BIXI USAGE REPORT

## Brain Station Consulting

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Introduction

First started in 2009, Bixi bike sharing system has provided people in North America a new way to commute and new ways to spend their leisure time. This report analyzed the Bixi bike usage data in Montreal from 2016 to 2017 to understand their current usage patterns and how Bixi can improve its operation in Montreal.

To summarize the findings, while the month-to-month usage distribution was similar in 2016 and 2017, the total usage amount has increased significantly in 2017. Furthermore, members and non-members show different usage patterns, which brought to the discussion of potential different pricing strategies to increase the profit. Upon a close examination of a pricing strategy proposed by the marketing team, the results support that this new strategy for single users will likely bring most profits over the weekend.

In short, the surging trend of Bixi usage indicates potential opportunity in the future, and further examination of a pricing strategy focusing on single-trip users can prove beneficial.

1. The Trend and Usage Patterns

To have a basic understanding of the recent usage pattern of Bixi, it is interesting to have a quick look of the month-to-month usage in the two years. The left graph below clearly shows an increase in total usage in 2017 comparing with 2016. Every month in 2017 has a greater usage number than the same month in 2016. However, the graph on the right show that the usage distribution over the months does not change much from 2016 to 2017. The percentage of trips in a month remains roughly the same for the two years.
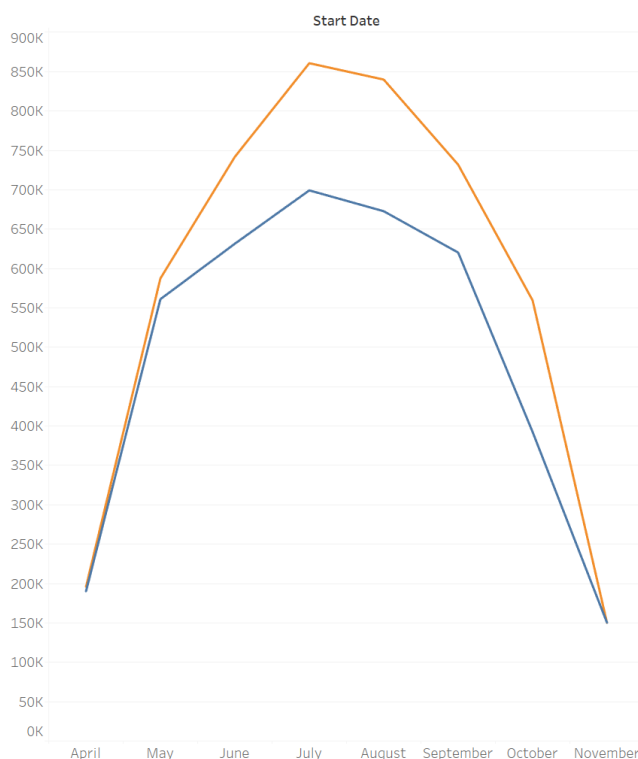
1.1 Total Monthly Usage
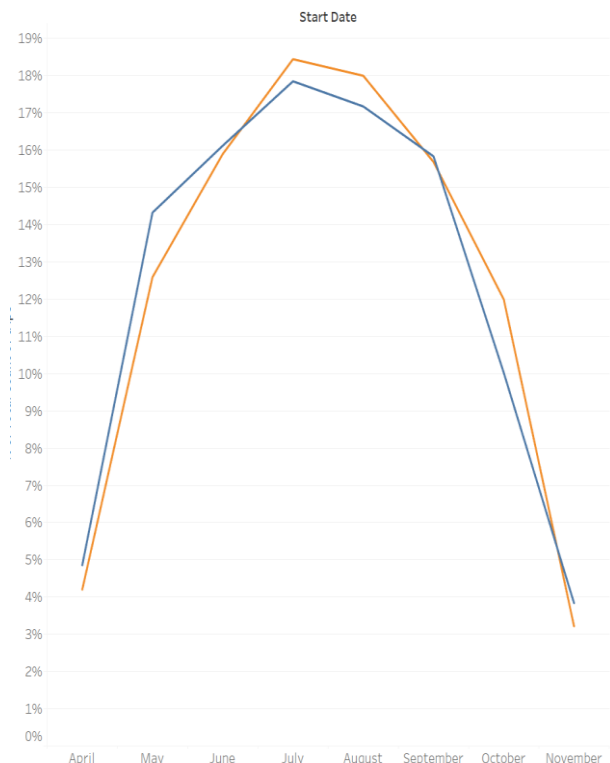
1.2 Monthly Usage Distribution (Over a Year)

