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Have Mega-Pass Mountain Resorts Continued to Charge Higher Lift Ticket Price Premiums?

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Claremont McKenna College

Have Mega-Pass Mountain Resorts Continued to Charge Higher Lift Ticket Price Premiums?

submitted to

Professor Laura Grant

by

Roman Bergeron

for

Senior Thesis

Spring 2023

ACKNOWLEDGEMENTS

I would like to thank Professor Grant for supporting me throughout the semester. I loved to chat with her each week about our favorite ski resorts and ski trips. Professor Grant was an awesome thesis advisor, kept my morale high and helped me achieve a thesis that I am proud of. I would also like to thank Professor Kim for his support, expertise and encouragement.

This thesis would also not have been possible without the hours of data collection by Katie Hanisch. I would like to thank her for being so generous to give me her data and I hope that she got some good powder turns this winter.

Thank you to my family who got me excited about the sport. An additional thank you to my brother Gian-Paul, who has always been by my side to help me think through my academic endeavors from brainstorming to proofreading. I appreciate your time and brain. Dre and Noah I hope you guys enjoyed the winter season and many more to come. Mom and Dad I will be forever grateful for all the summers and winters at Fallen Leaf Lake, you have truly fostered a home of pure joy, encouragement and curiosity.

ABSTRACT

The creation of the Epic and Ikon passes has given the public new unprecedented access to the world's top ski resorts. This study uses data on resort characteristics for 213 mountain resorts located in the USA to analyze whether the two megapass companies are overcharging customers for the quality of their mountain resorts. Through the lens of a Free Disposal Hull Model and a Hedonic Pricing Model, this study finds results in accordance with previous literature. The Free Disposal Hull Model finds that mega-mountain resorts charged $20.89 more than comparable resorts during the 2022-2023 season. Furthermore, the Hedonic Pricing Model estimates that mega-mountain resorts located in the Western region have increased their price premium by 21.87% since 2020. It also estimates that mega-mountain resorts charge significantly higher prices than cooperation-owned mountain resorts.

Keywords: Epic, Ikon, Vail Mountain Resorts, Alterra Mountain Resorts, Mega-pass, Lift tickets, Price premiums, Inefficiencies

Table of Contents

1. INTRODUCTION

Skiing has not always been the sport we know and love today. First as a mode of transportation for survival, then a weapon for war, and now, a fun yet expensive activity most humans can partake in, skiing has evolved several times (Sood, 2010). Currently in 2023, skiing is recognized as an Olympic sport. In fact, under the skiing umbrella in the Olympics there are several categories: alpine skiing (eleven events), cross-country skiing (twelve events), ski jumping (five events), nordic combined (three events), snowboard (11 events) and freestyle skiing (thirteen events) for a total of 52 (International Olympic Committee, 2022). In congruence with the increase in the competitive and televised aspect of the skiing industry, recreational skiing too increased over the past 100 years. Worldwide, the downhill skiing industry estimates a total of 400 million ski visits each year and 5700 ski resorts (Lehtonen, 2022). As this industry grows, and cash flows into the market, it is necessary to study the effects that market patterns have on the ski resorts as well as the visitation by skiers. As downhill ski resorts became more popular, customers had the option to purchase single day lift tickets or season passes. Season passes give the customer unlimited access to the respective ski mountain while they are open for the winter ski season. Prices for such passes vary, possibly due to the quality of the resort or accessibility to their customers.

The first large change in the industry regarding access to mountains was the launch of the Epic Pass, by Vail Mountain Resorts in 2008 (Diamond, 2019). This multi-mountain pass gave pass holders unlimited access to five resorts in Colorado as well as Heavenly, located in South Lake Tahoe for the price of $579 in 2008 dollars (Snowsports Industries America, 2018). From this point on, the industry was forced to shift to accommodate multi-mountains passes. At this time, a customer in Colorado had to decide to either buy the Epic pass, giving them access

to five mountains or buy season passes at single resorts and day passes at others when they wished to visit. Since the launch of the Epic Pass in 2008, Vail Resorts has added over 30 mountains to their passes and now gives its pass holders several purchase options, the unlimited Epic Pass (unlimited access to listed mountains), Local Epic pass (limited access and mountains), Tahoe local pass (unlimited access to Heavenly, Northstar, and Kirkwood), and several other passes (27 total options) (Epic season pass). In addition to these season passes, Epic also offers an alternate route of accessing the mountains in the form of day passes that span from one to seven days at 32 resorts listed (does not include holiday season) (Epic season pass). Currently, the Epic pass has gained a large portion of the ski pass market. For the most recent 2022-2023 season, 2.3 million passes were sold (LaConte, 2022).

In competition with Vail Resorts Epic pass, during the 2018 season, a new conglomerate joined the industry with the creation of the Ikon pass. The Ikon pass by Alterra Mountain Company served as an alternative way to access premiere skiing locations. On its launch, Alterra Mountain Company claimed that such multi-mountain passes are the "new standard in passes" and included access to 23 destinations (Introducing the Ikon Pass, 2018). With the creation of the Epic and Ikon pass, the season pass market was affected and the industry standard for mountain access was shifted. Currently, Alterra Mountain Company gives skiers the option between the Ikon Pass (unlimited access to 14 ski resorts), Ikon base Pass (limited access to 13 destinations, five-day access to 34 mountains), Ikon base Pass plus (limited access to 13 destinations and an additional six mountains for given day access) and 2, 3 and 4 days Ikon session passes at any of the 40 mountains listed (Ikon Pass, 2023). On 4/19/2023 the unlimited Ikon pass for the 2023/2024 season cost $1,159.

The relatively low price point of both the Ikon and Epic in comparison to several single day lift tickets serve as a motivational force to purchase the multi-mountain passes. One way in which these companies can make this happen is through the discounted purchasing options that are given in advance of the snow season. For either passes, you have to be locked into and plan your skiing intentions for the season well in advance. Much of the customers' decisions to purchase a type of ticket are based on last year's snowfall and conditions as well as future predictions of time availability on the purchasers' behalf.

This paper finds that a majority of resorts are not charging a fair price for their day lift tickets based on the amenities that they provide. Through graphing the 2022 lift ticket prices by a combination of resort attributes, I create a figure depicting each resort in comparison to the others. The fair (from now on noted as “efficient”) resorts are identified by charging the lowest price and providing the most amenities. This is called a Free Disposal Hull Model. In my sample, only 13 resorts charge efficient prices, seven of which are part of either the Epic or Ikon multi-mountain pass. While over half of the fair resorts are Ikon or Epic owned, results indicate that throughout the entire sample, Epic and Ikon resorts charge an increased price premium of $20.89 (51.5% higher than the mean) per single-day lift ticket in comparison to all other mountain resorts. I also conduct further analysis by decomposing the price of lift tickets into the mountain attributes and measure how much each attribute contributes to the price of the lift tickets based on each mountain. This is called a Hedonic Pricing Model that calculates the premiums that mountain resorts charge their customers. Through this lens, I find that Epic and Ikon mountain resorts have increased ticket premiums in comparison to non-Epic/Ikon mountain resorts. Since 2020, the calculated additional cost of day tickets at Epic and Ikon

mountain resorts has increased by $9.24 resulting in a total premium of $51.49 (a 21.97% increase since 2020) holding quality constant.

