LEISURE & TOURISM | RESEARCH ARTICLE

An examination of Utah skiers’ response to weekday snowstorms

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Abstract: Snowstorms may not come at an optimal time for snow skiers living relatively close to a ski resort. Some of these skiers may adjust their schedule to ski on freshly fallen snow. Knowing the types of skiers willing to make accommodations is important to ski resorts that operate only a fraction of the year. Previous studies find that skiers tend to ski on weekends and holidays. Ski resort data show that skier weekday visits increases from a midweek snowstorm. Utilizing ordinary least squares identifies different groups response to weekday snowfall. Marginally, skiers purchasing daily lift tickets at the window and half-day lift tickets are the most responsive. In terms of percentage, the largest increase is half-day tickets and skiers finding a discount daily lift ticket and season ticket holders. Adding a quadratic term in the model demonstrates whether there is a minimum amount of snow needed to get particular skiers to the resort or a maximum amount of having too much snow. Season ticket holders have the largest maximum and employee dependents have the smallest minimum (for some groups is larger than their maximum). Snowstorms closer to the weekend yield more skiers.

Subjects: Sport and Leisure Studies; Sport and Leisure Management; Sport Psychology

Keywords: Snow skiing; weekday snowfall; demand

1. Conceptual background and literature

After a snowstorm hits, skiers living near ski resorts may break for the mountains to ski on fresh snow. If this type of behavior exists, skiers’ schedules need to be rearranged to engage in this experience. Individual skiers may make various sacrifices to get to the mountain. One day there

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PUBLIC INTEREST STATEMENT

Ski resorts in Utah are easily accessible to skiers. Currently, from Salt Lake City a skier can get to six ski resorts in less than an hour and four additional ski resorts in 2 hours. Data from one of the ski resorts in Utah reveal that many skiers will ski weekends and holidays. However, if there is a large snowstorm during the week there will be a substantial increase in skiers then the typical weekday. The purpose of this study is to identify the types of skiers that are drawn to fresh fallen snow rather than waiting for the weekend. In other words, the skiers that are willing to adjust their schedule and/or make sacrifices for a good snow day. Ski resorts may use the information to ascertain the skier type dedicated to snowfall and consider a change in their current pricing structure.
might be a few on the mountain and the next day is exactly opposite with throngs of skiers. With so many additional skiers, ski resorts would like to know the types of skiers that are affected by new snow. This study will extract out factors that affect the demand for snow skiing and ascertain the effect of new snowfall. The purpose of this study is to identify the types of skiers willing to adjust their schedule to experience newly fallen snow. Thus, helping ski resorts have a better understanding of the demographic of skiers.

Snow skiing is a recreational sport enjoyed by many. In 2006, there were 4.06 million skiers in Utah ("DEA" 2006). Although there are many interested in the sport, there are concerns by ski resorts about the market. In the Northern Hemisphere, for many ski resorts, the ski season usually lasts from around December to around March or April. Some ski resorts have resorted to snow making techniques to extend the season (Steiger & Scott, 2020), but this has currently not happened in the Utah ski industry. The ski resorts need to earn enough revenue in roughly four or 5 months to cover the costs for the entire year. There have been growing concerns about the effects of global warming (Steiger & Scott, 2020). Although global warming is important, it is outside the scope of this paper. Another concern is the competitiveness of the market. In many instances ski resorts are near each other resulting in a competitive market for skiers. Thus, understanding the behavior of skiers is important to ski resorts.

Weekends and weekday holidays bring in numerous skiers (Holmgren & McCracken, 2014; Malasevska & Haugom, 2019). Additionally, a snowstorm occurring on a weekday may bring many skiers to a nearby ski resort. These types of customers are more willing to drop at a chance to ski on fresh snow. Some ski resorts in Europe offer a promise of good snow (Unbehaun et al., 2008). The objective is to identify the types of skiers living in close proximity to a ski resort that are going to make skiing a priority right after a snowstorm and the weekdays that bring the most skiers. The groups of skiers that will be analyzed are skiers purchasing daily tickets, multiday tickets, and season tickets. The results will help ski resorts near urban areas understand the demand for new snowfall excluding the effects of weekends and holidays for the various skier types. Ski resorts may want to adjust their current pricing scheme reflecting changes in snowfall based on the results presented.

