AN ANALYSIS OF INCREASING USE OF PRICE DISCRIMINATION IN THE

TRAVEL INDUSTRY

By

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A Thesis Submitted to The Honors College

In Partial Fulfillment of the Bachelors degree
With Honors in

Business Economics

THE UNIVERSITY OF ARIZONA

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ABSTRACT

This study aims to understand and evaluate the ways in which firms use price discrimination and other related strategies to influence consumer behavior. Ideally, the results of this study would allow consumers to be more informed about how their online browsing habits could influence how much they pay for goods and services. To do this, a website is created for data collection where subjects create a JavaScript Bookmarklet to collect inner HTML from a Priceline search for hotels in Las Vegas, NV. The journey to reach this data collection method led to invaluable learning experiences as several previous methods were explored and eventually abandoned. Unfortunately, the Coronavirus pandemic of 2019-2020 significantly impacted the results of this study, by way of decreased data collected and increased pricing variability. Nevertheless, several valuable conclusions were made from the successfully collected data submissions, including how both mobile/tablet and Windows computer usage affect prices. Additionally, several discoveries were made during the data analysis process that establish great starting points for future research. These include the presence of uniquely listed hotel amenities, the presence of "banners" on hotel listings, and the overall ordering/appearance of specific hotel listings within a consumer's search results. Overall, this study provides great insights into the increasing tendencies for firms to utilize customer data like User Agents and Cookies to personalize e-commerce websites for profit optimization.

INTRODUCTION

Within this digital era where online advertisements are eerily targeted and cookie collection notices are commonplace, it can often feel like e-commerce giants know more about consumers than they ought to. It is widely understood that retailers have the ability to collect copious amounts of data on the individual shopper, and we should expect that they use this data to their advantage. This is often seen through individually targeted advertisements and product suggestions, but the data could also be used to practice price discrimination: where not every consumer is offered a uniform retail price for the same item. Now, most retailers would likely be severely criticized by society if they were to be caught utilizing price discrimination. It would be very difficult for most industries to practice price discrimination inconspicuously, because prices in general need not be changed very rapidly. For price discrimination to occur unnoticed, it would have to be within an industry where prices are already expected to rapidly change due to other factors. For example, the travel industry is often known for rapidly changing prices. Airline and hotel prices often change day-to-day, due to many different factors. If price discrimination is occurring anywhere in the American marketplace, it is likely within the travel industry. This study aims to identify firms utilizing price discrimination within the travel industry, with the ultimate goal of increasing consumer knowledge. More specifically, this study will take a closer look at Priceline.com, a hotel booking intermediary, to uncover possible uses of price discrimination.

Consumers have had their own suspicions of firms utilizing price discrimination tactics for many years. As a result, many researchers have attempted to confirm such suspicions through studies similar to this one. In a 2014 study titled "Measuring Price Discrimination and Steering on E-Commerce Web Sites", researchers were able to illustrate measured pricing inconsistencies from many e-commerce sites, including those within the travel industry such as Priceline and Hotels.com. The data collection methods were similar to those used in this study, such as the hosting of iFrames with JavaScript tools. Even though the study was able to detect pricing inconsistencies, they were unable to identify contributing factors to such discrepancies. The study was also able to record evidence of price steering: personalizing search results so that more or less-expensive products are placed at the top of the page. This notion was especially intriguing because it can be just as impactful as price discrimination for influencing purchasing behaviors. According to the study, price steering was dependent upon a user's account information and collected Cookies on the site [1].

A 2012 study titled "Price discrimination by day-of-week of purchase: Evidence from the U.S. airline industry" found evidence of price discrimination within the U.S. domestic flight industry. After analyzing transactional ticket data, the study was able to conclude that ticket prices were cheaper on weekends than week days, on average. This is presumably because passengers traveling during the week are primarily doing so for business reasons and their price demand elasticity is lower than those traveling on the weekend for leisure [2]. This study asserted that price discrimination was based more so on generalizations made about the airlines' customer base rather than browsing data gathered from online shopping habits. It is now more likely that U.S. airlines are conducting price discrimination by means of Cookie collection or other data-driven methods.

