enviornment which can give better insight into the specific free-shipping pricing decision model. Speficially, my study isolates the quanity of items bought per shopping trip under different free-shipping schedules.

Model

In this section we develop a model to investigate the role of different shipping conditions on buyer behavior in terms of order size. This current model is based on the Free Shipping and Repeat Buying Model of David Bell (Yang et al. 2005) and the Nonlinear Shipping and Handling Fee model of Michael Lewis (Lewis et al. 2006). While Bell's model has clear description of the thresholds for which consumers are unlikely to be incentivized by free shipping offerings, Lewis' model creates a better description of what happens when consumers make decisions on the margin and are influenced by a particular shipping schedule.

Context and Basic Assumptions

We model a risk neutral consumer who is buying products on the Internet over the course of three periods (signifying three typical months). The consumer enters the game environment and is able to make purchase decisions for goods that are bought repeatedly over time given a certain endowment of money (E) and a fixed cost for Shipping (S_{fixed}). Every month the consumer plans to purchase some quantity of the product based on his or her particular shopping list of needed items which is provided for them. These goods have a positive storage fee associated with them, thus there is a negative holding cost (h) that is associated with buying a higher quantity of goods than needed. Moreover, we assume that the consumption rate (r) of each of the goods is 1, meaning that every month the consumer needs to replenish that good. Within each condition, the shopping list, prices, and holding cost remain constant. The items on the shopping list are chosen specifically for their neutrality to consumers. For the purpose of our lab experiment, we also assume that the transaction cost (k), that is the time searching for product information, typing in payment details and so forth is close to zero, thus while it plays a role in Bell's model, we choose to omit it.

Given these assumptions and a context of repeat buying over a given period of time we can characterize the optimal shopping policy. We determine the optimal purchase quantity per month and the long run average cost of shopping under the 6 different shopping experimental conditions with various costs to shipping (S_n). Under each of the conditions, free shipping, fixed fee, and contingent free shipping the objective of the consumer is to choose the purchase quantity (Q^*) with (Q_{min}) being the minimal quantity needed in order to minimize the long run cost.

Major Equations and Optimal Choices

The Long Run Cost per consumer is the total purchases made over the three periods (pQ_n) plus the shipping costs incurred in each period and any negative holding costs associated with buying extra goods. Each consumer has the option of buying the minimal amount of items needed or more per period subject to this long run cost.

$$LR(Q) = (pQ_1 + pQ_2 + pQ_3) + (S_1 + S_2 + S_3) + (h_1 + h_2 + h_3)$$

Optimal Choices

Condition 1: Free Shipping Condition

To minimize the long run costs and maximize profit, the consumer should buy only what they need, as the cost of shipping, $S_n = 0$, in each period. We derive the above equation by looking at the long run cost (Equation 1) and substituting our cost for shipping.

$$Q^*_{free} = Q_{min1} + Q_{min2} + Q_{min3},$$

Since there is a required minimal purchase for each of the periods, the consumer must spend Q_{minn} per period. While they are free to buy higher quantity of goods than is required, there is a negative cost associated with each additional item. If the consumer buys more they incur a cost that takes away from their endowed amount of money. Thus, we assume that the consumer is cost-minimizing, he or she should not buy additional goods as it increases the cost without any benefit to the consumer. For example, if in the game the consumer purchases an extra loaf of bread, one that he or she does not need to consume, that extra loaf takes up valuable pantry space. Moreover, since the consumer cannot eat the bread, it goes to waste.

If the consumer does spend on the minimal items necessary his or her payment will be the following equation,

$$Payout = E - (pQ_1 + pQ_2 + pQ_3),$$

Since there is no cost to shipping, and no extra holding costs, the payout reflects the total money given to the consumer less the total purchases per period. Here we describe the total purchases as the given quantity of items times each of their prices.

Condition 2: Fixed Shipping Condition

Since consumers are faced with a fixed shopping fee, $S_n = 10$, the optimal behavior is again to purchase the required quantity of goods,

$$Q^*_{fixed} = Q_{min1} + Q_{min2} + Q_{min3},$$

The logic and intuition is similar to the first condition where spending extra on unnecessary goods only adds a holding cost which has no positive value for the consumer. Moreover, since there is a fixed cost to ship all the items, the consumer has no choice but to incur the shipping cost of items. This is very similar to a lot of the ecommerce shops that are online today.