Economic theory suggests that some of the variables that influence demand is price, income, substitute price, and preferences (Mas-Colell et al., 1995). Some of the preferences for snow skiing is the particular time of the season or day of the week, the amenities of the ski resort, and weather, more notably, snow fall (Holmgren & McCracken, 2014). The next few paragraphs review recent studies that identify how certain variables influence individuals to go snow skiing. The last effect is the focus of this study, namely, the effect of snowfall on skier visits.

Historically, snow skiing has been a relatively expensive activity (Perdue, 1996). Thus, snow skiers with higher incomes tend to ski more often (Malasevska, 2018). Additionally, weather and the price have influence on skier visits (Haugom et al., 2019; Witting & Schmude, 2019). For many years, efforts have been made by ski resorts to offer more types of tickets to their customers. By permitting discounted early bird passes to skiers, revenues to ski resorts will increase, (Falk & Scaglione, 2018) and this is true for other types of discounted tickets (Malasevska & Haugom, 2018). A weekday discounted ticket type is another way for a ski resort to increase revenues (Alines et al., 2021; Haugom et al., 2020). Resorts investing in new ski lifts will result in more skiers but if other nearby ski resorts follow suit it is likely that revenues will not increase (Falk & Tveteraas, 2020). The results of Holmgren and McCracken (2014) show that particular types of skiers (discounted ticket purchasers, half-day skiers, and season ticket holders) are more likely to visit another nearby ski resort when the competitor lowers their price.

In addition to price, particular days is another major factor that influences the demand for snow skiing. Using skier visits, Easter holidays in Austria (Falk, 2010), Finland (Falk & Vieru, 2017), and Norway (Malasevska & Haugom, 2019) all see an increased number of skier visits. Christmas holiday week and school holidays also bring in many skiers based on studies in Norway (Malasevska &
Haugom, 2019) and the United States (Holmgren & McCracken, 2014). Furthermore, both of these studies along with Holmgren et al. (2016), empirically show that weekends, more considerably on Saturdays, have the greatest number of skiers during the typical week.

When skiers plan to go to the resort, their hope is that there will be plenty of snow. Recent studies have identified the positive effect of snowfall on skier visits in Austria (Falk, 2010; Toglihøfer et al., 2011), Canada (Rutty et al., 2015), Finland (Falk & Vieru, 2017), Germany (Bausch & Unseld, 2018), Norway (Malasevska & Haugom, 2019; Malasevska et al., 2020, 2017a, 2017b; Tjørve et al., 2015), Slovakia (Demiroglu et al., 2015), Sweden (Falk & Hagsten, 2016), and the United States (Holmgren & McCracken, 2014; Holmgren et al., 2016; Zhang & Smith, 2018). When the snow is poor, experienced skiers will travel farther for good snow while less experienced skiers will choose to do something else (Rutty et al., 2015). In response to bad snow conditions, ski resorts may offer discounts to increase revenues (Malasevska et al., 2017a). However, if there is an early snowfall there is excitement among some skiers leading to increased revenues for ski resorts (Falk & Hagsten, 2016). Skiers highly interested in the sport may choose to live where a ski resort is more easily accessible. Thus, gain easier access when the snow conditions are more favorable.

Although snowfall is important to skiers, to what degree is importance compared to other demands. As mentioned earlier the days with the most skiers are the weekends. Based on survey data, the results from Malasevska et al. (2020) indicate that skiers are willing to pay a higher price during the week given that the snow conditions are better. For season ticket holders the only cost they face is getting to the resort. Holmgren et al. (2016) ascertain that season tickets sold to the general public, K-12 students, and college students are more likely to go skiing during the week when there is new snowfall. However, Holmgren et al. (2016) is limited to only season ticket holders.

