Impacts of Ridesharing in Urban Society

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

The use of ridesharing services, such as Uber and Lyft, has increased dramatically in the last decade, especially in urban areas with denser populations. As the number of people living in urban areas increases, the usage of on-demand ridesharing services is also likely to increase (Simonetto, A. et al, 2019). In the United States, every major city and the majority of suburban areas have extensive ridesharing networks. As ridesharing services grow in popularity, it is becoming more apparent that there are issues and concerns surrounding ridesharing's effect on urban areas. If the current issues and concerns surrounding ridesharing are not addressed soon they could pose more problems in the future as ridesharing continues to scale. This research paper will analyze the impacts of ridesharing services, focusing on ridesharing's effect on traffic congestion, public transportation, and greenhouse gas emissions in urban areas. To accomplish this, I will utilize Frank Geels' Multi-level Perspective (MLP) to examine the history of ridesharing services and how they have come to popularity. I will then utilize actor-network theory (ANT) to analyze the current and future impacts of ridesharing. Finally, I will provide insights and evaluate solutions for the impacts of ridesharing, and I will address uncertainties that lead to relevant counter arguments.

Introduction to the Multi-Level Perspective

The multi-level perspective (MLP) is a framework that focuses on conceptualizing transitions in sociotechnical systems. "The MLP views transitions as non-linear processes that results from the interplay of developments at three analytical levels: niches (the locus for radical innovations), socio-technical regimes (the locus of established practices and associated rules that stabilize existing systems), and an exogenous sociotechnical landscape" (Geels, 2011). Niches are protected spaces that support emerging innovations which deviate from existing regimes. The sociotechnical landscape is the wider context, which influences and is influenced by niche and regime dynamics over long periods of time. It captures the technical and material backdrop of society: demographic trends, political ideologies, societal values, consumer demand, and macro-economic patterns (Hausknost, 2019). Regimes are sets of mainstream structures and activities that support existing sociotechnical systems. Pressure from the landscape level can lead to destabilization in regimes, which allows niches that opportunity to modify or overtake regimes.

The MLP will be used to analyze the growth and installed dominance of ridesharing services in urban society. The urban transportation industry experienced a sociotechnical transition when ridesharing services, which were initially a niche innovation, transferred into a dominant position in society. Analyzing ridesharing services as a newly formed regime using Geels' MLP will emphasize connection and tensions between the actors within and around the regime which led to the ridesharing regime taking a dominant position. The MLP should also allow for insights about what forms of disruption would be needed from the landscape and the niche levels to disrupt or change the current regime.

