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# Examining the Impact of Consolidated Ownership on Ticket Pricing in the Ski Industry: A Hedonic Price Model

Ari Caplan
*Skidmore College*, acaplan@skidmore.edu

# Examining the Impact of Consolidated Ownership on Ticket Pricing in the Ski Industry: A Hedonic Price Model

By

Ari Caplan

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# Abstract

This paper examines the impact of recent consolidation within the North American ski industry on day ticket and season pass prices. It utilizes a unique cross-sectional data set consisting of 120 ski areas in the US and Canada for the 2018/19 ski season. Using an OLS hedonic price model, I find that conglomerate owned ski areas price day tickets and season passes well above those of independent ski areas. However, for ski areas that are included on multi-area season passes such as the Epic or Ikon Pass, consumers actually pay a far lower price for their season passes. This is possible because the vertical integration of conglomerate owners enables them to extract additional profits from ancillary revenue streams such as dining and lodging. The results provide evidence that conglomerates possess elevated pricing power but cannot conclusively present a case for antitrust intervention.

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# 1 Introduction

The competitive landscape in the North American ski industry has seen a significant transformation over the course of the last two decades. A wave of consolidation that began in earnest during the early 2000s has seen conglomerates spend well over $3 billion acquiring ski areas, sweeping up a vast majority of the most iconic and popular resorts (Gittelsohn, 2017 and Megroz, 2018). While many smaller ski areas remain independent, the largest ski areas across the United States and Canada now belong to a select few conglomerate owners. The three most prominent players in the industry, Vail Resorts, Alterra Mountain Company, and Boyne Resorts, now account for over 80% of revenue in the US (Hyland, 2018). Some skiers bemoan this development as they view the corporate owners as taking the character out of their local mountain.[1] However, there are also positive economic benefits as these conglomerates have introduced new multi-area season passes that undercut the price of some traditional pass products. This paper seeks to empirically identify the true impact of consolidated ownership on both day ticket prices and season pass prices.

A complete collection of publicly available data did not exist for an analysis of this type, so I created a unique data set with information from both official and independent sources. The data is cross-sectional and covers 120 ski areas in North America over the 2018/19 ski season. There are four main categories of variables; ski area statistics, snowfall measurements, ticket pricing and passes, and ownership. Ski area statistics control for the permanent characteristics of each mountain that skiers' value, such as the amount of terrain available and type of ski infrastructure. Snowfall is split into official and independent measurements. Official data is included for all ski areas in the sample, but this number is prone to overestimating the actual

[1]For simplicity, the term "skiers" is inclusive of both skiers and snowboarders in this paper.

snowfall total since marketing purposes provide incentives to exaggerate. An independent measure that uses avalanche forecasting data eliminates this potential source of error but is only available for 79 ski areas in the sample. The prices for day tickets and season passes are combined with dummy variables that measure a ski areas' inclusion on a multi-area season pass. The ownership variables are dummies that measure whether or not a ski area is owned by a conglomerate along with which specific conglomerate it is.

Following Fonner and Berrens (2014), this paper employs a linear hedonic pricing model which takes the form of an OLS regression. The most basic form of the regression finds that holding all else equal, conglomerates price day tickets \$15 to \$17 above independent ski areas, which is roughly 16% of the average ticket price from the sample. When the dummy variables for multi-area season passes are added to the regression, the premium conglomerates command over independent ski areas drops slightly to just over \$11. The same regression model, when using season pass price as the dependent variable, finds that conglomerates in general price season passes over \$350 higher than an equivalent independent area, which is roughly 40% of the average season pass price in the sample. However, for ski areas with multi-area season pass inclusion, the model finds that there is actually a discount of roughly \$400. A region specific analysis finds that conglomerates' western ski areas possess more pricing power than eastern ski areas for both day ticket prices and season passes.

This may seem like a counterintuitive result, but the business models of Vail Resorts and Alterra align with the findings. These conglomerate owners have consistently raised day ticket prices in order to push consumers toward season pass products. Season passes ensure skier loyalty to a particular ski area and reduce revenue exposure to snow conditions as they are pre-paid products, making them highly favorable from a conglomerate standpoint. A further incentive for consumers to switch to a season pass is the relatively recent innovation of multi-area season passes. Vertical integration that captures ancillary revenue from products such as lodging and dining is a key reason why these passes can undercut the prices of independent areas. By attracting a greater number of consistent skiers, the conglomerates can make up any losses from pass sales via the margins on the ancillary products.

Overall, this paper contributes five main points to the existing literature. First, it expands Fonner and Berrens (2014) geographic analysis to include Canada along with the US, since both markets are substitutes for one another. Second, it incorporates controls for the ownership of each ski area, similar to the European focused Falk (2009) paper, which is critical due to the aforementioned consolidation within the North American industry. Third, it adds season pass price as a dependent variable, something not seen in any previous paper, as pass sales make up a large portion of overall industry sales. Fourth, it incorporates controls for multi-area pass inclusion as they make up a sizeable slice of total season pass sales. Fifth, it controls for state fixed effects because there are unobservable differences in liability regulations and local ski culture between states, another aspect not seen in any previous ski industry related paper.

The remainder of this paper is structured as follows: Section 2 provides background on the current North American ski industry. Section 3 reviews relevant literature regarding the ski industry, ticket pricing, and the empirical framework. Section 4 covers the data and collection process. Section 5 explains the empirical methodology. Section 6 presents the results of the regressions. Section 7 discusses implications, potential shortcomings, future research areas, and concludes the paper.

# 2 Industry Background

Over the past four decades, the North American ski industry has seen minimal growth. The National Ski Areas Association (NSAA) publishes an annual survey which estimates US snowsports visits going back to the 1981/82 season.[2] Total annual visits in that initial season reached 50.72 million, and by the 2017/18 season annual visits had only grown 5% to 53.23 million. Notably, annual visits were over 4 million people higher during the depths of the Great Recession in 2008/09 than they are presently, underscoring the stagnant nature of the industry (NSAA, 2018).

The NSAA also tracks the number of ski areas operating in the US, with 546 active areas during the 1991/91 season falling to 472 active areas currently (NSAA, 2018). A mixture of difficulty in land acquisition and permitting along with high infrastructure construction costs means practically no new destination resorts have been built in the last 35 years (Vail Resorts Inc., 2018). Due to this unique combination of flat long-term visitor growth and an inability to build new ski areas, the primary way to remain economically competitive or expand market share in the industry is via a merger or acquisition of an existing ski area. There are currently eleven multi-resort ownership companies in North America who collectively control 100 individual ski areas (NSAA, 2019).[3] The remaining ski areas are privately owned, generally by local ownership groups and families.

Broomfield, CO based Vail Resorts, Inc. pioneered this acquisition strategy, going on a multi-year spending spree and accumulating a broad, international portfolio of ski-related assets. Vail currently owns seventeen resorts in North America, including six of the top ten highest

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[2] Due to the fragmented nature of ownership, it is impossible to obtain exact ski area visitation numbers.
[3] A multi-resort ownership company is defined as a company that owns two or more ski areas.

visited resorts in the US, and accounts for 15.8% of annual skier visits in North America as a whole (Vail Resorts Inc., 2018). Since 2002, Vail has spent over $1.6 billion on acquisitions, including a record $1.06 billion for the 2016 purchase of Whistler Blackcomb in Canada (Gittelsohn, 2017). The other significant player in the industry is Alterra Mountain Company, a recently formed partnership between private equity firm KSL Capital Partners and Aspen Skiing Company. Alterra currently owns seventeen resorts across the US and Canada (NSAA, 2019). In 2017 alone, the company spent $1.5 billion to acquire Intrawest Group, including six ski resorts and a heli-skiing operation, and has continued to acquire ski areas in private transactions since (Megroz, 2018).

At a foundational level, both independent and multi-area owners utilize price discrimination strategies in order to maximize ticket revenue. By capitalizing on willingness to pay differences between consumer groups, they are able to sell functionally identical access to ski lifts for varied prices and tap into areas of consumer surplus. Independent ski areas generally offer two tiers of lift tickets; season passes and single-day lift tickets. Season passes are offered for a flat rate at the beginning of the ski season and grant the purchaser unlimited lift access exclusively at that ski area. Some ski areas also choose to offer discounted season passes that are only valid on weekdays or non-holiday periods, along with youth, senior, and military discounts. Single-day lift tickets are offered throughout the season and many ski areas now also utilize variable pricing strategies where prices fluctuate based on the day of the week and the expected quantity of skiers that day. Prices are generally set in advance and do not fluctuate based on instantaneous demand. For example, at Windham Mountain in New York an adult single-day ticket during a non-holiday weekday will cost $85, while the same ticket during a weekend or holiday period will cost $95, almost 12% higher. Some ski areas also offer discounts for purchasing single-day tickets in advance and in multiple-day combination packs.