Section one outlines previous literature and studies that have delved into the realm of ski ticket premiums and identify avenues for research. This is followed by a data section where I explain data collection as well as important summary statistics in my dataset. Section three is an in-depth guide to the construction of both the Free Disposal Hull Model and the Hedonic Pricing Model. Section four describes the significant and insignificant results of my paper based on my hypotheses. Section five takes the findings from section four and shows what the implications of these findings are. The last section is a conclusion of my research followed by a section for references and an appendix.

2. LITERATURE REVIEW

In my preliminary research of mountain resorts overcharging their customers based on their amenities, I only found two studies that wished to analyze the direct observed difference between Epic and Ikon mountains. The first was Lai (2019) who claims that multi-mountain resorts charge higher single-day premiums than non conglomerate owned resorts. While this study does find significant results, the change in price premium before and after a mountain's choice to join the conglomerate is not accounted for due to the single year of data. Lai (2019) finds that mountain resorts that are a part of mega-pass conglomerates charge higher premiums on their single-day lift tickets than they do on their season passes, which implies an influence to customers to purchase the full season pass. The data in this study was limited to only one year of observation and 302 ski resorts collected from OnTheSnow.com. Because of this fact, results can only be generalized to the 2018-2019 ski season and are not predictors or models of the

future of past seasons. In addition to the finding of price premiums, through hedonic price modeling, Lai (2019) finds that variables such as vertical drop, base elevation, total chairlifts, and percent of fast chairlifts are significantly correlated with increased prices for day lift tickets (Lai, 2019).

Hanisch (2021) took the existing literature a step further by taking data from *The White Book of Ski Areas* by Robert Enzel for mountain resorts from 1979, 1988, and 2000. Similar to Lai (2019), Hanisch (2021) also collected data from OnTheSnow.com for the years 2018 and 2020 to complete the analysis. Hanisch (2021) findings support Lai (2019), finding that mega-pass resorts have higher rates for single-day lift prices at mega-pass resorts in comparison to non-conglomerate-owned mountain resorts. The study estimates that mega pass-owned resorts charge from $20.19 to $39.87 more than their counterparts depending on the geographical region of the ski resort (North East and West respectively). The geographical differences could be due to better ski conditions posed in specific regions or the status/reputation that ski resorts have gained in specific regions. Hanish also finds that vertical drop, total chairlifts, and age of resort contribute to the increase in ski ticket prices for both mega-pass mountains and non-mega resorts.

Both studies acknowledge that by using OnTheSnow.com there are inherent biases but fail to note that OnTheSnow.com has inaccurate ski ticket data and often only shows data from one of the previous three seasons as a ticket price. For this reason, I had to update each ski ticket pricing individually and not rely on OnTheSnow.com's report of ticket prices since much of it was outdated.

Caplan (2019) took a similar approach to both Hanisch (2021) and Lai (2019), using data from the 2018-2019 season and 120 resorts in the United States as well as Canada. Caplan

(2019) finds that conglomerate-owned mountains charge premiums on both single-day lift tickets and season passes in comparison to other non-conglomerate-owned mountain resorts. Conversely, they found that multi-area season passes (mega-passes) charge no premiums and in fact, have discounts on their passes. With this being said, Caplan (2019), similarly to Lai (2019), cannot be generalized to current or prior seasons due to the limited data collection of only one year (Caplan, 2019).

Since the Epic pass has only been up and running for 14 years and the Ikon pass for only 5 years, two of which cannot have findings generalized to other skiing years (due to COVID-19), the studies that explore conglomerate pricing have been limited. With that being said there have been other studies that explored simple ski ticket premiums of mountain resorts and their related factors. Falk (2008) studied 84 ski resorts in Austria to understand what makes resorts charge higher ticket costs and which mountain attributes contribute to this change. He looked at the ticket prices of both one-day tickets and six-day tickets to determine the mountain premiums. Falk (2008) finds that the total length of slopes, vertical lift capacity, and the share of high-speed chairlifts are significantly correlated with higher lift ticket prices. Falk (2008) outlines a clear willingness to pay for specific amenities that evidently make the skiing experience more enjoyable, fun, and convenient. Falk is a leader in the field who has authored over 20 empirical papers on ski resorts and related tourism (Falk, 2008).

Further research has explored not only Epic and Ikon conglomerate-owned mountain premiums but the pricing strategy that arises due to mergers or strategic alliances. Firgo (2018) uses data from the 2011-2012 season from every resort in Austria. This study finds significance in similar mountain attributes as earlier discussed papers and includes other variables such as GDP per capita and distance to the nearest city with 100,000 inhabitants. Counter to their

hypothesis, GDP per capita is found to be negative and distance to the nearest city is insignificant. Further analysis would be needed to address this discrepancy since the study only used the years 2011-2012 and only resorts in Austria (Firgo, 2018).

Wolff (2014) works to identify pricing effectiveness for 168 ski resorts located in France during the 2010-2011 season. They use a Free Disposal Hull Model which characterizes the premiums or inefficiencies in resort ski tickets. This works by keeping all else constant using the cheapest ticket in each categorical bucket of pricing and comparing it to each other resort in the same bucket. Results indicate that regional differences weigh heavily in identifying inefficient and efficient resorts. Only 11.9% of resorts were characterized as having efficient pricing, 35% as inefficient (more than 4 Euros below what they should price tickets), and 20% charged more than 8 Euros more than the efficient price. These results indicate that across France, pricing strategies vary quite heavily and many resorts do not charge fair prices based on their amenities (Wolff, 2014)