YEAR
■ 2016
■ 2017

The increasing trend of usage is encouraging as it indicates potential growing opportunity for the service.
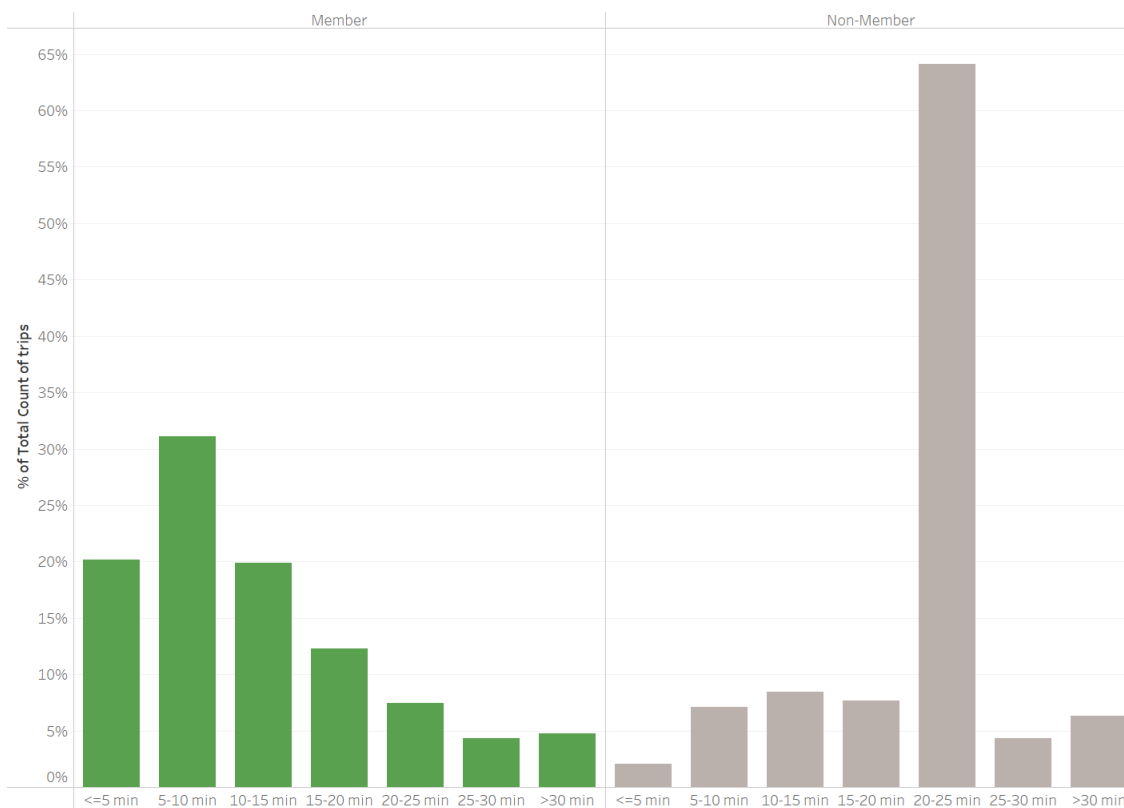
2. Members vs. Non-members

Bixi has different pricing strategies for members and non-members. It is therefore important to examine the distribution of usage across members and non-members and to observe any different patterns for the two different groups of users.

2.1 Percent of Trips from Member (2017)

The above is the percent of usage in each month that is from a member user in 2017. It is clear that the majority of Bixi usage are from members. For any given month, fraction of trips from members are above 76%. The difference is more prominent later in the year. In November, more than 90% of trips are from member users.

To further understand whether there is a difference in usage patterns between members and non-members, one may want to know whether the trip duration significantly differs between the two groups as compared in the graph below:

2.2 Trip Duration Distributions for Members/Non-members

Type
■ Member
■ Non-Member

As shown in the graph, non-members tend to have a longer trip than members. The majority of member trips are below 20 minutes, while the non-member trips tend to be longer than 20 minutes and particularly concentrate on the duration between 20-25 minutes.

