Chapter 10
Co-producing Mobility: Lessons from
Ridesharing for a More Just and
Sustainable Autonomous Future
Section: *Going Big: Changes at the Regional Scale*

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INTRODUCTION

How can we go big and make changes to mobility at the regional scale? One way is getting more people in the cars already on the road through carpooling. This has become much of the dialogue in the "revolutionary" predictions planners, policy makers and industry analysts have heard about sharing. However, there are many skeptics. The rate of carpooling has declined every decade since 1980 in the United States, yet more than one out of every seven American adults have used a ride-hailing app (McKenzie, 2015; Pew Research Center, 2016).

At the same time, growth in the use of smartphones as a platform for mobility presents an opportunity to promote individual and societal benefits of carpooling through savings in congestion, collisions, emissions, time, and money (Abrahamse & Keall 2012; Chen et al. 2000; Shaheen et al. 2016). These challenges create an opportunity for transport policies that manage the demand on roadway capacity (Abrahamse & Keall, 2012; Currie et al. 2014; Gärling et al. 2002; Meyer 1999). Co-production of services traditionally offered by government returns agency to the public while offering flexibility for top-down and bottom-up approaches (Clark et al. 2013; Griffin & Jiao 2018); in this case, for mobility management. Early adopters of ridesharing platforms offer a glimpse into how carpooling might, or might not, support co-production of more sustainable use of our current transportation system (Rogers 1995; Siddiqi & Buliung 2013).

Recent studies demonstrate a conflict of views on ridesharing platforms—they provide the means for a flexible, inexpensive, efficient travel option, yet are plagued by limited availability and inconsistent perceptions of safety and other social challenges (Nielsen et al. 2015).

The purpose of this chapter is to provide a clear illustration of the potential for carpooling; evaluating a pilot carpooling app through the perspective of the critical mass theory of interactive media (Markus, 1987). As a study, I hope to provide case details about the interaction of ridesharing technologies with transportation policy to support future policy development for ridesharing (Shirole, 2017). Understanding of the functions of ridesharing affordances and transportation policies may support more efficient utilization of the roadway systems already in place—that could help mitigate many of the environmental, economic, and equity challenges faced in the global South and North.

As you may have inferred from elsewhere in this book, terms surrounding new mobility are in a state of flux, particularly when context changes the impact of laws and policies. Uber and Lyft happen to be the most extensive examples of convenient services performing similar functions to taxis—which are not really "ridesharing," but rather "ridehailing" since the driver was not likely already taking a given trip (Associated Press, 2015). Following the definition in U.S. transportation-funding authorization, the term *ridesharing* refers to sharing of vehicle trips through an electronic platform, that allows reimbursement of costs from the rider(s) to a driver up to, but not exceeding the cost of the trip (One Hundred Twelfth Congress of the United States of America, 2012, p. 156).

The term *affordance* of ridesharing refers to include the communicative and financial interactions between the mobile ridesharing platform, its users, and the transportation network provider. *Critical mass* refers to whether an interactive media increases or decreases in the rate of use over time (Markus, 1987).

Since the critical mass theory of interactive media is foundational for this chapter, its application for ridesharing is described in the literature review.

To dive into this material, this chapter starts with a review of the literature concerning ridesharing affordances and critical mass, before introducing the empirical ridesharing pilot. I then describe the pilot methodology including recruitment for the pilot, and how the actual carpool trips worked. A discussion section addresses how this pilot test affected transportation in the region, and what the findings may mean for other transportation changes and technological advancements. I conclude with the limitations of the pilot study and directions for future research.

Ridesharing Affordances and Critical Mass Theory

Carpooling is as old as the car; no pun intended. However, concerted efforts to create lists of drivers and riders that could logically share trips came to being during WWII resource conservation, and again during the 1970's energy crises (Chan & Shaheen, 2012). More recently, mobile technology has merged the formerly different challenges to facilitate ridesharing via the Internet through the combination of accurate and inexpensive GPS location, messaging, and instant payment on a widespread, though not ubiquitous level in developed countries (Pearce & Rice, 2013; Perrin & Duggan, 2015). Though mobile phones may have reached a critical mass of users some time ago (Leung & Wei, 1999), analyzing the potential for widespread and regular use of ridesharing systems requires a full description of the critical mass of interactive media, and of ridesharing affordances.