Multi-resort owners also offer both day ticket and season pass options. Day tickets are priced and sold similarly to independent ski areas, however the primary innovation in ticket pricing models comes from new multi-resort season passes. Both Vail Resorts and Alterra Mountain Company sell season passes that are valid across all of their ski resorts, called the Epic Pass and Ikon Pass, respectively. Each company offers multiple tiers of season passes for a flat rate at the beginning of the season. They include the highest priced unlimited passes with zero restrictions down to lower priced options that cap the number of ski days at the most popular resorts and are not valid over certain holiday periods. Additionally, the passes provide limited access to "partner" ski areas not owned by the multi-resort companies, normally five to seven days of free skiing followed by discounted single-day lift tickets. The Epic pass includes 47 of these partner ski areas across North America, Europe, and Japan, while the Ikon pass includes 23 partners across North America, South America, Australia, and Japan (Megroz, 2018). Generally, these multi-resort season passes undercut the price of single-resort season passes, with the difference being made up for in volume along with business models that capture ancillary revenue from lodging, dining, and other ski related services. Vail reports selling 925,000 Epic Passes for the 2018/19 season while Alterra expects to sell upwards of 250,000 Ikon Passes, both large increases over previous seasons (Brown, 2019 and Blevins, 2018).[4] As reference for the total consumer base, the NSAA reports there are roughly 9.2 million current active skiers in the US (NSAA, 2018).

[4] Alterra has not publicly disclosed the exact number of passes sold.

# 3 Literature Review

## 3.1 Oligopolistic Competition

The exact nature of competition within the North American ski industry varies widely across geographical regions and largely depends on how the market itself is defined. As a result of the recent consolidation, the national market most closely resembles an oligopoly with a limited number of firms controlling virtually all of the most popular resorts. In local markets, competition varies considerably from state to state and consumer bases are generally smaller. Due to the continuing consolidation across both national and local markets, this paper will primarily explore impacts with regards to oligopolies.

Durham et al. (2003) investigated oligopolistic competition specifically in industries with high sunk and avoidable fixed costs. While this paper does not specifically mention skiing, sunk and avoidable fixed costs are key cost drivers for ski areas. Avoidable fixed costs are costs that can be eliminated entirely by simply halting that specific business activity. Operating a ski lift requires an equal amount of electricity and number of attendants if there are 100 skiers per hour versus 1000, whereas temporarily closing the lift eliminates this entire cost. The expensive infrastructure investment needed to build a functioning ski area (including lifts, powerlines, and snowmaking) is the primary sunk cost. The authors found that in this type of industry environment, firms engagd in “a pattern of price signaling and responses which maintain above normal profits” (Durham et al., 2003). Because such pricing schemes would negatively impact skiers, the results of this paper will attempt to shed light on multi-resort ownership companies’ ability to actually inflate prices.

A second paper that investigated oligopolistic competition is Adams and Williams (2019), which looked specifically at multi-store retailers and their pricing strategies. Similarly to multi-resort ownership companies, these retailers can vary the pricing of identical products depending on the location of their stores. The paper found that industry profits are optimized when these companies use uniform and market pricing strategies. Uniform pricing is when all markets are priced identically and market pricing adjusts prices based on local demand. Uniform pricing is particularly prevalent in multi-area season pass sales since prices for an Epic or Ikon pass will be identical whether you intend to ski in Vermont or Colorado. Additionally, many resorts use market pricing for single day lift tickets. Although retail stores are not a directly comparable industry to skiing, this paper established the ability for large, multi-property owners to exert pricing power over consumers. A potential issue with this paper is the use of college students as participants in the study as their decision making likely does not exactly mirror that of experienced executives in the industry. By breaking out ownership of ski areas, this paper will provide new insights into how the evolving competitive environment is affecting skiers.

An industry in which pricing schemes bear some resemblance to the ski industry is the US domestic airline market. Similarly to how ski areas charge different prices for what is ultimately the same lift access, airlines price discriminate by charging higher prices for certain classes of tickets even though everyone on the plane reaches the same destination. Additionally, competitive disparities between the broad US market and the route level market is comparable to the regionalization in the ski industry. Gerardi and Shapiro (2009) examined whether competition on airline routes impacts the dispersion of ticket prices using a panel data set from 1993 to 2006. They found that price dispersion for an airline on a particular route will decline as new entrants join the route which is in line with standard economic competition theory. This finding suggests that a more concentrated ski industry would provide firms with greater price discrimination abilities that would enable them to take more consumer surplus for themselves.

Ultimately, this could manifest itself in the form of higher ticket prices for those with lower price elasticities, such as out-of-town vacationers. A couple key areas of divergence between the airline and ski industries include that there are far fewer firms in the US airline industry than there are ski areas and that skiing is purely a leisure activity where you will not find lower elasticity "business" skiers.

## 3.2 Hedonic Price Models

The fundamental concept behind the hedonic price model is that the price of a good is an equilibrium value calculated as a function of the good's underlying characteristics. This is the theory set out by Rosen in his landmark 1974 paper which serves as the basis for hedonic estimations across a wide variety of economic fields. The key assumption necessary to apply a hedonic framework is the existence a single market with a basket of differentiated, heterogenous goods. When this market is combined with producers who profit maximize and consumers who maximize utility, the equilibrium price of each good can be separated into each underlying characteristic. It is essential that these utility-bearing characteristics be objectively quantifiable across all examined goods in order to ensure consistent outcomes.

Because Rosen (1974) set out to define a broad hedonic framework and each application of the model requires customization, the paper provided only general empirical implications. Ultimately, Rosen concluded that hedonic pricing models are broadly applicable to situations with cross sectional data sets and equilibrium (Rosen, 1974). The ski industry is well suited for a hedonic pricing model due to a consistent array of cross-sectional, quality defining statistics available on each ski area along with a market that is clearly comprised of heterogeneous goods. The heterogeneity comes from each ski area's varied physical terrain coupled with differentiated infrastructure levels. An area of the literature that where the hedonic price model has seen a solid amount of traction is the real estate industry. Bin et al. (2011) sought to estimate the impact of rising sea levels on coastal property in North Carolina using data on housing characteristics and predicted future sea levels. They found that by 2030, the four counties they examined would see close to $200 million in property losses, assuming a mid-range rise in seas levels. Hicks and Queen (2016) examined regions in Virginia with significant historical sites in order to ascertain if these sites impacted residential property values. They found that living in proximity to an open-space historical site is valuable to homeowners, however living directly adjacent to one is a detrimental due to increased tourism traffic. These papers demonstrate the broad applicability of the hedonic price model.

## 3.3 Ticket Pricing Models

Investigations of the determinants of lift ticket specific pricing began in the 1980s, with one of earliest papers being Walsh et al. (1983). The paper's core framework revolves around a contingent valuation method with a linear stepwise least squares approach that determines skiers' willingness to pay for lift tickets as a function of congestion effects, income, skier days, and other socioeconomic variables. The study focused on three Colorado resorts of varying size and terrain and found that skiers were willing to pay more for resorts that had better infrastructure such as high-speed lifts and valued less crowded slopes. This is logical since minimizing time spent in lift lines and riding lifts results in additional time actually skiing, which is the primary reason consumers are at the resort in the first place. Because of the narrow three resort sample and ski infrastructure improvements since the 1980s, there is ample room to expand and update the data set.

Mulligan and Llinares (2003) recognized these infrastructure upgrades and decided to investigate the impact of additional high-speed lifts on the willingness of firms to adopt this new technology. They found that avid skiers thoroughly enjoy the additional skiing time it gives them. However, the high initial capital costs needed to install the lifts have prevented many local resorts from making the investments, leaving them unable to compete for skiers who demand the new amenities. This paper is a somewhat simple analysis since it only focused on a single determinate of skier demand, but nonetheless is a good window into another pitfall affecting smaller ski areas that lack the same access to capital as conglomerates.

Falk (2011) further studied ski area price differences, specifically in the European market. His data set covers 214 ski resorts in France, Switzerland, and Austria over the 2010/2011 ski season and included standard resort statistic variables such as size and altitude of the ski area, lift quality, and snowmaking. Two additional unique variables are a dummy for the ski area's inclusion in a greater ski network and a dummy for whether the ski area is a recent World Cup ski racing venue.[5] Using a linear OLS hedonic price model with a natural log applied to the dependent ticket price variable, the paper found that prices are significantly lower for areas in France compared to the other two neighboring Alps countries. He determined this difference was not simply due to French resorts having lower costs and theorizes that consumers simply value Swiss and Austrian skiing more and are therefore willing to pay more. Because these are European countries with unique ski cultures and consumer bases, it is not particularly feasible to extrapolate the findings to US ski resorts. The OLS hedonic method and ski resort statistic variables used are the most beneficial aspects for building this paper's empirical model.

Moving onto North American focused research, Fonner and Berrens (2014) compiled a cross-sectional data set of 181 US ski areas during the 2011-2012 season in order to explore

[5] These ski networks generally only share multi-day tickets and not full season passes.

which characteristics are the most important in determining ticket prices. These characteristics include mountain statistics such as acreage and vertical drop, annual snowfall, lift capacity and quality, nearby lodging, and levels of crowding. For the empirical estimation, a linear hedonic OLS price model is used with multiple specifications run both with and without logs applied. This linear model was determined to be the best fit after running a two-sided Box-Cox test. The results demonstrate that skiers are willing to spend more for resorts that have greater amounts of terrain available and that are located at higher altitudes. There are also positive effects for the presence of on-site lodging along with having upgraded infrastructure such as high-speed chairlifts and snowmaking capability. These findings are all consistent with the previous literature and demonstrate that consumers value ski areas that are likely to have snow along with modern amenities. Fonner and Berrens (2014) provided the most relevant empirical framework and data set for this paper. Two potential areas for improvement in this paper, however, are the addition of ownership dummy variables and expanding the data set to include Canadian ski areas. Canadian ski areas are close substitutes for many American resorts and are therefore relevant to this study. Because of the increased consolidation in the industry and changing business models, the ownership of each ski area must also be accounted for. This paper will include data on Canadian ski areas along with dummy variables for Vail, Alterra, and miscellaneous ownership groups.