There is currently no study that identifies the effect of weekday snowfall on other types of skier types besides season ticket holders. Studies have identified the demand for snow skiing, namely, the effects of prices, certain days, and snowfall. However, there is some overlap between the days and snowfall. By examining the number of visits during the weekday immediately after a snow storm will more adequately examine the effects of snowfall for different skier types. Distinctive skier types are faced by different constraints. For example, a season ticket holder does not need to pay for a lift ticket that day as opposed to someone purchasing a day ticket. Even different season ticket holders are faced with different constraints. An individual purchasing a season ticket working may not be able to frequent the mountain as much as college or K-12 student. As mentioned earlier, skiers attest they would be willing to pay more for a good snow day during the week (Malasevska et al., 2020). The focus will be on the number of actual visits by skier type living near a ski resort, and days of the week for weekday snow.

The next section will identify the source of data. Then, the methods used applied to the data. Results of the methods will be presented. Finally, conclusions are drawn from the results.

2. Data
As shown in the literature review there are many factors that influence individuals to go to the mountains and go snow skiing. Based on Holmgren and McCracken (2014) what draws the greatest number of skiers are weekends and holidays. For the ski resort, there is a limited ski season (usually around four or 5 months) with most customers coming only 2 days a week (Saturday and Sunday) or maybe three (holidays). The ski resort is highly dependent on those days to have good weather conditions. Bad weather goes both ways, it may be too warm or too cold. Not only the weather being too cold, too much snowfall sometimes results in delayed openings or road closures due to avalanches.

Fortunately, snow storms that occur on weekdays may bring out a number of skiers given there are no avalanches. The results of Holmgren and McCracken (2014) demonstrate that weekdays do
not bring many skiers when considering the entire season. However, extracting out the weekdays reporting increases in snow depth may lead to a large number of skiers. Due to confidentiality, a ski resort located in Utah provided data on daily lift ticket visits by ticket type from the 2004–05 to 2006–07 ski seasons. Although the data is over 15-years old, it is likely that skier type’s response to snowfall has not changed over time. For instance, a college student back then purchasing a season pass desire to ski on freshly fallen snow long ago is still highly desirable for a college student today. The data indicates that there is an increase in visits on non-holiday weekdays. Matching high skier visit weekdays with U.S. Snowpack Telemetry Data Repository (SNOTEL) data provided by the National Resources Conservation Service (NRCS) identifies that the increase is due to snowfall. The SNOTEL is near the ski resort providing the data that measures snow density and snow fall (accounting for wind). The snow density measures the amount of water there would be when the snow melts (skiers prefer a lower snow density). Skiers skiing in Utah prefer a lower snow density, lighter snow is preferred over slush (Holmgren & McCracken, 2014). Drawing from the ski resort data and the SNOTEL data set reveals that even when there is two inches of snowfall on a weekday there is actually an increase in skier visits for many of the different ticket types.

During the 2004–05 to 2006–07 ski seasons there were 36 weekdays where there was at least two inches of snow fall over a 24-hour period. The SNOTEL measures at midnight. Of the 36 days measured at midnight there was six on Tuesday, seven on Wednesday, 10 on Thursday, and 13 on Friday (see, Table 1). For the days there was over two inches of snow fall measured at midnight on Monday yielded low visits since many people had already skied on Sunday except for Martin Luther King Jr. Day and Presidents Day. Examining these particular days and visits by ticket type will yield the groups of skiers influenced more by snow fall.

The different ticket types can be categorized into daily tickets, multiday tickets, and season tickets. From the daily passes, there is a general lift ticket, ticket purchased at a local gas station, local grocery store, local ski shop, senior lift ticket, half-day pass, Ski Salt Lake Super Pass, employee half-price ticket and premium lift tickets (an aggregation of discounted lift tickets not mentioned above). The multiday tickets are categorized into multiday tickets from 2 to 10-day tickets, 2 to 10-day tickets discounted, and 10 plus day tickets. The season tickets consist of season tickets sold to the public, college students, K-12 students, employees, employee dependents, concessions, and concession dependents tickets. For the public, college, and K-12 students season tickets there is a different type if the ticket was purchased before Labor Day.