Critical mass theory is an intuitive concept at face value, with wide-ranging potential impacts for interactive media (Markus, 1987). The idea in social science stems from the difficulty of organizing groups to work together in the interest of the larger organization, especially when there is little direct benefit to an individual participant (Olson, 1965). Critical mass theory suggests that the start-up time for a group is especially critical, when substantial efforts may be needed to get an idea for collective action in motion by a group (Oliver et al. 1985). The production function relates individual contributions towards a level of collective action. "In a decelerating production function, the first few units of resources contributed have the biggest effect on achieving the public good, and subsequent contributions progressively less. In an accelerating production function, successive contributions generate progressively larger payoffs, thus making additional contributions more likely" (Markus, 1987, p. 496). Theoretical and empirical evaluations have confirmed the role of motivated early adopters with a supportive community (Markus, 1987; Patterson & Kavanaugh, 2001), high-level endorsement of use of the new ICT platform (Evans-Cowley & Griffin, 2012), and the benefits of spatial proximity and friendships with ridesharers (Wang et al. 2017).

Travel demand management studies tend to show reduced personal costs, emissions reductions, and other benefits, but the pace of technological change complicates the transferability of results. Gamification, even when used with financial incentives, may be insufficient to impact travel behavior unless the incentives amount to significant savings in cost or time (Castellanos, 2016; Zhu et al., 2015). Public events and encouragement programs show promise for immediate changes toward alternatives to driving alone, but short-duration events may not change travel over the long term (Wall et al. 2017). Transportation policies that impact both convenience and direct cost to the driver, such as the availability of parking, may be more effective over time (Riggs, 2014; Shoup, 2005). Early evaluation of variable parking pricing shows promise for effectively managing demand (Maternini et al. 2017). Recent approaches to managing demand leverage information collected by users, often through smartphones and other wearable devices.

Ridesharing platforms are enabled by the communicative affordances of mobile media (Casas & Delmelle, 2017; Schrock, 2015), enabling an entire dynamic database of drivers and riders in a ridesharing system to be carried anywhere, while providing direct communication with participants on their schedules. Further, ridesharing platforms can support payments (as in commercial vendors), and incentives (rewards for sustainable choices), providing new ways to provide carrot or stick behavioral cues (Castellanos, 2016).

Locational identity given by the GPS reduces the burden of individuals to identify their location correctly, confirmed through a digital photograph and text that confirms the identity of the users. So what does this mean to Schrock's general typology of mobile media affordances towards any who might consider ridesharing? My goal is (and was) for us to consider a new "sociotechnical perspective" so that mobility is co-produced by participants and the technology (Bijker, 1995; Mitlin, 2008), using an example of ridesharing in Central Texas.

Ridesharing in Central Texas

The year 2014 was pivotal for ridesharing in Central Texas. The Federal Highway Administration (FHWA)-sponsored carpooling policy pilot launched in partnership with the region's transportation agencies and a private company in February 2014, with Uber and Lyft beginning a ride-hailing market just three months later (Ross, 2014; Wear, 2015). The carpooling pilot was a naturalistic research project, measuring the impacts of carpooling via a smartphone app, but with a critical distinction—carpools with one rider could take tollways at half the cost, while two or more riders with a driver were fully refunded their tolls in the pilot system (Griffin, 2014). The app used in the pilot allowed reimbursement of the driver only up to the cost of the trip—limited to \$0.56 per mile in 2014—so trips made sense for drivers when they already were headed that way, but would not enable profit in the form of a taxi service (Harding et al. 2016).