### 3.4 Weather Factors

Unlike many sports and activities, skiing is relatively unique due to its heavy dependence on weather to provide optimal conditions. While some shortcomings can be overcome through artificial snowmaking, ultimately a ski area cannot function without natural snow. Englin and Moeltner (2004) developed an empirical demand model for winter sports trips that quantifies the value of snowfall to skiers and snowboarders. This paper used cross sectional behavioral data on college students in the late 90s that skied in Nevada and California, along with statistics on the mountains they were skiing on. These ski area statistics are helpful for determining which variables are most likely to impact ticket prices.

The authors use a semi-log form equation to determine the actual demand for skiers and snow boarders. The results indicate that beginner and advanced terrain types are the most highly valued, snowfall increases trip demand at a decreasing rate, and lower temperatures and more snow are preferred. One extra inch of snow at a resort receiving an average of one foot of snow per week results in expected demand increasing by 1.8%. Another interesting finding is that demand is more responsive to changes in ticket prices than changes in snow. While these results are great for gaining insight into what motivates skiers to ski, the demand estimation equation is not particularly helpful for determining the effect snowfall has on ticket prices.

Beaudin and Huang (2014) shifted away from individual decision making to determining firm exit decisions due to weather conditions for firms in the New England ski industry. A 37-year data set is used that covers 78 ski resorts in the region, of which 47 discontinued operations. A discrete time survival analysis is used to determine the probability that a given resort will shut down. There are some new variables not seen in other studies, including the distance to the nearest metropolitan area, the proximity to lakes (necessary for snowmaking), and whether the resort is open for all four seasons (e.g. biking in the summer). Some of the key findings are that larger ski areas are less likely to close, increased snowfall and availability of snowmaking both decrease the likelihood of closing, and that four-season operation has no effect. What this has meant for the industry is that ski areas owned by corporations with easy access to capital have thrived while many smaller resorts have either gone out of business or been acquired by one of the conglomerates. This paper reinforces the idea that weather conditions and access to urban areas have a large impact on ski areas. Additionally, the large resort finding sheds light on the increased consolidation in the industry and provides additional incentive to determine the true impact of this consolidation. This paper studies a narrow geographic region and, as such, may not be generalizable to all of the North American ski market. The data set also relies on officially reported annual snowfall totals which are susceptible to exaggeration and may not accurately reflect true weather conditions.

## 3.5 Estimations of Skier Demand

Moving past weather dependent analyses, an early paper that attempted to estimate skier demand and served as the foundation for many following papers is Morey (1984). It set out to find a better model for determining skier demand than the hodgepodge of confusing existing methods. The paper used a single equation estimation model that determines demand as a function of the ski area characteristics, skiing ability, and costs. This became the new standard and every demand estimation paper since has followed a similar path. Falk (2015) estimated an empirical demand model for skiing using a panel data set for resorts in the French Alps. The variables cover 18 years and include skier visitation statistics, weather measurements, and country specific economic data for resorts owned by the CDA group.

The empirical model used a log-linear form with natural logs applied to national income, relative price ratio, and average natural snow depth. An interesting finding was that snowfall in urban backyards had a higher impact on skier visits than snowfall at the resorts. They also found that a 53% decrease in snow depth compared to the 40-year average would only decrease visits by 1.8%. This paper found that the overall demand for skiing has a low sensitivity to changes in real income and prices. Snowfall measurement occurring via weather stations not located directly adjacent to every resort is a potential error, meaning there is a possibility that the actual conditions experienced by skiers are not quantified. This paper reinforces the set of ski area characteristics necessary to quantify what skiers' value, however it focuses on a narrow sample of single-owner European resorts and did not directly address the issue of ticket prices.

### 3.6 Market Dynamics in the Ski Industry

The European and North American ski industries have little in common in terms of organizational structure and, as mentioned previously, the dynamics in the North American ski industry have shifted significantly over the past decade. European operators generally own only the physical ski infrastructure and not the surrounding property and services while consumers have a wider variety of easily accessible options due to many ski areas' proximity to urban zones and other resorts. Falk (2009) investigated the differences in efficiency between multi-resort conglomerates and independent owners with a focus on the U.S., Canadian, Swiss, and French ski markets. Falk hypothesized that corporate owners have greater access to capital and economies of scale, which makes them more efficient. One interesting variable not seen in other papers is the proximity to an international airport. A stochastic frontier production model simultaneously estimated with determinants of inefficiency is used with natural logs applied to the variables length of slopes and vertical lift capacity. This paper finds that only one of the corporations looked at, Intrawest, was more efficient than the independent resorts.[6] Falk (2009) also found that as distance from an international airport increases, resort efficiency decreases. The paper has good insights into the impact multi-resort owners have on operations, however there has been a massive amount of consolidation in the industry since 2009 which may have led to more efficient corporate owners.

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[6] Intrawest and its resorts are now wholly owned by Alterra Mountain Company.

Mulligan (2011) looked at this changing industry makeup using a two-sector Endogenous Fixed Cost model. His data set ranged from 1980 to 2002 and included 15 US states where information was available on skier visits, number of people who can be transported 1000 vertical feet per hour (VTFH), ticket prices, and ticket pricing method used. The paper found that Vermont and New Hampshire resorts increased VTFH capacity by roughly 70% over the 22 years while real ticket prices rose 43%. When compared to a state like Utah where VTFH capacity increased by 136% and prices by 92%, these numbers appear relatively small. The author theorized that cheap airfare has increased accessibility to higher quality skiing states such as Utah, with the resulting additional demand enabling them to raise prices faster. This paper's key contribution is the separation it makes between geographic markets and the clear ability for markets that attract skiers from across the country to raise prices faster. However, the paper could benefit from an updated data set due to the aforementioned industry consolidation along with continued decreases in airfare prices. Because many of the larger, corporate owned resorts are in the west and depend on out-of-state skiers, it will be important to determine if concentrated industry ownership has led to increased pricing power.

As a whole, my paper expands the existing body of literature in a number of ways. Using Fonner and Berrens (2014) as a baseline, it broadens the geographic market to include Canadian ski areas along with those in the US since the two markets share consumers and ownership groups. Similar to Falk (2009), this paper accounts for the ownership of each ski area, however it adds an up-to-date data set solely focused on the North American market. Two other sets of variables, season pass pricing and multi-area season pass inclusion, are completely novel additions to the literature but are key to understanding the current ski industry due to the prevalence of season pass products. This paper's regressions also include controls for state fixed effects, another element that has not been previously seen in the literature, which reduces potential error from unobservable differences between states that could impact pricing.

# 4 Data

This paper utilizes a unique cross-sectional data set covering 120 ski areas over the 2018/2019 ski season. The data was manually collected from a combination of official and third-party ski websites as there are no publicly available industry wide data sets. The data is organized into four categories; ski area statistics, snowfall measurements, ticket pricing and passes, and ownership. The shortened variable names used in the regression models are included in parentheses. Data collection occurred in early 2019. Summary statistics are available in Table 1.

## 4.1 Ski Area Statistics

These statistics are the fixed elements of a ski area that determine the quality of the ski experience. They are critical variables that control for differences between each mountain because skiers' value the type and quality of terrain and infrastructure. All ski area statistics are compiled from OnTheSnow.com, a website that aggregates official data on ski areas.

*Base (base).* This variable is the lowest point of the ski area, measured in feet. Higher altitude ski areas generally receive more consistent snowfall and retain snowpack better as a result of colder temperatures. Lower elevation ski areas are generally more susceptible to warmer temperatures. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Vertical Rise (vert).* This variable is the difference between *peak* and *base,* measured in feet. A ski area with more vertical rise is generally more desirable as it increases the length of skiable terrain per lift ride. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Skiable Acres (acres)*. This variable is the total area of in-bounds terrain available at the ski area, measured in acres.[7] Larger mountains are desirable as they provide additional ski options and reduced crowding. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Snow Making Acres (snowmke).* This variable is the total area of terrain able to be supplemented with artificial snow making, measured in acres. Increased snow making coverage lessens the impact of variable natural snow conditions, especially during the early months of the season and throughout poor snow years. Seen in Fonner and Berrens (2014) as a dummy variable but expanded here to include precise acreage numbers for greater differentiation between ski areas.

*Lifts (lifts).* This variable is the total number of operational lifts at each ski area. The variable accounts for all types of uphill transportation, including chair lifts, gondolas, T-bars, and magic carpets.[8]

*High-Speed Lifts (hslifts).* This variable is the proportion of total lifts that are classified as high-speed. A high-speed lift is defined as a chairlift where individual chairs detach from the main cable during loading and unloading, allowing for the main cable to reach higher speeds. High-speed lifts are generally favored by skiers as they reduce time spent waiting in lines and physically on the lift. Identical to the corresponding variable seen in Fonner and Berrens (2014) and Falk (2011).

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[7] In-bounds refers to terrain within the official boundary of the ski area and monitored by ski patrollers.
[8] Magic carpets are short, conveyor belt style lifts for beginners.

