Turo: Car Rental Platform Analysis

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Overview

Turo is an innovative San Francisco-based platform founded in 2009 that facilitates customer to customer car-sharing rentals while offering renters better flexibility of vehicle options compared to conventional options. Luxury, sports, and RVs are only some of the many vehicle types available on this unique platform. Individuals can rent their private-owned vehicles for short-term use at highly customizable rental rates. The parameters include make, model, year of manufacture, mileage covered, and fuel efficiency ratings. This information could be used to compare vehicles based on specific requirements or preferences.

Research Methodology

The main dataset was scraped from the official website of Turo (Turo.com). As this dataset did not include the longitude and latitude coordinates of the states, we obtained those from an open-source database on the internet. We have used mainly R programming language to create visualizations to prove our hypothesizes. Moreover, we have used R Shiny to create the dashboard.

Literature review

Initially, our group researched to gain more knowledge about the car rental market and the economic patterns behind the customer-to-customer (C2C) businesses. The first source we have researched is a book named "Planning for shared mobility" written by A. Cohen and S. Shaheen. The increasing popularity of car-sharing services has grown significantly over time due to their cost efficiency compared to owning automobiles outright. According to Shaheen & Cohen's "Planning for Shared Mobility" book findings, subscribing individuals can now access cars or trucks located at multiple points throughout neighborhoods and transit stations by joining reputable organizations that manage these collections. This eliminates maintenance-related fees typically involved with owning private transportation while carsharing owners instead handle the costs associated with these expenses (Shaheen & Cohen 2006).

A study by Cervero and Tsai (2004) analyzed the impact of City CarShare on car ownership levels in San Francisco. It revealed that within two years, close to 30% of members sold at least one vehicle, while nearly two-thirds decided against buying another. As a result, fewer vehicle miles traveled (VMT), and individuals exhibited greater discretion when selecting cars for their trips. The research findings suggest that car-sharing members tended to be highly selective regarding their transportation choices leading to superior mobility approaches within San Francisco's transport system (Cervero & Tsai 2004).

The changing landscape of the car rental market has brought about a rise in customer-to-customer business models for accessing transportation. Research conducted by Cohen and Shaheen underscores the cost-efficient nature of shared mobility services, while Cervero and Tsai emphasize their eco-conscious benefits. Taken together, these studies demonstrate how car-sharing platforms are crucial for creating practical and sustainable transport options.

Data

Our data has 31,261 rows and 53 columns.
Numeric columns: 22
Categorical columns: 8
Logical columns: 21

The Turo dataset includes various features related to the rental cars available on the Turo platform. These features can be categorized into different groups, such as car information (make, model, power, doors), location information (city, number of airports, hotels, and train stations the car can be delivered to), extra services available (beach gear, child safety seat, phone mount), and customer reviews (Turo and guest reviews in total and in the past 6, 12, and 18 months). Other important features include insurance provider, rental type, miles included, and extra services. The dataset also includes information on the availability of instant booking, FAQ, and the number of car photos. We also used external data about specific car buying prices in our analysis.

Hypotheses

We have identified two main hypotheses on the Turo dataset.

The first hypothesis investigates the relationship between extra car features and the rental price on Turo, a peer-to-peer car-sharing platform. The objective is to determine how additional amenities or services, such as beach gear, child safety seats, and phone mounts, impact the rental price and how hosts can leverage these features to increase their income. The analysis will involve collecting data on the rental price, car features, and additional services the host offers and using statistical tools to determine the correlation between these variables.

The second hypothesis aims to identify the most cost-effective car to purchase and start lending on Turo to maximize profits. The objective is to determine the optimal balance between the initial investment in the car, ongoing maintenance costs, and potential rental income. The analysis will involve collecting data on the purchase price, maintenance costs, and rental income of California's top 3 frequent and new car models and using financial modeling techniques to calculate the return on investment and identify the most profitable options. Overall, these hypothesis's aim is to provide insights into how Turo hosts can optimize their earnings and offer valuable information for potential Turo investors or hosts looking to maximize their profits

Exploratory Data Analysis

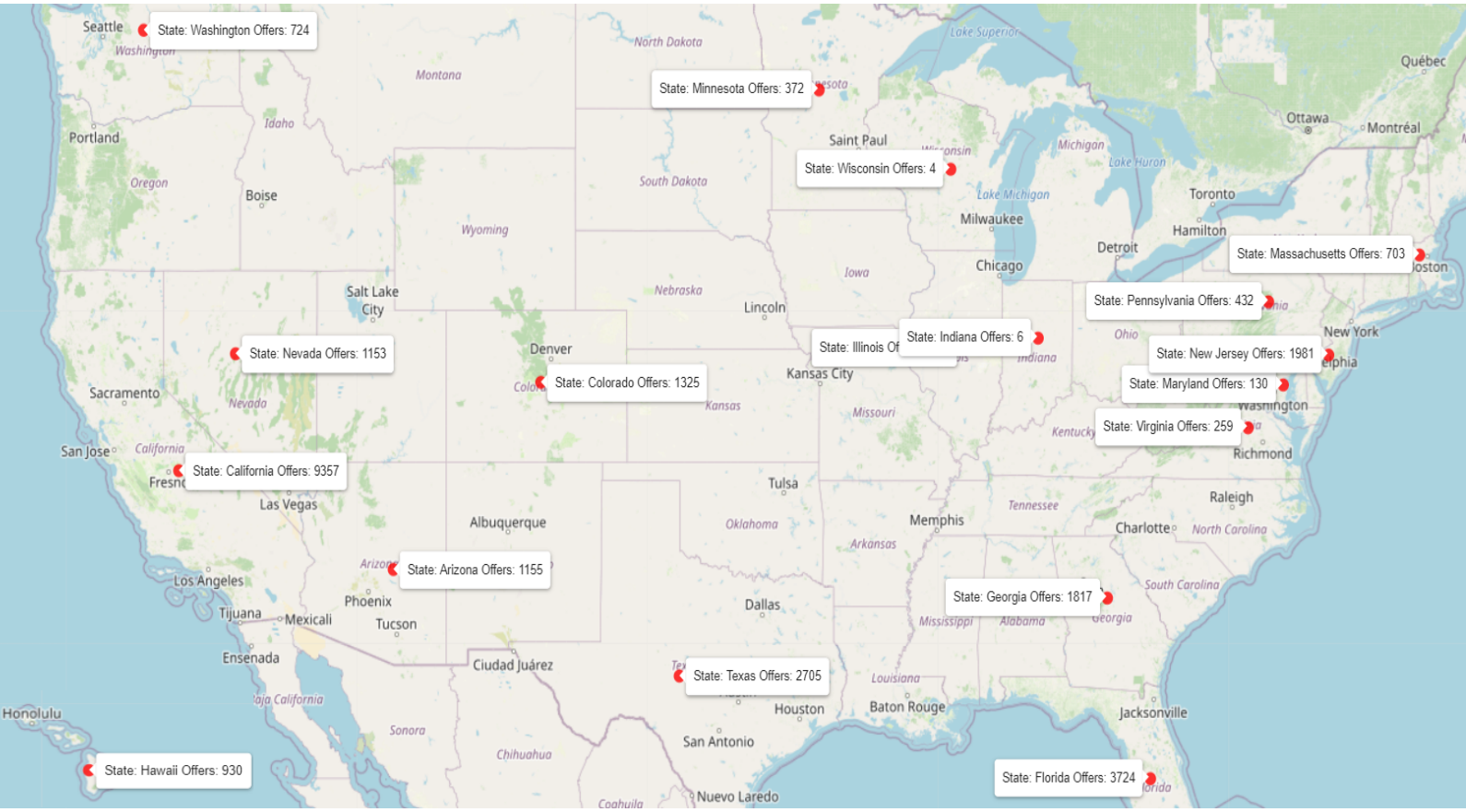

Figure 1: Map of car offerings per state in Turo.com

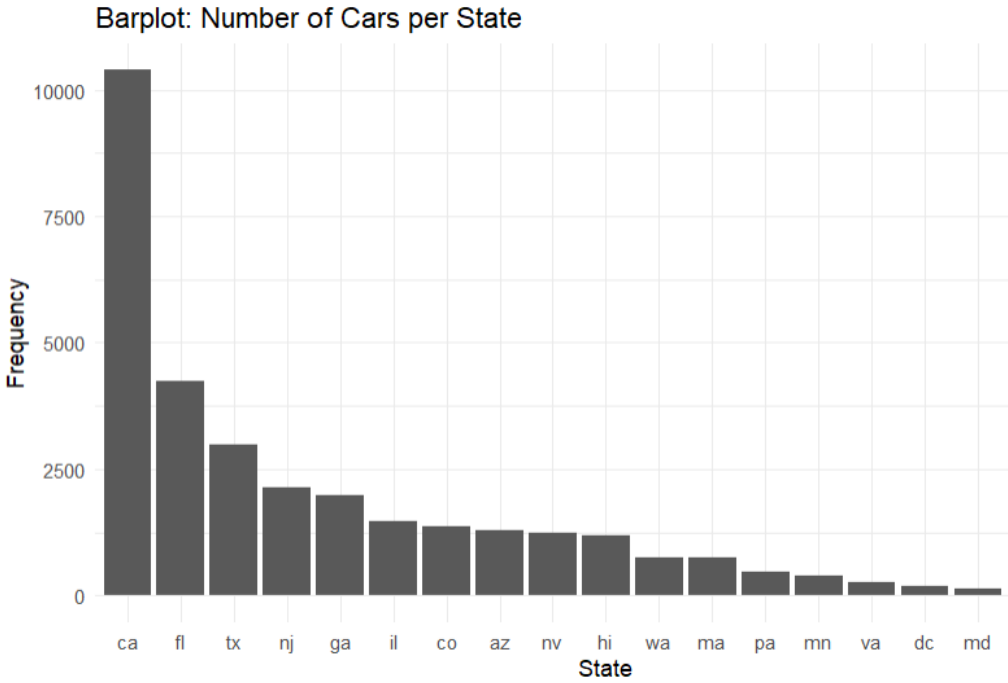

Figure 2: Barplot number of cars per state

Figure 1 and Figure 2 give us overall understanding about the distribution of cars in various states. We can see that majority of cars are being offered in California, Florida and Texas, hence it can be deduced that Turo's business is active in the mentioned states. Also the Turo headquarters is based in San Francisco, California and that may explain why their focus is primarily in that market. Ultimately, Turo is only prevalent in 19 states.