This policy approach is consistent with a peer-to-peer sharing model described as helping offset the cost of driving trips through micropayments, such that drivers can offer carpools they "intended to make any way, but below amounts that would incentivize additional journeys" (McLaren & Agyeman, 2015, p. 301). Drivers could also use the app without charging a rider—so there was no cost barrier to families or regular carpools to use it continually. In theory, the more this type of carpooling is encouraged, the more single-occupant vehicle trips are avoided—mitigating congestion and emissions while sharing the cost of travel (Abrahamse & Keall 2012; Shaheen et al. 2016).

Ride-hailing platforms are different. Since the drivers are paid a market rate for trips, they drive with no passengers to pick up riders, effectively increasing the miles driven for the same mobility benefit. Considered as convenient or more so than traditional taxis, ride-hailing offered Central Texas, and other communities in 2014 a new set of options to get around (Wear 2015). Ride-hailing and carpooling platforms are considered under a broader envelope of providing mobility as a service, instead of a product—a harbinger of options that focus on offering transportation solutions independent of a particular mode.

As I will show, the toll discount carpooling pilot program failed to reach a critical mass of drivers, and, therefore, riders taking the service. Meanwhile, Austin regulations defined ride-hailing services like Uber and Lyft as ground transportation services, requiring registration with the city. These regulations were later superseded by state law (Batheja 2014). Following documented sexual assaults of several riders, Austin citizens voted in December 2015 to require ride-hailing drivers to be fingerprinted similar to taxi drivers (O'Brien & Wattles 2016). Rather than conforming to the new regulations, leading providers Uber and Lyft ended service in Austin, before state legislation overturned the city's authority to require fingerprinting, and the services returned in 2017 (Samuels 2017).

METHODS

Given this, I chose to look at a post-assessment of the ridesharing pilot in the Austin region, providing a framework for the analysis of future services, and discussions about how to make the technology (and transport) more efficient. I focused on four key questions:

- What are the affordances of ridesharing platforms associated with successful critical mass?
- Absent a profit motive, which communication channels are associated with increased registration for carpooling?
- How are registering for a carpooling system and taking a trip related?

- What challenges with the carpooling system did participants report that could lead to not reaching a critical mass of users?

I used several sources of data to examine these research questions in depth. The primary information was from the Carma (the private partner) carpooling app which was used in Central Texas during 2014, enhanced by information from Uber in the market and time for context. The first data set was derived from the examination of the ridesharing platforms themselves, as evidenced online and through the mobile apps. Driver data from the vendor was provided directly through the research pilot, and comparison data for Uber is adapted from published submarket data (Hall & Krueger 2015).

Uber data was available only for May through October 2014, but it was sufficient for estimating trends in the production function. Second, the number of drivers per month was a determinant of the scale of availability of the service in the region—drivers are critical for all other ridesharing affordances to be accessed (Lee & Savelsbergh 2015; O'Brien & Wattles 2016).

Next, the analysis used a database of recruitment actions taken by the private partner pilot team, which includes advertising, events, digital media, and outreach to neighborhoods and targeted major employers. Data from the ridesharing platform included the number of new registrants and trip actions that were taken throughout 2014—this was summary data only, rather than personally identifiable information. Finally, text responses to a single-question, post-pilot email were used to bolster these findings.

These datasets support a QUANT→qual mixed-methods approach to the analysis of the case study data (Creswell 2003; Stake 1995). QUANT→qual is used to indicate both the sequential order of data gathering and analysis and that the quantitative approach provides the primary theoretical drive for this empirical study on the critical mass theory of interactive media (Creswell 2010).

For the first research question, the study adapts previous research on the analysis of production functions as indicators to identify critical mass success. The number of drivers is considered a primary “production” of a ridesharing app, which enables the core mobility functions of the service. A second-order polynomial trend line of the number of drivers in each service with slope equations provide a comparison between each service, and the literature describing production functions associated with critical mass.