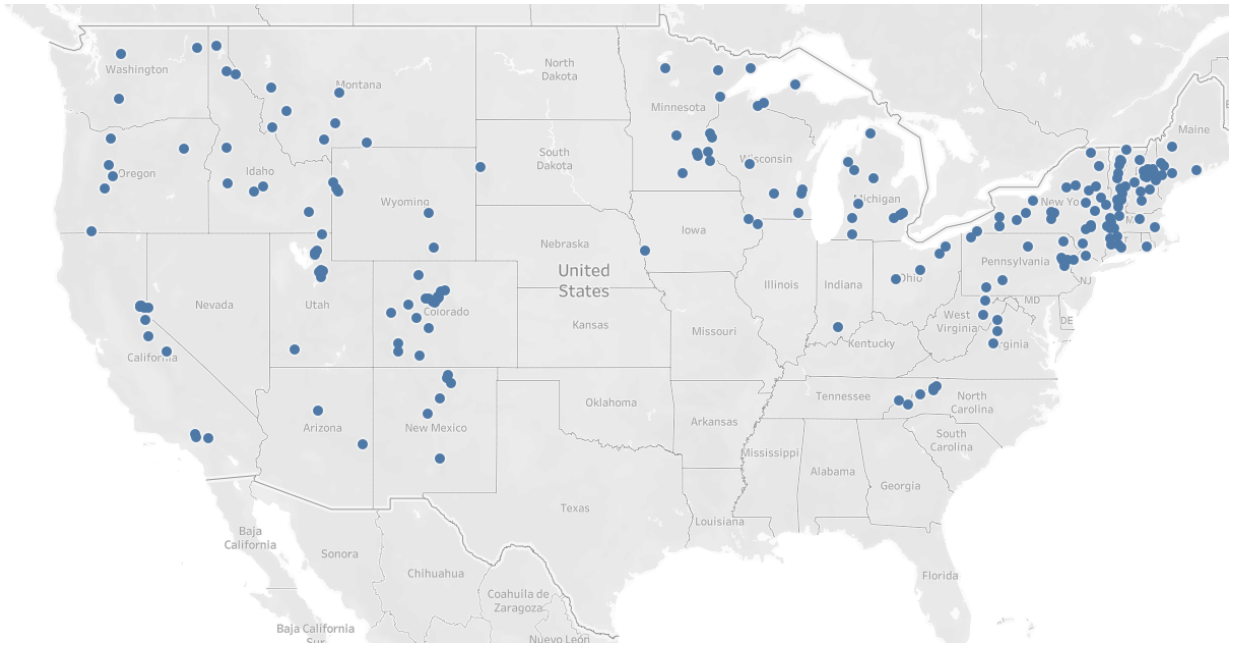
This thesis takes both Wolff (2014) and Hanish (2021) approaches to price premiums to create a multifaceted analysis of 213 ski resorts in the United States. The findings from the Free Disposal Hull Model in this thesis are in congruence with Wolff (2014) of limited "efficient" resorts. Results indicate that in my data sample, there are only 13 efficient resorts and 200 inefficient resorts. These findings further motivate the avenues for possible analysis of what amenities contribute towards these inefficiencies. Further regression analysis estimates that since 2020, the single-day lift ticket price premiums charged by resorts in my sample have increased by 21% over the two years. Furthermore, single-lift ticket price premiums charged by resorts are increasing faster than both private and other conglomerate-owned mountains. This

paper takes several approaches to identify price premiums and inefficiencies and finds results that are in congruence with prior literature.

3. DATA

The data I collected contains 213 ski areas based in the United States of America. The reason for this selection was due to the limited data from previous years which only included these 213 resorts. Katie Hanisch collected ski resort data for these 213 resorts for 1979, 1988, and 2000, from Robert Enzel's *The White Book of Ski Areas* which has since transformed to a digital website: OntheSnow.com. Further data was collected from this website for the 2018, and 2020 seasons by Hanisch using a web scraper.

Figure 1: Map of Mountain Resorts, USA



Source: Author Calculations

Note: 213 mountain resorts locations based on Google location data. Alyeska and Eaglecrest Ski Area are not represented since they are located in Alaska.

Figure 1 depicts the spread of resorts based on the Google Maps latitude and longitude. The dataset contains the largest concentration of ski resorts in New York State (26 ski resorts) and only one ski resort represented in several states such as Illinois, Indiana, and Nevada. Further geographic concentrations are California with 11 ski resorts, four of which are located in Nevada County, California. Additionally, Colorado has 17 ski resorts, most of which are internationally known for their quality and conditions. At each mountain resort in the dataset, data was collected on attributes such as summit elevation, vertical drop, base elevation, number of trams, number of fast chairlifts (eight, six, and four person), total chairlifts (total of fast chairlifts and all, quad, triple, double and surface lifts), longest run on the mountain, total ski runs, snow make, average snowfall and year opened. Hanisch gave me this data and I updated it for the 2022-2023 ski season.

I collected new data on each ski resort from OnTheSnow.com and manually inputted each data point into my dataset. Much of the ski ticket price data was outdated, so I had to visit each mountain's homepage to get an accurate depiction of what ticket cost in 2022-2023. Data was collected for window ticket prices on weekdays, weekends, and half days if given. During collection, a subset of the mountains no longer gave information on ski ticket pricing. For these resorts, the pricing structure from 2020 was translated to 2022-2023 since I could not obtain any new pricing on the web. The only mountains that I could not find 2022-2023 data on were Woodbury Ski Area (Connecticut), Toggenburg Mountain (New York), Alpine Valley (Ohio), and Boston Mills/Brandywine (Ohio).

Included in the dataset from Hanisch (2021), ikon_un (Ikon unlimited) and epic_un (Epic unlimited) were dummy variables that indicate if such a mountain gives pass holders unlimited mountain access. Similarly, the dataset contained ikon_lim (Ikon limited) and

epic_lim (Epic limited) showing which mountains give pass holders limited day access to their mountain. These variables were updated for the 2022-2023 season. Since the 2020 season, Ikon and Epic acquired new mountains and dropped some from their respective passes. In Table 1 below, the mountains added and removed from each pass are illustrated.

Table 1: Mountain Resorts Added or Removed from Epic and Ikon Passes

Ikon Unlimited Changes in Access 2020-2022	Ikon Limited Changes in Access 2020-2022	Epic Unlimited Changed in Access 2020-2022	Epic Limited Changes in Access 2020-2022
Mountains Added: Snow Valley Copper Mountain Steamboat and Blue mountain Resort	Mountains Added: Schweitzer, Windham, Snowbasin and Deer Valley	Mountains Added: Beaver Creek, Mount Brighton, Attitash, Big Boulder, Jack Frost, Seven Springs and Mount Snow	Mountains Added: Crystal Mountain
Mountains Removed: Crystal Mountain	Mountains Removed: Beaver Creek and Attitash	Mountains Removed: N/A	Mountains Removed: Sun Valley and Snowbasin

Source: Author calculations from Hanisch (2021) and Epic/Ikon season pass websites

Note: This table gives a graphic of resorts added or removed from Epic and Ikon limited and unlimited passes.