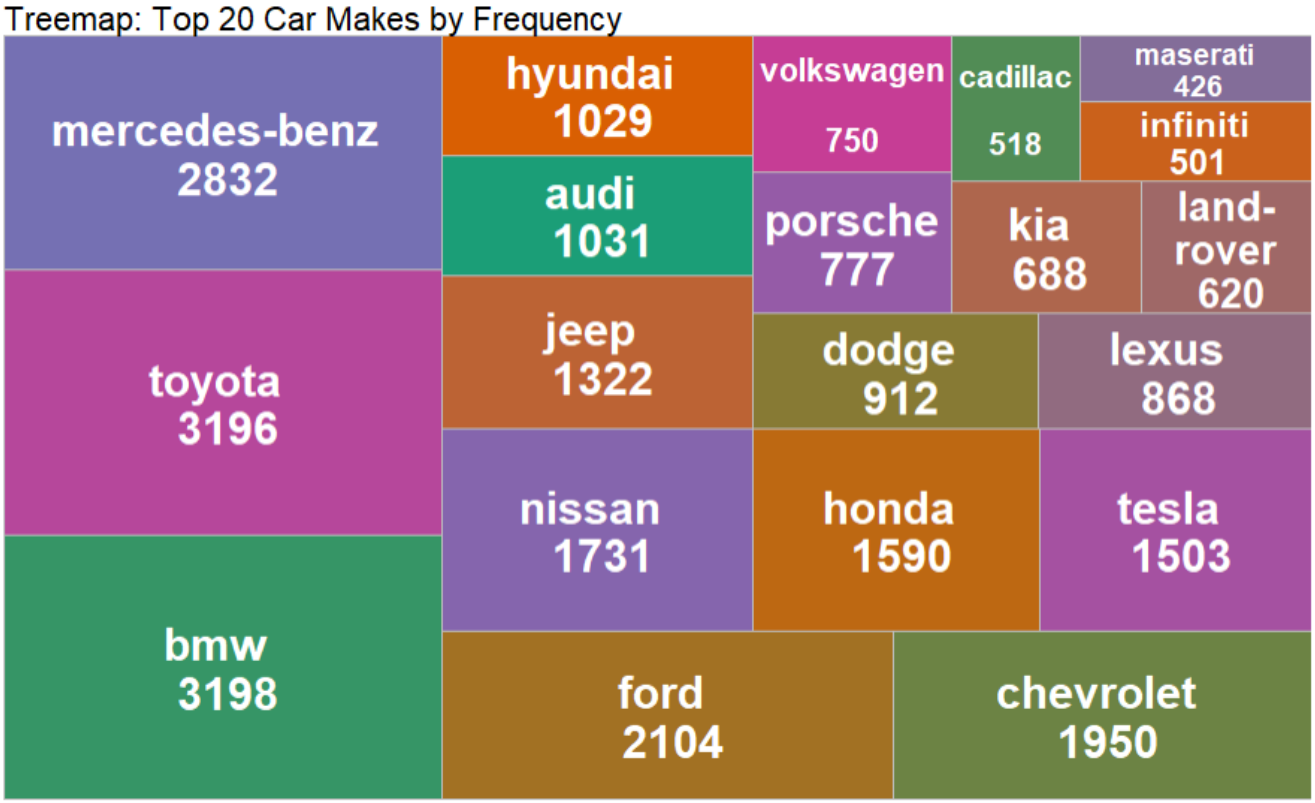

Figure 3: Treemap, number of top 20 car brands available

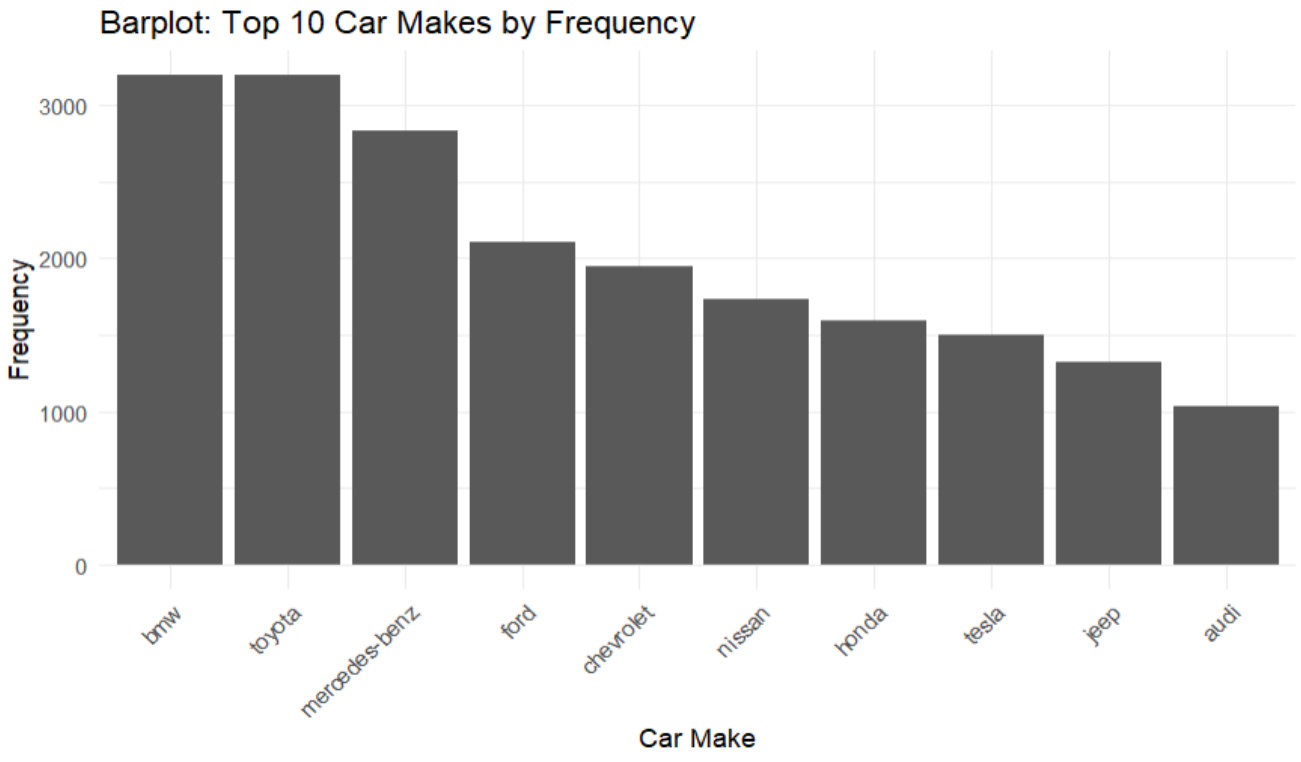

Figure 4: Barplot, frequency of top 10 car brands available

Figure 3 and Figure 4 show us the distribution of car brands which are most frequently offered and shared within Turo's system across all the states. The most repeated brands are BMW, Toyota, Mercedez-Benz, Ford, Chevrolet, Nissan, etc. As a result, we can deduce that those cars have higher demand amongst the customers. This information could be useful for individuals looking to purchase a car to rent out on Turo, as it could inform their decision-making regarding which brands may be more profitable to invest in.

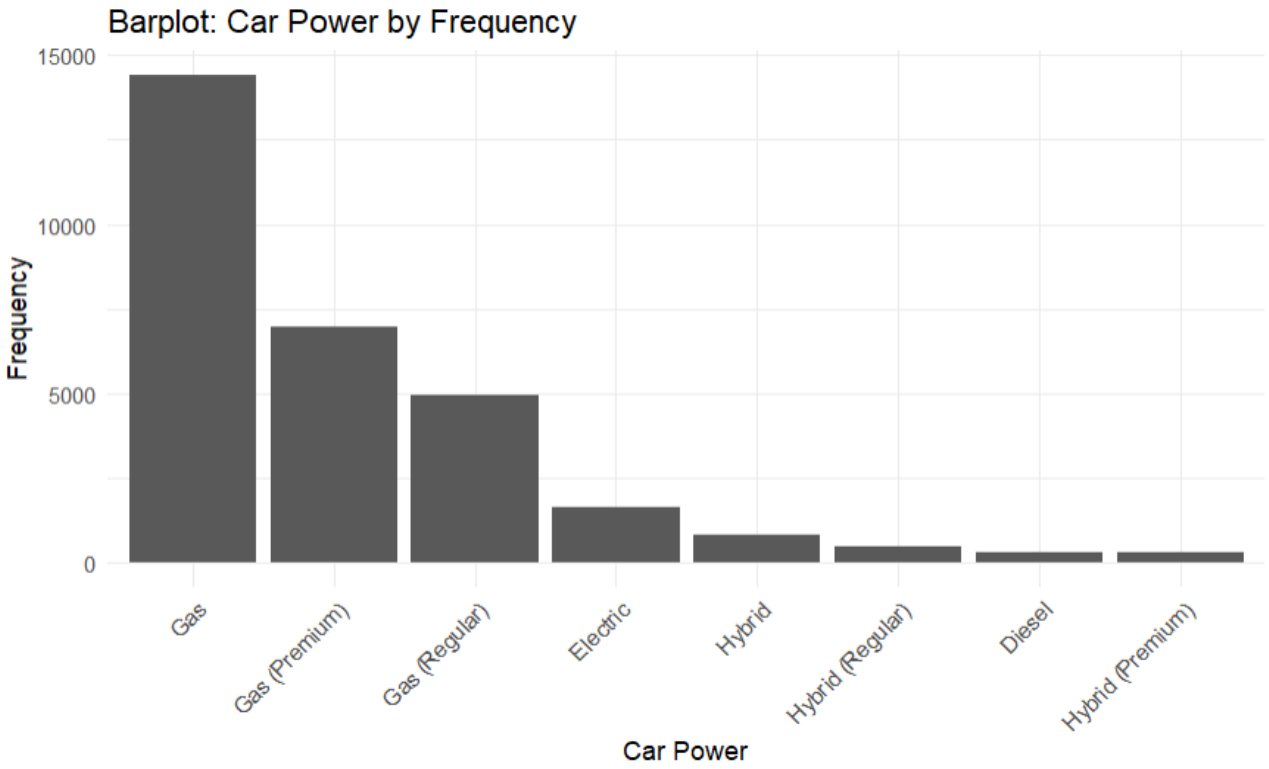

Figure 5: Barplot, distribution of fuel type for the available cars

From Figure 5 above we see that the majority of the offered cars in Turo are fueled only by gas, and more hosts use premium gas than regular. We see that electric, hybrid, and diesel vehicles are significantly less common, indicating that Turo's offerings are still dominated by traditional fuel types. As demand for eco-friendly transportation grows, it is expected that Turo will adapt to include more alternative fuel vehicles.