Again, if the consumer chooses the optimal solutions the payout will be,

$$Payout = E - (pQ_1 + pQ_2 + pQ_3) - (S_1 + S_2 + S_3)$$

We see now there is a second subtraction from the original endowment, which is the fixed cost of shipping during each period.

Condition 3: High Threshold Condition

In this condition consumers are faced with a very high threshold to earn free shipping where the threshold (*T*) is greater than the cost of shipping,

$$T > (S_n),$$

and

$$S_n = \begin{Bmatrix} 10\ if\ \ (pQ_n) + (h_n) < T \\ 0\ if\ \ (pQ_n) + (h_n) > T \end{Bmatrix}$$

In the equation above, we again assume that the fixed cost of shipping is $10 unless the consumer spends more than the given threshold, in which case he or she earns free shipping on their entire purchase. We can see that it is still ideal to purchase the minimum required goods because spending extra, and incurring holding costs to reach the high threshold is greater than just paying the regular shipping fee, on the required bundle of items. The threshold is so high and out of reach that there is no incentive for our cost minimizing consumer to buy that many goods, only to have them waste and have a small payout or in the worst case end up bankrupt before the end of the game. Similar to the other conditions the optimal payout is the same.

Condition 4: Low Threshold Condition

Since consumers are faced with a very low threshold to earn free shipping where the threshold is less than the minimum required purchases and we assume the following inequality:

$$T < Q_{min},$$

By purchasing the minimal required quantity (Q_{min}) , where the minimal quantity is less than the threshold to earn free shipping the consumer, by definition, will earn free shipping. A similar intuition as with all the other conditions follows as to why it is not beneficial to spend more than the required amount in this situation. The ideal payout in this case is the same as in the Free Shipping Condition (Condition 1).

Condition 5: Medium Threshold Condition

This condition has two sub parts with different holding costs.

(a) Medium Threshold we set,

$$h = 1,$$

$$T = 48$$

$$(pQ_n) = 40,$$

$$S_n = \begin{Bmatrix} 10\ if\ \ (pQ_n) + (h_n) < T \\ 0\ if\ \ (pQ_{1n}) + (h_n) > T \end{Bmatrix}$$

(b) Medium Threshold all equations are the same with a change in holding cost where,

$$h = 1.25$$

In sub-condition (a) the consumer should be indifferent between buying a higher quantity of goods to earn free shipping or paying the shipping fee. For example, if Consumer A spends 40 on his minimal required bundle and decides to buy 2 more items, thus bringing him to the required 48 to earn free shipping in this period he still incurs a negative holding cost of 1 unit per extra item. Consumer A's bundle is then a total of 50. If Consumer A chooses not to buy a higher quantity of goods, then he or she incurs a Shipping cost of 10 and has a bundle of 50. In condition (b) however, such is not the case and spending more to earn free shipping actually has a suboptimal payoff. This is a condition that many online retailers strive for as we predict that behaviorally a small marginal jump to earn the satisfaction and "deal" of free shipping would be enough incentive to spend more in sub-condition (a), even though the final payout is the same. The consumer would feel like they got more value by buying extra, when in fact any extra item is wasted. He or she does not consume at a rate where they would use the extra item. What is more interesting is that consumers may be tempted to spend more to earn free shipping in sub-condition (b) because of the cognitive belief that earning free shipping is again, a deal.

Statistics

In order to test our predictions we first calculate the percentage and standard deviation of all the conditions. We also perform a one- tailed proportion test to test the significance of our results. To test proportional independence as well the proportional differences, chi-squared tests are used.

We also expect to see a significant difference between conditions one to four and conditions 5 a-b. We particularly want to see whether we see the indifference in part (a), and higher quantities bought in part (b) despite it having a worse payoff.

Limitations of the model

While this model aims to come up with a simple model observing consumer behavior it omits factors such as site design, navigation, and other variables in which e-commerce consumers have to deal with when shopping online. Moreover, we do not account for probability of losing money, unavailability of given good, or uncertainty of conditional changes between periods. As we are running an isolated lab study aiming to pinpoint a particular difference all such variables are outside of the scope of this particular experiment.