Given there are many different ticket types, not all of them will be assigned an independent variable to identify the effect of weekday snow. The effects of weekday snow will be estimated for the daily general lift ticket, senior lift ticket, half day lift ticket, discount daily lift tickets, multiday tickets, season tickets, season tickets purchased before Labor Day, college season tickets, K-12 season tickets, and dependent lift tickets. The discount daily lift tickets consist of the ticket purchased at the gas station, grocery store, ski shop, Ski Salt Lake Super Pass and premium lift tickets. The multiday tickets consist of the multiday tickets mentioned earlier. The season tickets are all of the season tickets listed in the previous paragraph. The season tickets purchased before Labor Day include public, college, and K-12. College season tickets and K-12 season tickets are the season tickets sold to them, respectively. The dependent lift tickets consist of the employee half-price ticket and the dependent season ticket.

Results of the study identify the increase in visits by ticket type given new snow. The number of skier visits by ticket type varies greatly. Table 1 presents the average number of visits the day of the weekday storm and the response by reporting the next day visits as well as the percentage change.

The general daily ticket sold at the window is the most popular ticket type. However, when there is new snowfall during the week the largest percentage change in skiers are college students and employee dependents.
In addition, to presenting the percentage change of skiers by skier type the response to snowfall by weekday is presented in Table 2.

During the 2004–05 to 2006–07 ski seasons, there was more snowstorms with over 2 inches of snow on Friday; however, those storms did not yield as much snow as the other days on average. The largest snowstorm (15.8 inches) happened on Monday. Four of the six storms on Monday yielded over 10 inches of snow and the smallest storm brought 8.5 inches of snow. There was only one storm that brought over 10 inches of snow on Tuesdays; four out of nine on Wednesday and none on Thursday. Additionally, a snowstorm on Tuesday will see the greatest number of additional skiers to the resort. Not as many on Wednesday and Thursday since skiers were already making plans for the weekend but more than Monday, likely they skied the previous weekend.

To identify the lift ticket groups that are more responsive to changes in snowfall, the change in skier visits the day of the snow storm and the day after are analyzed. A dummy variable will be created for each group listed in Table 1 and then interacted with snowfall. A quadratic term for each of the groups interacted with snowfall is also included. Although new snowfall is desirable for skiers, there is a point at which there may be too much snowfall. There is also a dummy variable for each of the weekdays of new snowfall where Thursday is the base weekday. The data descriptions and summary statistics are in Tables 3 and 4, respectively.

From the summary statistics when there is at least two inches of snow fall on a weekday, the average increase number of skiers is around 47 skiers. However, the spread is quite large. The

| Ticket Type                     | Average Number of Visits Day Of | Average Number of Visits Day After | Change \((\text{After} - \text{DayOf})/\text{DayOf}\) |
|---------------------------------|---------------------------------|-----------------------------------|---------------------------------|
| General Daily Tickets           | 173                             | 309                               | 0.79                            |
| Discounted Daily Tickets        | 63                              | 108                               | 0.71                            |
| Senior Daily Tickets            | 14                              | 21                                | 0.50                            |
| Half Day Tickets                | 73                              | 141                               | 0.93                            |
| Multiday Tickets                | 74                              | 120                               | 0.62                            |
| Season Tickets                  | 48                              | 89                                | 0.85                            |
| Season Tickets Bought Before Labor Day | 66                           | 124                               | 0.88                            |
| College Season Tickets          | 32                              | 72                                | 1.25                            |
| K-12 Season Tickets             | 65                              | 113                               | 0.74                            |
| Dependent Lift Tickets          | 15                              | 31                                | 1.07                            |

| Number of Days with 2+ Inches of Snowfall in 24 Hour Period | Monday | Tuesday | Wednesday | Thursday |
|-------------------------------------------------------------|--------|---------|-----------|----------|
| Average Amount of Snowfall (Measured in Inches)            | 11.3   | 6.2     | 8.4       | 4.5      |
| Average Percent Change in Visits Day After Snowstorm       | 30%    | 130%    | 65%       | 59%      |
Table 3. Data descriptions