Online price discrimination is often viewed in a negative light as it typically leaves the consumer at a disadvantage. Many retailers are willing to risk receiving this negative publicity, however, because it often yields lucrative profits. In a 2019 study titled "Online Category Pricing at a Multichannel Grocery Retailer", grocery chains that operate both online and in brick-and-mortar stores have a lot to gain by increasing their prices online. Consumers who shop for groceries online for either delivery or pick-up are presumed to have a more inelastic demand than those in-store, due to the convenience of the service. When a grocer raises their prices online, they could potentially increase overall profits by 18% if the optimal online prices are correctly calculated and implemented. For example, the study states that the optimal online price for frozen pizzas would be 27% higher on average than if it were purchased in-store [3]. Each item would need its own individual optimal mark-up to its in-store counterpart. It is possible that this is true within the hotel

industry as well – that each hotel should maintain its own individual markup on sites like Priceline.com, rather than having a uniform markup for all hotels listed on the site.

Gap Analysis and Questions
It has been confirmed by the aforementioned studies that price discrimination is in fact used by firms in the travel industry like Priceline. Even though many published works have studied the existence of price discrimination within certain sectors of e-commerce, the question still remains: what factors are used to determine such prices while using price discrimination tactics? This study aims to replicate the detection of pricing inconsistencies on Priceline.com and attempt to identify potential factors contributing to such inconsistencies.

RESEARCH DESIGN

In order to identify price discrimination within Priceline.com, we must know what prices individual consumers see with identical search criteria. Our speculation was that Priceline may be utilizing the consumer's public User Agent to determine custom prices. One's User Agent is a string of information that describes your digital device and internet browser. You can learn more about your own unique User Agent [here](#)[1].

A company may also use Cookies to determine prices. Cookies track your activity while on a particular site. For example, the number of times you conduct a specific search or view a particular item could be indicative of how much you are willing to pay for it. However, while your User Agent is publically available to anyone, your Cookie activity is not. Thus, for the purposes of this study, only the User Agent will be used to analyze the prices an individual receives for uniform search results.

Many data collection methods were explored during this study, which resulted in the unveiling of many obstacles that needed conquering. It is important to understand the trials and tribulations of this study because this is where the majority of learning experiences occurred. By the end of this project, I have become confident in my basic coding skills in three different languages I had never previously attempted, using various modules and features within each one. Establishing the final data collection method was a rewarding experience, and the journey to reach that point was invaluable.

Attempted Data Collection Methods - Selenium

To ensure the maximum amount of data submissions, it was decided that necessary subject participation in the data collection process should be minimized. It was presumed that an increase in needed subject participation would result in a decrease in overall participation.

The first attempted data collection method utilized the Python module Selenium. This module included a webdriver (specifically named Chromedriver) that could automatically load the Priceline website, conduct the uniform hotel search, collect all of the necessary elements from that page, write it to a file, and submit it to a folder within a server. Our goal was to do all of this with one click of a button by the subject. After creating a server, we began writing the Python program to achieve this.

Unfortunately, the security measure CAPTCHA identified our data collection program as a potentially harmful bot, and the program was successful in conducting the Priceline search only 50% of the time. Several remedies were attempted to mediate this issue,

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[1] https://www.whatismybrowser.com/detect/what-is-my-user-agent