In Table 2, summary statistics are given to indicate the distribution of data as well as all included variables. Summit, drop, and base are shown in hundreds of feet; snowfall is measured in inches. The age variable is the product of subtracting the current year from the year the resort opened obtained from OnTheSnow.com.

Table 2: Summary Statistics of Variable Included in Data Collection

VARIABLES	N	mean	sd	min	max
adult_week	1,182	45.14	39.20	0	269
adult_end	1,181	50.66	41.46	0	270
year	1,278	2,005	16.70	1,979	2,022
summit	1,197	50.43	37.79	1	131.5
vertdrop	1,271	13.62	11.02	1.750	96.03
base	1,199	36.30	31.90	0.310	110
trams	1,200	0.128	0.454	0	4
fastEight	1,009	0.00396	0.0629	0	1
fastSixes	1,200	0.135	0.583	0	6
fastQuads	1,200	0.657	1.739	0	15
quad	1,199	0.717	1.168	0	9
triple	1,198	1.269	1.544	0	8
doublelift	1,199	2.483	2.329	0	18
surface	1,200	2.436	2.257	0	20
totallift	1,200	7.842	5.125	1	44
long_run	1,150	10.25	27.44	0	341
totruns	1,052	33.49	39.51	0	341
avsnowfall	934	191.7	133.1	0	669
yearopen	1,261	1,956	16.10	1,823	1,991
age	1,261	47.06	22.43	0	197
own_corp	1,278	0.160	0.366	0	1
dist_air	1,273	118.1	74.67	7	392
Ikon_un	1,278	0.0133	0.115	0	1
Ikon_lim	1,278	0.0243	0.154	0	1
epic_un	1,278	0.0290	0.168	0	1
epic_lim	1,278	0.00313	0.0559	0	1

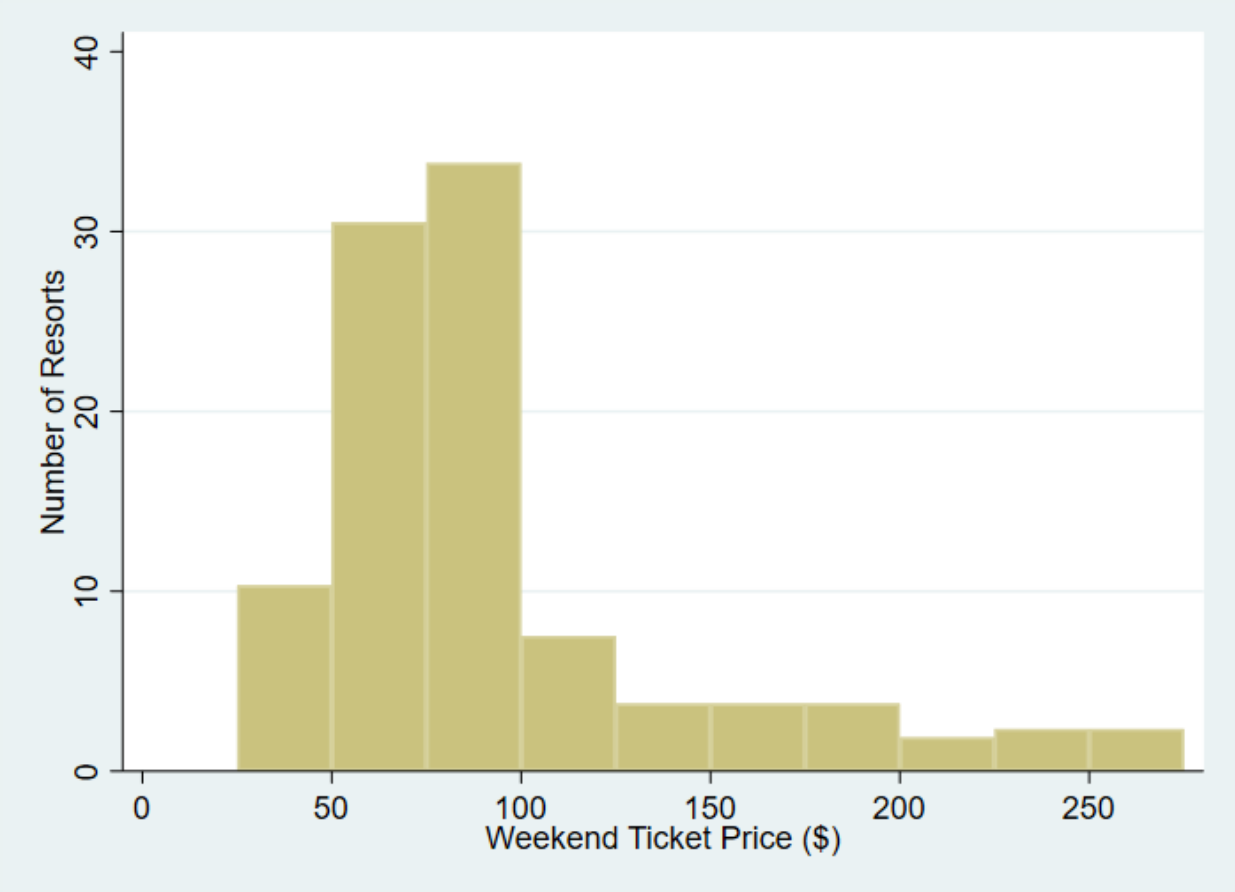
4. ANALYSIS STRATEGY

4.1 Free Disposal Hull Model

Following Wolff (2014) by using the Free Disposal Hull Model to detect inefficient pricing in the market, I use the same approach with my 2022 data to see a descriptive relationship between the quality of a resort and lift ticket prices. Ticket prices for the 2022-2023 season range from $25 at resorts such as Willamette Pass to $270 at resorts such as Beaver

Creek. The distribution of the resorts is given in Figure 2 below. I find that 74% of resorts have weekend ticket prices below $93, with the majority of the mountains having ticket prices between $75 and $100 in the 2022 season.

Figure 2: Distribution of Weekend Lift Ticket Prices



Source: Author Calculations

Note: This figure gives a distribution of weekend ticket prices for each resort in the sample.

I then used this data on lift tickets as well as each mountain's amenities to create a new chart that shows the relationship between the quality of a resort and the actual price that they charge to their customers. Using my dataset for the 2022-2023 season I use principal component analysis (hereafter PCA) to identify three variables that account for the majority of the variation within the 12 variables included in the PCA. I find the first principle component contains

47.64% of the variation of all variables. Following the rule of including the variable in PCA if and only if the eigenvalue is greater than one, I find that the first three components are able to explain 69.41% of the variation experienced within all 12 variables. Using the first three principal components, I then create a quality score for each resort using the first three principal components. Given that some of the quality index values are negative for some mountains, following Wolff (2014), I transpose these values by this function

$$QualityScore = A_i + Amin + 1 \quad (1)$$

A_i is the quality score for a given resort. $Amin$ is the minimum quality score for a mountain resort calculated in the PCA. This creates the quality score values to all start at a quality score of 1.