| Variable          | Description                                                                 |
|-------------------|------------------------------------------------------------------------------|
| Difference        | Change of visits for day with at least 2 inches of snowfall and the day after |
| Snow Density      | Quality of snow that fell, scaled between 0 and 100                          |
| General—SF        | Dummy variable for general daily lift ticket type interacted with snowfall   |
| Discount—SF       | Dummy variable for discounted daily lift ticket types interacted with snowfall|
| Senior—SF         | Dummy variable for senior day lift ticket type interacted with snowfall      |
| Half Day—SF       | Dummy variable for half day lift ticket types interacted with snowfall       |
| Multiday—SF       | Dummy variable for multiday lift ticket types interacted with snowfall       |
| Season—SF         | Dummy variable for season ticket types interacted with snowfall              |
| Early Seas—SF     | Dummy variable for season ticket types purchased before Labor Day interacted with snowfall |
| College—SF        | Dummy variable for college season ticket types interacted with snowfall      |
| K-12—SF           | Dummy variable for K-12 season ticket types interacted with snowfall         |
| Dependent—SF      | Dummy variable for dependent ticket types interacted with snowfall           |
| General—SF²       | Dummy variable for general daily lift ticket type interacted w/snowfall squared |
| Discount—SF²      | Dummy variable for discounted daily lift ticket types interacted w/snowfall squared |
| Senior—SF²        | Dummy variable for senior day lift ticket type interacted w/snowfall squared |
| Half Day—SF²      | Dummy variable for half day lift ticket types interacted w/snowfall squared  |
| Multiday—SF²      | Dummy variable for multiday lift ticket types interacted w/snowfall squared  |
| Season—SF²        | Dummy variable for season ticket types interacted w/snowfall squared         |
| Early Seas—SF²    | Dummy variable for season ticket types purchased before Labor Day interacted w/snowfall squared |
| College—SF²       | Dummy variable for college season ticket types interacted w/snowfall squared  |
| K-12—SF²          | Dummy variable for K-12 season ticket types interacted w/snowfall squared    |
| Dependent—SF²     | Dummy variable for dependent ticket types interacted w/snowfall squared      |
| Monday            | Dummy variable for snowfall on Monday                                       |
| Tuesday           | Dummy variable for snowfall on Tuesday                                       |
| Wednesday         | Dummy variable for snowfall on Wednesday                                    |

minimum of—93 (44% decrease) was from the general group and the decrease happened on December 23rd, suggesting holidays is a major factor in deciding to go skiing. From the observations that resulted in a negative value for the variable Difference, the average percent change was 21% and 324% for the positive value observations. The group that had the most days where there was a decrease in skier visits was the discount group and the groups that had the most days with increase visits was the season ticket group. The maximum change, 373, was the general daily lift ticket of 3 to 376 skiers from Wednesday to Thursday in March with 11.7 inches of new snow. Selling only three general daily lift tickets is so low due to an avalanche preventing skiers form getting to the resort. The largest recorded amount of snowfall from the 04–05 to 06–07 ski seasons in a 24-hour period is 15.8 inches. Most of the weekday snow falls occurred on Thursday (36%).

3. Methodology

Snow fall is a major proponent in the decision process for snow skiers when a ski resort is nearby. To extract the importance of new fallen snow the analysis will only be made for weekdays. Although there are cross sections over three consecutive seasons, the model will be estimated that includes dummy variables for days of the week. The purpose is not to identify differences in seasons since there was not much variation between seasons except for snowfall and those differences are accounted for in the days of the week variables. Including the variables for weekdays will demonstrate to what magnitude that more snow skiers will ski on Friday and/or Monday as opposed to the other weekdays. For some individuals skiing on a Friday or Monday is an
extended weekend as opposed to taking a “ski day” when there is a considerate amount of new snow.