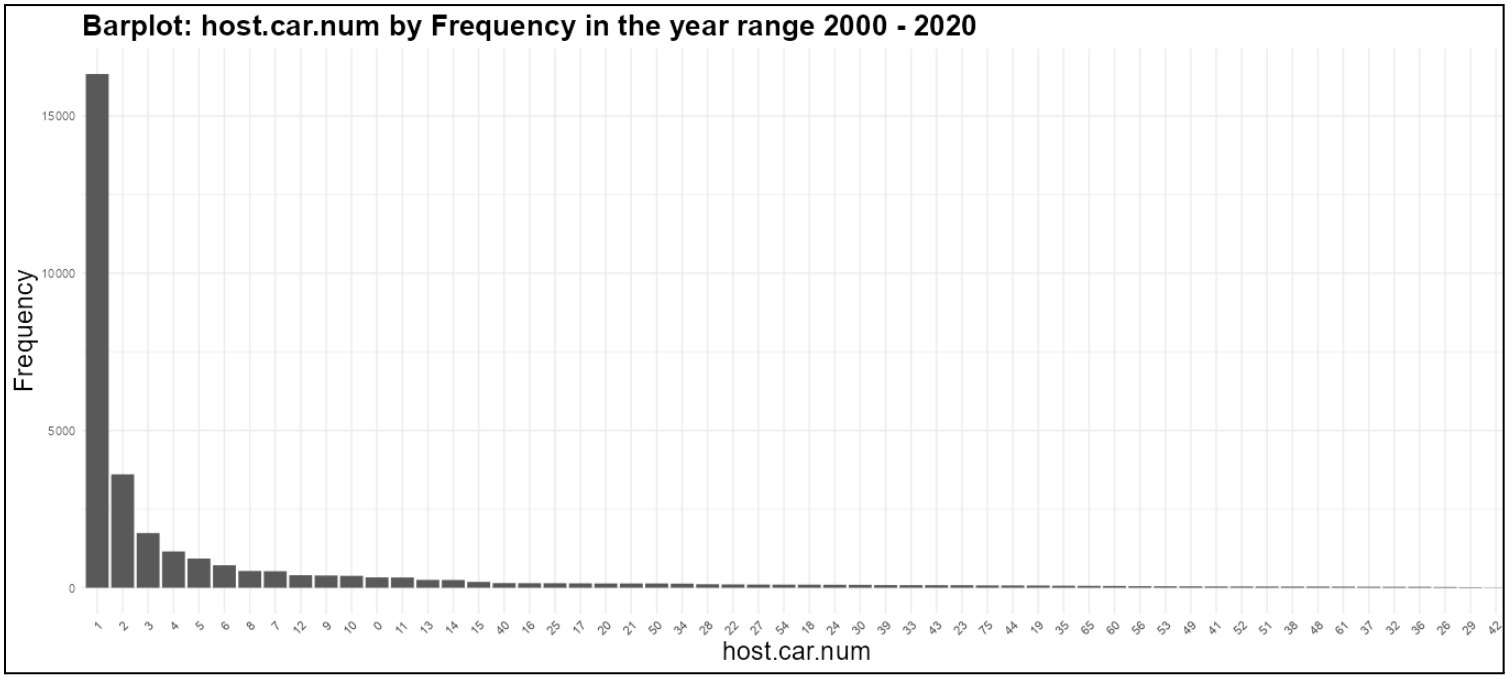

Figure 6: Barplot, frequency of hosts according to the number of cars they have

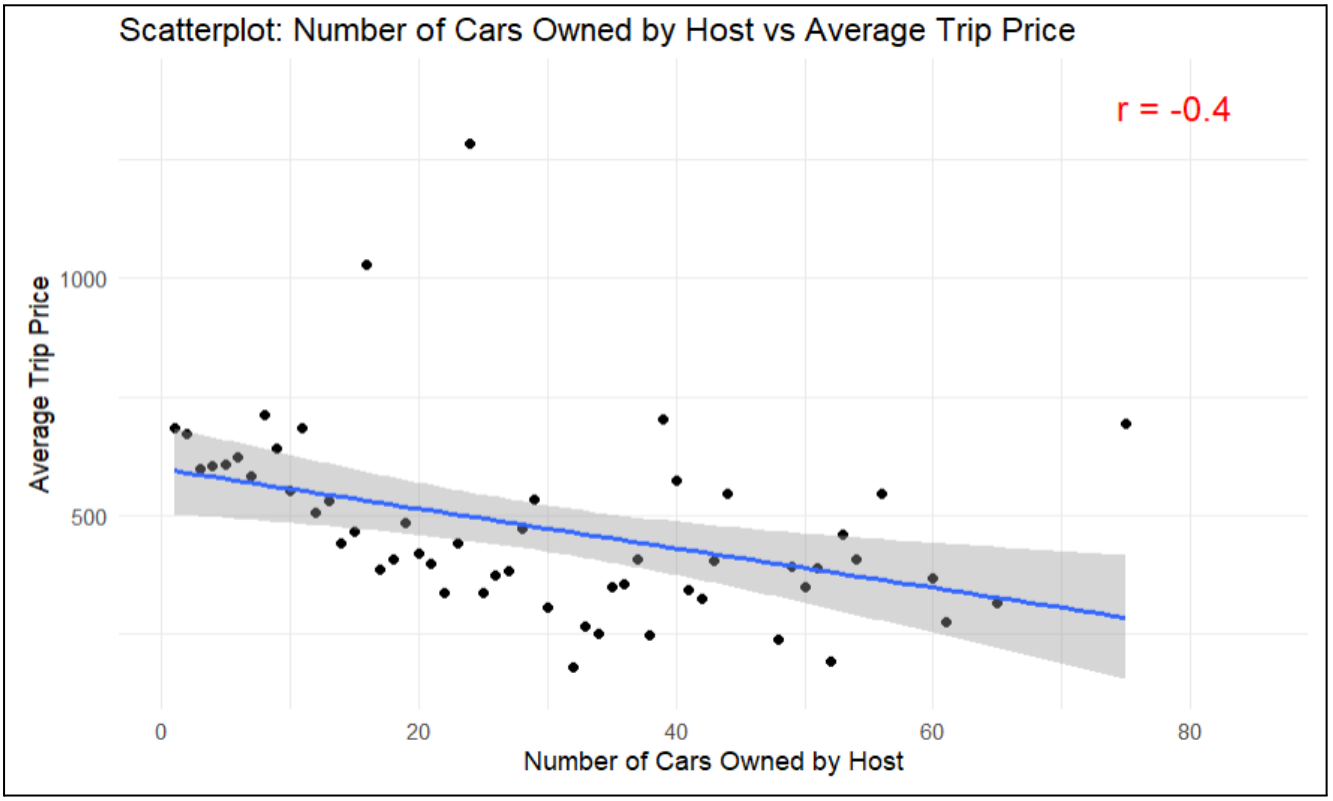

Figure 7: Scatterplot, average trip price vs number of cars owned by a host

Figure 6 displays the range of cars provided by each Turo host. It's clear that most hosts list just one car, while fewer offer more extensive collections. This implies that the majority of Turo hosts are ordinary people renting their cars to boost their income. However,

some hosts have multiple cars, which might suggest small businesses or specialized rental companies using Turo to reach more customers. These hosts may see Turo as a flexible, affordable alternative to traditional rentals and have adjusted their approach. Turo could also use this data to focus on and reward hosts with several cars, as they might bring more earnings to the platform. Overall, Figure 6 offers helpful information about Turo's car rental market, which can guide both hosts and renters in their decision-making.

Figure 7 shows that hosts with more cars on Turo usually charge lower average trip prices. The negative relationship between the host's car count and average trip price (r = -0.4) might be because hosts with fewer cars aim to make more money, so they set higher prices. In contrast, hosts with many cars may be more open to adjusting their rates and offering lower prices to attract more renters. This insight can help hosts competitively price their listings, as they can consider their car inventory and modify their pricing strategy accordingly.

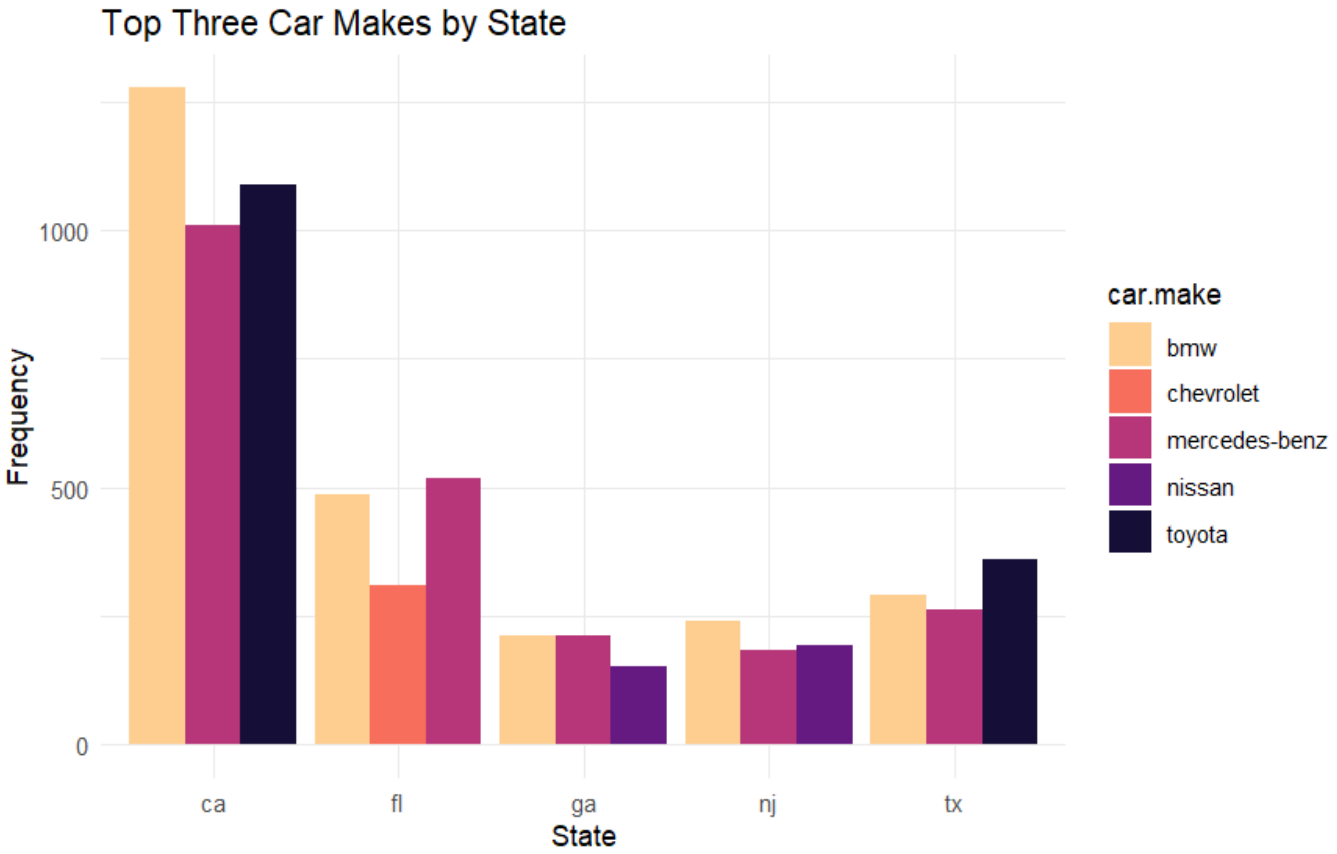

Figure 8: Barplot, the top three most offered car brands in the top five states

From the plot above, we can see that in all states, BMW is dominating, followed by Mercedes in most of the states, and in the 3rd place, it's either Nissan or Toyota.