Data & Results

The data for this experiment is taken from a sample of 34 Carnegie Mellon Undergraduate and Graduate Students in the Pittsburgh campus (see Appendix 2 for details). The data set contains the purchasing decisions of each of the participants in each of the conditions. The participants were randomly assigned a random order of conditions. Each condition consisted of an independent trial. We record the quantities purchased of each good at each period and are able to determine whether the total quantity or purchases was optimal based on the model.

Table 1: Variable Explanations

Variable Name	Definition
Free	Free Shipping Condition, where the consumer has no cost to shipping items without any restrictions.
Low Threshold	The consumer earns free shipping by spending $25 or more.
Medium Threshold Regular Holding Cost	The consumer earns free shipping by spending $48 or more. There are two ways of spending optimally for this condition. The consumer can either buy the minimum quantity of goods or pay for shipping or he or she has the opportunity to buy higher quantity of goods and pay the holding cost of purchasing extra items. In this definition, we define both of these strategies as optimal strategies.
Medium High HC	The threshold for earning free shipping is still $48. However, the holding cost of buying extra items is $1.25.
High Threshold	The consumer earns free shipping by spending $75 or more.
Fixed Cost	The consumer does not have the opportunity to earn Free Shipping. They pay a fixed cost for shipping, $10.
(Optimal +Paid Shipping)/Reg HC	Threshold is $48 and we examine those who paid for shipping without buying more goods as optimal spenders. The holding cost is $1.00.
(Optimal + Bought More)/ Reg HC	This condition is the same as the above except we only identify those who bought higher quantities of goods as optimal spenders.
Reg HC & NonOpti < $48	This proportion represents those who saw the Medium Threshold with the regular holding cost who did not spend optimally and did not earn free shipping.
Reg HC & NonOpti >$48	The proportion of participants who saw the Medium Threshold with the regular holding cost who did not spend optimally but did earn free shipping.
High HC Saw High HC 1st + Optimal	Those who saw the Medium Threshold with the High Holding Cost first and performed optimally.
High HC Saw Reg HC 1st + Optimal	Those who saw the Medium Threshold with the Regular Holding Cost first and performed optimally.
Reg HC Trying for Free Shipping	All those in the Medium Threshold Condition who tried to earn free shipping.
High HC Trying for Free Shipping	All those in the Medium Threshold Condition with the High Holding cost who earned free shipping.
Trying for Free Shipping in both	All those in both Medium Threshold conditions who earned free shipping.
High Optimal/Med Reg Optimal	Out of those who performed Optimally in the Regular Condition, the proportion who performed optimally in the High Holding Cost Condition.

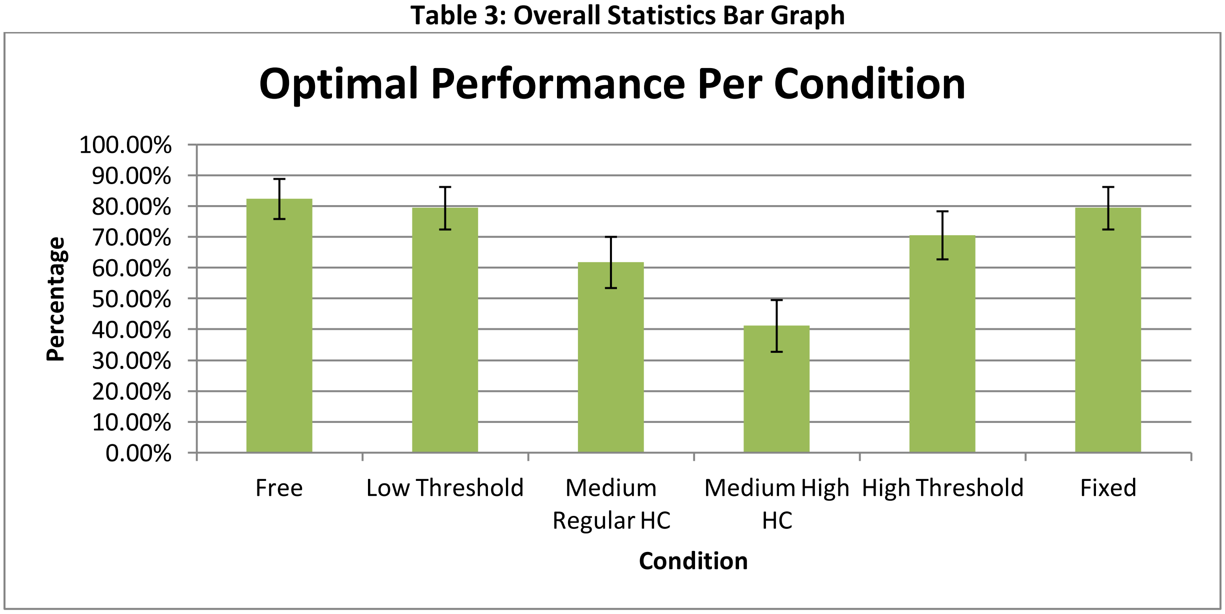
Note: This table provides the descriptions of the condition definitions used in the below analysis.