A potential explanation for the difference is the pricing strategy. Trips for members are free until after 45 minutes. Therefore, members are likely to plan for a shorter trip. On the other hand, non-members need to pay a $1 unlock fee for every trip, and then charged by minutes until their trips end. It may not be worth it for non-members if it's just a 5-minute trip.

Another significance difference between members and non-members is their tendency to take a round trip. The graph below shows for each Bixi station the relationship between the fraction of trips from members and the fraction of trips that are round trips (i.e., start and end at the same station):
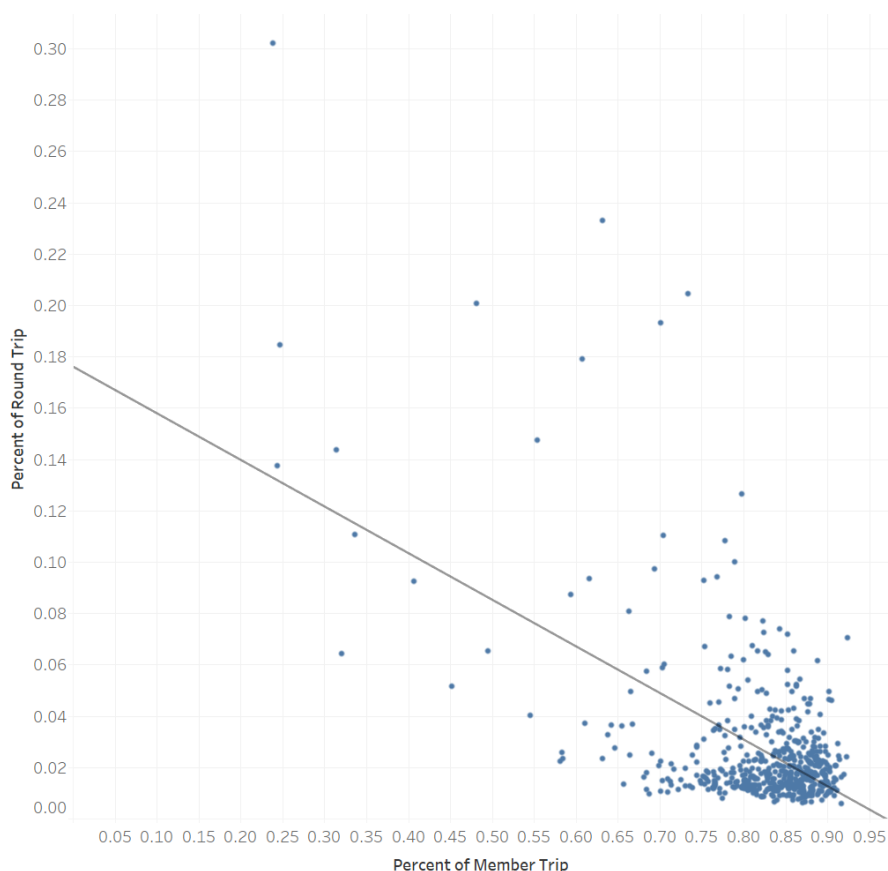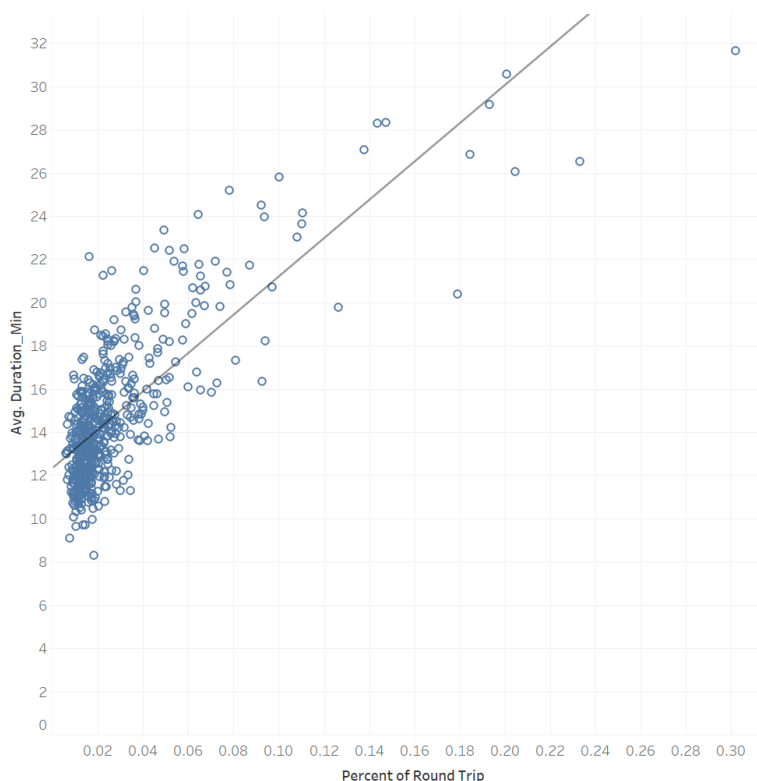
2.3 Correlation Between Round Trips and Trips from Members