To identify the effects of snow fall, the dependent variable for the model is the change in skier visits for different ticket types. Since this variable is continuous the model will be estimated using ordinary least squares (Greene, 2018). To ensure robustness of the model the variance covariance matrix was adjusted by using the Huber/White/sandwich estimate of variance. The exact equation estimated is:

$$\text{Difference}_i = \alpha + \beta_1 \text{SnowDensity} + \gamma \text{Type} \times \text{Snowfall}$$

$$+ \delta \text{Type} \times \text{Snowfall}^2 + \nu \text{Weekday} + \epsilon_i$$

where $\text{Difference}_i$ is the change in skiers from the day of the weekday snow storm to the day after as defined in Table 1. $\text{Snow Density}$ is the quality of snow (the percentage of snow that turns into water when melted). $\text{Type} \times \text{Snowfall}$, $\text{Type} \times \text{Snowfall}^2$, and $\text{Weekday}$ are vectors. $\text{Type} \times \text{Snowfall}$ is the dummy variable categorized ticket types as defined from the data section interacted with the snowfall from the respective day. $\text{Type} \times \text{Snowfall}^2$ is the quadratic term for each of ticket types interacted with snowfall. $\text{Weekday}$ are dummy variables defined explicitly in the data section.

| Variable           | Mean  | Std. Dev. | Min.  | Max.  |
|--------------------|-------|-----------|-------|-------|
| Difference         | 47.08 | 62.10     | −93   | 373   |
| Snow Density       | 31.44 | 7.69      | 16.29 | 45.08 |
| General—SF         | 0.30  | 1.61      | 0     | 15.8  |
| Discount—SF        | 2.14  | 3.79      | 0     | 15.8  |
| Senior—SF          | 0.30  | 1.61      | 0     | 15.8  |
| Half Day—SF        | 0.30  | 1.61      | 0     | 15.8  |
| Multiday—SF        | 0.90  | 2.69      | 0     | 15.8  |
| Season—SF          | 3.38  | 4.28      | 0     | 15.8  |
| Early Seas—SF      | 0.91  | 2.69      | 0     | 15.8  |
| College—SF         | 1.19  | 3.02      | 0     | 15.8  |
| K-12—SF            | 0.61  | 2.24      | 0     | 15.8  |
| Dependent—SF       | 0.61  | 2.24      | 0     | 15.8  |
| General—SF^2       | 2.68  | 17.51     | 0     | 249.64|
| Discount—SF^2      | 18.90 | 43.01     | 0     | 249.64|
| Senior—SF^2        | 2.68  | 17.51     | 0     | 249.64|
| Half Day—SF^2      | 2.68  | 17.51     | 0     | 249.64|
| Multiday—SF^2      | 8.03  | 29.62     | 0     | 249.64|
| Season—SF^2        | 29.73 | 50.71     | 0     | 249.64|
| Early Seas—SF^2    | 8.04  | 29.62     | 0     | 249.64|
| College—SF^2       | 10.51 | 33.59     | 0     | 249.64|
| K-12—SF^2          | 5.36  | 24.48     | 0     | 249.64|
| Dependent—SF^2     | 5.36  | 24.48     | 0     | 249.64|
| Monday             | 0.17  | 0.38      | 0     | 1     |
| Tuesday            | 0.23  | 0.62      | 0     | 1     |
| Wednesday          | 0.26  | 0.44      | 0     | 1     |

Observations: 815
4. Results

Using ordinary least squares the function identified in the methodology section is estimated. The effects of snow density, different skier types interacted with snowfall, and weekdays will be ascertained on the change of skiers from a weekday snowfall. From the literature review skiers

| Table 5. Marginal effects on the change of skiers for weekday snow storms |
|---------------------------|-----------------|-----|
| Variables                | Coefficient     | SE  |
| Snow Density             | 0.37            | 0.23|
| General—SF               | 41.37 (24%)***  | 5.24|
| Discount—SF              | 18.09 (29%)***  | 2.90|
| Senior—SF                | −14.19 (~100%)*** | 2.27|
| Half Day—SF              | 26.14 (36%)***  | 6.15|
| Multiday—SF              | 15.18 (21%)***  | 3.49|
| Season—SF                | 13.50 (28%)***  | 2.98|
| Early Seas—SF            | 6.49 (10%)**    | 1.98|
| College—SF               | −1.32 (~4%)     | 1.75|
| K-12—SF                  | −1.20 (~2%)     | 3.28|
| Dependent—SF             | −9.12 (~61%)*** | 1.54|
| General—SF               | −2.37***        | 0.45|
| Discount—SF               | −1.07***        | 0.19|
| Senior—SF                 | 0.93**          | 0.19|
| Half Day—SF               | −1.66***        | 0.46|
| Multiday—SF               | −0.77***        | 0.25|
| Season—SF                 | −0.65***        | 0.19|
| Early Seas—SF            | −0.44*          | 0.18|
| College—SF               | 0.05            | 0.16|
| K-12—SF                   | 0.13            | 0.31|
| Dependent—SF             | 0.56*           | 0.14|
| Monday                    | −29.59***       | 8.42|
| Tuesday                   | −23.00***       | 5.51|
| Wednesday                 | −14.71**        | 6.71|
| Constant                  | 14.21           | 11.45|