Introduction to Actor-network theory

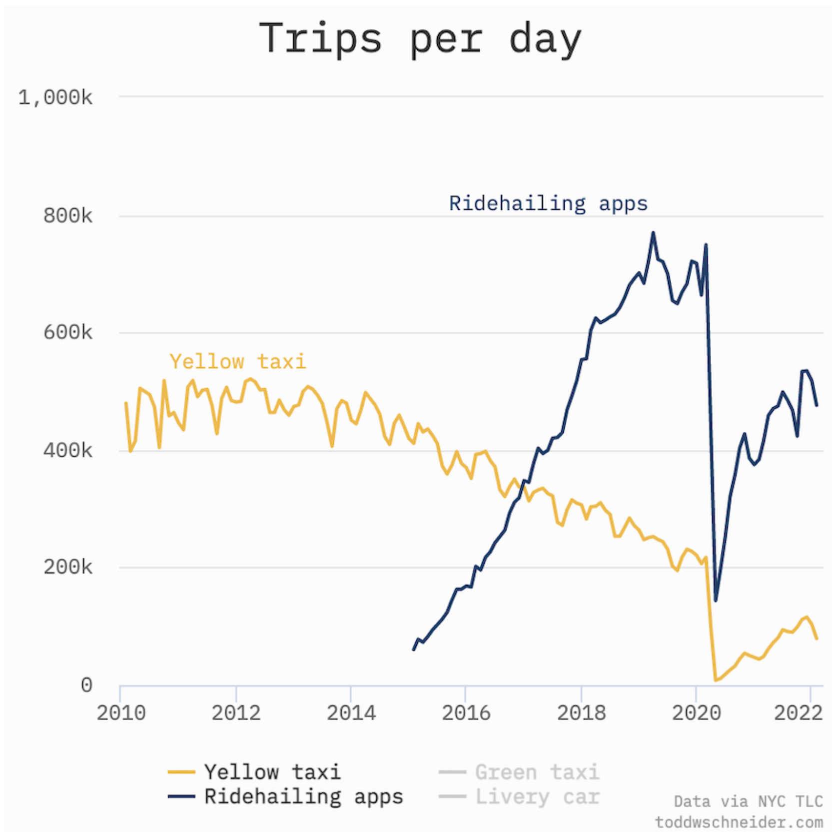
Actor-network theory (ANT) is a highly flexible approach that can be used to analyze technical systems by focusing on the interconnectivity of all of the actors in a system and how they affect each other. A key principle of ANT is that all technical and social parts of a given system form a network where each part actively interacts with another and must be equally considered when evaluating the overall system (Latour, 2005). ANT allows for the facilitation of a broader perspective and deeper understanding which is especially useful because it leads to strong problem definition, and ideally stronger problem solving.

ANT will be used as the main framework for analysis as the purpose of this paper is to analyze the impacts of ridesharing and provide insight on how the future of this technology could shape urban areas. ANT fits well as a framework to analyze current and future impacts of ridesharing because the technical and social aspects behind ridesharing are deeply intertwined. Ridesharing and its effects on urban areas has involved both technical and social elements, so according to ANT it would be necessary to evaluate each element equally to examine the overall system. By using ANT we can analyze ridesharing as a node in a complex and ever-changing network of human and non-human actors. This allows us to easily identify the methods by which the actors in the network directly and indirectly influence each other.

The Rise of the Ridesharing Regime

Ridesharing is an agreement between a passenger and a driver where the driver offers a one-time ride in their private vehicle for a fee. This is in contrast to taxi services where the taxi cab is usually owned and maintained by the company the driver is employed by. Ridesharing has an advantage over taxi services because it "cuts costs of middlemen needed to bring consumers and drivers together" (Pepić, 2018). This often translates to lower fares for the passenger. Transport network companies (TNCs), such as Uber and Lyft, provide platforms for ridesharing which have replaced traditional taxi services as the dominant form of on-demand transportation in most urban areas. In New York City, ridesharing services had the majority of the market share by 2017. Figure 1 illustrates the trips completed per day for both taxis and ridesharing services, with ridesharing services being used for around 350,000 trips per day in 2017 (NYC Taxi and Limousine Commission, 2022).

Figure 1



This figure shows the steady decline in the number of trips per day with yellow taxis and a rapid increase in trips per day with ridesharing. The trips per day for ridesharing surpassed taxis at the beginning of 2017 (Schneider, 2022).