The scattered plot above shows a negative correlation between percent of trips from members and percent of round trips over all trips. The relationship is not affected if excluding trips from the station Metro Jean-Drapeau, which has an extremely high percentage of round trips (30.2%) that is not representative of the other stations. The importance of round trips will be explored in the next section.
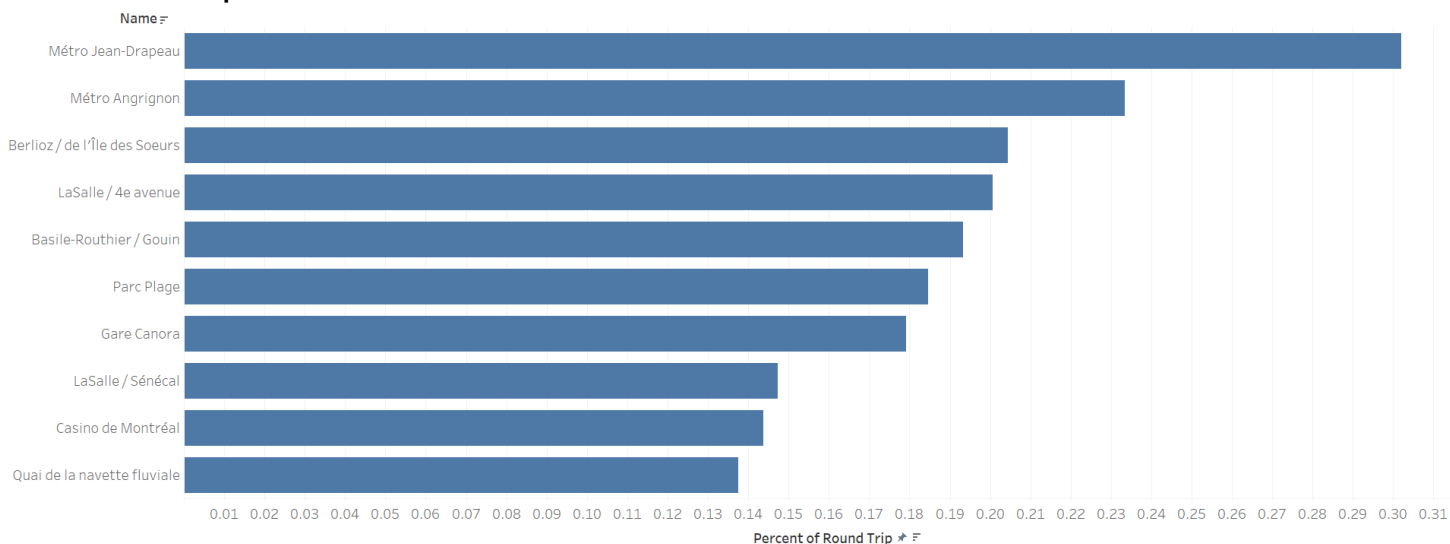
3. Round Trips

One pattern of the member users that has now been observed is that they tend to take fewer round trips. This observation is potentially important because the people taking round trips are more likely to take the ride for exercise or recreational purposes rather than commuting purposes. If one must guess, it is likely that round trips are longer trips with potentially more profit opportunities. The graph below confirms this conjecture:

3.1 Fraction of Round Trips and Average Trip Duration

The above graph shows the relationship between the fraction of round trips and average trip duration for each Bixi station. There is a clear positive correlation between the two. Again, the relationship is not affected if excluding trips from the station Metro Jean-Drapeau, which has an extremely high percentage of round trips.