Table 2: Overall Statistics For All Conditions

Condition	% of Optimal Decision	One Sided 95% Confidence Interval
Free	82.4% (6.5)	(71.2,92.8)
Low Threshold	79.4% (6.9)	(67.6,90.4)
Medium Threshold Regular Holding Cost	61.8% (8.3)	(48.2, 75.6)
Medium High HC	41.2% (8.4)	(27.1, 54.9)
High Threshold	70.6% (7.8)	(58.1,83.9)
Fixed Cost	79.4% (6.9)	(67.6,90.4)

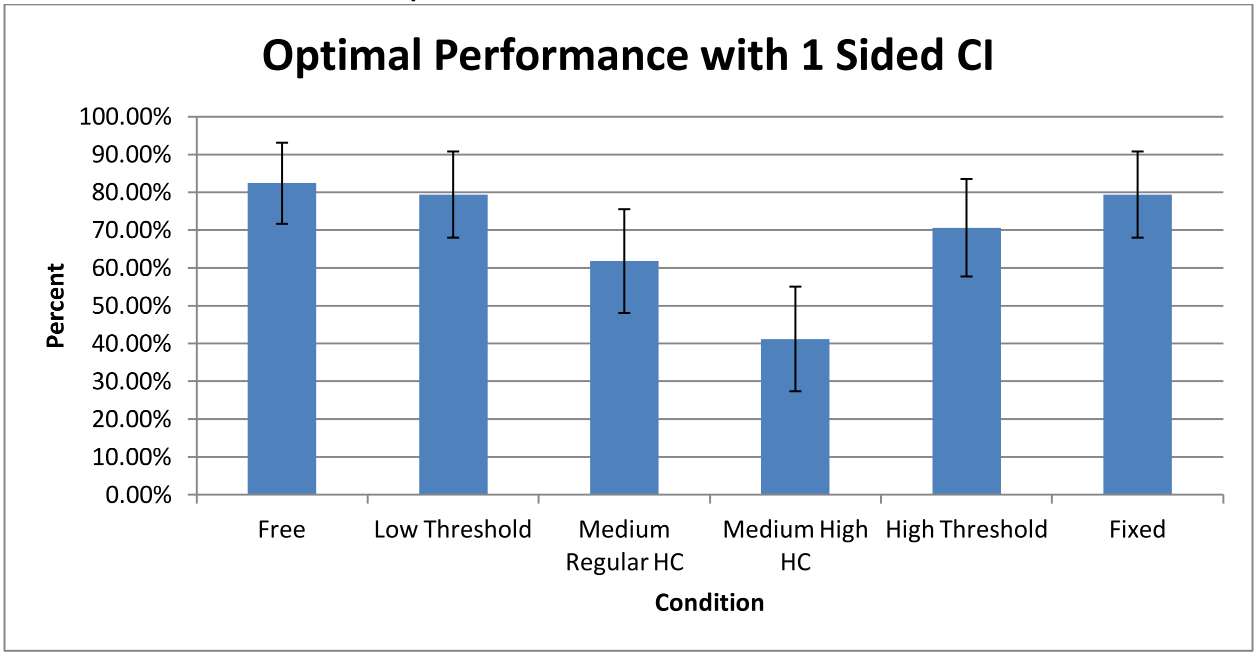
Note: Standard errors are in parentheses below the percentage calculation. All above calculations are in the forms of percentages. We calculate the percent of optimal decision by taking all 34 trials for a given condition and assigning either a "1" or "0" for optimal and non-optimal spending behavior respectively. Therefore we treat buying as a binomial variable approximated to the normal distribution and calculate the test statistic as the number of successes ("1") divided by the total number of trials. We then calculate the standard error, and one sided confidence interval as shown above.