To analyze recruitment methods, deployment of various tactics by the ridesharing pilot team used on a daily basis throughout 2014 were coded under seven categories: employer, residential, event promotion, paid ads, media coverage, and driver-focused methods. The pilot recruitment team had first worked with a major employer located along a tollway to host breakfast and an information table about the pilot project; then undertook activities such as leaving door hangars at residences in target neighborhoods, hosting coffee events, and mailing postcards. Occasionally, they conducted major events, such as holding a free breakfast for people downloading the app or offering gift certificates for signing up in December.

Advertisement methods included ads on newspaper, radio, and billboards. Local news media also ran chapters describing the pilot, in addition to selected coverage by television news and radio. Recruitment targeted drivers through inserts in toll bills and temporary banners on transportation agency's online newsletters. Perhaps ironically, digital recruitment techniques were the most durable, since website development and social media posts remained discoverable throughout the project. Coding these activities resulted in a binary database (1 on a day with a given category of action, and 0 on days without). Least squares regression associated these explanatory variables with the number of registrations for the carpooling pilot.

The third research question applies a bivariate least squares regression to examine the relationship between the number of program registrations, and actual trips taken during a given day, throughout the pilot. A direct correlation between registration for the pilot and trips taken during the same day would suggest

few technical barriers to use—that is, people interested would be able to use the system. This regression technique will not uncover reasons why the program did not work for people, however. The final research question leverages actual reports from participants to describe issues that could challenge the program's potential to achieve a critical mass of users.

RESULTS

What Are the Affordances Of Ridesharing Platforms Associated with Successful Critical Mass?

Ridesharing platforms provide affordances for trip planning, during the journey, and after completion of the trip. Table 10.1 provides a descriptive contrast between platform affordances of the carpooling pilot, and the better-known Uber X ride-hailing service that was offered in the Austin region at the same time. Though they both enable the coordination of trips, there are several key differences to point out that may play a role in achieving critical mass. First, the pilot required matching of drivers and riders based on both the origin, and destination, of a given trip. The probability of riders and drivers sharing both an origin and destination within reasonable proximity is a persistent challenge to rideshare matching (Xia et al. 2015), which is addressed by profit-oriented models that are more akin to taxi services than true ridesharing.

Uber dynamically adjusts prices to manage both the supply of drivers willing to take trips and the demand by riders in specific markets over time, fostering both availabilities of the service and acceptability of the pricing (Harding et al. 2016). A minor difference is that Uber did not allow pre-trip scheduling in 2014—it was assumed that a driver in the service area will get to the rider quickly—whereas a match must be planned and scheduled using the app. The pilot afforded the ability to provide discounts on toll roads, which benefit longer trips from rural or suburban areas in Central Texas but would not be applicable for urban trips within the downtown area, where there were not toll roads. The key difference between the platforms is that Uber drivers can receive payment above the cost of the trip—the distinguishing affordance of a ride-hailing app.

Table 10.1 Platform Affordances of a Carpooling and Ride-hailing App in 2014

Trip Phase	Platform Affordances	Carpooling Pilot	Uber X ride-hailing
Trip planning	Matching of drivers and riders based on <i>starting location</i> and time	●	●
	Matching of drivers and riders based on <i>entire route</i> and time	●	-
	Picture, contact info, and messaging	●	●
	Dynamic pricing to manage supply and demand	-	●
	Pre-trip pickup scheduling	●	-
	Real-time pickup	-	●
During trip	Cost estimate available for trip	●	●
	Trip map for driver and rider(s)	●	●
	Time and distance recorded for driver and rider(s)	●	●
	Discount on toll roads during pilot	●	-
	Driver payment can exceed cost of trip (profit potential)	-	●
After trip	Rating of drivers by riders	●	●
	Rating of riders by drivers	●	●

These differentiating affordances are enabled by Uber's high level of capital investment to support the rapid start-up. Plotting of the number of drivers in each system during 2014 in Figure 10.1 shows that despite the toll road discounts offered to participants in the pilot, the suite of affordances was insufficient to support an accelerating production function. The number of drivers using the system peaked at 45 active drivers in June 2014, and subsequent recruitment efforts did not support enough participants to achieve critical mass. A total of 314 individuals had registered as drivers, suggesting people tried the service but did not continue. However, Uber achieved an active pool of more than 71 times the number of drivers in the pilot, with a trend line suggesting an increasing production function, and an intentional leveling-off of new-driver enrollment in July, 2014.