To explore more about the round trips, one can take a look of the stations with the most round trips and their location:

3.2 Top 10 Stations with the highest fraction of round trips

The above 10 stations are the ones with the highest percentage of round trips. Regarding their location, most of them are close to park or recreational area.

One can also take a look at the relationship between the location of a station and its average trip duration. Such relationship is demonstrated in the graph below:

3.3 Location of Stations with the Longest Average Trip Duration

AVG Duration(min)

8.31   31.65
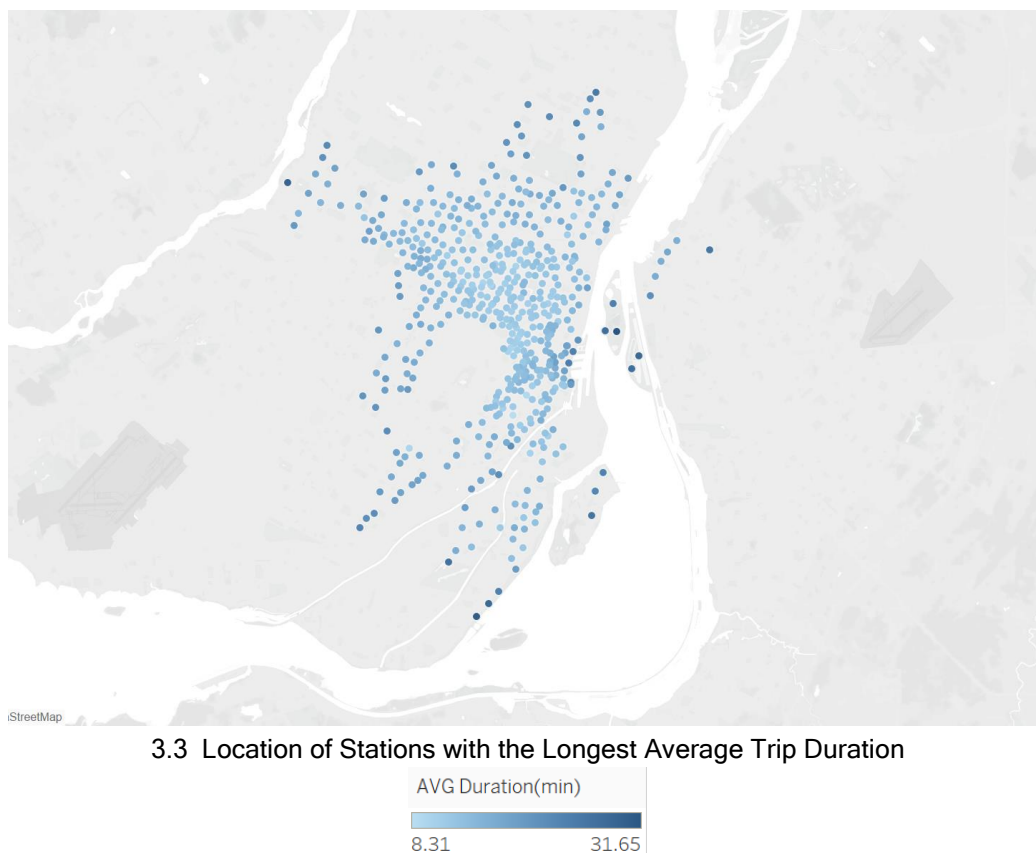
One can easily see that the stations with the longest average trip duration tend to be the ones that are close to water or park areas. This again supports the earlier reasoning about the relationship between round trips and trip duration.

Combining the observations in this section with section 2, one may conclude that non-members tend to use Bixi bikes every now and then for recreational purposes, and these trips tend to have longer durations. This would be an important feature to consider when discussing about the pricing strategy for non-members. A particular strategy will be analyzed in the next section.