*Gondolas (gndla).* This is a dummy variable that equals one if the ski area has at least one gondola or tram and zero if none exist. Gondolas reflect a significant capital investment for the ski area and provide higher uphill capacity while keeping skiers protected from the elements. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Trails (trails).* This variable is the total number of ski trails at each ski area. A greater number of trails provides skiers with more options to fit their preferred terrain type and reduces crowding. Some ski areas artificially inflate their trail numbers by separately naming different sections of a single continuous run, however this a small proportion of overall trails. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Region (region).* This is a dummy variable that equals one if the ski area is located in western North American and zero if it is located in eastern North America. A western ski area is defined as one located in the Rocky Mountains or further west and an eastern ski area is anything to the east of the Rocky Mountains. The Rockies serve as the border between east and west because they represent a significant change in topography in North America.

## 4.2 Snowfall Measurements

Snowfall is the key determinate of skiing conditions and, as such, skiers are keenly aware of the quantity of snow their ski area receives. For marketing purposes, ski areas usually place their official snow stakes in a location on the mountain that consistently receives good snow. This can result in upwardly skewed estimates of snowfall that may not accurately represent actual conditions. In order to control for this, this paper's regressions include both official and independent snowfall data. Official data is available for all 120 ski areas in the data set and is collected from OnTheSnow.com. Independent data is available for 79 ski areas in the data set and is collected from BestSnow.net, a website that formulates and compiles detailed snow statistics using public weather stations located nearby ski areas.

*Official Annual Snowfall (SAS_OFC).* This variable is the average annual snowfall over the course of a full ski season officially reported by each ski area, measured in inches. There is no industry standard for this statistic and each individual ski area is responsible for providing the number. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Independent Annual Snowfall (SAS_IDP).* This variable is the average annual snowfall calculated by BestSnow.net, measured in inches. The average is obtained through the use of "extensive monthly statistics compiled for avalanche forecasting," which enables the site to "project reliable seasonal averages for the period November 1 through April 30" (BestSnow.net).

*Season Standard Deviation Snowfall (stdev).* This variable is the standard deviation of independent average snowfall, measured in inches. Ski areas with higher standard deviations receive less consistent snowfall from year to year. This variable is collected from BestSnow.net

*Percent of Days with 6+ in. Powder Days (per6in).* This variable is the percent of days between December and March with a minimum of six inches of fresh snow. A higher percentage means skiers are more likely to experience powder type conditions, which is generally a positive. This variable is collected from BestSnow.net.

## 4.3 Ticket Pricing and Passes

As discussed in Section 2, the North American ski industry features a wide variety of ticket options and pricing schemes. This paper measures prices using single-day tickets and season passes. Full day ticket prices do not include any discounts for purchasing online or in advance. These discounts are excluded because they vary significantly between ski areas. Season pass prices also exclude early purchase discounts for similar reasons. Both day ticket and season pass price data was collected from OnTheSnow.com, and limited instances of missing data were collected directly from official ski area websites. Ticket prices in Canadian dollars were converted to US dollars at a market rate of 0.7512 USD/CAD, a midday quote on March 14th, 2019.

*Full Day Price (dayprice)*. This variable is the price of a single-day ticket purchased at the full window rate, measured in USD. Excludes all online and advance purchase discounts. Identical to the corresponding variable seen in Fonner and Berrens (2014).

*Full Day Price – Log (log_dayprice).* This variable is the log transformed version of full day price. It decreases the standard deviation of the variable and reinterprets the regression result in expected change form.

*Season Pass Price (sznprice).* This variable is the price of a season pass to the ski area, measured in USD. In order for a pass to qualify as season-long it must provide unlimited access to the ski area with no blackout dates or other skiing restrictions.[9] Excludes all advance purchase discounts.

*Season Pass Price – Log (log_sznprice).* This variable is the log transformed version of season pass price. It decreases the standard deviation of the variable and reinterprets the regression result in expected change form.

*Epic Pass (epic)*. This is a dummy variable that equals one if the ski area is included on the Epic Pass and zero if not included. The Epic Pass must include unlimited days at the ski area to qualify.

*Ikon Pass (ikon).* This is a dummy variable that equals one if the ski area is included on the Ikon Pass and zero if not included. The Ikon Pass must include unlimited days at the ski area

[9] Blackout dates are high-visitor periods (holidays) where some passholder tiers are restricted from skiing.

to qualify.

*Multi-Area Season Pass (multi_area)*. This is a dummy variable that equals one if the ski area is included on any multi-area pass and zero if it is not. If the Epic or Ikon pass variables equal one, this variable will also equal one.

## 4.4 Ownership

The ownership dummy variables quantify the aforementioned industry consolidation. A ski area is considered owned by a conglomerate if the ownership group owns two or more ski areas. Ownership is further classified by specific ownership company. Vail and Alterra, as the two largest players, receive individual dummy variables, and miscellaneous conglomerates excluding those two receive their own individual dummy. Ownership was verified by comparing each resort to a master list of multi-area owners compiled by the NSAA. These variables are similar to the measure of ownership used in Falk (2009).

*Owned by Conglomerate (cong).* This is a dummy variable that equals one if the ski area is owned by a conglomerate and zero if it is not. If any of the following three dummy variables equal one, this variable will also equal one.

*Owned by Vail (vail).* This is a dummy variable that equals one if the ski area is owned by Vail Resorts and zero if it is not.

*Owned by Alterra (altra).* This is a dummy variable that equals one if the ski area is owned by Alterra Mountain Company. and zero if it is not.

*Owned by Miscellaneous (misc).* This is a dummy variable that equals one if the ski area is owned by a conglomerate that is not Vail or Alterra and zero if it is not.

## 4.5 Summary Statistics

**Table 1:** Summary Statistics

| Variable | N | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| *Ski Area Statistics* | | | | | |
| Base | 120 | 5,565 | 2,962 | 118 | 10,800 |
| Vertical Rise | 120 | 2,344 | 984.2 | 700 | 5,620 |
| Skiable Acres | 120 | 1,686 | 1,512 | 50 | 8,171 |
| Snow Making Acres | 120 | 282.0 | 388.2 | 0 | 3,379 |
| Lifts | 120 | 12.07 | 7.341 | 3 | 41 |
| High-Speed Lifts | 120 | 0.245 | 0.186 | 0 | 0.727 |
| Gondolas | 120 | 0.367 | 0.484 | 0 | 1 |
| Trails | 120 | 92.39 | 54.43 | 2 | 341 |
| Region of North America | 120 | 0.733 | 0.444 | 0 | 1 |
| *Snowfall Measurements* | | | | | |
| Official Average Snowfall | 120 | 298.5 | 131.9 | 31 | 669 |
| Independent Average Snowfall | 80 | 307.0 | 106.3 | 107 | 652 |
| Season Std. Dev. Snowfall | 79 | 81.15 | 35.78 | 20 | 181 |
| % Days w/ 6+ in. Pow Days | 79 | 0.125 | 0.0433 | 0.0430 | 0.268 |
| *Ticket Pricing & Passes* | | | | | |
| Full Day Price | 120 | 99.58 | 40.97 | 35 | 209 |
| Full Day Price - Log | 120 | 4.518 | 0.414 | 3.555 | 5.342 |
| Season Pass Price | 120 | 971.3 | 448.9 | 299 | 2,450 |
| Season Pass Price - Log | 120 | 6.787 | 0.424 | 5.700 | 7.804 |
| Epic Pass | 120 | 0.117 | 0.322 | 0 | 1 |
| Ikon Pass | 120 | 0.117 | 0.322 | 0 | 1 |
| Multi-Area Season Pass | 120 | 0.233 | 0.425 | 0 | 1 |
| *Ownership* | | | | | |
| Owned by Conglomerate | 120 | 0.400 | 0.492 | 0 | 1 |
| Owned by Vail | 120 | 0.117 | 0.322 | 0 | 1 |
| Owned by Alterra | 120 | 0.142 | 0.350 | 0 | 1 |
| Owned by Miscellaneous | 120 | 0.142 | 0.350 | 0 | 1 |

Summary statistics for the complete data set are available above in Table 1. On average, official annual snowfall is 8.5 inches lower than independent annual snowfall. However, these two averages are not directly comparable as independent observations do not cover the full 120 ski area data set. When focusing specifically on ski areas for which both official and independent data is available, official annual snowfall is an average of 26 inches higher than the independent metric. This confirms the commonly held notion that ski areas tend to overreport snowfall totals.

Of the 120 ski areas in the data set, 40% are owned by a conglomerate and 23.3% are included on a multi-area season pass. Due to the wide variety of ski areas and terrain included in the sample, many ski area statistic variables have proportionally large standard deviations. The day ticket and season pass price variables also have large standard deviations, but the log transformed versions effectively eliminate this issue.