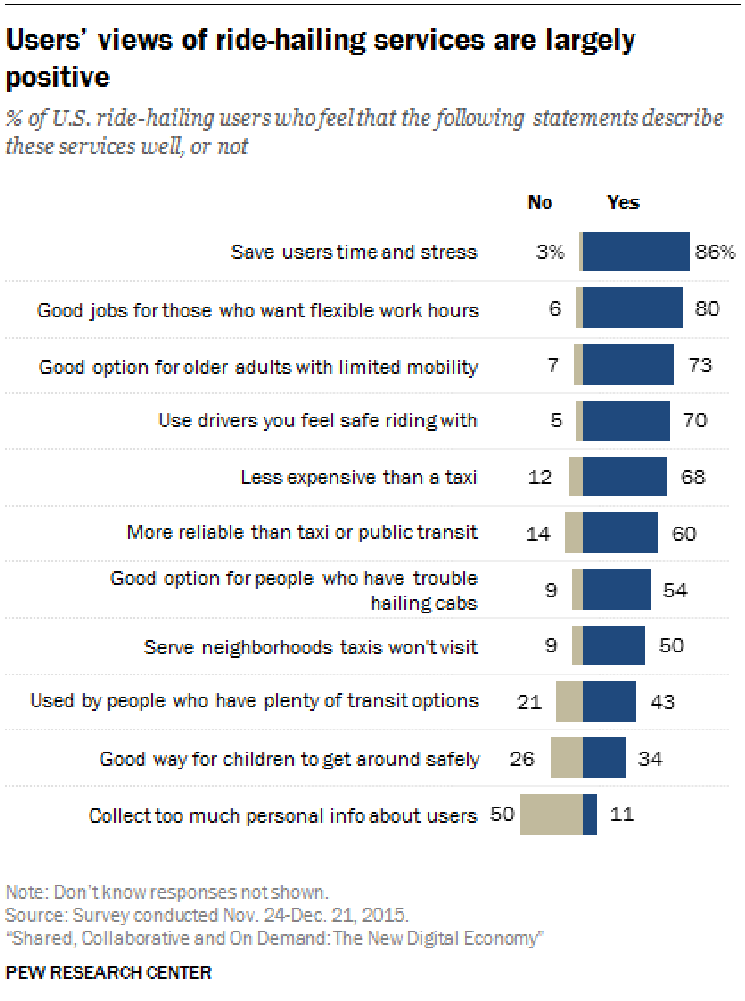
Using the MLP as a framework for analysis, it is clear that taxi cabs were the uncontested regime of on-demand transportation before the introduction of ridesharing. MLP says that a regime can only be modified or replaced when there is some form of change in the overarching landscape that causes destabilization within the regime. In the case of the destabilization of the taxi regime, the shift in the landscape can be attributed to two main factors: the wide adoption of smartphones and internet availability in cities. By 2014, three years before ridesharing overtook taxis in New York, 53.6% of the population in the United States owned a smartphone. By the time ridesharing became the dominant regime in around the year 2017, 67.3% of the population owned a smartphone (O'Dea, 2021). With a large portion of the population owning smartphones and with reliable 3G and 4G LTE cellular network coverage in metropolitan areas, ridesharing apps provided by TNCs became a much more efficient and cost effective option for on-demand transportation. Smith states, "Unlike traditional taxi cabs that require customers to hail a car on the street or call into a central dispatch, these apps allow users to request a ride using their smartphone, track the progress of their driver in real-time, and offer an integrated payment and ratings system" (p.3). The change in landscape allowed for what was previously a niche innovation to displace the dominant regime.

Impact Analysis

The increased usage of ridesharing services is linked to unintended negative effects on the transportation networks and the environment within urban communities. The basis of ANT is that in order to understand the technological systems as a whole we must consider each actor in the network equally. Because of the complex nature of the impact of ridesharing technology, ANT will be used to examine these concerns from the perspective of a larger network of actors, where each actor interacts with others in the network. The human actors that will be examined are the riders and drivers who use ridesharing services as well as the officials within TNCs, such as Uber and Lyft, who provide the platform for ridesharing. The non-human actors that will be examined consist of the traffic on city streets and public transportation.

Focusing first on human actors in this network, the riders who request and pay for rides on apps like Uber and Lyft are key actors. While ridesharing has been adopted in some rural areas, its usage is most heavily concentrated in urban areas with the main user demographic being college graduates and individuals with an annual household income of $75,000 or more, and 77% of frequent riders feel that ridesharing is more reliable than other forms of transportation such as a taxi or public transportation (Smith, 2016). Ridesharing has had a mostly positive impact on the users of the service. As seen in the survey from Figure 2, the majority of users report that ridesharing saves them time, stress, and money. The survey also reports that users believe ridesharing provides more accessibility to people with limited mobility and those who cannot easily hail a cab. While riders might see ridesharing as more reliable and useful, it is important to note that most people do not rely on ridesharing as their only means of transportation. To support this, 64% of regular riders report that they own a personal vehicle, and from that group, 63% report that they drive that vehicle on at least a weekly basis (Smith, 2016). Despite most riders not relying heavily on ridesharing as their only means of transportation, most likely due to the monetary cost, the number of regular riders has surged.