Figure 10.1 Ridesharing Drivers in the Austin Market, 2014 (Drawn by the author using data from Hall & Krueger, 2015; Wood & Jones-Meyer, 2016) **Note Y-axis scales are different.**

Two of the five differences in ridesharing affordances between the systems relate to profit motive for drivers, enabled by a massive influx of start-up capital. Recognizing that not all ridesharing systems begin with either a profit motive or venture capital, a closer look at the effectiveness of recruitment communication techniques is needed.

Absent a Profit Motive, Which Communication Channels Are Associated with Increased Registration for Carpooling?

Analysis of the recruitment actions coded by every day in the pilot suggests some methods may be more efficient than others. Event promotion, media coverage, and driver-focused messages have a positive impact on registration for the ridesharing program, as shown by least squares regression. Paid ads on billboards, newspapers, and radio were significantly associated with pilot registrations on the same day. Each of these methods has the potential for hundreds of thousands of visual impressions in a day, so there is a clear role for paid advertisement to disseminate information about such a ridesharing program. Event promotion, in this case, included several face-to-face events, including tangible incentives such as breakfast or small gift cards for participation.

This method couples the channel with the richest media available, face-to-face (Stephens & Mandhana 2017), with the social norms (social reciprocity norms) of offering an incentive for participation (Riggs 2017; Zhu et al. 2015). Driver-focused techniques like toll road bill inserts provided access to the target audience—tollway drivers, at precisely the moment they might be most interested in potential cost-saving measures. Residential-focused strategies, including small ads hung on front doorknobs, and employer-focused special events like employee breakfasts with information about the ridesharing pilot did not have a significant effect on daily ridesharing registration.

How Are Registering for a Carpooling System and Taking a Trip Related?

This pilot showed that if people are willing to register for a system, they will likely take a trip the same day. The first two research questions addressed the rate of registration, and which recruitment methods were associated with that rate. The third research question addresses whether enrollment in the program is likely to lead to an actual carpool taken with the system. A bivariate least squares regression between registrations and trips taken on every day in the pilot showed that registrations highly predicted carpool trips using the app, explaining 97 percent of the daily variance in taking carpool trips. Programs similar to this pilot may also find that focusing energy on getting new people to register for the system is more important than the next steps of using the system. Getting the word out about the approach may be a challenge, but platforms should be designed so that using the system is not a barrier.

What Challenges with the Carpooling System Did Participants Report that Could Lead to Not Reaching a Critical Mass of Users?

To uncover issues with using the carpooling pilot system not present in registration and use statistics, 341 driver participants in the pilot were emailed a single question: *Could you tell me about your experience using the carpooling system with the toll reimbursement program, and whether you feel it changed your travel choices?* Thirteen responses ranged from minimal experiences with the program to rich descriptions of how the program affected their travel. Nine respondents reported using the system to complete a trip, and all cited the toll road discount affordance as the reason. Four of the respondents did not use the app to complete a journey. The non-users either did not take toll roads on their commutes or could not find a carpool match. This response succinctly describes the problem of a lack of critical mass for the carpooling pilot:

“I never used the service. There were no people in my part of town that traveled to my work area...” (female)

Others experienced more nuanced challenges with the system, such as this respondent concerned with the

dependability of the system, showing the importance of fully testing the socio-technical assemblage of communication, mobility, and fiscal policy affordances:

“It seemed cool. My wife and I both installed it and started using it. We stopped using it when I found a big disconnect between how much the app said I 'had' and how much the toll was going to bill us. The tollways charge a lot of money if you don't pay, and seeing a different balance made me too nervous to use the app. We ride the tolls every day, so if things have changed, and there are other incentives to using it, then I would be willing to try again.” (male)

Others provided full support of the system and describe how the toll discounts encouraged carpooling while saving commute costs.