including randomizing wait times in the webdriver action intervals, but to no avail. The selenium method was abandoned after two months of trials. The written program can be seen below as Figure 1.

```
1   import time
2   from selenium import webdriver
3
4   driver = webdriver.Chrome('./chromedriver')
5   driver.get('https://www.priceline.com/?tab=hotels')
6
7   import random
8
9   time.sleep(1+4*random.random())
10  driver.find_element_by_xpath("//div[@class='sc-kUaPvJ irfWYZ'][@data-autobot-element-id='DASH_TAB_HOTELS_STARTLOCATION']").click()
11
12  time.sleep(1+4*random.random())
13
14
15  query=random.choice(['L',"La","Las","l","las","la"])
16  for l in query:
17      driver.find_element_by_id('location').send_keys(l)
18      time.sleep(random.random()*.3)
19
20
21  time.sleep(1+4*random.random())
22  driver.find_element_by_id('location-dropdown')
23  driver.find_element_by_id('location-dropdown-item-0').click()
24  time.sleep(1+4*random.random())
25  driver.execute_script('document.getElementById("date-range").click()')
26  time.sleep(1+4*random.random())
27  driver.execute_script('document.querySelector(\'[aria-label="November 12, 2019"]\').click()')
28  time.sleep(1+4*random.random())
29  driver.execute_script('document.querySelector(\'[aria-label="November 14, 2019"]\').click()')
30  time.sleep(1+4*random.random())
31  driver.find_element_by_xpath("//button[@class='sc-qrIAp bbZvcz'][@style='white-space:nowrap;height:56px']").click()
```

Figure 1 – Python program utilizing Selenium module - Chromedriver

Attempted Data Collection Methods – iFrame

The second attempted collection method involved hosting the Priceline search page within our own webpage, called an iFrame. In other words, a subject would load this study's website, but the page would host the previously determined Priceline search, so the subject would see the Priceline listings while on our site.

This method was tried and tested for approximately one month before a serious flaw was discovered. Like most e-commerce websites, customers have the ability to maintain a personal account for the shopping site. Within these accounts are often saved records of payment information and connected checking accounts. Hosting a site within our own that has access to a subject's identification and payment methods would be a serious security flaw, even though we had no interest in gathering such information. To maintain clear, ethical guidelines within the study, this method was eliminated as a potential collection method.

Website Creation

After the previous two methods were abandoned, it became clear that the subject would have to submit the needed data in some way. To make this possible, a website would need to serve as the designated submission location. This required three written

programs: one in HTML for displayed text and functions, one in JavaScript to collect the data from the HTML site, and one in Python to submit the data to our server. This required several weeks of work to effectively learn the basic skills necessary for these coding languages.