# 4. A Potential Pricing Strategy for Single Trips

This section will provide an analysis of a single-trip pricing strategy proposed by the marketing team of Bixi for the trips less than an hour. In particular, the strategy proposed a flat rate of $2.99 for trips under 30 minutes, a rate of $4.79 for trips between 30 minutes and 45 minutes, and a rate of $7.79 for trips greater than 45 minutes and under 60 minutes.

The analysis here examines the trip data for non-members between 2016 and 2017. The assumption is that all non-members are potential single-trip users, but the member users are not. Another assumption here is that the implementation of this new pricing strategy will not drastically change the non-member user behaviors as the numbers in the data will not be informative if this is not the case.

Assuming the same trip behaviors from the non-members, the graphs below show the revenue from each price tier:
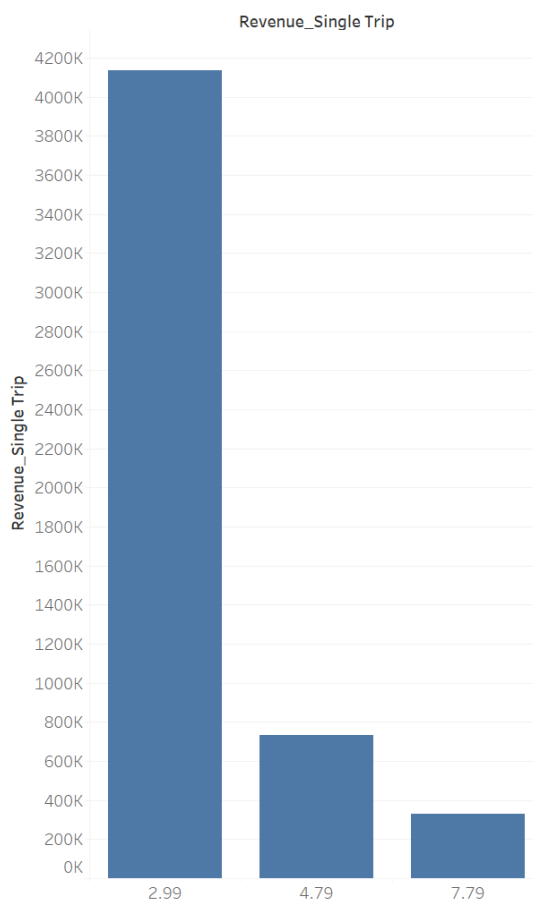

4.1 Total Revenue from Each Price Tier
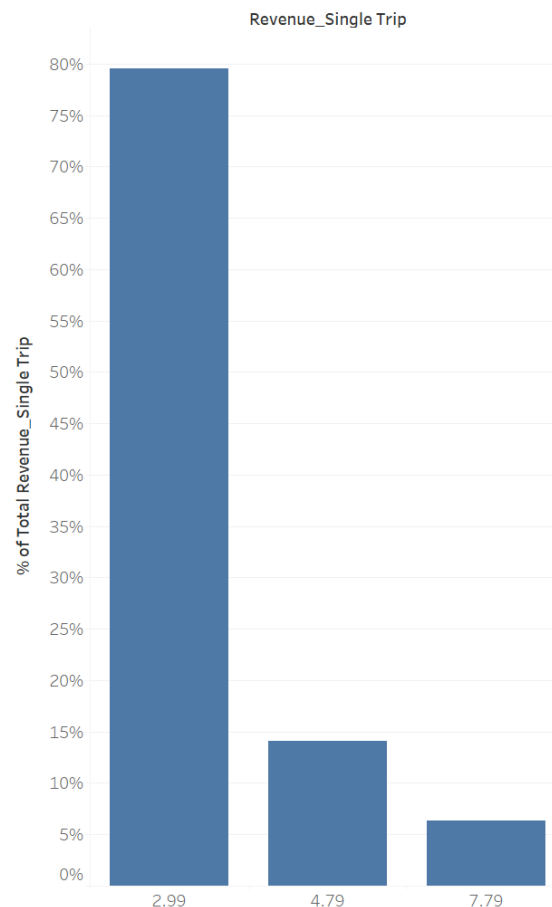
4.2 Percent of Total Revenue from Each Price Tier

The above graphs shows that most of the revenue would come from the under-30-minute tier if the strategy is implemented. This is not surprising given the results shown in graph 2.2. Even though non-members tend to have longer trips than members, most of the trips are still in the 20 to 25-minute range, and only a few of them exceed 30 minutes.