“Yes it was great—there are a few of us that live within a couple miles of each other and all work at the same place. Normally we took surface roads since it would cost us four dollars a day to take the tolls, but with the program we took the tolls each day and carpooled—instead of 4 cars on the road it was just 1.” (unknown gender)

This carpool group was then able to leverage the toll exemption policy for a 3+ carpool to drive faster, and likely safer, using the tollway, rather than finding parallel routes. The richest explanation of their carpooling experience also incorporated the role of an individual's place in his life course and the use of different travel modes over time. Carpooling played a role in getting more out of a required commute, but eventually, the complexities of other family members place a higher demand on the driver:

“We originally shared a Cap Metro van for saving money. That got too expensive, and the members were not regular enough, so it disbanded. We then set up personal carpools. We used the app to save money on tolls. The app didn't cause the creation of the group, but it prolonged it. We did completely stop carpooling before the discounts ended. Our families have grown and our transportation needs have required greater flexibility in terms of departure times, so we each now drive our own vehicles. The flexibility need now outweighs the monetary savings need. [...] If I take the toll road, I get home about 13 minutes sooner, but it costs me \$2.04. Those 260 extra evening minutes cost me \$40.80 a month. When your family is growing, you need both time and money.” (male)

LESSONS FOR NEW MOBILITY AND DISRUPTIVE TRANSPORT

As you have seen, this naturalistic pilot showed that a carpooling program requires more than a nominal incentive to change transportation behavior. This suggests that users of new mobility, whether it be shared or autonomous vehicle services, require greater incentives to share trips with others. We should all be skeptical of the shared assumption. Though limited in generalizability, this study offers four lessons for developing policies to support just, sustainable, autonomous mobility—critical mass, planning for affordances, marketing, and the role of public policy during rapid technological advancement.

Convenience, Cost, and Critical Mass

The carpooling pilot platform requires pre-planning to find and coordinate a match for a given route, making non-regular trips difficult, if not impossible. Since drivers can only be reimbursed up to the cost of the trip, the added time to coordinate a trip was more than the benefits derived from the carpooling pilot, with notable exceptions documented in the qualitative responses. The example of Uber shows a system where the benefits for drivers are immediate and financial—the difficulties in coordination are overcome by the capital investment of the company. Critical mass theory of interactive media suggests the overall interest and resources of an interactive media are supported by adoption by community leaders or incentives (Markus, 1987). Carma was a relative unknown in the 2014 pilot community, while early adopters of Uber were portrayed in the media as leveraging cutting-edge technology to solve mobility problems. The pilot

lacked both a recognizable champion and adequate incentives to create bottom-up leaders in local communities. The company continued to offer service following the conclusion of the toll road discount pilot in 2015, but use trickled to near zero, which also confirms Markus' first proposition: an interactive media will either achieve near-universal access or eventually completely fall off. Analysis of both the carpooling and ride-hailing systems during a period of early adoption suggests the critical mass theory of interactive media is both durable and relevant to ICT use for solving mobility challenges.

Plan for Affordances, Rather than Features

The affordances approach to human-computer interaction is less than two decades old (Resnick, 2001), and this study contributes a new understanding of how the trip planning, taking, and post-trip affordances of ridesharing platforms contribute to their tendency to reach critical mass. This is both a theoretical and practical contribution. The typology of ridesharing affordances can be evaluated and changed as sociotechnical advancements occur in the field. As automated vehicles enter the marketplace, many of my ridesharing affordances may become irrelevant, but the emphasis on affordances, rather than features, is likely to offer more generalizable knowledge (Faraj & Azad 2012; Treem & Leonardi 2012). Ridesharing affordances are also described in sufficient detail for app designers and transportation technologists to consider their role in widespread adoption.