Figure 2



This figure shows the user survey response pertaining to statements about ridesharing services. This survey shows that ridesharing is seen in a generally positive light by its users (Smith, 2016).

This surge in riders would not be able to utilize ridesharing without a matching surge in drivers. The number of unique drivers in New York City increased rapidly from 2014 to the end of 2019, following a similar pattern to the ridehailing trips per day in Figure 1. Unlike most traditional taxi services, apps like Uber and Lyft use an automated dispatch algorithm to pair riders to drivers. Though the exact proprietary algorithms used are not available to the public, based on general statements made by TNCs, it can be reasoned that a significant portion of the algorithm involves the distance between a given driver and the requesting rider (Uber, n.d.a). This means that drivers potentially benefit from remaining on the road in areas with high traffic and high population in order to increase their opportunity to be assigned a ride. This contributes to an occurrence called deadheading. Deadheading accounts for the driving a driver does when they are waiting for a request from a rider, and it also accounts for the miles needed to get to rider pickup points and from rider dropoff points. One study found that 40.8% of ridesharing miles are deadhead miles driven without a passenger in the car (Ward, 2021). These extra miles and the location that these extra miles are driven lead to greater greenhouse gas emission and higher traffic congestion, which will both be discussed later in this section. Though deadheading is not unique to ridesharing apps like Uber and Lyft, the steep competition between drivers as well as the struggle for drivers to maintain a steady income from these apps means deadheading is much more of a problem now than it was before with taxis.

There are quite a few different TNCs whose services operate in urban areas however Uber and Lyft dominate the market share in the United States. When these platforms were launched, both Uber and Lyft made claims using their services would be more environmentally friendly than driving a personal vehicle when it comes to greenhouse gas emissions. For example, Lyft’s transportation policy manager stated that “by using Lyft to share rides, passengers are helping to reduce the carbon footprint left by our country’s dominant mode of transportation – driving alone” (Galbraith, 2016). Despite this claim, ridesharing services have not been found to be more environmentally friendly than personal vehicles in most situations. One study found that greenhouse gas emissions from taking an Uber or Lyft are 20% higher than if you were to drive a personal vehicle (Ward, 2021). This can be most directly attributed to deadheading as described previously.

TNC officials also made early claims that their services would ease traffic congestion and decrease vehicle usage in urban areas. Studies have concluded that these claims of the benefits of these services do not hold. One study done on San Francisco reported that ridesharing has not had any positive impact on traffic congestion and has instead increased the number of traffic congestions by .9% and the duration of these congestions by 4.5% (Diao, 2021, p. 494). Even if relatively small, ridesharing has had an impact on traffic in urban areas. Thinking of traffic as an actor in the overall ridehsharing system, it can also be realized that traffic has had an impact on ridesharing. One of the ways most ridesharing services have responded to traffic congestion is by implementing and promoting their carpooling features. These features aim to improve efficiency by filling as many of the seats in an available car as possible (Lo, 2018). One MIT study suggests that carpooling features like UberPool and Lyft Line could decrease traffic in urban areas by as much as 75% (Conner-Simons, 2016). Carpooling on ridesharing services leads to a potential positive impact for riders who utilize it because of cheaper fares at the cost of a less predictable pre-trip experience and potential detours.