One can also check the distribution of revenue across different hours in each weekday:
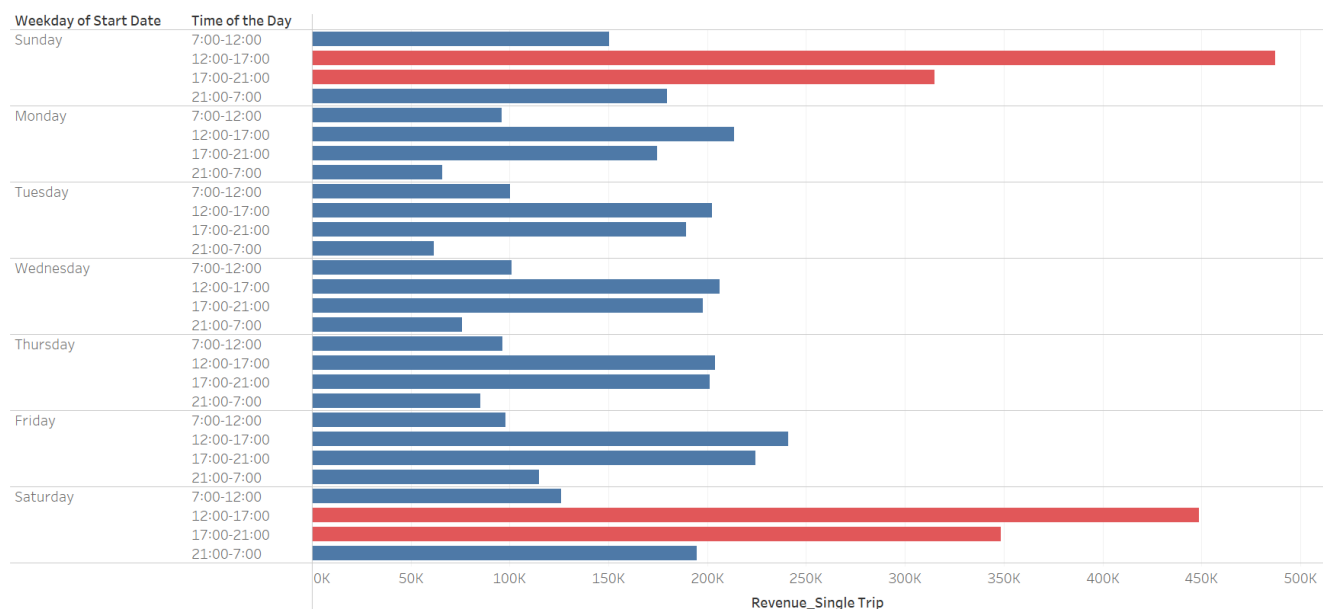
4.3 Revenue Distribution Under New Pricing Strategy

If the pricing strategy is implemented, the most profitable time during a week would be the afternoons over the weekends. Again, given the understanding of non-member user behaviors, this is not surprising. According to analyses in section 2 and 3, non-member users are more likely to use the bike for recreational purposes, thus the higher demand during the off days of a week.

Based on the analysis, there are two recommendations regarding the pricing strategy. The first is to refine the pricing tiers. The strategy as proposed would lead to a disproportionate portion of revenue in the lowest tier. There is potential to adjust the pricing tiers to improve the profits. Second, given the distribution of revenue across different weekdays, it is recommended to have a special pricing tier over the weekends as there is clearly a much higher demand.

5. Conclusion

This report dives into the Bixi user data and provide some insight regarding the patterns of the users. There was a clear increasing trend in total usage from 2016 to 2017. Members account for a large portion of total trips, while non-members tend to take longer trips for recreational purposes. The current single-trip pricing strategy proposed by the marketing team can potentially refined to incorporate knowledge about the non-member trip durations and higher demand over the weekends.