Attempted Data Collection Methods – Copy/Paste

The first submission method involved the subject highlighting the Priceline search results, and Copy/Pasting them into a text box for submission. This method showed much promise. On a computer, it is quite simple to click the Priceline search URL, highlight everything displayed on the page, Copy it, and Paste it into a text box for submission. Many submissions were successfully tested and we felt confident to begin parsing the data. A typical submission using the Copy/Paste method would look like Figure 2 below.

```
   Sign in  Find My Trip  Help USDSearch DestinationPasadena, CANumber of Guests and Rooms – 2 Rooms, 2 AdultsUpdate
SearchBrowse AllDeals For YouExpress DealsPrivate RentalsList ViewMap ViewDowntown Los AngelesMid City – Koreatown –
USCFree ParkingRestaurantLess than $129 per nightYour search: Wed, Dec 18 – Sun, Dec 22(Not Available)|Showing results
for: Wed, Jan 22 – Sun, Jan 26PRIVATE RENTALSNEWApartments & HousesView ListingsAmenitiesSet Your Budget$0 to $500+ per
nightRate OptionsNeighborhoodsHotel Star LevelSearch HotelsEnter Hotel NameSearchBrandsBest Price. GUARANTEED.Tired of
searching? Book now! We'll refund the difference if you find a lower price.Showing 30 of 641 HotelsinPasadena, CA$129
avg. per nightBook online or call:800-895-8964FREE BREAKFASTRamada by Wyndham PasadenaPasadenaView MapFree Parking,
Free Internet AccessFree Cancellation AvailableBEST DEALTOP BOOKED6.2331 Reviews2–STAR HOTEL$$$$I love staying at this
hotel every year that I attend my conference. I always know what to expect: clean rooms and a good breakfast.PRICELINE
VIP13% OffThanks for booking a rental car with Priceline!wasPrice marked down from original price of $81$69$276 for 4
nightsChooseNEWPricebreakerPet-Friendly HotelsYou'll get one of these 3 for:$150Guaranteed: Swimming Pool, Outdoor
Swimming Pool, Free Internet Access, Fitness Center, Pets AllowedResidence Inn by Marriott Los Angeles Pasadena/Old
Town9.210 Reviews|3–Star HotelPasadenaRetail price$191/nightWestin Pasadena8.71175 Reviews|4–Star HotelPasadenaRetail
price$221/nightHotel Constance Pasadena8.682 Reviews|4–Star HotelPasadenaRetail price$188/nightWe'll reveal your hotel
right after you book.Choose for $150/nightSee all exclusive deals like thisActual room may vary3.5–Star
HotelPasadenaView MapSwimming Pool, Fitness Center, Restaurant7+400 Reviews3.5–STAR HOTEL$$$$EXPRESS DEAL24% OffWe
choose the hotel, you save 24%wasPrice marked down from original price of $172$131$524 for 4 nightsChoosePRICELINE
VIPCongratulationsYou've earned access to Priceline VIP deals and benefits.View BenefitsOmni Los Angeles Hotel At
California PlazaDowntown Los AngelesView MapSwimming Pool, Pets Allowed, SpaFree Cancellation, Pay Later
Available8.4812 Reviews4.5–STAR HOTEL$$$$5 left$331$1,324 for 4 nightsChooseFREE BREAKFASTHotel Le Reve
PasadenaPasadenaView MapFree Parking, Free Internet AccessFree Cancellation AvailablePRICELINE PREFERRED6.6197
Reviews2–STAR HOTEL$$$$PRICELINE VIP32% OffThanks for booking a rental car with Priceline!wasPrice marked down from
original price of $109$74$296 for 4 nightsChooseFREE BREAKFASTHoliday Inn Express Hotel & Suites Pasadena-Colorado
BoulevardPasadenaView MapFree Parking, Free Internet AccessFree Cancellation, Pay Later Available8.1149 Reviews2.5–STAR
HOTEL$$$$PRICELINE VIP15% OffThanks for booking a rental car with Priceline!wasPrice marked down from original price of
$143$120$480 for 4 nightsChooseThe L.A. Grand Hotel DowntownDowntown Los AngelesView MapSwimming Pool, Fitness Center,
RestaurantFree Cancellation, Pay Later Available8.2589 Reviews3.5–STAR HOTEL$$$$3 left$240$960 for 4
```

Figure 2 – Snippet of typical Copy/Paste data submission

Within the data there are consistent patterns for each hotel listing that would make it possible to write a parsing program in Python. A parsing program would identify certain pattern markers and sort the information into an easily understandable string called a Dictionary. After parsing the data above, one could see an entry as outputted in Figure 3 below.

```
[], 'HotelName': 'TheMirageTheStrip-Northwest', 'OriginalPrice': '153', 'ListPrice': '',
'Amenities': 'SwimmingPool,PetsAllowed,SpaFreeCancellation', 'Rating': 9, 'Reviews': '812
'}, {'Banners': [], 'HotelName': 'FlamingoLasVegasTheStrip-Northeast', 'OriginalPrice': '
92', 'ListPrice': '', 'Amenities': 'SwimmingPool,Spa,FitnessCenterFreeCancellation', 'Rat
ing': '6.3', 'Reviews': '2884'}, {'AverageRetail': 'Muchlowerthantheaverageretailpriceof$
```