*** p < 0.01, ** p < 0.05, * p < 0.10.
Numbers in parenthesis represent percentage change based on values from Table 1.

| Table 6. Average maximum/minimum inches of snow for respective group |
|---------------------------|-----------------|-----|
| Groups                   | Maximum/Minimum | SE* |
| General                  | 8.73            | 0.62|
| Discount                 | 8.45            | 0.61|
| Senior                   | 7.63            | 1.28|
| Half Day                 | 7.87            | 0.73|
| Multiday                 | 9.86            | 1.43|
| Season                   | 10.38           | 1.62|
| Early Seas               | 7.38            | 1.65|
| Dependent                | 8.14            | 1.80|

Values italicized and in bold represent minimum.
*Standard errors computed using the Delta Method.
do not tend to ski on weekdays. Hence, this approach measures the demand for snowfall excluding the effects of weekends and holidays. The results from the estimation is in Table 5.

The variable Snow Density is of the right sign but is not statistically significant at the 10% level. Of the 10 groups eight are statistically significant at the 10% level for both the interaction term and the quadratic term. Every inch of new snow increases each group between 21 and 36% except for the Early Season group and the coefficients that are negative (Senior, College, K-12, and Dependent). The largest number of skiers coming to the ski resort after a snowfall is the from the General group and the fewest number of skiers that are positively responsive is from the Early Season group (skiers that purchase a season ticket prior to Labor Day). The most responsive group of skiers coming to the ski resort in percentage terms is from the Half Day group and the least responsive in percentage terms is Early Season. The coefficients for College and K-12 are of the wrong expected sign, but are not statistically significant at the 10% level. The model predicts that the number of seniors and dependents will decrease when there is new snowfall. Some possible explanations for the senior’s group may be that they do not enjoy driving after a snow storm or that they want to avoid the crowds. A possible explanation for the decrease in the dependent group is that the employees dissuade them to come because there is a large influx of skiers.

A quadratic term was included in the model to ascertain the maximum (minimum) snow for snow skiers. For many skiers there is a possibility of having too much new snow since it may be difficult to ski through deep snow. Another reason too much snow will turn away a skier is the burdensome of reaching the ski resort. Alternatively, certain types of skiers will not ski unless there is a particular amount of new snow. The maximum/minimum is calculated using the procedure suggested by Greene (2018), and the standard error computed using the delta method (Moffatt, 2016). Results are shown in Table 6 (only groups that were statistically significant at the 10% level and the quadratic term are presented).

On average, skiers purchasing season tickets before Labor Day have a lower threshold for large amounts of new snowfall and all other season ticket holders have a larger threshold. Skiers from the Senior and Dependent groups are exhibiting minimums. Seniors probably have the most experience skiing and know the crowded times. The average senior skier will go after the average early season ticket holder leaves. The seniors schedule is more flexible and may wait to go another day to avoid the crowds. Dependents have close communication with the employees and will know whether there are large crowds or not. The dependents on average will start to show up after the half day ticket holders and early season ticket holders have met their average threshold. These results suggest that on average seniors and dependents prefer larger amounts of snowfall when it occurs on the weekdays.