**Table 2:** Summary Statistics by Ownership

| | Congl. | | Vail | | Alterra | | Misc. | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| *Ski Area Statistics* | | | | | | | | |
| Base | 5,694 | 3,091 | 6,546 | 3,149 | 5,933 | 2,716 | 4,754 | 3,315 |
| Vertical Rise | 2,658 | 972.5 | 2,934 | 909.8 | 2,627 | 1,037 | 2,461 | 959.5 |
| Skiable Acres | 2,085 | 1,860 | 3,155 | 2,404 | 1,603 | 1,300 | 1,686 | 1,535 |
| Snow Making Acres | 447.5 | 520.5 | 740.2 | 841.3 | 338.1 | 261.1 | 316 | 215.8 |
| Lifts | 16.62 | 9.026 | 21.50 | 9.630 | 15.18 | 7.477 | 14.06 | 8.835 |
| High-Speed Lifts | 0.324 | 0.176 | 0.340 | 0.188 | 0.382 | 0.143 | 0.253 | 0.181 |
| Gondolas | 0.521 | 0.505 | 0.643 | 0.497 | 0.588 | 0.507 | 0.353 | 0.493 |
| Trails | 114.9 | 66.39 | 148.4 | 73.56 | 90.82 | 52.05 | 111.5 | 65.06 |
| Region of North America | 0.750 | 0.438 | 0.857 | 0.363 | 0.765 | 0.437 | 0.647 | 0.493 |
| *Snowfall Measurements* | | | | | | | | |
| Official Average Snowfall | 296.7 | 111.3 | 332.1 | 75.36 | 266.5 | 118.6 | 297.8 | 124.9 |
| Idp. Average Snowfall | 294.8 | 88.20 | 311.5 | 84.75 | 304.7 | 89.69 | 269 | 91.16 |
| Season Std. Dev. Snowfall | 79.21 | 34.96 | 87.08 | 37.55 | 83 | 37.73 | 67.85 | 28.86 |
| % Days w/ 6+ in. Pow Day | 0.119 | 0.0361 | 0.125 | 0.0367 | 0.123 | 0.0356 | 0.109 | 0.0368 |
| *Ticket Pricing & Passes* | | | | | | | | |
| Full Day Price | 126.0 | 43.56 | 145.9 | 40.71 | 137.9 | 44.20 | 97.70 | 30.38 |
| Full Day Price - Log | 4.774 | 0.367 | 4.945 | 0.293 | 4.869 | 0.366 | 4.537 | 0.311 |
| Season Pass Price | 1,133 | 473.9 | 949 | 0 | 1,293 | 673.9 | 1,124 | 385.4 |
| Season Pass Price - Log | 6.962 | 0.364 | 6.855 | 0 | 7.054 | 0.467 | 6.959 | 0.391 |
| Epic Pass | 0.292 | 0.459 | 1 | 0 | 0 | 0 | 0 | 0 |
| Ikon Pass | 0.271 | 0.449 | 0 | 0 | 0.647 | 0.493 | 0.118 | 0.332 |
| Multi-Area Season Pass | 0.562 | 0.501 | 1 | 0 | 0.647 | 0.493 | 0.118 | 0.332 |

*Note*: Number of observations for Congl.: 48, Vail: 14, Alterra: 17, Misc.: 17.

Summary statistics specifically for ski areas owned by conglomerates are available above in Table 2. Key areas of divergence from the full sample focus on day ticket and season pass prices. Conglomerates average $126 for a day ticket, a $26.42 premium over the full sample, while Vail and Alterra command even higher premiums of $46.32 and $38.32, respectively.

Season pass price differences are considerably more mixed, with Vail passes costing $22.30 less than the full sample, whereas Alterra and miscellaneous conglomerates charge a premium of $321.70 and $152.7, respectively. This disparity is a result of Vail including all of its ski areas on the Epic Pass while Alterra and other conglomerates restrict some of their most popular resorts to single-area season passes that are considerably more expensive.

# 5 Methodology

The core empirical framework utilized in this paper is a hedonic price model, as seen most closely in Fonner and Berrens (2014). The regressions follow a linear OLS format with price as the dependent variable. Although a basic model, Fonner and Berrens (2014) note that this empirical method is best suited to hedonic price estimation when it is not possible to obtain a complete data set of underlying attributes. A key variable missing from this paper is annual skier visits because the vast majority of ski areas are privately held and do not publicly disclose that number. Skier visits are a clear indicator of overall demand which inherently impacts ticket price. Therefore, a linear OLS regression is the best specification for this paper.

The independent variables are shared between all equations and represent a mix of established variables seen in the literature along with additions unique to this paper. *Vert*, *Base*, *Acres*, *Lifts*, *HSlifts*, *Gndla*, and *Trails* are all standard mountain statistic and quality variables used by Fonner and Berrens (2014) and Falk (2006). Fonner and Berrens (2014) quantify the existence of snowmaking at a ski area with a dummy variable while this paper adds further detail by breaking out *Snowmke* into the number of acres covered by snowmaking equipment. The key differentiating independent variable is *Congl* which enables this paper to investigate the impact of oligopolistic competition. *Price* serves as both the day ticket price and the season pass price. An additional point of expansion beyond Fonner and Berrens (2014) is the inclusion of Canadian ski areas in the sample. Due to the ease of cross-border access between the US and Canada and similarity of ownership structure, it is logical to include both countries.

$$Price_i = \beta_0 + \beta_1 Vert_{1i} + \beta_2 Base_{2i} + \beta_3 SAS\_OFC_{3i} + \beta_4 Acres_{4i} + \beta_5 Snowmke_{5i} + \beta_6 Lifts_{6i} + \beta_7 HSlifts_{7i} + \beta_8 Gndla_{8i} + \beta_9 Trails_{9i} + \beta_{10} Congl_{10i} + \tau_s + \varepsilon_i \quad (1)$$

$$Price_i = \beta_0 + \beta_1 Vert_{1i} + \beta_2 Base_{2i} + \beta_3 SAS\_IDP_{3i} + \beta_4 StDev_{4i} + \beta_5 Per6in_{5i} + \beta_6 Acres_{6i} + \beta_7 Snowmke_{7i} + \beta_8 Lifts_{8i} + \beta_9 HSlifts_{9i} + \beta_{10} Gndla_{10i} + \beta_{11} Trails_{11i} + \beta_{12} Congl_{12i} + \tau_s + \varepsilon_i \quad (2)$$

In order to account for differences between official and independent snowfall metrics, two broad regression categories are used. Equation (1) uses *SAS_OFC* as the snowfall variable and includes no additional weather variables. Equation (2) uses *SAS_IDP* as the snowfall variable and includes *StDev* along with *Per6in*. The inclusion of additional snowfall variables controls for conditions that change substantially from year to year and skiers' preference for consistent fresh snow.

$$Price_i = \beta_0 + \beta_1 Vert_{1i} + \beta_2 Base_{2i} + \beta_3 SAS\_OFC_{3i} + \beta_4 Acres_{4i} + \beta_5 Snowmke_{5i} + \beta_6 Lifts_{6i} + \beta_7 HSlifts_{7i} + \beta_8 Gndla_{8i} + \beta_9 Trails_{9i} + \beta_{10} Congl_{10i} + \beta_{11} Epic_{11i} + \beta_{12} Ikon_{12i} + \tau_s + \varepsilon_i \quad (3)$$

$$Price_i = \beta_0 + \beta_1 Vert_{1i} + \beta_2 Base_{2i} + \beta_3 SAS\_OFC_{3i} + \beta_4 Acres_{4i} + \beta_5 Snowmke_{5i} + \beta_6 Lifts_{6i} + \beta_7 HSlifts_{7i} + \beta_8 Gndla_{8i} + \beta_9 Trails_{9i} + \beta_{10} Congl_{10i} + \beta_{11} Multi\_pass_{11i} + \tau_s + \varepsilon_i \quad (4)$$

Equations (3) and (4) are functionally identical to equation (1) but also include dummy variables that account for multi-area season passes. Equation (3) utilizes the *Epic* and *Ikon* dummy variables in order to identify the impacts each of the two major multi-area passes have on ticket prices. Equation (4) only utilizes the *Multi_pass* dummy which enables the regression to look at impacts from general multi-area season pass inclusion. These dummy variables are another key area of improvement over the existing literature as multi-area season passes are a recent innovation in the industry that now make up a significant portion of overall season pass sales.

An additional area of improvement over the previous literature is the inclusion of controls for state fixed effects, as represented in the above four equations by $\tau_s$. This enables the regressions to control for unobservable differences between the states and provinces in which the ski areas are located that could impact ticket pricing. A couple key areas of potential difference are state-level liability regulations and the local ski culture. In the US, each state is responsible for legislation regarding the level of liability that ski area operators incur when an accident takes place on their property. These regulations vary significantly between states, meaning practically identical accidents can have different legal consequences depending on the location (Chalat, 1996). Controlling for these differences is important because it is reasonable to assume that the cost of liability insurance fluctuates between states and that this cost is most likely passed to consumers through ticket prices. The local ski culture is also hard to quantify yet can influence a variety of crucial factors. Skiing is a social activity for many people, so the local community surrounding the sport can influence how committed a consumer might be to skiing. This, in turn, could impact the price elasticity of demand for ski tickets, which further solidifies the importance of controlling for state fixed effects.

Due to the similarities in the empirical framework and overlap of variables, I expect the signs and general coefficients to be consistent between this paper and Fonner and Berrens (2014). All of the ski area statistic and snowfall measurement variables should have a positive impact on ticket prices since skiers' value higher quality mountains that receive large amounts of snow. Conglomerate owned ski areas should increase both day ticket and season pass prices, however those on multi-area season passes should see season pass price decreases due to the undercutting strategy that is employed.