The plot displaying the distribution of car brands across different states is a useful tool for both hosts and newcomers in the car-sharing business. Hosts with multiple cars can make informed decisions regarding what type of cars to list in each state to maximize their rental income by identifying the most frequently offered and shared car brands in each state. For instance, if BMW is the dominating brand in a particular state, hosts can consider offering BMW cars in the given state to attract more renters.

In addition, newcomers to the car-sharing business can use this information to determine which car brand to invest in for their business. For example, if Toyota is a popular brand in a state, a newcomer may opt to invest in a Toyota car to increase their chances of success. Understanding the distribution of car brands across different states can help hosts and newcomers make data-driven decisions, leading to better outcomes in the car-sharing business.

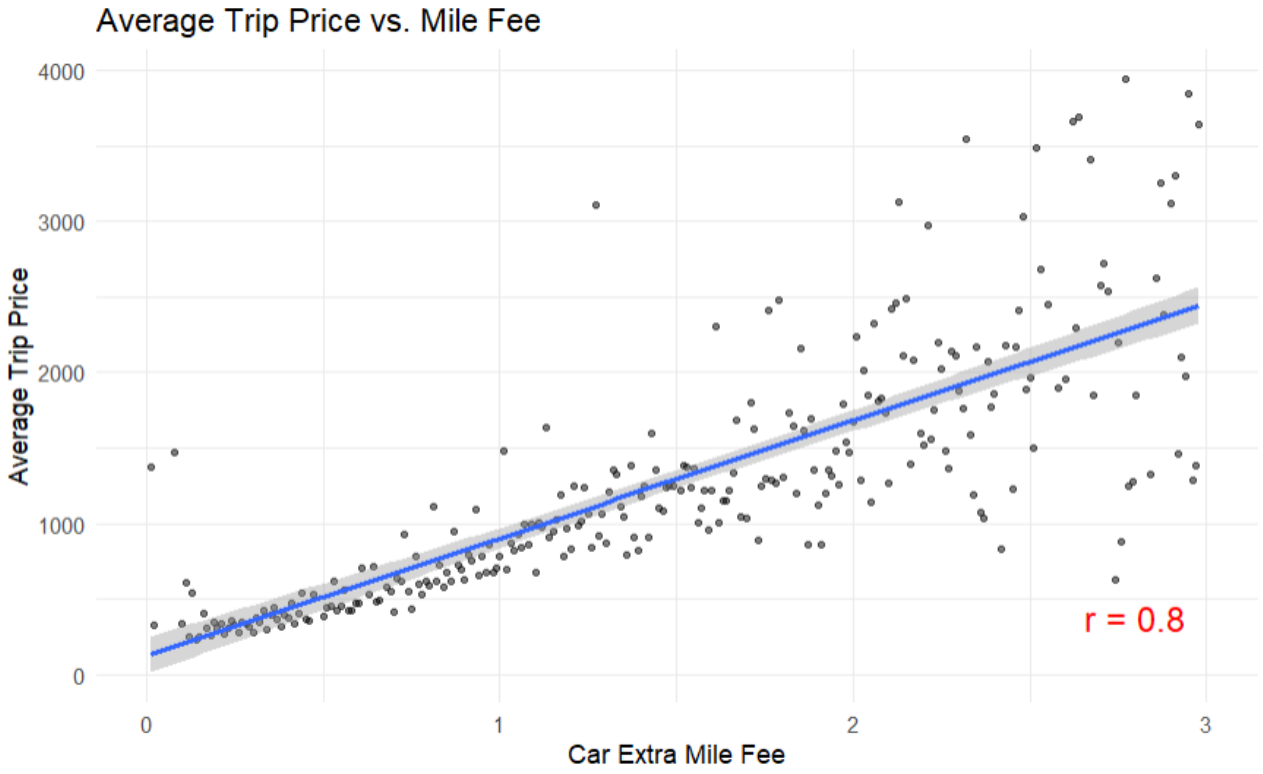

Figure 9: Scatterplot, of the average trip price for each extra mile fee

It is important to note that the plot shows a clear positive correlation between the average trip price and the extra mile fee. This relationship is logical as expensive cars typically require a higher fee for each additional mile traveled.

Extra car services

Hypothesis 1: Cars with more extra services available have higher trip prices.

Let's initially understand the data by visually representing the distribution of extra services offered by the hosts in the dataset.

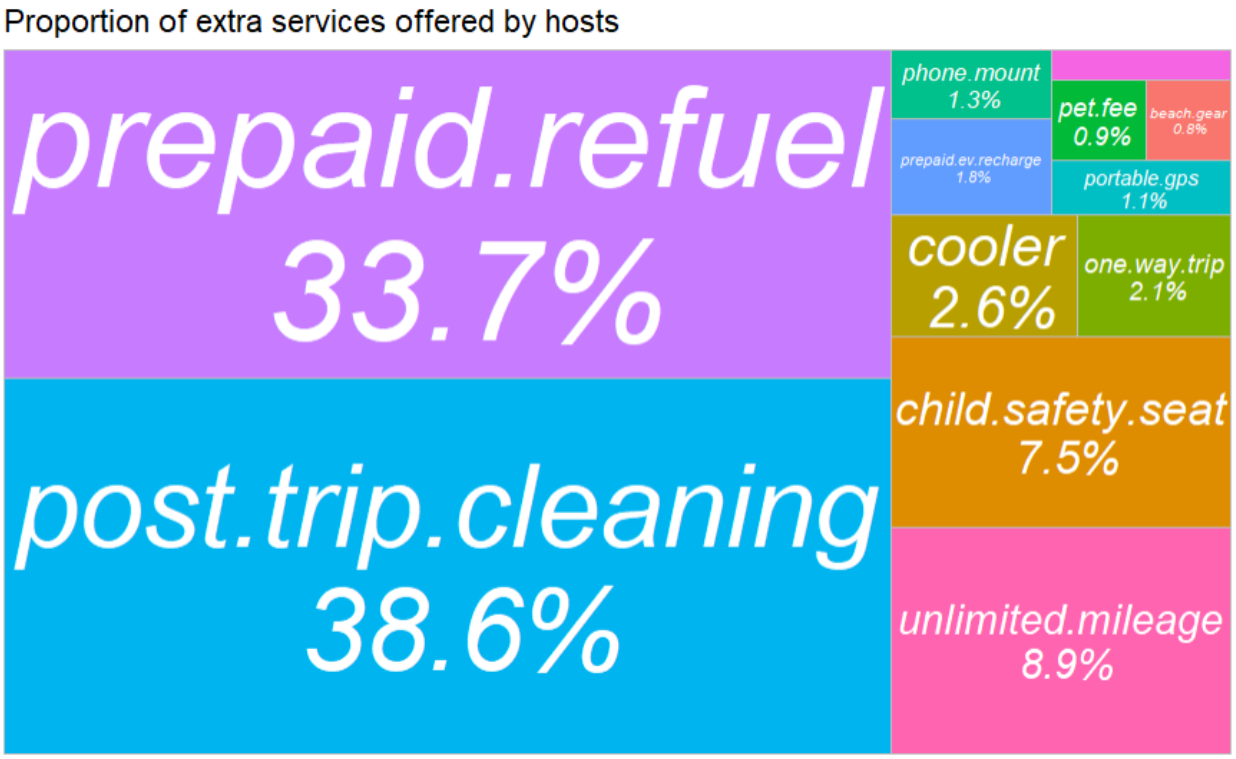

Figure 10: Treemap, extra services offered by the hosts

From the plot above, we can deduce that the majority of the cars on Turo.com offer the extra service of post-trip cleaning (38.6%), making it the most prevalent extra feature. The second most prevalent feature is prepaid refueling (33.7%). These two services are significantly more widespread compared to other features, primarily due to a key reason. Unlike materialistic features that depend on the car's specifications or accessories, post-trip cleaning, and prepaid refueling are services that any car requires and can provide, regardless of its make, model or year. These services are solely based on the host's preference, which allows them the flexibility to cater to the diverse needs and expectations of their clients.

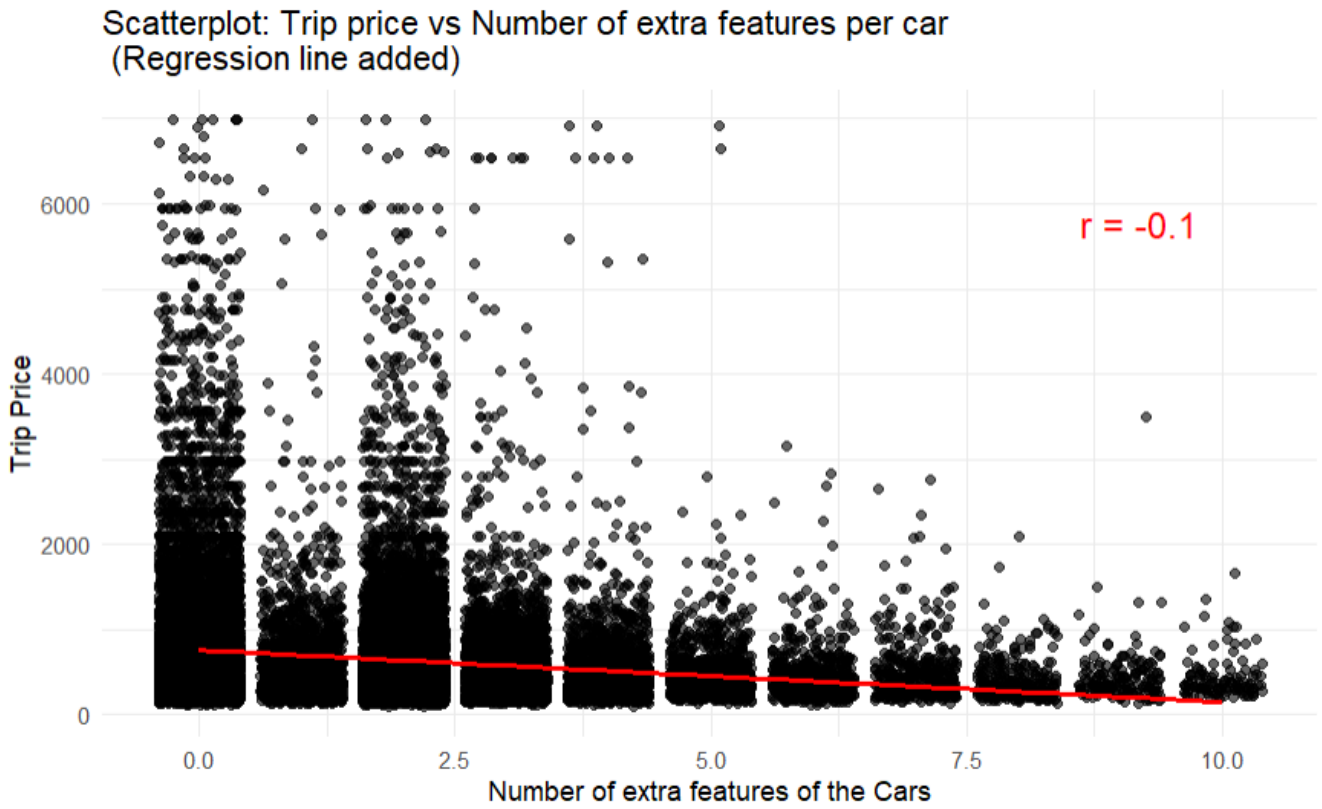

Figure 11: Scatterplot, of the average trip price for each extra mile fee

Our analysis of car rental prices by hosts indicates that there is a slight negative correlation between the number of extra features offered by hosts and the rental price of their cars. However, this relationship is not statistically significant, which means that offering more features may not necessarily increase the rental price of the car. In fact, their low correlation must be analyzed further, as there may be several contributing factors.