Public transportation is another actor that has been impacted by the advent of ridesharing in urban areas. Uber and Lyft have both stated that public transportation is foundational to any city and that its availability is important (Uber, n.d.b; Lyft, n.d.). A San Francisco study estimated that Uber and Lyft have contributed to a 12.7% decrease in public bus usage since 2010. The same study claimed that when ridesharing services are introduced to a city, the rail ridership can be expected to decrease by 1.3% annually, and the public bus ridership can be expected to decrease by 1.7% percent annually (Graehler Jr. 2019). If ridership continues to decrease as ridesharing grows, public transportation funding will decrease as well, and this could lead to less availability to people who depend on these services. With other independent studies with similar results and reaching the same conclusion, the future of public transportation could depend on that of ridesharing.

Potential Solutions

With the impact of ridesharing services on urban areas laid out, the question that needs to be answered is: What can be done to improve the situation? The majority of ridesharing's impact on traffic congestion and the environment stems from deadheading, so reducing the overall number of deadheading miles performed by drivers should help reduce these negative impacts. As for public transportation, the impacts of ridesharing are more direct because ridesharing competes with public transportation for riders. I will address potential solutions for ridesharings's effect of both deadheading and decreased public transportation ridership.

Deadheading miles, in the context of ridesharing, are miles driven between a dropoff point and the next pickup point. Some ridesharing apps have designated pickup points in certain cities. One way to address deadheading would be for more of these points to be strategically distributed and for their use to be strongly encouraged, especially in high traffic areas. This encouragement could come from lower fares for riders who utilize the feature. Another way to address deadheading would be to encourage more carpooling trips where separate riders share the same ride. Again, a trip with a lower fare would encourage the use of this feature. The efficiency of carpool features would also be aided by multiple riders meeting at the same designated pickup point which would reduce the distance a driver would have to travel to pick up all riders.

As mentioned previously, ridesharing has a very direct impact on public transportation because of the natural competition for riders. Uber and Lyft have attempted to mitigate their impact by proposing and forming partnerships with public transit agencies such as discounting rides to public transit stations (NYPTA, n.d.). TNCs can also aid public transportation by allowing the integration of public transportation services directly into the ridesharing platform. Uber and Lyft both offer this to public transit agencies with the claim that their services can expand the reach of public transportation and increase ridership (Uber, n.d.b; Lyft, n.d.). These types of partnerships must be supported and expanded because they provide a balance between on-demand ridesharing and public transportation that has the potential to benefit both services.

Uncertainties and Counter-Arguments

The future impacts of ridesharing are unpredictable because there are many unknowns about the future business models, scalability, and public demand of ridesharing services. Ridesharing has been established as a dominant regime, and the MLP would highlight that ridesharing cannot be replaced or altered without destablishion from the contextual landscape. Though it is unlikely that ridesharing will be completely replaced by a new regime, there is a strong chance that it will have to change dramatically in the future due to a changed economic landscape.

A solution to deadheading miles, as discussed in the previous section, was to lower the fares for carpooling rides and use designated pickup points, but this might not be a reasonable solution for TNCs. At present, the largest uncertainty behind the ridesharing industry is whether or not these services are financially sustainable as they are. Despite apparent success, Uber and Lyft have continued to lose billions of dollars for almost every year since their creation. Both companies reported a net loss of a combined 10.75 billion dollars in 2019 and a combined 8.53 billion dollars in 2020 (Uber, 2021; Lyft 2021). Since both TNCs struggle to reach profitability, it is not likely that they will intentionally lower their bottom line by lowering fares.

Conclusion

Ridesharing services like Uber and Lyft have become the dominant form of on-demand transportation in urban society. Ridesharing services have grown and evolved as a part of a sociotechnical network of human and nonhuman actors. These services have provided many benefits to the people who utilize the technology for transportation and as a source of income, but these benefits have come at the unexpected cost of more city traffic, increased greenhouse gas emissions, and decreased public transportation ridership. It appears that ridesharing will remain a popular form of transportation and will continue to scale, so actions must be taken to mitigate the negative impacts of ridesharing on the other actors in the sociotechnical network.

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