Quality Scores range from 1 to 11.48 with Park City, Utah taking the spot for the highest calculated quality of a resort. 11 mountains have insufficient data on one or several of the principal components. Mountains that were omitted due to absent data in these variables are: Middlebury Snow Bowl, Big Boulder, Maple Ski Ridge, Wild Mountain Ski & Snowboard Area, Buck Hill, Timber Ridge, Snow Snake Mountain Ski Area, Pine Knob Ski Resort, Alpine Valley Ski Area, Blue Hills Ski Area, and Soldier Mountain Ski Area.

As Wolff (2014) outlined, an efficient resort charges the least amount of dollars for a ticket at the same or similar quality level. So, I draw a horizontal line from the cheapest resort for a given quality and make a step function where the most efficient resorts are points on the line and all others are above. This distance between the depicted efficient resort price and the individual resort price is a representation of the resorts that are charging too much for the value that is actually given by the resort amenities.

Results of the Free Disposal Hull model indicate that only 6.10% of resorts are charging their customers an efficient rate for their amenities, while a staggering 93.89% are overcharging for their lift tickets. The efficient frontier is found by identifying the resorts which have the highest quality score for the lowest ticket price. The efficient frontier that I identified is made up of 13 resorts in ascending order: Bruce Mound ($27), Mt. Abram Ski Resort ($35), Mount Kato Ski Area ($40), Nordic Valley Resort ($50), Discovery Ski Area ($50), Lost Trail - Powder Mtn ($58), Sunday River ($65), Loon Mountain ($89), Mt. Bachelor ($160), Snowbird ($184), Killington Resort ($184), Big Sky ($220) and Park City ($269). Using these efficient ski resorts, resorts are grouped into sections based on the stepwise function of the efficient resort quality indexes. For example, if Resort X has a lower quality score than Nordic Valley Resort, their ticket price is compared to the ticket price of the previous mountain on the efficient frontier, Mount Kato Ski Area. This result yields the exact price premium and efficiency charged by Resort X.

A few examples of the highly inefficient resorts are Arapahoe Basin Ski Area which has a quality score of 3.741 yet is charging $229 for their day lift tickets. Based on the principle component analysis and the amenities of the resort, Arapahoe Basin Ski Area's inefficiency and price premium level is represented by $229-$50= $171, their ticket price minus the price of the efficient resort. This is indicative of a 342% increase in ticket price than the efficient resort. Another resort that is highly inefficient is Sugarbush, with a quality score of 4.279 and a ticket price of $189. This represents a price premium of $189-$58=$131, a 225.86% increase from the efficient resort. While many resorts are charging more than the efficient resort in their bucket such as Arapahoe Basin Ski Area and Sugarbush, the range of premiums range from $4 to $171 with Belleayre charging the lowest premium in all buckets.

Figure 3: Resort Price Inefficiencies Based on PCA Analysis for the 2022-2023 Season

Source: Author Calculations

Note: This figure gives a visual representation of the quality score of each resort and their respective ticket price. Resorts in red represent resorts that charge the lowest price for weekend ticket prices and the highest quality score. The distance from the blue resorts to the horizontal lines is the inefficient price premium.

The average inefficient charge that each mountain imposed on their weekend skiers is $40.61 with a standard deviation of $26.38. As I would expect, a single regression of weekend lift ticket prices on quality score results in a positive coefficient. This regression finds that as the quality score rises by a factor of 1, the price for an adult weekend ticket rises by $27.34 at a 95% confidence interval. Based on this analysis I conclude that many resorts are charging

premiums, but the question remains, do mega-mountain resorts charge higher premiums for their weekend tickets, or are they relatively efficient when compared to similar resorts in their bucket? I then create a new variable named, *MegaMountainResort*, which indicates if a mountain is a part of either the Epic or Ikon pass. Next, I create a regression model to look at the difference in price premiums charged between mountains that are mega-mountain resorts versus those that are not, holding the quality score constant. This measures the price premium for each resort. $\beta 1$ is the price premium coefficient for mountains part of an Epic or Ikon pass. $\beta 2$ is the price premium coefficient based on the quality of the resort. i is the identification of each resort. The equation for this regression is

$$PricePremium_i = \beta 0 + \beta 1*(MegaMountainResort_i) + \beta 2*(QualityScore_i) + \varepsilon_i . \quad (2)$$

Results from this regression analysis are significant at a 95% confidence interval and indicate that mega-mountain resorts charge $20.89 more than all other mountains holding their quality scores constant. In comparison with the mean price premium of $40.61 the mega-mountain price premium represents a 51.44% increase from the mean. The *QualityScore* variable in the regression has a coefficient of -.$89 but is not significant. When the same regression is run substituting MegaMoutainResorts for all resorts that are corporation owned, there is no significant difference between cooperation and individual-owned mountain resorts. This indicates that resorts that are a part of Ikon and Epic passes are not acting similarly to other cooperation-owned mountains and instead charging premiums for day tickets. The reason that companies like Ikon and Epic are charging higher premiums than their counterparts could be to

convince their customers to purchase the multi-mountain season passes that they offer for the significantly lower price value ratio.

4.2 Hedonic Pricing Model

Following the structure set by several previous studies, I then used a Hedonic Pricing Model in order to analyze the entirety of the data set. To see exactly how these resort premiums have changed from 2020 to 2022, I use the same analysis strategy as Hanisch (2021). As Hanisch (2021) outlined, to analyze the effects the mountain attributes and conglomerate identification have on both weekend and weekday lift ticket prices, I used the regression equations:

$$Adult\ weekday_{iy} = \alpha + \beta(A_{iy}) + \gamma(M_{iy}) + \mu_{iy} \quad (3)$$

$$Adult\ weekend_{iy} = \alpha + \beta(A_{iy}) + \gamma(M_{iy}) + \mu_{iy}. \quad (4)$$

A is the given attributes of each mountain such as summit, vert drop etc. i is the identified ski resort. γ is the year of observation for the six years in my sample. M is a dummy variable for the MegaMountainResorts. My hypotheses are as follows, summit, vertical drop and total lifts will have positive effects on weekend and weekday ticket prices. I also hypothesize a positive beta for MegaMountainResort, representing a higher price premium for their tickets than other mountains. Based on Hanish's research, I would also suspect that mega-mountain resorts in the West will continue to have significantly higher price premiums due to the "fame" of the West factor outlined by Hanish. "Fame" of the West being the public view of western ski resorts as those with often the most snowfall and highest quality.