Table 3: Overall Statistics Bar Graph



Note: Visual representation of Table 2, with calculated percentages per condition and the standard error bars. We see a dip in the Medium Threshold conditions, and a noticeable similarity between the other conditions.

Table 4: Optimal Performance with Confidence Intervals



Note: This table displays the same percentages as Table 3. However, we also include the one sided 95% Confidence Intervals per condition. We observe that the intervals for Free, Low, High, and Fixed overlap and are similar, as predicted. We also observe that the Medium High HC Condition is statistically different from the Free, Low, High, and Fixed Conditions. We cannot say the same for the Medium Regular HC condition.

In Table 2, I present the overall percentages for each condition of the proportion of consumers that acted in the optimal way as specified by the model. I also present the one sided 95% Confidence Interval which gives a better sense of the range of data. Moreover, I conduct a one sided binomial test to test the significance of each of the findings where results show that each of the data points are statistically significant (see Appendix Table 4 for details). This helps us become more confident about drawing conclusions about the general population given the limited sample size.

We observe that Free Shipping has the highest rate of optimal behavior, and this finding is very similar to that of Lewis' paper (2006). We can also generally observe that there is a dip in optimal behavior for the Medium Threshold Conditions as only 41.2% of participants behaved optimally in the Medium Threshold High Holding Cost condition, and 61.8% in the Medium Threshold Regular Holding Cost condition. However, in Table 4 we include the Confidence Intervals over the data and observe that there is overlap between all of the conditions except Medium High HC. It only overlaps with Medium Regular HC, and we can attribute that to the nature of the games, which have similar features. These observations are supported by a chi- squared test for independence of groups (Appendix, Table 1) where only the Medium Threshold with High Holding Cost yields a p-value (*.303)* that is greater than .05, and overall the null hypothesis is rejected meaning that not all the proportions are equal. We continue to analyze the medium threshold conditions, as they are most interesting to our main hypotheses.

Table 5: Medium Threshold Breakdowns

Condition	Proportion of Population (%)	One Sided 95% CI (%)
Medium Regular Threshold	61.8% (8.3)	(48.2, 75.6)
Medium High Threshold	41.2% (8.4)	(27.1, 54.9)
Medium Threshold Paid	57.1% (10.8)	(39.3,75.0)
Medium Threshold Bought	42.9% (10.8)	(25.0,60.7)
Reg HC & NonOpti < $48	23.1% (11.7)	(3.8, 42.4)
Reg HC & NonOpti >$48	76.9% (11.7)	(57.6, 96.2)
High HC Saw High HC 1st + Optimal	37.5% (12.1)	(17.5,57.5)
High HC Saw Reg HC 1st + Optimal	44.4% (11.7)	(25.1, 63.8)
High Optimal/Med Reg Optimal	29.4% (9.9)	(13.0,45.8)
Reg HC Trying for Free Shipping	55.9% (8.5)	(41.8,69.9)
High HC Trying for Free Shipping	50.0% (8.6)	(35.9,64.1)
Trying for Free Shipping in both	29.4% (7.8)	(16.5,42.3)

Note: In this table we see a breakdown of the optimal performance in the Medium Threshold conditions. The difference in optimal performance for the general Medium Regular Threshold and Medium High Threshold condition is displayed again. Next, we look at the Medium Regular Condition and see if there was indifference between those who paid for shipping and spent optimally and those who bought more goods to earn free shipping but still spent optimally. We observe a bias toward paying for shipping with an overlap in Confidence Intervals. Next we observe the non-spending behavior in the Medium Condition and see that there was a bias toward earning free shipping, without an overlap in Confidence Intervals. Following we examine if there was a bias for performance on the High Holding Cost Condition due to order effects by looking at those who saw the High/ Regular Condition and performed optimally. Next, we observe the population that performed optimally in the high condition out of those that performed optimally in the regular threshold condition. We see an overlap in Confidence Intervals and can support that there was no bias. Following we look at the proportion of the population who tried to earn free shipping which is under the majority.