Figure 3 – Snippet of Parsed data from Copy/Paste submission

You can see that the hotels highlighted in this section are The Mirage and The Flamingo. In addition to the hotel name, hotel amenities, customer ratings out of ten, the number of customer reviews, promotional tags called Banners (if any), and prices were also collected. A snippet of the Python program used to parse and output this data is seen below in Figure 4. You can see the program creates a Dictionary called "thisInfo" to aggregate the data, and uses significant markers to locate valuable information. This program took approximately two months to create.

```python
78    allData=[]
79 ▼  for entry in entries:
80 ▼      if entry.find("ViewMap")>-1:
81
82            thisInfo={}
83
84            ### tags that highlight featured bookings
85            possibleBanners=["TOPBOOKED","GUESTFAVORITE","BESTDEAL", "PRICELINEPREFERRED"]
86            foundBanners=[]
87 ▼          for banner in possibleBanners:
88                if entry.find(banner)>-1:
89                    foundBanners.append(banner)
90                entry=entry.replace(banner,"")
91            thisInfo['Banners']=foundBanners
92
93
94            ### hotel name and overall avg price per night
95            start=0
96            end=entry.find("ViewMap",start)
97            hotelName=entry[start:end]
98 ▼          if hotelName.find('$')>-1:
99                overall_avg={}
100               start = hotelName.find('$')>-1
101               end = hotelName.find('END')>-1
102               avg_per_night = hotelName[start:end]
103               hotelName = hotelName.strip(avg_per_night)
104               overall_avg['OVERALL_AVG/NIGHT'] = avg_per_night
105
106               allData.append(overall_avg)
107           thisInfo['HotelName']=hotelName
```

Figure 4 – Small snippet of Python parser program

Unfortunately, a serious flaw was identified with the Copy/Paste method. When the method was attempted on a mobile device or tablet, the success rate for viable data submissions plummeted. Only the most recent mobile operating systems could successfully Copy and Paste the data, and even then most test subjects believed the method to be too difficult. Since comparing mobile device submissions to computer submissions was such an integral feature to this study, this data collection method was abandoned.

The Final Method – JavaScript Bookmarklet

After many trial-and-errors, the official data collection method used in this study involves a JavaScript Bookmarklet. A JavaScript Bookmarklet utilizes an internet browser's Bookmark feature to run a JavaScript program in the background when a user clicks on the designated bookmark. In this case, the subject creates a Bookmark, and Copy/Pastes our JavaScript program into said Bookmark, thus creating the Bookmarklet. Then, the subject conducts the official Priceline search using the provided URL, clicks their Bookmarklet and waits while our JavaScript program Copies the site's entire inner HTML to the user's clipboard. The JavaScript then returns the user to the official website for this study where the user can Paste their HTML code into a provided text box for submission. An entire video of a successful computer submission can be viewed [here][2].

In addition to the gathered User Agent and prices, other demographic information was collected from the subject to test for the possibility that Priceline uses additional factors to determine prices. For example, Priceline could speculate a person's age or gender from behaviors captured by Cookies, and this information may be useful in determining their reservation price – the highest price one is willing to pay for a certain good/service. This information was collected using a survey the subject encountered after submitting their Priceline data.

The official data collection website for this study can be accessed [here][3]. I highly encourage you to take a look, and even conduct a submission of your own. I plan on continuing to analyze data long after this study is published.

Due to the complexity and uniqueness of each HTML data submission, it was not possible to write a parsing program similar to the one developed for the Copy/Paste method. The collected User Agents were effectively parsed and written to a CSV file using a Python module, while the Priceline data was manually analyzed for valuable information. The Python program used to parse the User Agents and a sample output can be seen in Figures 5 and 6 below.

---

[2] https://youtu.be/IkLgqXAyX44
[3] http://207.246.81.17/index.html

```
fileList=['20200318_134851673538.txt','20200318_141659408467.txt','20200318_152133702287.txt','20200
string=""
order=0
for fileName in fileList:
    file = open(fileName,'r')
    fileData=file.read()
    file.close()
    start=0
    order+=1

    import os
    size = os.path.getsize(fileName) / 1024

    while start>-1:

        start = fileData.rfind('-----------------------------------------------------------------')
        ua = fileData[start:]
        strip = ua.strip('-----------------------------------------------------------------')
        uaAgain = strip.strip('\n')

        from user_agents import parse
        user_agent = parse(ua)

        browserFamily = user_agent.browser.family
        browserVersion = user_agent.browser.version_string
        osFamily = user_agent.os.family
        osVersion = user_agent.os.version_string
        deviceFamily = user_agent.device.family
        deviceBrand = user_agent.device.brand
        deviceModel = user_agent.device.model
        isMobile = user_agent.is_mobile
        isTablet = user_agent.is_tablet
        isPC = user_agent.is_pc

        start=-2

        string+="%s,%s,%s,%s,%s,%s,%s,%s,%s,%s,%s,%s,%s\n"%(fileName,order,size,uaAgain,browserFa

filename='UserAgents.csv'
file = open(filename,'w')
file.writelines(string)
file.close()
```