One potential explanation for the low correlation could be that the overall coefficients of the individual extra features are quite small, making their combined impact on the rental price minimal. In other words, each extra feature's effect on the price might be too minor to create a significant correlation when considering all the features together.

Another possible scenario could be that there are both large negative and positive coefficients for different extra features, which, when combined, diminish the overall correlation value. This might indicate that some features lead to a higher rental price, while others result in a lower price. A more granular analysis of the individual features' effects on the rental price would be necessary to better understand this relationship and provide actionable insights for hosts looking to optimize their offerings.

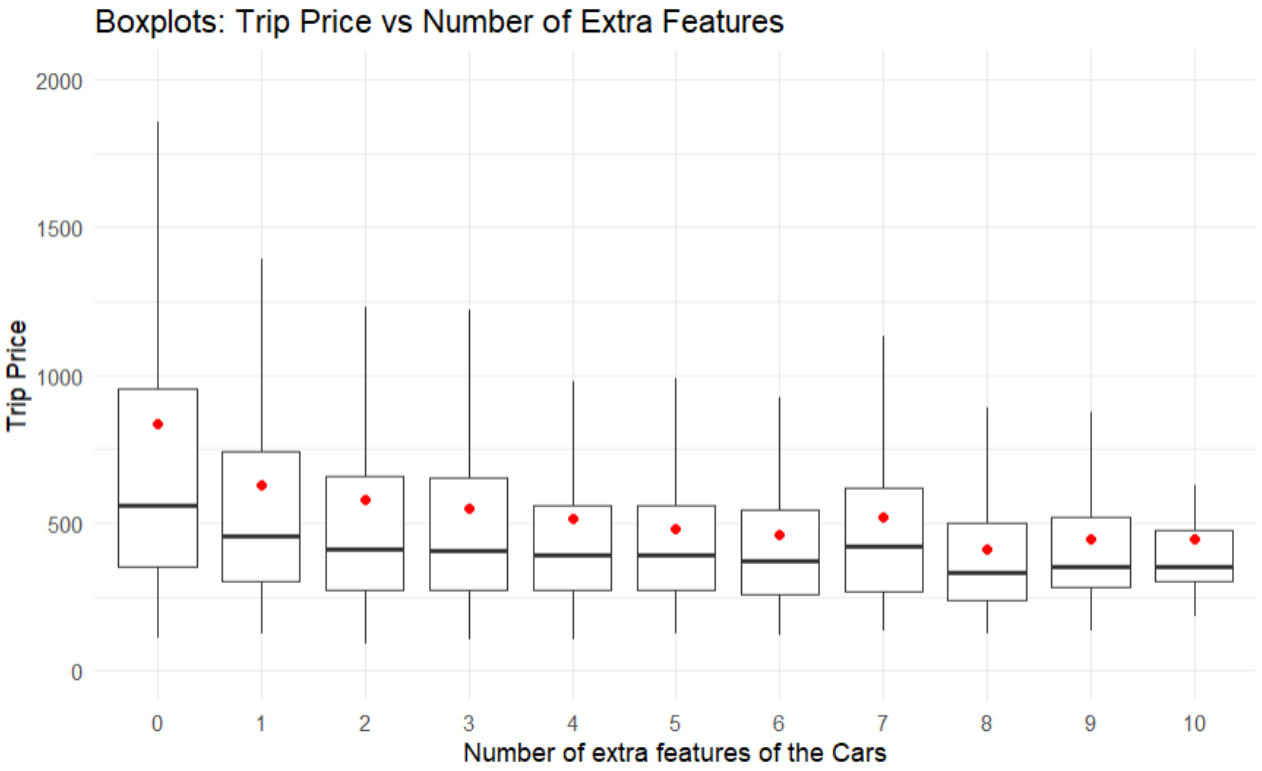

Figure 12: Boxplot, of trip price vs extra features count (mean value is presented with red dots)

Furthermore, our boxplots show that as the number of extra features offered by hosts increases, the rental price range of the cars becomes narrower. In other words, cars with more features tend to have similar rental prices, while cars with fewer features have more variability in their rental prices. This suggests that having many features may not be as valuable as we might think, and renters may not be willing to pay significantly more for them.

To understand deeper how each feature affects the car rental price we have implemented a linear regression model and identified the coefficients of the features, which helps us to discuss their importance. The model predicts the car rental price using the extra car features as an input variable.

feature <chr>	coefficient <dbl>
car.extra.beach.gearTRUE	-35.75781
car.extra.child.safety.seatTRUE	-76.67795
car.extra.coolerTRUE	-76.64842
car.extra.one.way.tripTRUE	62.85052
car.extra.pet.feeTRUE	-122.62017
car.extra.phone.mountTRUE	-19.94604
car.extra.portable.gpsTRUE	-39.66284
car.extra.post.trip.cleaningTRUE	-205.60267
car.extra.prepaid.ev.rechargeTRUE	237.86702
car.extra.prepaid.refuelTRUE	-52.09033

Table 1. Coefficients of regression model

With all other variables held unchanged, each coefficient in this table displays the expected change in the trip cost for a rental car when the relevant feature is present (TRUE) as opposed to when it is absent (FALSE). Positive coefficients show that a feature raises the trip costs, whereas negative coefficients show that a feature reduces the trip costs.

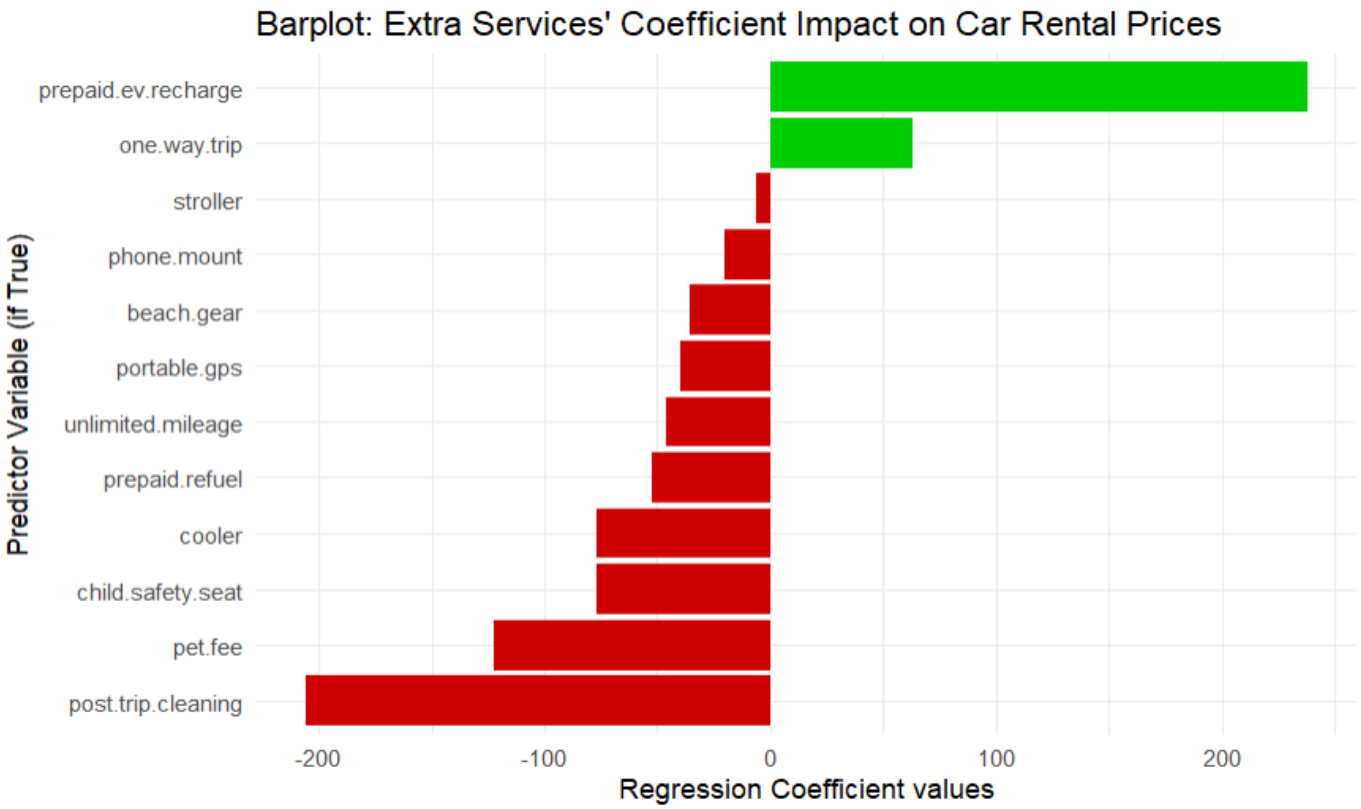

Figure 13: Barplot, the effect of each extra feature on the trip price

As we can see in the plot above, the majority of the extra features affect negatively on the trip price, and only two of them (one-way trip & prepaid recharge) affect positively. Finally, it's worth noting that cars with a high number of features offered by hosts are less common, which further supports the idea that additional features may not be as desirable as we might expect. Therefore, hosts should carefully consider the value of offering extra features in their rental cars, as it may not necessarily result in higher rental prices or increased demand.

Finally, we **reject** our **hypothesis** that cars with more extra features have higher trip prices as we know how different features affect prices.

Starting a Business in Turo

Hypothesis 2:
Which car model is the best choice for the fastest profitability in California?

We have chosen to use the data from the state of California as it has the highest number of offered cars in Turo, which allows us to conduct a more detailed analysis of car ownership trends and potential influencing factors.