# 6 Results

Table 3 reports the full results of the OLS regression. Using regression (1) with official annual snowfall, a conglomerate owned ski area prices a single day ticket $15.50 higher than an independent ski area, all else equal. Using regression (2) with independent snowfall data returns a similar result, with conglomerates commanding a $17.73 premium over independent areas, all else equal. Compared to the average day ticket price from the sample of $99.58, these coefficients represent roughly 15% to 17% of the total ticket price. These positive price coefficients are statistically significant at the 1% level for regressions (1) and (2). When looking at regressions (3) and (4) that use season pass price as the dependent variable, all else equal, a conglomerate will price its season passes $205 and $201 above independent ski areas, respectively. The season pass results are significant at the 5% and 10% levels, respectively. Because the regressions with independent snowfall metrics closely resemble the regressions with official snowfall data, it appears that the overreporting problem is not particularly serious and that previous papers are justified in using official data.

Other independent variables that return significant results are the three lift quality variables along with the base altitude and vertical drop variables. Every additional foot in vertical drop adds about one cent to a day ticket price and slightly over thirty cents to a season pass price. Regressions (1) and (2) find very slight negative coefficients for base altitude, which is counter to the predicted sign. However, this significance disappears when season pass price is the dependent variable. Total number of lifts, proportion of high-speed lifts, and gondolas all positively impact day ticket price but similarly find little to no significance for season pass price. The snowfall variables are generally insignificant which is consistent with the findings of Fonner & Berrens (2014). In order to test for robustness, these regressions are also run excluding state fixed effects and with log transformed versions of the dependent pricing variables. The results of the log variable regressions are available in Table 6 and the regressions without fixed effects are available in Table 7. The directions and significance of the coefficients remain consistent with Table 3, indicating that the results are robust.

Regressions (5) through (8), available in Table 4, expand the analysis by adding dummy variables that account for a ski area's inclusion in a multi-area season pass. The regressions are run both with the broad multi-area pass variable and individual Epic and Ikon pass variables. Using day ticket price as the dependent variable, regressions (5) and (6) find that all else equal, conglomerate owned ski areas price tickets \$11.58 and \$11.57 higher than independent areas, respectively. These results are consistent with regressions (1) and (2), although the magnitude of the coefficients is slightly smaller. Where these additional variables provide the most value is in regressions (7) and (8) where season pass price is the dependent variable. Both regressions find at a 1% significance level that a conglomerate owned ski area will price a season pass \$352 dollars above an independent area, all else equal. This is a significant premium as it represents roughly 36% of the average season pass price in the sample. When looking at the multi-area season pass dummy variables, the regressions find that a ski area included on one of these passes charges considerably less. Regression (7) finds that, all else equal, a ski area available on the Epic Pass will charge $396 less while one on the Ikon Pass will charge $394 less. These discounts are roughly equivalent to 40% of the average season pass price. The coefficients and significance levels for the remaining independent variables are consistent with those in Table 3.

Intuitively, there may appear to be a disconnect between conglomerates commanding a premium for season passes while multi-area season passes provide discounts since most ski areas on multi-area passes are owned by conglomerates. However, a unique pass structuring decision by Alterra can explain much of this divide. While Vail Resorts offers unlimited skiing at every ski area it owns on the Epic Pass, Alterra chooses to cap the number of days on the Ikon Pass at its most popular ski areas, such as the four Aspen mountains in Colorado and Deer Valley in Utah.[10] This means the Ikon Pass is not a true season pass for these conglomerate owned mountains and that skiers would need to purchase a separate season pass for that mountain. A 2018/19 season pass for Deer Valley costs $2,365, which is over 240% higher than the average season pass price in the sample. Because a group of conglomerate owned ski areas have these extraordinarily expensive season passes, it is logical that there is a positive coefficient on the conglomerate dummy while the ski areas with less expensive multi-area passes retain negative coefficients.

Conglomerates' decisions to price these multi-area passes at a discount is explained by vertically integrated business models. By pricing day tickets above those of independent ski areas, conglomerates incentivize skiers to purchase the relatively cheaper season passes. Even if season passes are priced below cost, the conglomerate is able to make up the difference via ancillary revenue from amenities such as transportation, food, and lodging. Vail Resorts finds

[10] The Ikon Pass allows for a maximum of seven days at each of these ski areas, among others.

that skiers with season passes spend more days on the mountain each season than non-pass holders, further increasing ancillary revenue (Vail Resorts Inc., 2018). Skiers who own multi-resort season passes may also be incentivized to take trips to ski areas they do not traditionally visit since they pay no additional costs for lift access, also increasing ancillary revenue for a conglomerate. An additional aspect of multi-area season pass sales that enable conglomerates to lower prices is the fact that the passes must be paid in full before the season begins. This means consumers are effectively providing interest free loans to the conglomerate, lowering overall financing costs for the company. The greater the pass sales, the greater the financing savings. As reference, Vail Resorts collected over $410 million from season pass products in fiscal 2018 (Vail Resorts Inc., 2018).

The notable geographical differences between the eastern and western portions of North America also warrant a region-specific analysis. Table 5 separates the regression results into eastern and western regions but only utilizes official annual snowfall data. Independent snowfall is excluded from this regression because the number of observations would not be sufficient to obtain robust results. Regression (9) finds that out of all western-located ski areas in the sample, conglomerate owned ski areas price single day tickets $15.61 higher than independent ski areas, all else equal. This represents a premium of $4.04 over the comparable full sample estimation from regression (6), implying that the conglomerates' western ski areas possess elevated pricing power. Regression (10), which focuses on eastern ski areas, does not find a statistically significant increase for conglomerate owned ski areas. It is difficult to determine if this is due to less pricing power in the region or simply a low number of observations for eastern ski areas. Regressions (11) and (12), which use season pass price as the dependent variable, find that conglomerates also possess more pricing power in the west. The coefficients on the conglomerates in the western region are roughly $16 lower than the non-region dependent analysis and are equally as significant. When comparing the impacts of multi-are ski pass inclusion, a western ski area on a multi-area pass will provide an additional $253 discount over a similar eastern ski area. This is potentially explained by the expensive conglomerate owned ski areas that are primarily located in the west.

In order to specifically investigate the impact of market concentration within the industry, Table 8 includes further regressions that utilize a consolidated form of the data set. Instead of each ski area being an independent data point, the data is collapsed at the state level so that each state and province is a measure of all ski areas within the area. This serves as crude approximation of market concentration but also severely diminishes the number of observations to 23. Section 7 below includes a more thorough analysis regarding the difficulty in measuring the North American ski industry's market concentration. The results of the regressions are generally consistent with previous regressions, however none of the key explanatory variables are significant. One divergence is that the sign on conglomerate ownership is flipped when season pass price is the dependent variable. It is unclear what causes this flip, but it is likely that the small number of observations prevents the regression from finding any significant results.

Ultimately, the key takeaways from this paper show that the impact of consolidation varies significantly across consumer and ownership groups. Starting off with skiers who generally ski enough to warrant a season pass, those who can access ski areas on multi-area passes will benefit significantly as a result of the discount these products provide. Season pass skiers for which it is only feasible to access conglomerate owned or independent ski areas not on a multi-area pass will not receive these economic benefits. Finally, day ticket purchasers at conglomerate-owned ski areas will see higher prices than independent areas regardless of their multi-area pass inclusion.

# 7 Discussion & Conclusion

In light of this paper's findings, there is not a universally applicable set of implications for skiers. For any one individual, the impact of consolidated ownership depends largely on the frequency and location of their skiing. The hundreds of thousands of skiers for which multi-area season passes make sense are reaping hefty economic benefits in the form of prices that are hundreds of dollars less than the equivalent single-area season pass. This is quite clearly a net positive for consumers as it enables consistent skiers who have easy access to the mountains to lower their fixed lift ticket costs while also increasing the quantity of ski areas they can visit. This is also a positive development for the companies selling multi-area passes because a greater percentage of prepaid season passes reduces exposure towards poor snow years where revenue might otherwise decrease. However, skiers who visit the mountains less frequently and stick to purchasing single-day tickets are not quite as fortunate and are subject to double-digit percent premiums over independent ski areas. Even though this is a conscious decision on the part of conglomerates to drive people toward more favorable season pass products, it is possible that the expense will deter novice skiers from trying the sport. Novice skiers are more likely to buy day tickets since they are learning and may not be willing to commit to a full season. As a sport that currently sees stagnant visitation numbers, attracting new participants will be critical to the future of industry.

## 7.1 Contributions

As a whole, this paper contributes five main points to the existing literature. First, it expands the analysis of Fonner and Berrens (2014) to include Canadian ski areas. Canadian ski areas are generally substitutes for US ski areas as they share similar terrain types, have common ownership groups in some cases, and the consumer base can travel between each country with minimal hassle. Therefore, it makes sense to include Canadian ski areas in the data set. Second, this paper includes variables that control for the ownership of each ski area. While Falk (2009) explores the efficiency level of a select number of American and international resort operators, this is the first paper that controls for ownership in respect to ticket prices in the North American market. Because of the recent buying sprees from Vail Resorts and Alterra along with the statistical significance for the conglomerate variable seen in this paper's regressions, it will be important to include a measure of ownership in future research on the subject. Third, this paper expands the dependent pricing variable to also include season pass prices. Even though season passes have historically been a sizeable portion of sales, most papers focused solely on day ticket prices. Expanding the data set provides greater insights into what the entire skier base is experiencing. Fourth, this paper includes variables that control for the inclusion of a ski area on a multi-area season pass. With the increasing prevalence of these types of season pass products within the industry, it is a critical explanatory factor of pass prices and should also be included with any further research that looks at season pass price. Finally, this paper incorporates controls for state fixed effects to account for unobservable differences between states and regions. Each state and province included in the sample has individual regulations regarding the amount of liability ski areas incur for accidents which results in varied insurance costs that are ultimately passed to consumers. Additionally, the local ski culture is very much region dependent and has the potential to impact demand elasticities. A fixed effect model has not been applied to any previous ski-focused papers.