Figure 5 - User Agent parsing program – Python

Browser	Browser Vers	OS	OS Version	Device Famil	Device Brand	Device Mode	Mobile	Tablet	PC
Safari	13.0.5	Mac OS X	10.13.6	Mac	Apple	Mac	FALSE	FALSE	TRUE
Mobile Safar	13.0.5	iOS	13.3.1	iPhone	Apple	iPhone	TRUE	FALSE	FALSE
Chrome	80.0.3987	Windows	10	Other	None	None	FALSE	FALSE	TRUE
Safari	13.0.5	Mac OS X	10.15	Mac	Apple	Mac	FALSE	FALSE	TRUE
Chrome	80.0.3987	Mac OS X	10.14.6	Mac	Apple	Mac	FALSE	FALSE	TRUE
Chrome	79.0.3945	Mac OS X	10.11.6	Mac	Apple	Mac	FALSE	FALSE	TRUE
Safari	13.0.5	Mac OS X	10.14.6	Mac	Apple	Mac	FALSE	FALSE	TRUE
Safari	13.0.5	Mac OS X	10.14.6	Mac	Apple	Mac	FALSE	FALSE	TRUE
Chrome	79.0.3945	Windows	10	Other	None	None	FALSE	FALSE	TRUE
Mobile Safar	13.0.5	iOS	13.3.1	iPhone	Apple	iPhone	TRUE	FALSE	FALSE

Figure 6 - User Agent parsing sample output

RESULTS AND DISCUSSION

Coronavirus Impact

Unfortunately, the 2020 Coronavirus pandemic significantly impacted the integrity of this study in several ways. Data collection for this study began in early March of 2020 and continued through April of 2020. During this time, the Coronavirus pandemic had significantly affected the world economy in many ways, and prices across all industries were particularly volatile. As this study analyzes pricing trends, it was difficult to control for the coronavirus' affect on variability found within the pricing data. That being said, there seemed to be uniform price increases and decreases on specific dates across all hotels, so this study will pay particular attention to those pricing variabilities that are outliers to this trend.

Additionally, the pandemic negatively affected the volume of data collected during this study. The original Priceline search for this study was for a two-night stay, 4/10/2020 – 4/12/2020, in Las Vegas, NV. After the global pandemic took hold in March of 2020, the search dates were changed to 7/29/2020 – 7/31/2020 to help mediate pricing variability. Subsequently, all of the data collected under the original search dates were discarded. The University of Arizona's campus closure also significantly affected our ability to collect data. Due to the campus closure, the only means of encouraging individuals to participate in this study was through internet postings and online personal messaging. As a result, only 22 pieces of usable data were collected. If this study were to be conducted on campus, I estimate that we would have been able to collect at least 50 records of data, by means of club organizations, class announcements, social groups, and other personal networking methods. Nevertheless, valuable information was able to be drawn from the 22 successful data submissions.

Results Analysis

Out of the 34 hotels that appeared within submissions, eight seemed to exhibit patterns indicative of price discrimination, including listings that frequently oscillate between two prices, and hotels that list three or more different prices. One hotel had even displayed seven different prices to customers within the testing period.

After running a linear regression to identify possible variables that have a significant effect on determining prices for hotels that seem to use price discrimination, there remained to be only one significant variable. According to the regression results where the only input variable is mobile device usage, using a mobile device will lower the price you receive by an average of $35, holding all else constant. This variable is in fact statistically significant with a P-value of 0.0006.

That being said, there are other patterns within the data that are worth mentioning. Three out of the four submissions using Windows devices faced higher prices across the board, when compared to Mac or iOS, from all hotels suspected of using pricing discrimination. This contradicts our previous hypothesis that Apple users may face higher prices as they are frequently associated with having higher income than those who use products produced by Apple's competitors, or none at all [4]. Additionally, in some cases, nearly all hotels will exhibit higher or lower prices together for the same entry, while other hotels seem to alternate prices on their own, irrespective of how the other hotels change their prices. This could mean that Priceline has some input for systematic price changes across many hotels for a specified region, while other hotels choose to individually control their own prices on the site.