Marketing Matters

This research also provides practical implications for the future promotion of ICT-enabled mobility services. First, this evidence suggests that recruitment efforts targeted to residences and employers may be overemphasized. Rather than refuting previous research supporting these tactics (Neoh et al. 2015; Riggs 2015), this study provides evidence that paid media advertisements, organic media coverage, face-to-face events, and driver-oriented messages are all moderately related to enrollment in the carpool pilot program. Analysis of the registration and trip-making activity on the same day shows that the pilot implementation did not create systemic barriers to participation, yet qualitative responses show at least isolated examples of dissatisfaction with the system. Since a private-app vendor and a public-tolling agency were both pivotal for the toll-waiving system to function, this area of concern would need further research. Future travel-demand management programs should consider broad marketing approaches to capture users of an automated vehicle market.

Transportation Policies Remain in the Driver's Seat

Policymaking in Austin, Texas, showed that despite the rapid advancement in available mobility technologies, local and regional authorities could direct implementation toward, or against, just and sustainable mobility. Policies on transportation network companies caused them to leave the market, if temporarily, as governments wrestled to find a balance between supporting private-sector innovation and setting policies to protect users. The discount and removal of tolls for registered carpools with an emerging platform showed regional authorities' willingness to innovate, but the relatively low transaction value may have prevented reaching a critical mass of carpools.

Cities, metropolitan planning organizations, and states have the opportunity to direct policymaking for autonomous vehicles to encourage carpooling, rather than promoting single-occupant trips. This study showed potential for technology-delivered policies—through dynamic carpool registration—yet more partnership with the private sector may be needed to provide mobility options for lower-income communities in the autonomous future. A strong policy role can support just, sustainable transportation under a wide variety of future technologies, but only if transportation officials take leadership to support individuals' co-production of mobility.

CONCLUSION

Though this study provides naturalistic, mixed methods data on “how people *actually* use ICTs, not just how they *say* they use them” (Stephens & Sætre 2008, p. 34), the context of the pilot test imposes limitations. The Austin, Texas region lacks several conditions that are known to facilitate transportation mode choices other than driving alone. First is the lack of high-occupancy vehicle lanes, which previous research in the Dallas-Fort Worth and Houston areas in Texas shows is “the most important factor in their decision to form a carpool” (Li et al. 2007, p. 10) because they provide a speed advantage to avoid highway congestion. Second, increased automobile parking rates are associated with higher use of transportation modes other than driving alone (Christiansen et al. 2017; Hamre & Buehler 2014; Shoup 2005; Whitfield et al. 2016). Parking in Austin is largely free, with a \$1/hour charge for most on-street spaces in downtown (The Downtown Austin Alliance, 2016), which was the median rate for low-density United States cities in 2009 (Auchincloss et al. 2014). Travel demand management research shows parking is a vital part of travel mode choice (Riggs 2014). Finally, the price of gasoline dropped \$1.42 per gallon during the pilot study—about the same cost as tolls on a suburban commute in the region, but more than the average reimbursement of tolls for the average trip in this study (\$1.08) (Central Texas Regional Mobility Authority, 2015; U.S. Energy Information Administration, 2015). The decreasing cost of fuel during this pilot nullified the financial advantages of toll reimbursement, suggesting a similar pilot in different contexts could achieve different results.

In addition to conducting similar studies in different contexts, future research should examine the role of the sequencing of communication methods with potential carpoolers. Previous research on organizations suggests the order of different messages and channels could play a part expanding cues for behavior changes (Stephens, 2007; Stephens et al., 2008). Future evaluations of ridesharing should also consider the role of access to mobile media through an equity perspective (Martens et al. 2012; Pearce & Rice, 2013; Schwanen et al., 2015), which have ramifications to ladders of opportunity (Blumenberg & Pierce, 2014).

At the same time, it is worth reinforcing a critical theme that arises from this work. Policy matters and sharing is not automatic. Citizens, policymakers, planners and engineers should be skeptical of overly optimistic assumptions, but they should also “lean-in” and shape travel incentives and marketing efforts that encourage more sustainable travel decisions in the disruptive, new mobility transportation future.

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