For the Medium All Condition we can no longer objectively judge whether the population is behaving in accordance with our model, as behaving optimally does not mean that participants are not incentivized to buy higher quantities of goods. In fact, we recall that there are two ways to spend optimally. In one scenario, the consumer can simply buy the minimum quantity and pay for shipping. In the other, the consumer can buy higher quantities of goods, pay for the holding cost and earn free shipping. In both scenarios, the consumers spend the same amount of money. Thus we break down the overall condition, which shows 61.76% of the population behaving optimally and look at the breakdown for those that paid for shipping and those that bought more goods. We observe a bias towards paying for shipping and overlapping Confidence Intervals which leads us to support that there was a statistical indifference between earning free shipping and paying the shipping cost. This is also supported by a chi-squared test of proportions (χ^2 = .583 p=.445) (Appendix Table 2). Next we look at the proportion of participants who did not perform optimally in the Medium Threshold regular holding cost condition, to observe whether there was a bias toward earning free shipping, but perhaps not spending optimally. We observe that 76.9% of the non-optimal performing population earned free shipping.

Following we aim to observe if there is a bias toward negative performance in the Medium High Threshold Condition due to the ordering effects of seeing it before or after the Medium Threshold with Regular Holding Cost condition. We see however that the Confidence Intervals closely overlap and perform a chi-squared test of proportions the probability is rounded to 1.0 since the differences are so small (Appendix, Table 3). In this way we can reject the hypothesis that there is a bias of order effect.

It is appropriate now to examine, the effects of the conditions on the participant decision to earn free shipping. We see that 55% (SD=8.5%) try to earn free shipping in the Regular Threshold Condition and similarly 50% (SD=8.6%) try to earn free shipping in the Higher Threshold Condition. As all participants saw all the conditions we examine those that consistently try to earn free shipping despite the holding cost, and observe that only 29.4% (SD=7.8) aims to earn free shipping. With the Confidence Interval under 50%, we can observe that less than the majority of the participants were aiming to earn free shipping in the medium threshold conditions.

Conclusion

Low and High Thresholds for Shipping do not incentivize consumers to spend higher quantities of goods.

We support this hypothesis and observe that the majority of consumers did not elect to buy higher quantities of goods in these conditions. In the Low Threshold, the size of the basket is already larger than the threshold and consumers earned free shipping without having to buy more goods. Since the consumers were aiming to minimize costs to maximize their end payout, they did not elect to buy higher quantities of goods. They were already earning a deal. This may be counterintuitive to what we cognitively believe as it is intuitive to assume that since we do not have to pay a sunk cost for shipping we may want to use those savings as a way to buy higher quantities of goods. However we do not observe this type of mental accounting. For the High Threshold condition the size of the basket is so small ($40) compared to the Threshold to earn Free Shipping ($75) that consumers are not incentivized to buy higher quantities of goods as spending that much money would severely deplete their endowment, and coming close to the threshold, is also not beneficial.

Based on this finding we recommend that if firms are trying to encourage the buying of higher quantities of goods, they should not offer a threshold that is either too small or too large.

Free and Fixed Thresholds for Shipping do not incentivize consumers to spend higher quantities of goods.

We support this hypothesis as well and observe that consumers are not incentivized to buy higher quantities of goods in these conditions as well. The Free Shipping Condition actually acts in a similar way to the Low Threshold, as the minimum spending already earns free shipping. In the fixed condition, there is a sunk cost that one has to pay regardless of how much they buy so a cost-minimizing consumer would only spend the minimum required. The results for Free Shipping, while upholding the findings of Lewis (2006), are in fact very counter-intuitive. It is intuitive to think that Free Shipping encourages consumers to buy higher quantities of goods and spend more over time. The major online shopping e-commerce sites, such as Amazon Prime, all offer schedules for free shipping. In fact, Amazon Prime, and Zappos.com, two well established and popular online brands, both offer free shipping as a main incentive to earn shoppers. However, results show quite the opposite, with those in this condition performing optimally or not spending more, at the highest rate among all conditions.

Based on this finding we recommend that if firms are trying to encourage the buying of higher quantities of goods, they should not offer just free, or fixed shipping rates.