First v. Third-Degree Price Discrimination

There exist different degrees of price discrimination that describe the nuances of how pricing strategies are implemented. First-degree price discrimination offers unique prices to each individual consumer. Third-degree price discrimination offers different groups of consumers different prices depending on predetermined factors. At the beginning of our study, we hypothesized that we would see evidence of first-degree price discrimination, as firms continue to increase the amount of gathered individual consumer data. Instead, the data shows more evidence that third-degree price discrimination is being used, as groups of people face different prices together rather than the individual facing unique prices. For example, mobile users face lower prices that desktop users, on average. This is an example of one group of people facing lower prices based on a predetermined factor by the firm. However, it is worth mentioning the one hotel that could potentially be utilizing a pricing model more closely resembling first-degree price discrimination - the hotel that listed seven different prices to consumers rather than the more commonly used model with two or three possible prices. This model is currently an outlier to those seen in the data, but it is not unlikely that more hotels and other similar firms will begin to move away from using third-degree price discrimination, in favor of a more lucrative first-degree pricing model.

Additional Discussion

There existed other notable factors observed in the data that could not be effectively measured within this study. When analyzing the data submissions, we noticed that the ordering and appearance of hotel listings were quite different within each submission. Nearly every submission had a unique ordering of hotel listings on the page and unique appearances of the 34 hotels that could possibly be listed. For example, one submission could include the Encore At Wynn Las Vegas hotel (seen in Figure 7) at the top of the page and the next may have the Encore near the bottom of the page, or not at all. This

could be an example of price steering as mentioned in the referenced study titled "Measuring Price Discrimination and Steering on E-Commerce Web Sites" [1].

Additionally, some hotel listings displayed "Banners" at the top of each entry, displaying tags such as "guest favorite", "best deal", "top booked", and "Priceline preferred". The Banner "guest favorite" can be found at the top of the listing depicted in Figure 7 below. The appearance of these Banners were not consistent across data submissions, indicating that they too are subject to factors for personalization. Similarly, the amenities listed in each entry differ across data submissions. The amenities in the listing below can be seen as "Free Parking, Swimming Pool, Spa" in Figure 7. This hotel may also offer a business center and a fitness center, but it is not listed. Another consumer, however, may see a different representation of such amenities, thus indicating that amenities are also subject to factors of personalization.

Figure 7 - Sample Priceline hotel listing

CONCLUSION AND FUTURE DIRECTIONS

Attribute inconsistencies discovered in this study provide great insight into overall use of price discrimination in the travel industry. Factors that have proven to have a significant impact on receiving higher prices from Priceline include using a computer rather than a mobile device, and using a Windows computer as opposed to a Mac. However, these price inconsistencies will not be seen across the board, as it is apparent that not all hotels on Priceline practice price discrimination.

Other attribute inconsistencies that were discovered but not further evaluated provide a great stepping stone for future research. Search results inconsistencies such as appearance and ordering of different hotel listings, the presence of "Banners", and the selective listing of amenities prompt other questions of strategy usage similar to price discrimination. Understanding all of the personalization strategies utilized by firms to influence purchasing behaviors will be important for the consumer to understand how to always purchase the products or services they truly desire, rather than those the firm wishes to sell.

Educational Takeaways and Acknowledgments

From an educational standpoint, I am very thankful for all of the obstacles presented during this study that provided significant learning opportunities. I had never before written in program coding languages, nor had I understood the common methods now commonly used for online data collection. I am now confident in my basic coding skills, and more importantly, my ability to problem-solve and develop new skills associated with data collection and analytics. Conducting this study has allowed me to realize a new passion for data collection and analytics that I hope to incorporate into my future career. Finally, I would like to sincerely thank my advisor, Dr. Julian Romero, for patiently teaching me new skills and pushing me to tackle unfamiliar obstacles. This study would not have been possible without him.

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