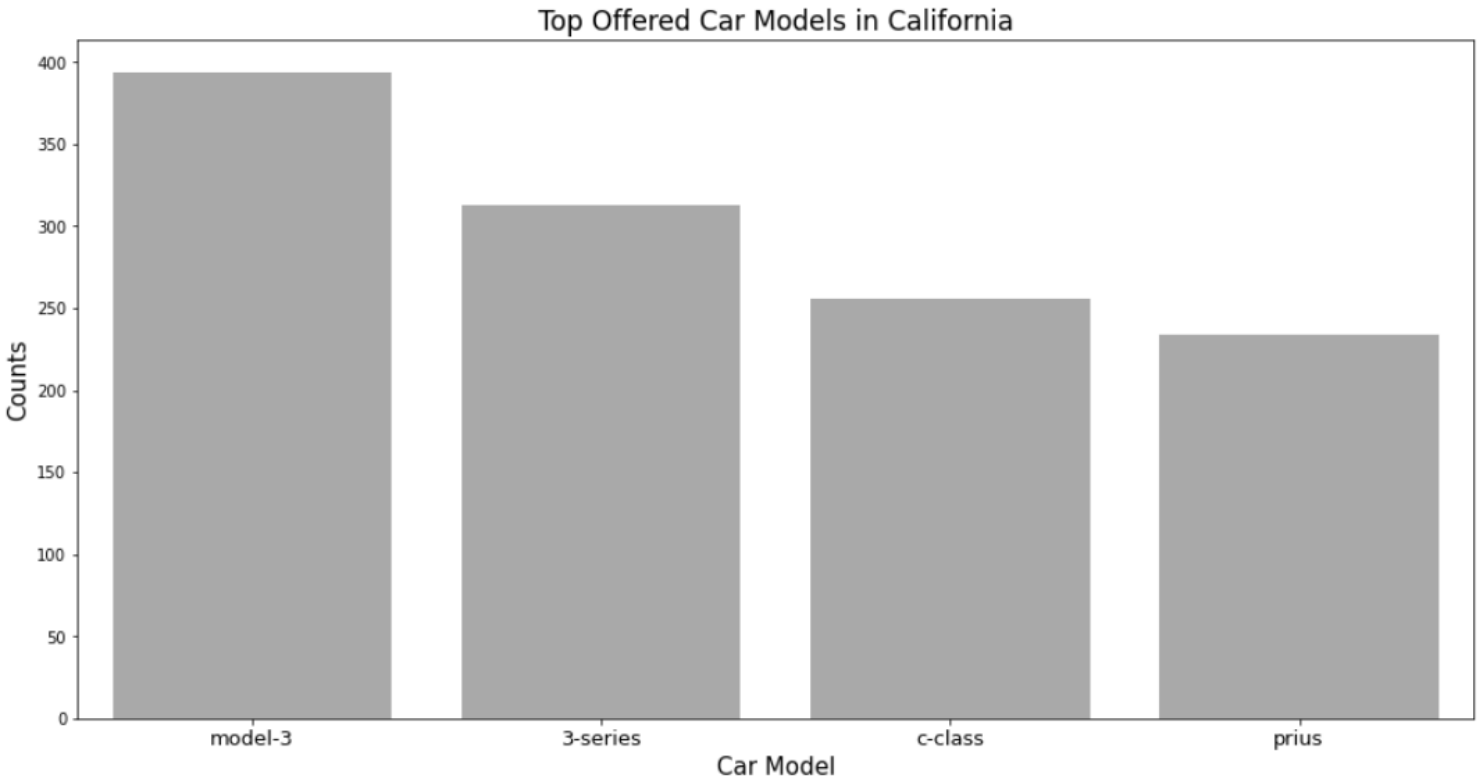

Figure 14: Barplot, The top 5 car models in California

From Figure 14 it can be inferred that the top prevalent car brand models on Turo's website particularly in California state, are the Tesla model-3, BMW 3-series, Mercedes-Benz C-class and Toyota Prius. Consequently, our analysis will mainly focus on these top four car models, taking into account factors such as insurance, maintenance, repair costs, taxes, fees, financing, and depreciation.

Toyota Prius

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Tax Credit	0	0	0	0	0	0
Insurance	823	852	882	912	944	4413
Maintenance	70	523	428	1737	1817	4575
Repairs	0	0	87	209	305	601
Taxes & Fees	1779	73	73	73	73	2071
Financing	2680	2180	1631	1033	377	7901
Depreciation	4178	2086	1977	2318	2194	12753

Tesla Model 3

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Tax Credit	-2000	0	0	0	0	-2000
Insurance	1380	1428	1478	1530	1584	7400
Maintenance	122	171	151	1509	157	2110
Repairs	0	0	0	782	1198	1980
Taxes & Fees	2267	93	93	93	93	2639
Financing	3417	2779	2080	1317	481	10074
Depreciation	12849	2742	2240	2511	2196	22538

Mercedes C Class

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Tax Credit	0	0	0	0	0	0
Insurance	1051	1088	1126	1165	1206	5636
Maintenance	107	727	599	2876	2486	6795
Repairs	0	0	0	907	1391	2298
Taxes & Fees	2879	93	93	93	93	3251
Financing	4379	3560	2666	1687	617	12909
Depreciation	12838	4953	4047	4536	3965	30339

BMW series 3

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Tax Credit	0	0	0	0	0	0
Insurance	997	1027	1058	1089	1122	5293
Maintenance	537	3592	1257	1458	4024	10868
Repairs	849	1304	1401	1502	1611	6667
Taxes & Fees	1605	93	93	93	93	1977
Financing	2377	1932	1447	916	335	7007
Depreciation	5170	4308	2906	2270	1831	16485

Table 2: Expenses for each car model in 5 year period

Firstly, all the values in the table are in USD. In order to estimate the most probable total costs for each model, our group has considered taking the expenses of insurance, maintenance, repairs, taxes, financing, and depreciation for the next 5 years.

The US government has provided various incentives to boost the sales of electric cars, mainly Tesla and this explains why there is an expected 2000 USD tax credit for Tesla Model 3. The Mercedes C Class stands out as a

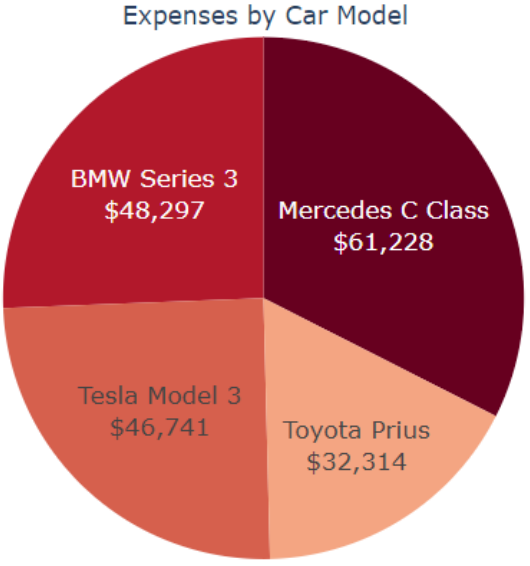

Figure 15: Total expenses (5 years) for car models

notably expensive total cost ($61,228 USD), followed by BMW Series 3, which comes in about thirteen thousand dollars cheaper yet still quite expensive at $48,297 USD. The Tesla Model 3 follows in third place with an estimated cost of approximately $46,741 USD. Next comes the Toyota Prius, with a total projected expense of just about $32,314 USD.

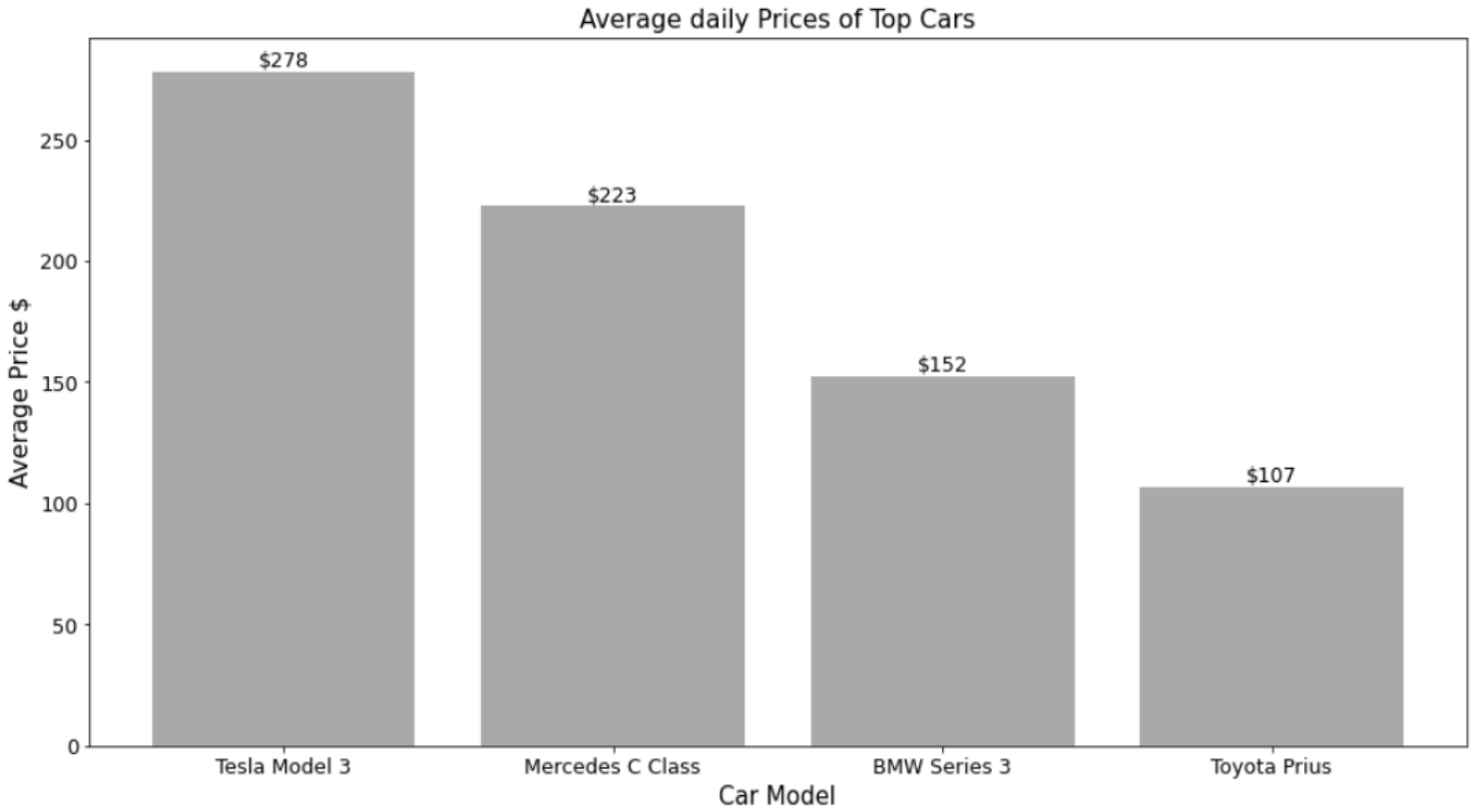

Figure 16: Barplot, Average car rental prices of the models

According to Figure 16, the Tesla Model 3 has the highest average daily rental price in California at $278. Mercedes C Class is in the second place with $223. Oddly, BMW Series 3 has a significantly lower average daily rental price in California, compared with the previous two, thus it comes in third place with $152. Ultimately Toyota Prius is in fourth place with $107. Thus, the Tesla Model 3's has a premium position in the California rental market of Turo.