Medium Threshold Conditions incentivize consumers to spend higher quantities of goods.

Generally we saw the lowest amount of optimal spending in the Medium Threshold conditions, which does indicate a drop off at the rate at which consumers were buying higher quantities of goods. Once we break down the population even more we see however that in general only 29% of the population tried to consistently earn free shipping in both Medium Threshold Conditions. However, in the high holding cost condition, it was more obvious that spending higher quantities of goods was not optimal as this was the only condition with a $1.25 holding cost. So break down the group even further and we see that in the Medium Condition with a regular $1.00 Holding Cost, a statistically significant amount of consumers chose to earn Free Shipping (55.9%). In the High Holding Cost Condition, roughly half of the consumers, chose to earn free shipping, which is interesting considering that the holding cost only changed by 25c. We see that this condition is the only one where there was an indication that a significant portion of the population was actively seeking to earn free shipping.

Based on this finding we recommend that if firms are trying to encourage the buying of higher quantities of goods, they should offer a medium threshold for earning free shipping.

Overall, the findings are consistent with the theoretical predictions of the model and previous research. Neither High or Low, nor Fixed of Free Shipping is ideal to incentivize consumers to buy higher quantities of goods, thus spending more per month on items. It is not intuitive to think about Free Shipping as not being a major contributor to spending more with sites like Amazon Prime and Zappos as the leading case studies on why firms should be offering schedules of shipping that offer free -shipping. Cognitively, we can also think about free shipping as a way to mentally account for a savings that we otherwise would not have had. The limitations of the model do not account for brand loyalty, or long term spending habits as we look at only one choice for consumption firm and only three periods, so these findings may in fact hold over time as consumers build brand awareness toward a site that is willing to consistently offer free shipping. Thus, that firm becomes competitive, and may perhaps be earning a higher income rate, on aggregate, from the proportion of consumers that shop there, rather than on an individual level. Our findings are also consistent with the effects of a Medium Threshold on order quantities, as we support that finding a threshold that is close to the original basket size, makes consumers reach for the extra goods by buying items they may not need, and will throw away (as the shopping needs were the same each month), in order to earn the "deal" of free-shipping. There are times when this is positive for both the consumer and firm, as we see in the Regular holding cost condition, and other times when it is actually harmful to the consumer but still benefits the firm. Overall, we can conclude that medium thresholds incentivize consumers more than the other conditions we have tested. The limitation here is that our model assumes consistent consumption over time of neutral goods, when this is not consistently applicable to the real world. Thus finding the average basket size would be a more difficult task given the other psychological (e.g. current style, preference) and economical (e.g. cost minimizing, quantity minimizing consumers) factors. Future studies, including varied shopping lists, multiple firms, and more variation in holding cost would all be recommended to further test this model.

References

ChannelAdvisor. *How big is Amazon Prime*. 14 May 2009. Blog. 13 February 2012.

Chen, Su-Jane and Tung-Zhong Chang. "A descriptive model of online shopping process: some empirical results." *International Journal of Service Industry Management* (2003): 556-569.

Degeratu, Alexandru M., Arvind Rangaswamy and Jianan Wu. "Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes." *International Journal of Research in Marketing* (2000): 55-78.

Fazekas, Dave. *How to Solve the Free Shipping Challenge*. 2012. 13 February 2012.

Gabbay, Nisan. *Zappos.com Case Study: Why shoes are great for e-commerce... yes, really*. 17 September 2006. Blog.

Knowles, Luke. *Free Shipping and Online Shopping Statistics*. 2012. 13 February 2012.

—. *The Free Shipping eBook*. Colorado: FreeShipping.org, 2011. e-book.

Lewis, Michael, Vishal Singh and Scott Fat. "An Empirical Study of the Impact of Nonlinear Shipping and Handling Fees on Purchase Incidence and Expenditure Decisions ." *Marketing Science* (2006): 51-64.

Miniwatts Marketing Group. *Inernet Usage Statistics: The Inernet Big Picture*. 8 February 2012. 13 February 2012. <http://www.internetworldstats.com/stats.htm>.

Park, Chung-Hoon and Yount-Gul Kim. "Identifying key factors affecting consumer purchase behavior in an online shopping context." *International Journal of Retail & Distribution Management* (2003): 16-29.