## 7.2 Policy Implications

In terms of policy implications, this paper finds little evidence of antitrust concerns that would warrant government intervention, although this sample data set only focuses on the most recent ski season. The US Department of Justice and Federal Trade Commission, which are responsible for antitrust enforcement, utilize the Herfindahl-Hirschman Index (HHI) when determining market concentration within an industry. As a result of the two primary measures of market share (skier visits and revenue) not being publicly information for most ski areas, it is difficult to independently generate the HHI for the North American ski industry. IBISWorld estimates that the top three firms are responsible for over 80% of industry wide revenue, but this number is inexact due to the lack of public financial data (Hyland, 2018). Calculating the HHI solely based off of the number of ski areas owned by each company would be highly unlikely to find high levels of market concentration due to the large number of firms in the industry.[11]

A key point of contention in many antitrust cases revolves around the definition of the market. In the case of ski areas, there is actually precedent regarding geographic market determination involving a 1979 civil lawsuit filed against Aspen Skiing Co. (ASC) by Aspen Highlands. Macher and Mayo (2010) analyze this case, which focuses on whether ASC, the owner of three of the four Aspen area mountains, was exerting undue power over Highlands, the owner of the fourth Aspen area mountain. After multiple rounds of appeals that ultimately went as far as the Supreme Court, the relevant market was found to narrowly be the immediate Aspen area and not the broader North American destination resort market. This decision was surprising since it was seemingly at odds with the standard method of determining a geographic market

[11] Vail Resorts, the largest operator in North America, owns 16 of 472 ski areas in the US and accounts for less than 16% of total annual skier visits (Vail Resorts, 2018).

which is the ability of consumers who live far away from the area to switch to a different firm.[12] Because out-of-town skiers have the ability to choose practically any ski area in the country, it is reasonable to think that this standard logic applied to a modern day case would produce a ruling counter to the Aspen case and find the market to be much broader. A broad market definition would be favorable toward the current conglomerates as it lessens their overall market control. Ultimately, the fact that many skiers have actually benefited from the consolidation via lower season pass prices means there is a slim case for consumer harm that would necessitate antitrust litigation.

## 7.3 Limitations

Due to a variety of factors, this paper does run into limitations that potentially impact its results. A key point of missing data on ski areas is the annual skier visitation metric. While this number is available for the North American industry as a whole, there is no publicly available data set that breaks out annual visits by each individual ski area. To the author's knowledge, there is no modern paper on the North American ski industry that includes individual level visitation numbers. Because the vast majority of ski areas are owned by private companies, it is highly unlikely a comprehensive data set will ever become available. The number of people who visit a ski area in a given year is a key determinant of overall demand and therefore prices, so excluding it from the regressions potentially adds error to the results. The lack of public data also prevents the calculation of market concentration measures which are important when examining a consolidating industry. An additional aspect of the industry that this paper's variables may not accurately quantify is the variety of lift ticket pricing schemes. As discussed earlier, most ski

[12] While the Supreme Court did not rule specifically on the geographic market definition, a justice called the lower court's geographic ruling "perfectly absurd" (Macher and Mayo, 2010).

areas employ price discrimination techniques that alter the price of day lift tickets based on factors such as the number of ski days you purchase or how early in advance you book. Because these discounts and pricing schemes vary significantly across the sample, it is difficult to consistently measure them. As a result, the day ticket prices included in the data set may not accurately represent the true prices consumers are paying. When it comes to season pass products, there are a similarly varied array of products available that each have their own unique facets.

## 7.4 Future Research Topics

One feature of multi-area passes that future papers might explore is the inclusion of partner resorts with a restricted number of days. These partner resorts theoretically provide value to skiers and do incur costs for the pass provider, so it is likely they impact the overall price of the season pass. Another avenue of future research should focus on how the increasingly vertically integrated business models are impacting the "all in" price consumers are paying. Conglomerates are not simply reducing multi-area season ticket prices for the benefit of skiers and are largely making up the difference from ancillary revenue streams. An in-depth analysis of this type would need to include detailed data on the prices of ski area amenities such as on-mountain and off-mountain dining, lodging, and ski school lessons. This would enable a more complete analysis of the industry that might be able to determine the true economic impact of the consolidation on skiers. An analysis of this type is not unprecedented as Krautmann and Berri (2007) examine the pricing schemes of MLB teams and find that it is feasible for profit maximizers to price tickets in the inelastic portion of the demand curve in order to maximize concessions revenue. Similarly to professional sports teams, ski areas have a low (or zero) marginal cost of attendance, which means the lower season pass prices are an economically viable method of revenue maximization. Therefore, it is certainly possible that conglomerates are ultimately extracting a much higher amount of consumer surplus than pure ticket prices suggest. It is also likely that the industry will continue to consolidate over the coming years, which should only further the examinations on this subject. A final area of further research should expand the data set beyond a cross section to include a longer time frame, ideally stretching back to the early 2000s before much of the consolidation began. This would enable a difference-in-differences empirical approach which could shed light on how pricing has adjusted as the industry has shifted.

## 7.5 Conclusion

In summary, a spate of mergers and acquisitions within the ski industry over the past two decades have shifted the competitive environment to such a degree that consumers are feeling the impact. The unique data set in this paper coupled with an OLS hedonic price model added a variety of contributions to the existing literature, largely centered around the inclusion of season pass prices, multi-area passes, and ownership data. Ultimately, it found that conglomerates charge premium prices for day tickets and season passes but that the availability of multi-area season passes benefit consumers via comparably lower prices. This creates a dichotomy whereby some skiers should be pleased with recent consolidation and others should feel negative repercussions. As a result, it is difficult to draw any singular conclusions about the impact of consolidation on the overall North American ski industry.

# Appendix

**Table 3:** OLS Regression Results

| | Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| Variables | (1) | (2) | (3) | (4) |
| vert | 0.013*** | 0.009* | 0.331*** | 0.311*** |
| | (0.003) | (0.004) | (0.063) | (0.083) |
| base | -0.006*** | -0.008** | -0.021 | -0.002 |
| | (0.002) | (0.003) | (0.011) | (0.017) |
| sas_ofc | 0.025 | | -0.258 | |
| | (0.022) | | (0.407) | |
| sas_idp | | -0.171 | | -6.488* |
| | | (0.199) | | (3.723) |
| stdev | | -0.220 | | 9.448* |
| | | (0.295) | | (5.512) |
| per6in | | 665.346 | | 10,068.415 |
| | | (469.957) | | (8,777.456) |
| acres | -0.004 | -0.004 | -0.113** | -0.114* |
| | (0.003) | (0.003) | (0.049) | (0.064) |
| snowmke | 0.002 | 0.001 | -0.015 | 0.014 |
| | (0.006) | (0.007) | (0.111) | (0.132) |
| lifts | 1.437*** | 1.252** | 2.189 | -2.432 |
| | (0.534) | (0.616) | (9.759) | (11.499) |
| hslift | 29.436** | 35.949* | 428.846* | 555.784 |
| | (13.904) | (18.504) | (254.011) | (345.605) |
| gndla | 14.858** | 16.466** | -9.141 | 95.162 |
| | (5.655) | (6.333) | (103.312) | (118.285) |
| trails | 0.042 | 0.065 | -1.063 | -0.864 |
| | (0.088) | (0.102) | (1.614) | (1.899) |
| congl | 15.497*** | 17.732*** | 204.756** | 200.781* |
| | (4.715) | (5.925) | (86.133) | (110.671) |
| Constant | 103.220*** | 121.453*** | 534.392 | 429.778 |
| | (21.560) | (36.034) | (393.894) | (673.016) |
| Observations | 120 | 79 | 120 | 79 |
| R-squared | 0.855 | 0.882 | 0.596 | 0.653 |

*Notes*: All regressions include state fixed effects.
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

**Table 4:** OLS Regression Results with Multi-Area Season Pass Variables

| | Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| Variables | (5) | (6) | (7) | (8) |
| vert | 0.014*** | 0.014*** | 0.292*** | 0.292*** |
| | (0.003) | (0.003) | (0.060) | (0.060) |
| base | -0.006*** | -0.006*** | -0.016 | -0.016 |
| | (0.002) | (0.002) | (0.037) | (0.036) |
| sas_ofc | 0.024 | 0.024 | -0.244 | -0.244 |
| | (0.022) | (0.022) | (0.380) | (0.378) |
| acres | -0.005* | -0.005* | -0.092** | -0.092** |
| | (0.003) | (0.003) | (0.046) | (0.046) |
| snowmke | 0.001 | 0.000 | 0.052 | 0.051 |
| | (0.006) | (0.006) | (0.109) | (0.105) |
| lifts | 1.462*** | 1.462*** | 1.237 | 1.237 |
| | (0.531) | (0.528) | (9.125) | (9.072) |
| hslift | 28.357** | 28.569** | 461.205* | 461.431* |
| | (13.851) | (13.749) | (238.033) | (236.192) |
| gndla | 13.838** | 14.087** | 19.609 | 19.874 |
| | (5.726) | (5.606) | (98.393) | (96.299) |
| trails | 0.028 | 0.025 | -0.450 | -0.453 |
| | (0.089) | (0.088) | (1.525) | (1.508) |
| cong | 11.577** | 11.566** | 352.527*** | 352.516*** |
| | (5.198) | (5.169) | (89.328) | (88.804) |
| epic | 9.406 | | -395.955*** | |
| | (7.472) | | (128.409) | |
| ikon | 11.340 | | -393.897*** | |
| | (6.902) | | (118.606) | |
| multi_pass | | 10.503* | | -394.788*** |
| | | (5.983) | | (102.785) |
| Constant | 103.374*** | 103.215*** | 534.746 | 534.577 |
| | (21.434) | (21.307) | (368.337) | (366.025) |
| | | | | |
| Observations | 120 | 120 | 120 | 120 |
| R-squared | 0.860 | 0.860 | 0.655 | 0.655 |

*Notes*: All regressions include state fixed effects.
Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0 .05$, * $p < 0 .1$.