Cars	Mean Price	Car Prices	Expenses	Car prices with expenses	Days Required to Break Even	Fuel expenses
Mercedes C Class	222.536232	50000	61228	111228	500	13857
BMW Series 3	152.175214	45000	48297	93297	613	11547
Toyota Prius	106.615385	28000	32314	60314	566	5674
Tesla Model 3	278.116751	52000	46741	98741	355	2331

Table 3: Summary of each car model and their refund duration

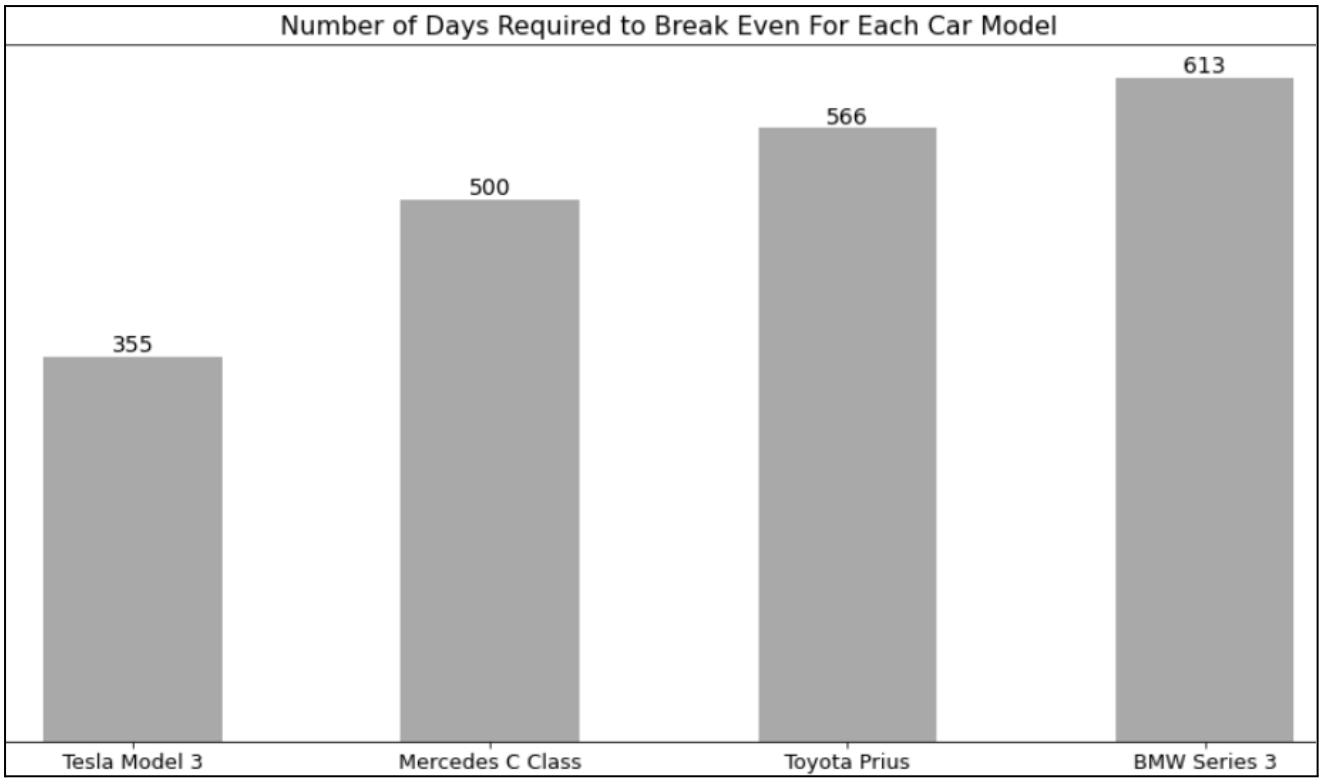

Figure 16: Barplot, Days requires for cars to break even, after which they become profitable

Based on our analysis, it appears that the Tesla Model 3 requires the least amount of days to break even with expenses, with only 355 days required. This is followed by the Toyota Prius with 566 days, the BMW Series 3 with 613 days, and the Mercedes C Class with 500 days.

Our study revealed that the Tesla Model 3 emerges as the most cost-effective option for purchase. After accounting for taxes and fees, owners can recoup their investment by renting the vehicle for 355 daily trips within 5 years, including additional annual charges - insurance, maintenance, repairs, taxes, and fees. Moreover, due to not having trip frequency data of the cars, we are not able to give a real estimate on how much time will it actually take to cover the 355 daily trips.

Recommendations

Key Takeaways for Turo based on our Analysis:

- **Recommendation based on the results of Hypothesis 1**: Turo should prioritize promoting significant extra features, such as one-way trips and prepaid refueling, as they positively affect trip prices. Additionally, Turo should educate hosts on extra feature selection by providing resources or webinars that would help them understand which features attract renters and increase the rental prices.
- **Recommendation based on the results of Hypothesis 2**: To attract more hosts, Turo should focus on informing potential hosts about the benefits of their platform. They should also provide resources and advice for launching car-sharing businesses. As our second hypothesis revealed that the Tesla Model 3 is currently the top choice for California, offering similar state-specific guidance is important for ensuring hosts' success and developing Turo's business.
- Another recommendation for Turo in the United States would be to focus on expanding and having a business presence in more than 19 states. It would also be beneficial to enforce the less active states such as Maryland, the District of Columbia, Virginia, Minnesota, Pennsylvania, Massachusetts, Washington, etc.
- As we have found out that most Turo car hosts in the USA offer mainly one car, our group also suggests Turo to convince those hosts to offer more cars on Turo's website. Turo can accomplish this by periodically offering bonuses and privileges to those hosts.
- To better address the growing demand for sustainable transportation, Turo should encourage hosts to offer electric or hybrid cars by providing incentives such as reduced fees. Moreover, partnering with electric vehicle charging networks can offer discounted rates or special offers for Turo hosts and renters, making the platform

more convenient. Lastly, improving the website's UI to highlight eco-friendly options in search results will increase its visibility and adoption among renters.