4.3 Hedonic Pricing Model Including Propensity Score

Using the same Hedonic Pricing Model as in 4.2, I include a new variable to analyze the causal relationship between MegaMountainResorts and lift ticket premiums. For this regression, I categorize each resort into the geographical region of "West," "New England," "North Central," "South" and "California." Then I count the amount of MegaMountainResorts in each region for 2018, 2020 and 2022. I hypothesize that regions which already have MegaMountainResorts would be less likely to add more. This is based on the assumption that Alterra Mountain Resorts and Vail Resorts wish to diversify their holdings to get to a larger customer portfolio and furthermore account for low snow seasons in specific regions. For example, in California for the 2018 season, there were only two MegaMountianResorts (Northstar and Mammoth). So, each resort in California got a value of two for MegaMountainResort2018.

This same process was completed for each of the five regions for years 2018, 2020 and 2022. Identification of each region's MegaMountainResort count was then used in a logistic regression on the dummy variable MegaMountainResort identification. Using this regression I created a new variable ranging from 0-1 that identifies the causal relationship between the MegaMountainResort count and the MegaMountainResort identification. A value of 1 suggests that the resort has a 100% propensity to be a MegaMountainResort and 0, a 0% propensity to be. This is called a propensity score. Each resort in their respective region and years had the same propensity score. I then use the new variable propensity score in my regressions to analyze the causal effect of density of MegaMountainResorts. The propensity score variable serves the same function as any other mountain attribute in the regression. I hypothesize that as the propensity to be a MegaMountainResort increases so will the price for single day lift tickets.

5. RESULTS

Given the attributes of the mountain and the extreme dichotomy in resort quality and location, it is evident that these factors would have significant effects on the price of both weekend and weekday tickets. Tables 3 and 4 below show this effect using several different regression models.

Table 3 shows several significant variables for weekend ticket prices. Surprisingly, among these significant variables, the height of the summit is only significant in one of the five regressions run and only equates to a 78-cent increase in the weekend ticket price for a 1000-foot increase in summit elevation. Vertical drop is statistically significant in 4 of the 5 models predicting anywhere from an increase of $3.59 to $5.04 for each additional 1000 feet of vertical drop. Furthermore, total lifts were a statistically significant predictor in all five models at a confidence interval of 99%. The results indicate that for each additional lift that a mountain has, they charge $2.52 to $3.42 more for their weekend tickets. This result could help understand capital investment into new lifts and the monetary return that they directly give the mountain.

Table 3: Adult Weekend Hedonic Price Model

VARIABLES	(1)	(2)	(3)	(4)	(5)
summit	0.0347	0.0779**	0.0652	0.0915	0.0444
	(0.0378)	(0.0353)	(0.0570)	(0.0665)	(0.0528)
vertical drop	0.311	0.473**	0.385*	0.504**	0.359**
	(0.208)	(0.214)	(0.201)	(0.228)	(0.168)
totallift	3.422***	3.061***	3.207***	3.060***	2.519***
	(0.351)	(0.288)	(0.296)	(0.335)	(0.244)
age	0.109	0.0620	0.0644	0.0633	0.0603
	(0.0865)	(0.0414)	(0.0420)	(0.0409)	(0.0400)
cooperation owned mountains	10.38**	7.919***	7.751***	13.70***	10.89***
	(4.059)	(2.927)	(2.873)	(3.311)	(2.695)
distance air	0.0371***	0.0267**	0.0303**	0.0196	0.0262**
	(0.0131)	(0.0118)	(0.0127)	(0.0134)	(0.0107)
limited mega pass (mega1)				-26.45***	
				(4.428)	
unlimited mega pass (mega2)	62.99***	36.21***	36.23***		-20.96***
	(6.523)	(6.014)	(5.916)		(4.135)
year 1988		-16.71***	-16.81***	-16.48***	-16.56***
		(0.960)	(0.958)	(0.972)	(0.933)
year 2000		-7.048***	-7.015***	-7.462***	-7.052***
		(0.994)	(1.010)	(1.051)	(0.924)
year 2020		22.88***	22.86***	25.86***	22.88***
		(1.657)	(1.663)	(1.666)	(1.676)
year 2022		37.01***	36.93***	41.12***	37.47***
		(1.914)	(1.912)	(2.359)	(1.919)
west			-11.12***	-13.16***	-11.55***
			(3.230)	(3.527)	(2.892)
north_cen			-20.42***	-15.63***	-15.64***
			(3.137)	(2.914)	(2.350)
new_eng			-9.268***	-7.531***	-7.248***
			(2.352)	(2.422)	(1.991)
westmega1				77.94***	
				(9.306)	
newemega1				34.25***	
				(8.501)	
westmega2					86.04***
					(7.091)
newemega2					34.96***
					(8.011)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4 also shows interesting findings. In comparison to Hanish's calculation of mega-pass resorts outside of the West and northeast region having $18.39 lower weekday ticket prices for the 2020 season, my data shows that this discrepancy has increased, yet marginally.

Mega-pass mountains outside of the west and northeast on average charge a $18.51 lower price than their counterpart. This value shows that though some aspects of ticket prices have changed since 2020, not all are indicative of large industry-wide shifts.

Table 4: Adult Weekday Hedonic Price Model

VARIABLES	(1)	(2)	(3)	(4)	(5)
summit	0.0833**	0.121***	0.0766	0.102	0.0593
	(0.0377)	(0.0353)	(0.0571)	(0.0652)	(0.0528)
vertical drop	0.341*	0.484**	0.404**	0.522**	0.384**
	(0.206)	(0.212)	(0.203)	(0.232)	(0.175)
totallift	3.242***	2.883***	3.014***	2.891***	2.448***
	(0.321)	(0.265)	(0.274)	(0.315)	(0.235)
age	0.0991	0.0574	0.0587	0.0581	0.0556
	(0.0775)	(0.0381)	(0.0382)	(0.0374)	(0.0368)
cooperation owned mountains	10.95***	8.381***	8.443***	13.30***	11.15***
	(4.048)	(3.158)	(3.160)	(3.336)	(3.019)
distance air	0.0365***	0.0271**	0.0326***	0.0226*	0.0287***
	(0.0124)	(0.0111)	(0.0123)	(0.0130)	(0.0106)
limited mega pass (mega1)				-18.51***	
				(4.215)	
unlimited mega pass (mega2)	58.54***	35.21***	35.22***		-13.91***
	(6.171)	(5.748)	(5.700)		(4.158)
year 1988		-15.02***	-15.06***	-14.75***	-14.87***
		(0.995)	(0.995)	(1.009)	(0.981)
year 2000		-6.238***	-6.186***	-6.551***	-6.264***
		(0.973)	(0.982)	(1.026)	(0.919)
year 2020		19.07***	19.04***	21.72***	19.09***
		(1.473)	(1.485)	(1.407)	(1.474)
year 2022		32.48***	32.38***	36.01***	32.78***
		(1.890)	(1.886)	(2.203)	(1.908)
west			0.824	-1.178	0.543
			(3.462)	(3.696)	(3.126)
north_cen			-9.116***	-4.845	-5.105**
			(3.202)	(2.994)	(2.603)
new_eng			-0.789	0.794	0.666
			(2.681)	(2.693)	(2.349)
westmega1				69.84***	
				(9.305)	
newemega1				31.30***	
				(9.257)	
westmega2					71.97***
					(7.045)
newemega2					33.54***
					(8.343)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Results indicate that for weekend ticket prices of the unlimited mega-pass resorts in the West, the ticket premium has increased by $9.24 since Hanish's calculated premium of $42.25, a 21.87% increase since the 2020 season. Conversely, for the unlimited mega-pass resorts in the North East, the ticket prices for weekend tickets have decreased by $10.16 since Hanish's calculated premium of $17.96, a 43.43% decrease. This furthers the evidence that resorts in the West have continued and accelerated their premiums for a single-day lift ticket.