**Table 5:** OLS Regression Results by Region

| | Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| | (9) | (10) | (11) | (12) |
| Variables | West | East | West | East |
| vert | 0.011*** | 0.006 | 0.297*** | -0.037 |
| | (0.004) | (0.011) | (0.073) | (0.121) |
| base | -0.005** | -0.003 | -0.013 | 0.025 |
| | (0.002) | (0.010) | (0.041) | (0.110) |
| sas_ofc | 0.025 | 0.111 | -0.292 | 1.925 |
| | (0.023) | (0.105) | (0.436) | (1.194) |
| acres | -0.006* | -0.001 | -0.114** | 0.035 |
| | (0.003) | (0.007) | (0.055) | (0.081) |
| snowmke | -0.001 | 0.068 | 0.046 | 0.789 |
| | (0.006) | (0.041) | (0.118) | (0.466) |
| lifts | 1.466** | -1.882 | -0.992 | 13.191 |
| | (0.590) | (1.792) | (11.101) | (20.366) |
| hslift | 44.956*** | 13.167 | 536.958* | 555.903** |
| | (16.408) | (21.386) | (308.715) | (243.091) |
| gndla | 19.783*** | -7.028 | 76.780 | -23.988 |
| | (7.334) | (11.120) | (137.994) | (126.398) |
| trails | 0.042 | 0.250 | 0.072 | -3.756 |
| | (0.093) | (0.323) | (1.750) | (3.674) |
| cong | 15.607** | 0.201 | 368.309*** | 99.047 |
| | (5.959) | (10.745) | (112.111) | (122.137) |
| multi_pass | 3.916 | 25.167* | -434.398*** | -181.996 |
| | (6.733) | (11.447) | (126.682) | (130.117) |
| Constant | 96.907*** | 37.702 | 482.768 | 323.847 |
| | (21.874) | (70.651) | (411.557) | (803.065) |
| | | | | |
| Observations | 88 | 32 | 88 | 32 |
| R-squared | 0.877 | 0.895 | 0.668 | 0.876 |

*Notes*: All regressions include state fixed effects.
Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

**Table 6:** OLS Regression Results with Log Variables

| | Log Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| Variables | (13) | (14) | (15) | (16) |
| vert | 0.000*** | 0.000** | 0.000*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| base | -0.000* | -0.000* | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| sas_ofc | 0.000 | | -0.000 | |
| | (0.000) | | (0.000) | |
| sas_idp | | -0.001 | | -0.004 |
| | | (0.002) | | (0.003) |
| stdev | | -0.002 | | 0.007 |
| | | (0.003) | | (0.004) |
| per6in | | 5.197 | | 6.957 |
| | | (4.627) | | (6.721) |
| acres | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| snowmke | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| lifts | 0.008 | 0.005 | -0.002 | -0.007 |
| | (0.006) | (0.006) | (0.009) | (0.009) |
| hslift | 0.396** | 0.384** | 0.462** | 0.573** |
| | (0.153) | (0.182) | (0.225) | (0.265) |
| gndla | 0.116* | 0.150** | -0.029 | 0.069 |
| | (0.062) | (0.062) | (0.091) | (0.091) |
| trails | 0.001 | 0.001 | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| cong | 0.148*** | 0.155** | 0.216*** | 0.217** |
| | (0.052) | (0.058) | (0.076) | (0.085) |
| Constant | 4.329*** | 4.538*** | 6.130*** | 6.239*** |
| | (0.237) | (0.355) | (0.349) | (0.515) |
| | | | | |
| Observations | 120 | 79 | 120 | 79 |
| R-squared | 0.827 | 0.859 | 0.645 | 0.676 |

*Notes*: All regressions include state fixed effects.
Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0 .05$, * $p < 0 .1$.

**Table 7:** OLS Regression Results without State FE

| | Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| Variables | (17) | (18) | (19) | (20) |
| vert | 0.015*** | 0.017*** | 0.330*** | 0.330*** |
| | (0.003) | (0.004) | (0.055) | (0.070) |
| base | 0.004*** | 0.005*** | 0.005 | 0.009 |
| | (0.001) | (0.001) | (0.011) | (0.017) |
| sas_ofc | 0.000 | | -0.149 | |
| | (0.017) | | (0.273) | |
| sas_idp | | -0.276 | | -3.131 |
| | | (0.169) | | (2.856) |
| stdev | | -0.007 | | -2.153 |
| | | (0.157) | | (2.657) |
| per6in | | 732.523 | | 8,972.661 |
| | | (440.715) | | (7,445.923) |
| acres | -0.005** | -0.005 | -0.130*** | -0.107** |
| | (0.002) | (0.003) | (0.039) | (0.048) |
| snowmke | 0.008 | 0.009 | 0.021 | 0.079 |
| | (0.006) | (0.007) | (0.103) | (0.124) |
| lifts | 1.420*** | 0.818 | -4.912 | -12.791 |
| | (0.483) | (0.599) | (7.866) | (10.117) |
| hslift | 37.027*** | 35.224** | 553.521** | 567.496** |
| | (13.106) | (16.074) | (213.332) | (271.576) |
| gndla | 15.280*** | 18.943*** | -32.449 | 1.426 |
| | (5.722) | (6.547) | (93.134) | (110.605) |
| trails | 0.038 | 0.102 | 0.971 | 1.359 |
| | (0.073) | (0.094) | (1.181) | (1.585) |
| congl | 15.370*** | 14.661** | 112.363 | 92.470 |
| | (4.768) | (5.771) | (77.608) | (97.496) |
| Constant | 4.368 | -13.041 | 227.434* | 196.504 |
| | (7.949) | (13.492) | (129.385) | (227.943) |
| | | | | |
| Observations | 120 | 79 | 120 | 79 |
| R-squared | 0.762 | 0.772 | 0.475 | 0.451 |

*Notes*: Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0 .05$, * $p < 0 .1$.

**Table 8:** OLS Regression Results by Collapsed State

| | Dependent Variable | | | |
|---|---|---|---|---|
| | Day Ticket Price | | Season Pass Price | |
| Variables | (21) | (22) | (23) | (24) |
| vert | 0.009 | 0.021 | 0.170 | 0.473 |
| | (0.011) | (0.018) | (0.138) | (0.295) |
| base | 0.005** | 0.007** | -0.024 | 0.039 |
| | (0.002) | (0.003) | (0.021) | (0.042) |
| sas_ofc | -0.010 | | 1.362** | |
| | (0.039) | | (0.490) | |
| sas_idp | | 0.477 | | 8.362 |
| | | (0.646) | | (10.577) |
| stdev | | -0.291 | | -10.746 |
| | | (0.411) | | (6.722) |
| per6in | | -893.179 | | -10,138.906 |
| | | (1,405.087) | | (22,995.686) |
| acres | -0.004 | -0.013 | -0.383*** | -0.353* |
| | (0.010) | (0.009) | (0.123) | (0.154) |
| snowmke | 0.020 | 0.093 | 0.166 | 1.491 |
| | (0.040) | (0.079) | (0.504) | (1.295) |
| lifts | -0.109 | -0.392 | -11.694 | -7.700 |
| | (1.469) | (1.260) | (18.524) | (20.625) |
| hslift | 21.149 | 2.940 | 923.468* | 380.172 |
| | (37.604) | (40.945) | (474.073) | (670.106) |
| gndla | 28.901 | 5.739 | -570.130* | -392.334 |
| | (21.762) | (29.927) | (274.349) | (489.780) |
| trails | 0.144 | -0.074 | 9.973** | 0.559 |
| | (0.329) | (0.527) | (4.142) | (8.622) |
| cong | 18.956 | 9.607 | -513.154 | -299.451 |
| | (22.834) | (26.956) | (287.872) | (441.163) |
| num_areas | 0.517 | -0.107 | 3.115 | -22.072 |
| | (0.874) | (1.396) | (11.022) | (22.850) |
| Constant | 11.876 | 1.570 | 270.162 | -104.751 |
| | (20.874) | (34.238) | (263.166) | (560.333) |
| Observations | 23 | 19 | 23 | 19 |
| R-squared | 0.783 | 0.898 | 0.835 | 0.881 |

*Notes*: Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0\ .05$, * $p < 0\ .1$.

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