References

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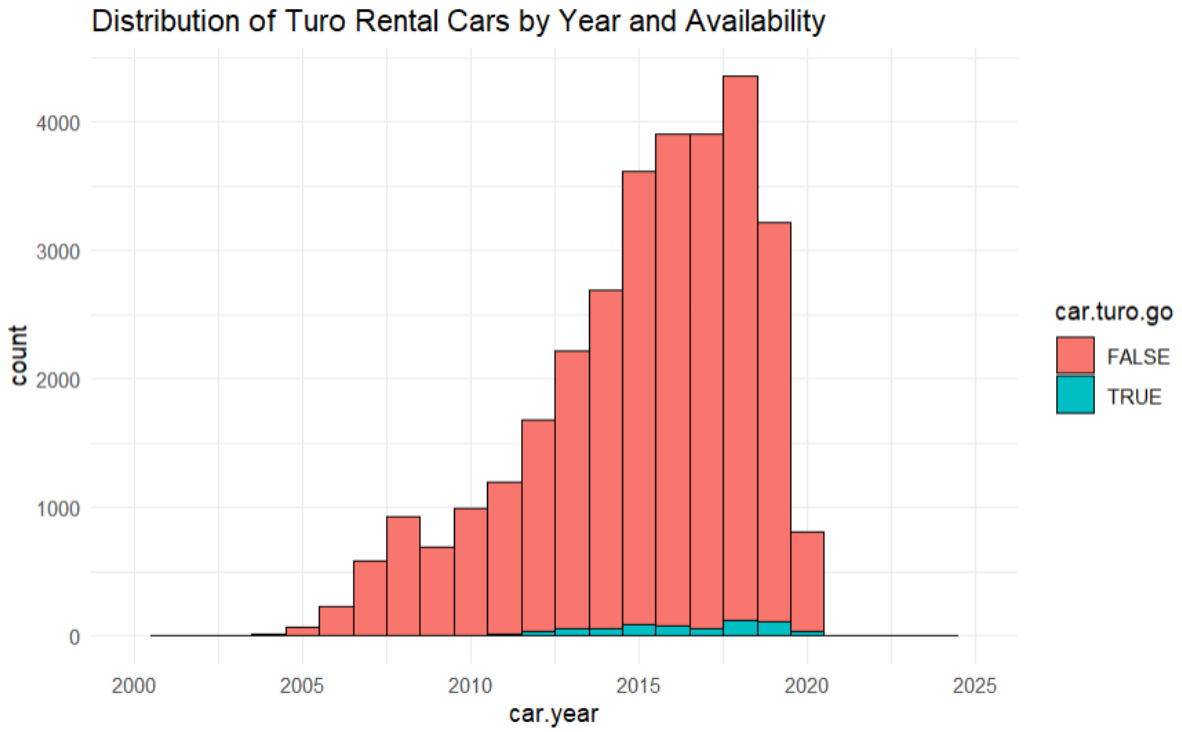
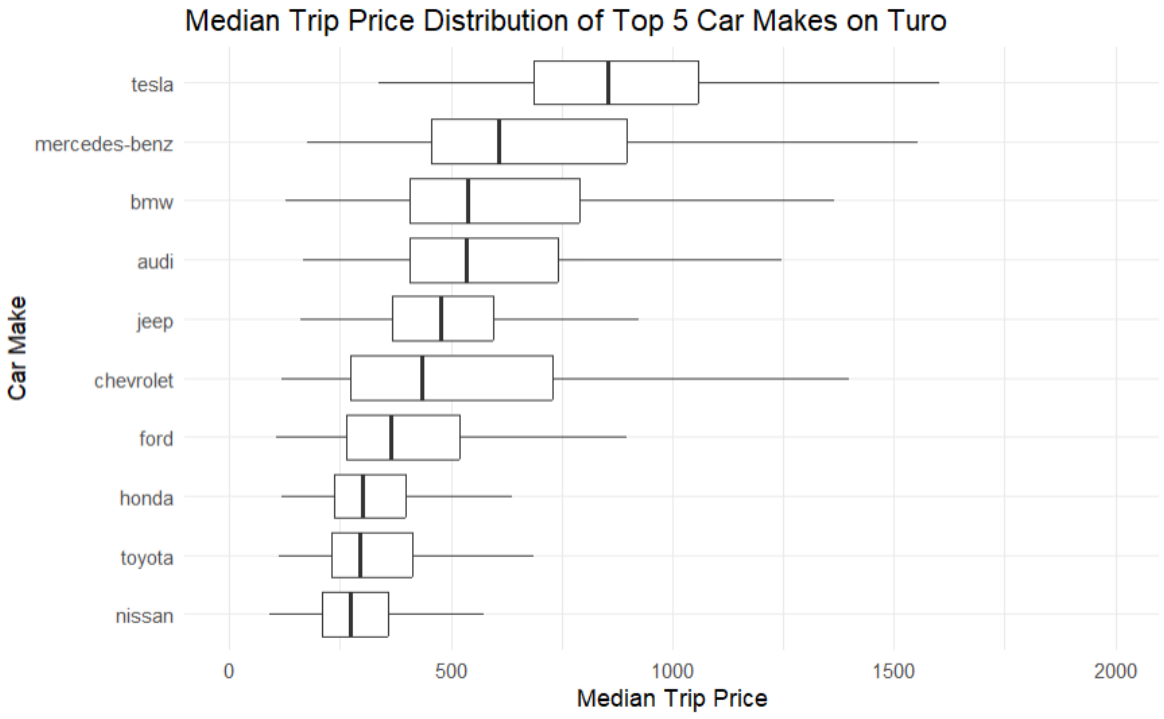
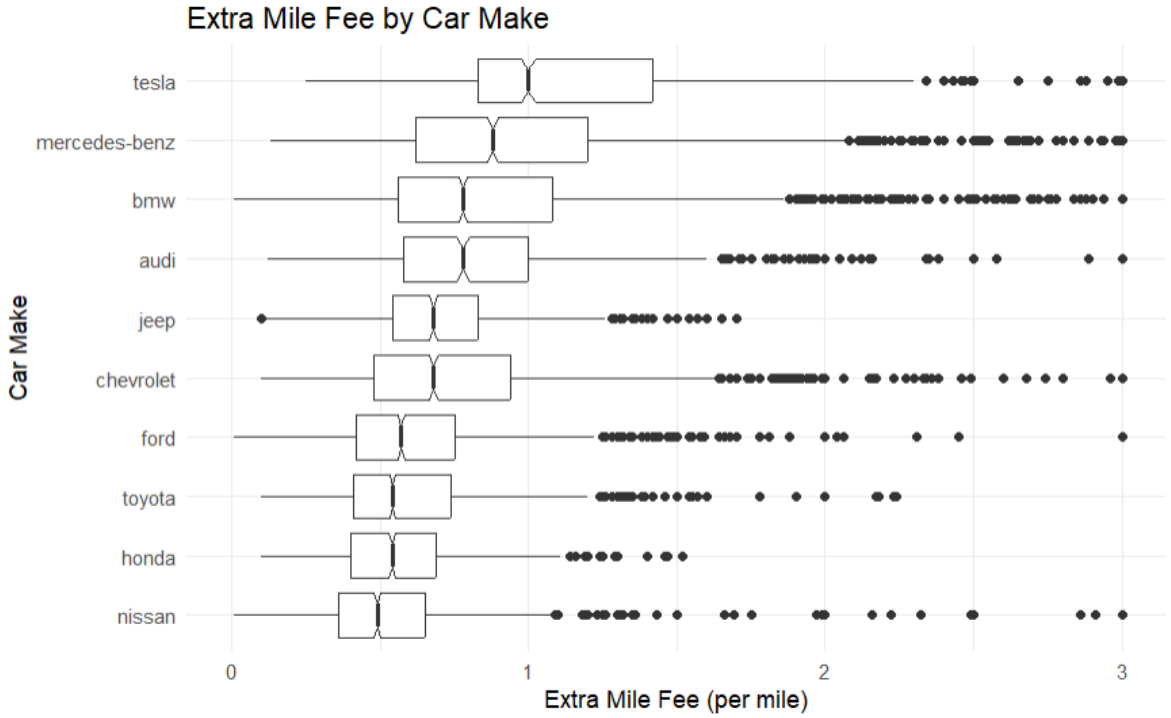
2. Cervero, R., & Tsai, Y. (2004). City CarShare in San Francisco, California: Second-Year Travel Demand and Car Ownership Impacts. *Transportation Research Record, 1887(1), 117–127.* https://doi.org/10.3141/1887-14

Appendix

Some other plots that can be interesting to observe.






Extra Mile Fee by Car Make
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mercedes-benz
bmw
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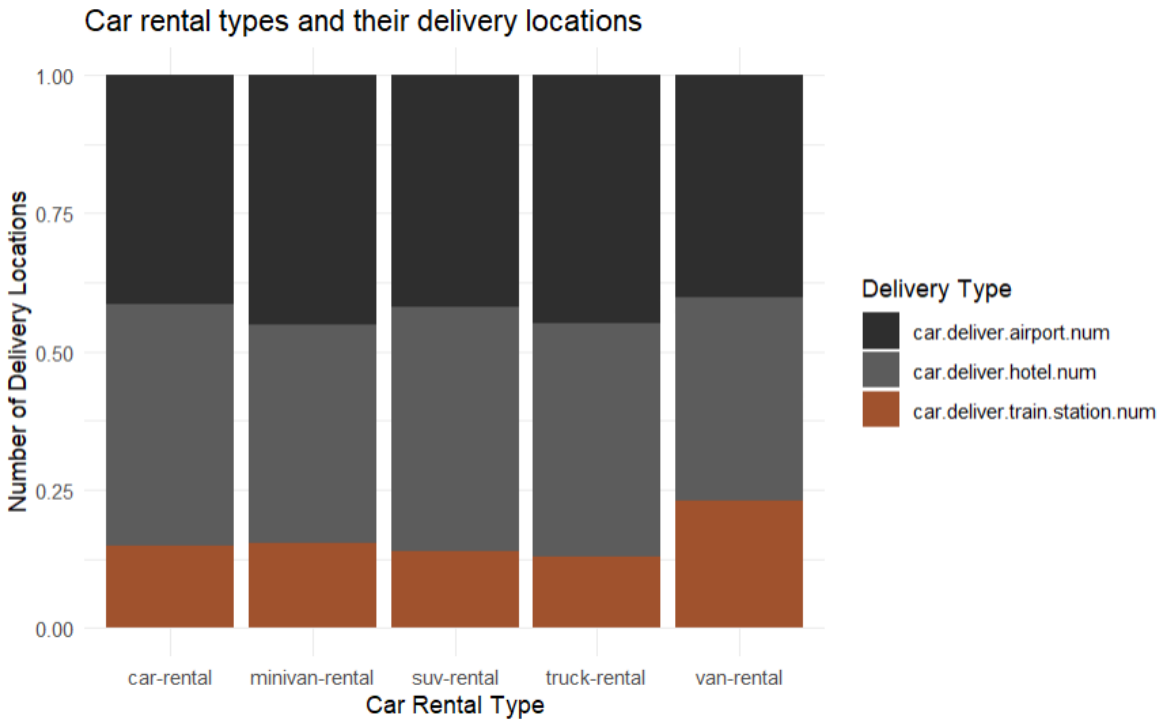
Extra Mile Fee (per mile)


Car rental types and their delivery locations
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Number of Delivery Locations
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minivan-rental
suv-rental
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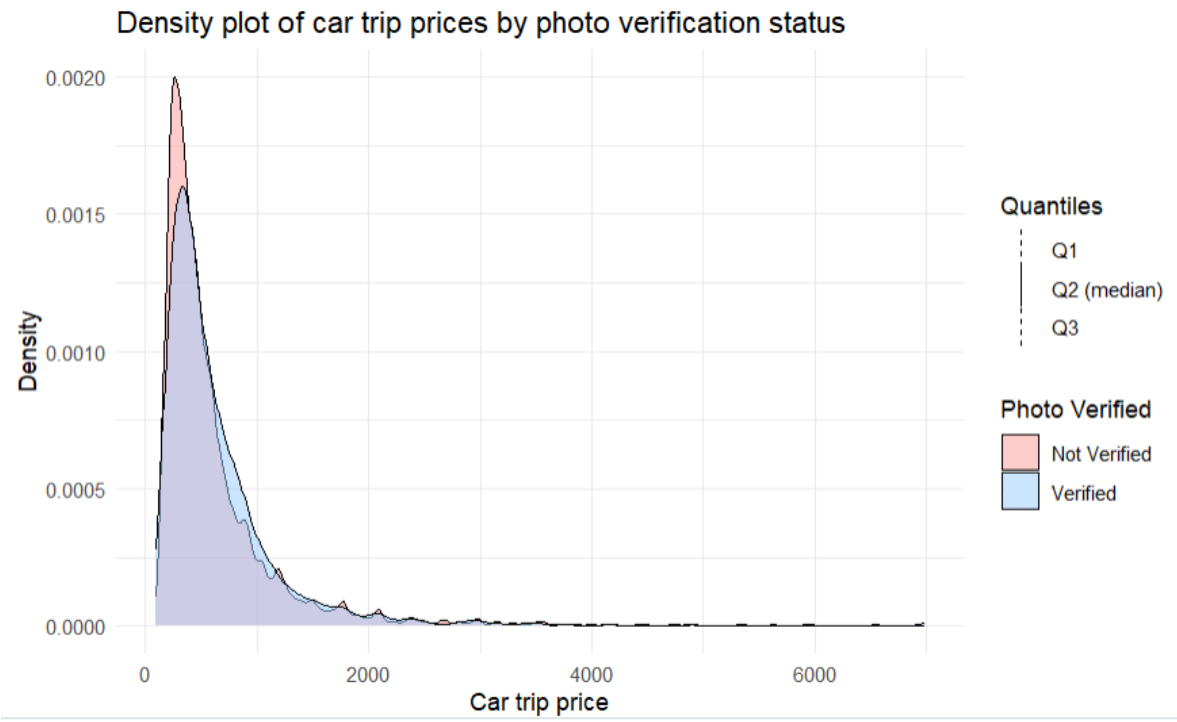
car.deliver.hotel.num
car.deliver.train.station.num


Density plot of car trip prices by photo verification status
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Density
0
2000
4000
6000
Car trip price
Quantiles
Q1
Q2 (median)
Q3
Photo Verified
Not Verified
Verified


Car Trip Prices vs Extra Mile Fees
6000
4000
2000
0
Car Trip Price
0
1
2
3
Car Extra Mile Fee
r = -0.4

Acknowledgments

We want to thank our lecturer, Gevorg Atanesyan, for scraping and providing us with the dataset, which was crucial to our analysis. His support and feedback helped us understand the requirements and gain deeper insights into the Turo car service market.