In addition to findings of ticket premiums charged by mega-resorts, I also find significant results of ticket premiums for cooperation-owned mountains. Hanish's regressions found significant results for three of the 10 regressions for cooperation-owned resorts. My regression indicates significant results in all 10 regressions. Price premiums range from $7.92 to $13.70, with both the upper limit and lower limit found in the weekend ticket regressions. This could be because the variable cooperation-owned mountains encompass those owned by both Ikon and Epic. Yet, in totality, cooperation-owned resorts charge significantly less than mega-pass resorts.

The Hedonic Pricing Model of both weekend and weekday ticket prices yield significant results that indicate mountain characteristics, regional differences and pass alliance contribute to higher premiums. Each of these data points is crucial to analyze if the market monopolies, Epic and Ikon, are charging fair prices for their lift tickets. With this analysis in consideration, a driving factor for the price premiums charged by both Ikon and Epic Resorts could be a marketing strategy in efforts to push the multi-mountain season pass option that they offer. Both of these passes offer avid skiers amazing access to the world's top resorts at a very compelling price given that you ski a considerable amount of days in the season. This is called a bundling

strategy which gives customers several services and amenities under the blanket purchase of an Ikon or Epic pass.

Following the results from the Hedonic Pricing Model, I then included a propensity score in each of the five regression models previously run. The variable propensity score was significant in all 10 models run on weekend and weekday ticket prices. The beta coefficients for the propensity ranged from $68.19 to $105.5 with the adult weekend ticket regressions having the highest and lowest estimates. Mountain resort propensity scores range from .02 to .37. Since our propensity score variable ranges from 0-1, the coefficient is best interpreted in hundredths. Using the upper estimate, I find that .01 increase in propensity score for a mountain resort results in a $1.06 increase in weekend ticket price. The lower estimate finds that a .01 increase in propensity score results in a $.67 increase in weekend ticket price. All beta coefficients for the propensity scores were in accordance with my hypothesis, showing a positive relationship between a mountain's propensity to be a MegaMountainResort and ticket price. This represents a positive causal relationship between the two variables. Further supporting the fact that MegaMountainResorts are charging higher premiums than other mountains.

When propensity score is included in our regression model however, the coefficients of the other variables previously explored change. In contrast to the first Hedonic Pricing Model which found an increased price premium for MegaMountainResorts located in the West of $51.94, when including propensity score, a price premium of $28.70 is estimated for weekend lift tickets. Other variables such as vertical drop, total lifts and cooperation owned mountains remained significant at similar values to the initial regression. Table 5 below indicates the regression results discussed in this section.

Table 5: Adult Weekend Hedonic Model With Propensity Score

VARIABLES	(1)	(2)	(3)	(4)	(5)
summit	-0.0305	-0.00443	0.0349	0.0602	0.0128
	(0.0354)	(0.0340)	(0.0593)	(0.0662)	(0.0589)
propensity score	105.5***	80.14***	89.96***	93.83***	68.19***
	(13.21)	(13.35)	(13.35)	(14.02)	(12.45)
vertical drop	0.302**	0.363**	0.401**	0.522***	0.396***
	(0.131)	(0.151)	(0.158)	(0.188)	(0.147)
totallift	2.913***	2.882***	2.846***	2.973***	2.591***
	(0.302)	(0.288)	(0.286)	(0.306)	(0.265)
age	0.812***	0.680***	0.633***	0.622***	0.635***
	(0.0794)	(0.0737)	(0.0690)	(0.0690)	(0.0688)
cooperation owned mountains	6.289**	4.783*	4.138	8.232***	5.824**
	(2.875)	(2.711)	(2.680)	(2.955)	(2.747)
distance air	0.0195	0.0187	0.0237	0.0204	0.0244*
	(0.0179)	(0.0161)	(0.0152)	(0.0161)	(0.0145)
limited mega pass (mega1)				6.057	
				(10.25)	
unlimited mega pass (mega2)	35.81***	33.97***	33.85***		9.168
	(4.924)	(5.063)	(4.999)		(10.54)
year 1988		-4.479***	-4.471***	-4.868***	-5.213***
		(0.905)	(0.888)	(0.916)	(0.861)
year 2000		-1.744	-1.163	-1.984*	-2.121**
		(1.080)	(1.092)	(1.131)	(1.041)
year 2020		5.106***	5.361***	6.835***	7.015***
		(1.244)	(1.206)	(1.058)	(1.165)
year 2022		15.10***	15.01***	17.49***	18.29***
		(2.054)	(2.016)	(1.953)	(2.043)
west			-21.27***	-23.43***	-21.54***
			(4.249)	(4.671)	(4.268)
north_cen			-17.47***	-15.03***	-17.86***
			(4.645)	(4.805)	(4.334)
new_eng			-11.79***	-10.44**	-11.63***
			(3.930)	(4.090)	(3.644)
westmega1				34.75**	
				(14.36)	
newemega1				4.239	
				(12.89)	
westmega2					45.94***
					(12.62)
newemega2					7.484
					(13.02)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

6. DISCUSSION

Based on the results of this regression analysis, there are several effects on consumers and owners of ski resorts. For resort owners, this regression analysis can help to identify if their resort is overcharging for their amenities as well as which amenities are contributing to their ticket prices most, and where they are getting the highest return. For example, if their beta on gondolas is $3.5, they can associate increasing their price by $3.5 as capital returns on the initial investment. Or, if a chairlift costs a few million dollars to construct, ownership can calculate how many tickets they would need to sell before the chairlift becomes profitable. Obviously, there are other expenses such as maintenance and electricity that are not calculated in this figure, due to lack of data, but resort owners with access to this data could conduct targeted analysis to understand the return on investment of different resort amenities.