Rohm, Andrew J and Vanitha Swaminathan. "A typology of online shoppers based on shopping motivations." *Journal of Business Research* (2004): 748-757.

Wauters, Robin. *Forrester: oNline Retail Industry In the US Will Be Worth $279 Billion in 2015*. 28 February 2011. 13 February 2012.

Yang, Yinghui, Skander Essegaier and David R. Bell. "Free Shipping and Repeat Buying on the Internet: Theory and Evidence." 2005.

Appendix 1

Table 1: Chi-Squared Test for Independence between Conditions

Test Statistics

	Free Shipping	LOW THRESHOLD	MEDIUM THRESHOLD	MEDIUM THRESHOLD HIGH HOLDING COST	HIGH THRESHOLD	FLAT RATE SHIPPING
Chi-Square	14.235[a]	11.765[a]	1.882[a]	1.059[a]	5.765[a]	11.765[a]
df	1	1	1	1	1	1
Asymp. Sig.	.000	.001	.170	.303	.016	.001

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 17.0.

Table 2: Cross-Tab of Proportion Difference and Chi-Square Significance for those who Bought More or Paid for Shipping

Opti_Paid * Opti_Bought Crosstabulation

			Opti_Bought		Total
			0	1	
Opti_Paid	0	Count	6_a	3_a	9
		Expected Count	5.1	3.9	9.0
	1	Count	6_a	6_a	12
		Expected Count	6.9	5.1	12.0
Total		Count	12	9	21
		Expected Count	12.0	9.0	21.0

Each subscript letter denotes a subset of Opti_Bought categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.583[a]	1	.445		
Continuity Correction[b]	.101	1	.750		
Likelihood Ratio	.589	1	.443		
Fisher's Exact Test				.660	.377
Linear-by-Linear Association	.556	1	.456		
N of Valid Cases	21				

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.583[a]	1	.445		
Continuity Correction[b]	.101	1	.750		
Likelihood Ratio	.589	1	.443		
Fisher's Exact Test				.660	.377
Linear-by-Linear Association	.556	1	.456		
N of Valid Cases	21				

Table 3: Cross-Tab of Proportion Difference and Chi-Square Significance for those who Saw the High/Regular Holding Cost Condition First

Saw HC bf and got right * Saw Reg Cost bf and got it right Crosstabulation

			Saw Reg Cost bf and got it right		
			0	1	Total
Saw HC bf and got right	0	Count	5_a	5_a	10
		Expected Count	5.0	5.0	10.0
	1	Count	3_a	3_a	6
		Expected Count	3.0	3.0	6.0
Total		Count	8	8	16
		Expected Count	8.0	8.0	16.0

Each subscript letter denotes a subset of Saw Reg Cost bf and got it right categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000[a]	1	1.000		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.000	1	1.000		
Fisher's Exact Test				1.000	.696
Linear-by-Linear Association	.000	1	1.000		
N of Valid Cases	16				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.00.

b. Computed only for a 2x2 table

Table 4: Binomial Tests for Significance of Data

Condition	p-value
Free	<.001
Fixed	<.001
Low Threshold	<.001
Medium Threshold Regular Holding Cost	<.001
Medium Threshold High Holding Cost	<.001
High	<.001

Tested against an alpha of .05 thus indicating that the true probability of success rate is less than 1.

Appendix 2: Demographic Information of Participants

Participants were asked to participant in an exit demographic study. Below shows the breakdown of participants with N=10 missing values.

Gender Breakdown

Male Participants: 50%

Female Participants: 50%

Race Breakdown

American Indian or Alaska Native	4%
Asian	29%
Black or African American	8%
Native Hawaiian or Other Pacific Islander	0%
White or Caucasian	58%
Prefer not to answer	0%
Other	0%

Hispanic/ Latino Population

Hispanic/Latino Participants	8%
Non Hispanic/ Latino Participants	92%
Prefer not to answer	0%

Self Rated Mathematical Level (1-5 Scale)

1 -	Poor	4%
2		8%
3	Neutral	25%
4		38%
5 -	Excellent	25%

Graduation Year Breakdown

2011	9%
2012	43%
2013	13%
2014	13%
2015	22%