Coopetition and Profit Sharing for Ride-sharing Platforms

Introduction

On-demand ride-hailing platforms totally changed the way people commute and travel for short distances. Within the online ride-hailing market, a recent trend emerged on several platforms: ride-sharing or carpooling services. Several ride-hailing platforms offer an option which allows passengers heading in the same direction to be matched to the same vehicle and share their ride. In such a service, riders cannot select the people they are sharing with but instead an algorithm will match several riders to the same vehicle. For example, in NYC, one can find at least three such services: uberPOOL, Lyft Line, and Via. One of the main arguments for sharing a ride is the low price paid by the rider.

In response to this recent market trend of on-demand ride-sharing platforms, taxi companies started to also offer on-demand services via mobile platforms to better fit in today’s economy. For example, in several cities, taxi rides can now be directly ordered from a smartphone application and the payment (including the tip) can either be completed via the application or in person. One such platform based in the U.S. is Curb. On their website, one can read: “Curb is the #1 taxi app in the US that connects you to fast, convenient and safe rides in 65 cities (50,000 Cabs – 100,000 Drivers).”

In the last two years, several partnerships between ride-hailing platforms have emerged. One such example is the partnership between Curb and Via in NYC. Via offers an affordable fare for riders who are willing to carpool, whereas Curb offers a private taxi ride while charging the meter price plus an additional fixed fee per trip. One can definitely view these two platforms as competitors. Yet, they decided to collaborate and engage in a unique partnership. More precisely, on June 6, 2017, both platforms started to offer a joint service through a profit sharing contract, under which Curb and Via each earn a certain portion of the net profit from the joint service. This type of partnerships is sometimes referred to as coopetition, a term coined to describe cooperative competition. The new joint service introduced by Curb and Via in NYC allows users to book a shared taxi from either platform. For example, when a user requests a ride through the Via smartphone application, s/he may be offered to ride with a nearby available taxi (this option is called Shared Taxi). Then, the rider can either accept the Shared Taxi or decline by requesting a regular Via ride. Shared Taxi fares are calculated using the meter price and paid directly to the

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driver. If the matching algorithm finds another rider heading in the same direction, the two riders will carpool and save 40% on any shared portion of the trip. Finally, the rider can pay (and tip) the taxi driver directly through either online platform.

The recent partnership between Curb and Via in NYC is definitely not an exception. Other similar examples include the partnership between Uber and Indonesia’s second largest taxi operator PT Express Transindo Utama Tbk

- In December 2016, Uber partnered with Indonesia’s second-biggest taxi operator PT Express Transindo Utama Tbk.

- In October 2014, Uber partnered with For Hire taxis to expand pick-up availability in Seattle.

- In March 2017, Grab partnered with SMRT Taxis in Southeast Asia.

It is clear that both parties have their own incentives to engage in this type of partnerships. For example, it allows ride-hailing platforms to expand their number of drivers and complement their existing market share. In addition, platforms can potentially benefit from the technological advances developed by other platforms (e.g., efficient matching algorithms and online secured payments). Nevertheless, such partnerships can increase the congestion levels and cannibalize the original market shares. Indeed, by introducing the new joint service, each platform needs to be cautious about the potential elevated congestion and the market share losses (customers who were initially riding with one of the platforms may now switch to the new service). In addition, the platforms need to decide which pool of drivers will serve the new joint service as well as the terms of the profit sharing contract.

This paper is motivated by the type of partnerships described above. In particular, we are interested in studying the implications of introducing a new joint service between two competing ride-hailing platforms via a profit sharing contract. Our goal is to draw practical insights on the impact of the new joint service on both platforms (e.g., Curb and Via), drivers, and riders.

Model

We propose to model the coopetition between different ride-sharing platforms using the Multinomial Logit (MNL) choice model to capture the fact that riders face several alternatives. The drivers are self-scheduled so that they can choose when and how long to work. Different platforms engage in a price competition to maximize their own profits. We also explicitly model the congestion of both platforms, and capture the practice that a platform may incur extra labor costs (i.e., additional driver wage to induce enough drivers that can cover the excessive demand) when the system is congested. The platforms engage in coopetition by introducing a new joint service (e.g., the taxi-sharing service offered by Curb and Via). We base our model on current practices in the ride-hailing industry and study the impact of introducing the coopetition partnership on different stakeholders of the market: platforms, riders, and drivers. In particular, our model enables us to characterize conditions under which a well-designed profit sharing contract could be beneficial for platforms, riders and drivers.
Results and Contributions

Given the recent popularity of ride-hailing and ride-sharing platforms, this paper studies a timely practical problem directly motivated by several recent partnerships. At a high level, our contributions can be summarized as follows.

- **Characterizing the equilibrium of a competitive ride-sharing market.** To the best of our knowledge, this paper is among the first to study the (price) competition between ride-sharing platforms. We use the MNL choice model to capture the decision process of potential riders and show that the competition between ride-sharing platforms reduces to a price competition under an MNL model with convex costs. Consequently, the equilibrium outcome is analytically tractable and can be computed efficiently.

- **Studying the impact of coopetition under a profit sharing contract.** We study how the introduction of the new joint service affects the competing platforms. First, we identify clear conditions under which the coopetition is beneficial for both platforms. In particular, the driver capacity congestion levels of both platforms should not be too high, as otherwise the coopetition will be detrimental to the total profits. We then consider several decision making dynamics depending on which platform sets the price of the new service. We identify three main effects induced by introducing the new service: new market share, cannibalization, and increased congestion.

- **Demonstrating that a profit sharing contract can yield a win-win outcome.** When initial congestion levels are not too high, we show that regardless of which platform sets the price of the new service, there always exists a profit sharing contract that increases the profits of both platforms. As a result, engaging in a coopetition could be a win-win strategy for both parties.

- **Showing that drivers (and riders) can also benefit.** As expected, riders also benefit from introducing the new service. Furthermore, we discuss two strategies that allow the drivers of both platforms to also benefit from the coopetition partnership. Consequently, when the coopetition terms are carefully designed, every single party will benefit (riders, drivers, and both platforms).

Finally, we note that the ideas, analysis, and insights presented in this paper are not limited to the ride-hailing industry. One can potentially apply a similar approach to any market with several competitors who decide to engage in a coopetition partnership through a profit sharing contract.

*Key words: Ride-sharing, coopetition, profit sharing contracts, choice models*