For customers, this paper serves as a reference point for premiums that their local or destination mountains may be charging for day lift tickets. Furthermore, customers reading this thesis can identify resorts that are efficient for the provided amenities and be confident that they are being charged a fair price for their tickets. Informed customers should consider this information when deciding where to travel for their vacation as well as if they will ski enough days to purchase an Epic or Ikon mega-pass. On average, for the past seasons, the Epic and Ikon passes only return excess utility to the customers if they ski more than five days at ski resorts. Other customers can use this paper as a third-party resource that vouches for specific resorts and their amenities.

6.1 Limitations

There are several limitations to the data that I began this project with. First and foremost is the limited number of resorts represented by my dataset. I only had 213 out of the 473 ski resorts in operation for the 2021/2022 season, as reported by OnTheSnow.com. This limitation was because data from years before 2022 was inaccessible on the web and the only data available for prior years was from Katie Hanisch who was nice enough to share the data that took her countless hours to manually collect from books. Another limitation of my study is that much of the data for lift tickets in 2022 was collected from the mountain website, some of which had very straightforward constant pricing and others that changed pricing based on how far in advance you purchased the ticket. I chose to input these values for ski tickets based on same-day purchase levels listed on the website. I checked each pricing for weekend lift ticket prices on Saturday morning and imputed the data for the same-day ticket. Similarly, I checked each pricing for weekday lift ticket prices on Tuesday mornings and imputed the data for the same-day ticket. The method of collection was uniform, but the websites were different, so there was some inherent bias in reporting accurate values in the data. Furthermore, if one mountain was giving an unknown discount, this value was not accounted for in my collection of the 2022 lift ticket data.

6.2 Future Research

Research in the field of ski tickets and mountain resorts under Epic and Ikon ownership is quite limited. This is mainly because both mega-passes are quite young in comparison to the sport of downhill skiing. As both passes grow and more data is released on users of the passes as well as changes in mountain ownership, it is important to continue to study the competition

between both companies. While Epic is currently a public company and publishes data such as sales for their Epic pass, Altera Mountain Company is still private and does not release this data. If future circumstances allow so, it would be interesting to be able to compare their sales of passes in comparison to the sales of the day lift tickets. This would enable significant research into the competition as well as more granular data as to the pricing strategies and investment revenue of both companies. Additional future datasets could enable researchers to explore the relationship between daily snowfall as a predictor of mountain interest and attendance. Since most rational skiers look for the best conditions, there are often "storm chasers" that base their vacations and such activities on current snowfall and conditions. If data would allow, interesting studies between the snowfall the week before and attendance could enable findings as to how much actual snow is valued at each resort. I would suspect that mountain resorts part of Epic and Ikon passes would experience fewer shifts in attendance based on prior snowfall due to the fact that they already have such a large pool of skiers. Conversely, smaller mountains that experience heavy snowfall would have a significant increase in attendance.

7. CONCLUSION

Following the outline set by several prior studies in the field of downhill skiing, this paper used a Hedonic Pricing Model to estimate the price premiums that mountains owned by Epic and Ikon charge their customers. Based on the data of 213 U.S. ski resorts since 1979 and an average spread of around 10 years between data collection, this paper was able to find significant findings as to the factors that drive ticket premiums. Such factors that significantly affect ticket prices are vertical drop, number of lifts, and total runs. Furthermore, this study used

a Free Disposal Hull Model to calculate lift ticket premiums or "inefficiencies." Based on 13 efficient resorts that charge a lower price for higher quality, the inefficiencies are calculated to indicate resorts that charge too much for what they offer. Both the Hedonic Pricing Model and the Free Disposal Hull Model were in congruence in that resorts part of the Epic and Ikon pass charge significantly higher premiums to their customers in comparison to all resorts. Though the calculated values for the premiums or "inefficiencies" varied between models, the important conclusion is that Epic and Ikon Resorts are charging their customers unfairly for day lift tickets based on the amenities that they offer.

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9. APPENDIX

Table 6: Adult Weekday Hedonic Model With Propensity Score

VARIABLES	(1)	(2)	(3)	(4)	(5)
summit	0.0172	0.0352	0.113**	0.138**	0.0989*
	(0.0331)	(0.0326)	(0.0559)	(0.0618)	(0.0571)
propensity score	100.6***	81.67***	90.90***	94.18***	74.27***
	(11.32)	(11.82)	(11.79)	(12.33)	(11.25)
vertical drop	0.316**	0.364**	0.409***	0.525***	0.400***
	(0.130)	(0.148)	(0.158)	(0.189)	(0.149)
totallift	2.732***	2.707***	2.620***	2.728***	2.436***
	(0.283)	(0.268)	(0.266)	(0.285)	(0.255)
age	0.693***	0.596***	0.555***	0.556***	0.565***
	(0.0680)	(0.0620)	(0.0580)	(0.0593)	(0.0585)
cooperation owned mountains	6.541**	5.169	4.631	7.725**	5.867*
	(3.297)	(3.159)	(3.105)	(3.057)	(3.151)
distance air	0.0212	0.0206	0.0212	0.0180	0.0209
	(0.0159)	(0.0144)	(0.0138)	(0.0150)	(0.0135)
limited mega pass (mega1)				10.92	
				(9.227)	
unlimited mega pass (mega2)	34.62***	33.43***	33.22***		13.55
	(5.078)	(5.131)	(5.088)		(9.548)
year 1988		-3.304***	-3.252***	-3.509***	-3.768***
		(0.866)	(0.854)	(0.890)	(0.845)
year 2000		-0.518	0.00746	-0.712	-0.773
		(1.077)	(1.079)	(1.132)	(1.057)
year 2020		2.920**	3.127***	4.247***	4.211***
		(1.160)	(1.149)	(1.020)	(1.100)
year 2022		12.15***	12.06***	13.97***	14.30***
		(1.858)	(1.839)	(1.787)	(1.860)
west			-17.88***	-19.68***	-18.00***
			(3.743)	(4.181)	(3.889)
north_cen			-9.145**	-6.851	-9.372**
			(4.045)	(4.203)	(3.953)
new_eng			-6.801**	-5.381	-6.818**
			(3.430)	(3.583)	(3.315)
westmega1				31.25**	
				(13.09)	
newemega1				4.420	
				(12.66)	
westmega2					34.92***
					(11.84)
newemega2					8.852
					(12.41)

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1