The last set of independent variables, days of the week, infer that skiers prefer to ski later in the week when there is weekday snow storm. Recall, the respective day of the week variable was the day of the snow storm. For example, Monday is the day of the storm and Tuesday is the response to the storm. Since Thursday (the day of the storm) is the base day, skiers are more inclined to ski on Friday given a snowstorm on Thursday as opposed to other weekdays. As mentioned in the data section when there was a snowstorm on Sunday, there was a decline in skier visits for most of the groups. There is also some bias since in the last season (06–07 season), most of the snowstorms occurred on Thursday resulting in many skiers going on Friday. For the last season, it is difficult to extract out whether the increase in skier visits was due to new snow, a three-day weekend, or a combination of both. However, the results demonstrate that Utah skiers are more responsive to a snow storm on Tuesday than Monday, and a snow storm on Wednesday rather than Tuesday.

5. Conclusions
The data reveals that the number of skier visits increases after a weekday snow storm. This study identifies the type of skiers that respond to the new snow. Results from Holmgren and McCracken (2014) illustrate that most skiing occurs on Saturday and Sunday. By extracting out weekday
snowstorms in the data, ski resorts will ascertain the types of skiers that snowfall is most important.

Based on the results new snowfall on a weekday increases the number of skiers at a ski resort near an urban area. Given the estimated model, the quality of snow does not seem to have a statistically significant for snow skiers when there is new snow. Summing the interaction terms with snowfall for each group yields about 100 new skiers for an inch of new snow. In percentage terms, the largest response to new snow is skiers from the half day group. One possibility is that these types of skiers will work a few hours in the morning and then take the afternoon off to ski on new snow. Seniors and employee dependents exhibited a decrease in visits when there was new snowfall on a weekday. The quadratic term for each group in the model identified that for both of these groups there was a minimum of weekday snowfall. The minimum value of snow for these two groups was higher than some the maximum value for some of the other groups. Thus, seniors and employee dependents are more likely to ski when there is a major snow storm. Although new snowfall during the week accumulates more skiers to the resort, the increase is more noticeable the closer the snow storm is to the weekend.

The estimation results on weekday snow is for only one ski resort. In Utah there are several resorts close to each other and easily accessible to many people, each attracting different types of skiers. Each snow storm will not bring the same amount of snow to each resort. Additionally, there is not one resort that will consistently receive the most amount of snow. Expanding the data to include other ski resorts would further clarify the effect of weekday snowfall for skiers. For instance, some resorts would attract more skiers of a particular type. Additionally, when there is new snow, does the ski resort with the most amount of new snow reported attracts the greatest number of skiers? Expanding the data to other resorts may give further explanation to the effect of weekday snow. An additional study may examine the lagged effects of the snowstorm. For example, if there is a snowstorm on Monday and skiers cannot get to the resort on Tuesday will there be an increase in skiers from a typical Wednesday. Furthermore, the data is only by the ticket type and does not present any information on the experience of the skier.

One group influenced by weekday snowfall are skiers purchasing a discounted daily ticket. There is a possibility ski resorts could attract more skiers by offering a ticket type related to weekend snow storms, see, Haugom et al. (2019) and Malasevka et al. (2020). Further studies may identify whether a ski resort could earn more revenues by offering a ticket type (daily ticket, multiday ticket, and/or season ticket) where price depends on the snow conditions. However, offering this type of ticket may cut into the revenues for the skiers that purchase a non-discounted day ticket.

Snow skiing is a sport that is enhanced given particular conditions. When the conditions are most favorable and works with the skier's timetable, it will most likely result in a day with many other skiers. The optimal conditions may not coincide with the skiers’ schedule. The results demonstrate the value of the snow for various types of skiers by excluding the popular weekends (Holmgren & McCracken, 2014). Ideal skiing conditions may occur at a time not suitable for many skiers. The results show the types of skiers that are willing to ski on days with new snow when typically, is considered inconvenient. There are also factors that affect the decision to snow skiing and may be examined in future studies.

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Management implications
For ski resorts in the United States a season will usually last about five months of the year. Given a short season, each snowstorm is important. Many storms occur during the week that may not be optimal for the typical working
skier. It is imperative that managers know what type of skiers are willing to adjust their schedule when a weekday snowstorm occurs. This may lead to a different pricing strategy for ski resorts.

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