Analysis of environmental impacts of tourists' ridesharing transport

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Introduction

This paper investigates ridesharing of tourists from one destination to the other examining data from ridesharing provider over the years 2016-2022. Focusing mostly on ridesharing trips to nearby airports and tourist destinations we investigate how shared mobility of tourists contributes to reducing environmental impact by saving distance traveled and mitigating CO2 emissions by lowering vehicle kilometers traveled (VKT).

Literature Review

Tourist travel is a major contributor to environmental problems (Høyer, 2000). Tourist transportation, among others, contributes to energy use and CO_2 emissions (IEA, 2011; Dubois, Peeters, Ceron, & Gössling, 2011). Increased environmental consciousness (Han, Meng, & Kim, 2017), environmental regulations (Al-Mulali, Fereidouni & Mohammed, 2015) and price sensitivity (Sobrino & Monzon, 2014) contributed towards aspirations of transport companies to its environmental footprint. Change in tourist demand for sustainable transportation and the suppliers' incentives, together with sustainability driven European policies, caused new transport modes with lower costs and carbon emissions to emerge. This has been enabled by recent developments in information technologies that gave rise to the collaborative consumption allowing to join travelers on the same route in a single vehicle (Botsman & Rogers, 2010).

When investigating the transportation research mostly focuses on the modes of transportation (Girod, van Vuuren, & de Vries, 2013), increasing the use of public transport (Hensher, 2017) and investigates sustainable tourist mobility (Cohen, Higham, Gössling, Peeters, & Eijgelaar, 2016; Hall, 2013; Høyer, 2000). Although ridesharing is one of the increasingly available modes of transportation, it mostly focuses on the urban mobility in order to reduce traffic (Hensher, 2017). This mode of transportation is changing travelers' preferences in mobility and these changes in behavior are linked to the discussion about carbon emissions (Dubois et al., 2011). More climate friendly travel behavior is modeled to reduce CO_2 emissions (Girod, van Vuuren, & de Vries, 2013); ridesharing is a form of carbon reduction behavior, especially with higher load factor or occupancy rate.

Methodology

Data is collected from a fast-growing Slovenian transportation provider of shared rides for up to eight travelers that operates on short routes, usually to the nearby airports (100–500 kilometers). The company developed their own platform with a complex algorithm, similar to those of low-cost airlines. Shared rides that offer also door-to-door pickup are especially attractive to the price sensitive and environmentally conscious travelers that substituted own car transportation for ridesharing. The dataset includes all passengers who booked a shared ride from 2016 to 2022, which accounts to 1,944,227 passengers and 295,881 rides. For each ride data on occupancy rate, distance traveled as well as route are available for journey.

Firstly, we examine the routes over time and observe the increase in demand for ridesharing until 2020, when demand fell significantly. Furthermore, we study the demand of different segments of tourists based on their countries of origin.

Secondly, we determine how ridesharing minimizes VKT and mitigates the environmental impact of airport travel, especially in areas with inadequate transport infrastructure. Based on the occupancy rate and the distance travelled, we assess the distance saved. The distance saved is calculated by comparing the sum of the individual distances of all travelers in the shared ride and the distance travelled. This means, of course, that more distance is saved with a higher occupancy or load factor.

Thirdly, we calculate the total CO_2 emissions generated by the distances saved. We assume that the second-best alternative for the tourist would be a car (with 120g/km CO_2 emissions). Then we compare the CO_2 emissions of a van (with 250 g/km CO_2 emissions) for the distance travelled with the CO_2 emissions saved by ridesharing.

Results

Most tourists who use ridesharing come from Slovenia, followed by Italians and tourists from the UK. In total, 43 million kilometers were traveled with ridesharing, about 8 million annually before 2020 and 2 million in 2020, and almost 6 in 2022. On average, the trips were 150 km long, but with a high standard deviation, with the shortest distance being 1 kilometer and the longest almost 1,100 kilometers. The average the occupancy rate was 0.5, but was heavily skewed to the right.

We find that due to high occupancy of shared rides, 172 million km of distance traveled was saved in the observed period, ranging from 7.2 million km in 2020 to 38 million km in 2019. Due to the high occupancy rate, with the distribution of occupancy heavily skewed to the right, the average distance saved was 580 km per trip. We estimate that on average 51 kg of CO_2 emissions are avoided per trip and a total of 15 million kg of CO_2 emissions for the observed years.

Conclusion and Discussion

This study shows the significant environmental benefits of ridesharing in reducing vehicle kilometers traveled (VKT) and CO_2 emissions associated with tourist travel, especially for airport transfers and other short to medium distance trips. Ridesharing shows to lower kilometers traveled and CO_2 emissions, emphasizing its role as a more sustainable alternative to the use of the private car.

Shared mobility contributes to environmental sustainability by increasing vehicle occupancy and reducing the number of individual car trips. This highlights its potential to address the environmental challenges posed by tourist transportation, particularly in areas with inadequate public transport. Covid-19 has presented a major challenge for such services, therefore optimizing system efficiency and fostering consistent user adoption is crucial for a more sustainable future.

The more effective integration of ridesharing into regional transportation systems and policies, especially in areas with limited infrastructure, should be a focus of further research. Ridesharing is not only successful in reducing emissions, but can also define the model of collaborative consumption based on sustainable travel.

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