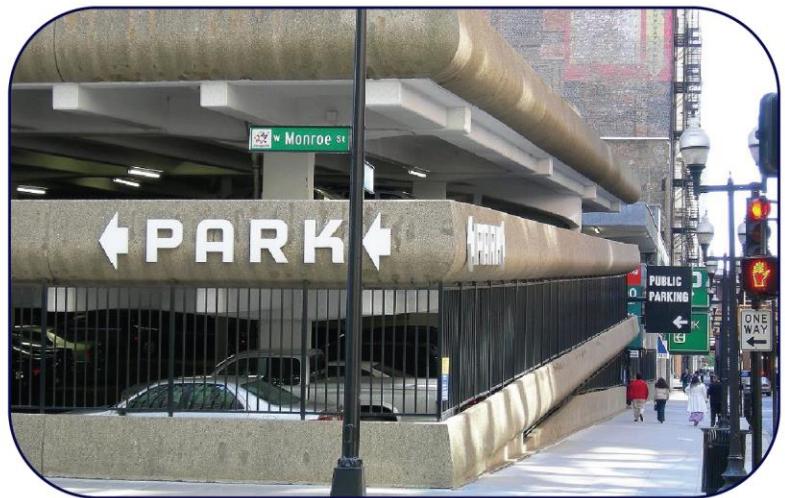
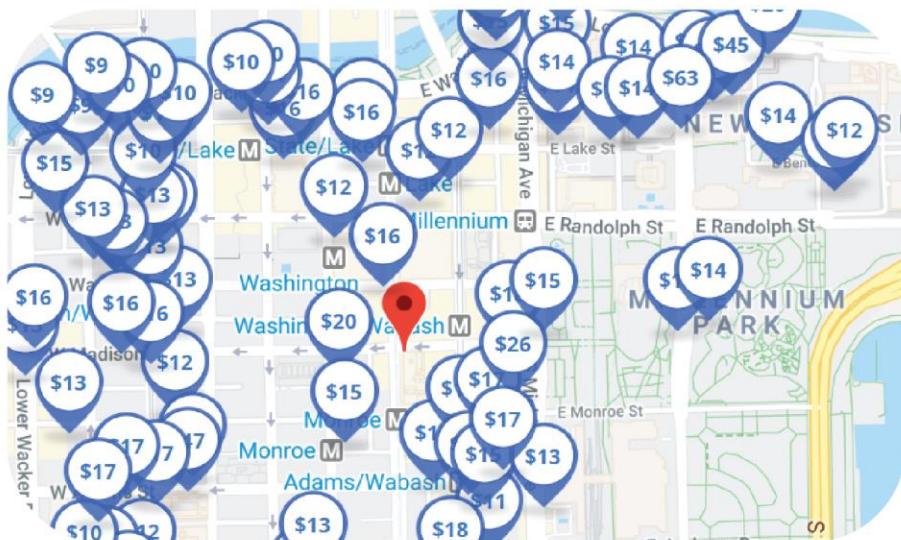


DRIVING TOWARD EFFICIENCY

How SpotHero and Other Parking Booking Intermediaries
Add Value to Off-Street Parking in Chicago

BY: JOSEPH P. SCHWIETERMAN, C. SCOTT SMITH & JESSICA KUPETS





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COVER PHOTOS

TOP LEFT: SPOTHERO.COM
BOTTOM RIGHT: FLICKR/BRIAN FARASEY

NOTE: THIS STUDY WAS COMMISSIONED BY SPOTHERO, A PARKING BOOKING INTERMEDIARY, TO ALLOW FOR AN INTENSIVE STATISTICAL REVIEW OF THE CURRENT PARKING ECOSYSTEM. THIS REPORT AND ITS FINDINGS ARE THE INDEPENDENT VIEWPOINT OF THE CHADDICK INSTITUTE.

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INTRODUCTION

The emergence and expansion of parking booking intermediaries, such as SpotHero, Parking Panda, ParkWhiz and Best Parking, give consumers new options for locating and purchasing off-street parking from parking facility operators at the palm of their hand. All of these app-based tools, operating on a commission basis, facilitate comparison shopping, allow customers to reserve spots in advance, and enable buyers to easily switch between payment options. Commuters and leisure travelers who previously made drive-up parking purchases are increasingly turning to these intermediaries in order to reduce the uncertainties associated with urban parking.

This study examines the degree to which parking booking intermediaries provide value and help foster the efficient allocation of parking in ways beneficial to cities, consumers, and parking facility operators. The study begins with a review of four common problems associated with private off-street parking and the challenges of maximizing utilization of available spaces generally. This is followed by a series of spatial analyses that compare the prices and availability of parking as advertised via SpotHero with more traditional payment methods in Chicago. The authors also evaluate the digital features and services provided on several online platforms – including those of parking facility operators – to better understand the ways in which such intermediaries are increasingly enhancing the consumer experience.

The final section explores some of the public policy-related issues pertaining to parking booking intermediaries. It assesses the potential for intermediaries to be conduits for economic development, congestion mitigation, and “Smart City” initiatives (i.e., strategies to improve urban life through real time data collection using sensors, public access data, and other data-intensive methods). This section also offers evidence supporting the idea that parking booking intermediaries should be treated differently than parking facility operators in municipal and state parking taxation policy.

INEFFICIENCIES IN THE MARKET FOR PRIVATELY PROVIDED PARKING

A wide body of research shows that the market for urban off-street parking is riddled with inefficiency (Millard-Ball et al., 2014; Shoup, 2017). High search costs facing customers, sub-optimal pricing policies, and the diverging goals of private facility operators and public governing bodies all impair performance. Many parking facilities, despite spectacular advances in digital technology, still adhere to a “first come, first served” approach to allocating parking spaces without adjusting prices in response to market conditions. Accustomed to these practices, many motorists—by choice or necessity—drive to their destination without a clear understanding of the parking options available upon arrival. Due to their lack of awareness of other options, many drivers pay more than necessary, buy more time than needed, or “roam” in search of a better deal (Shoup, 2017).

Past research has argued that public agencies, parking facility operators, and consumers can all benefit when more sophisticated approaches of parking allocation are employed.¹ The pioneering study by McShane and Meyer, “Parking Policy and Urban Goals: Linking Strategy to Needs,” for example, has for decades been a standard reference for decision makers looking to align community parking strategies with broader quality of life goals. The study calls for policymakers to devise parking strategies that promote: (i) a healthy economic climate; (ii) the most efficient use of existing transportation, land, and other public resources; (iii) ease of mobility and accessibility of resources; (iv) equity of resource distribution and preferential allocation of some resources; (v) environmental goals, especially reduced air pollution and minimizing energy consumption; and (vi) enhanced amenities and cultural attractiveness. If such complex objectives are to be achieved, it is critical that private and public parking facility operators make adjustments to balance supply and demand, maximize the use of available spaces, and develop

strategies that discourage roaming and other forms of unproductive driving. Unfortunately, there are at least four problems that tend to prevent the privately-owned parking facilities market from optimizing benefits in this manner.

PROBLEM 1: Consumers have traditionally faced high search costs when selecting parking options, which prevents them from optimizing trip planning.

Consumers, particularly those who do not regularly make the same trip, have tended to lack effective ways to evaluate their parking options before arriving at their destination. Some facilities do a little more than post their prices online, without allowing spots to be reserved or parking availability to be checked. Some parking facility operators have websites and apps that provide information about prices and availability, but they are often confined to particular cities or other narrowly defined geographic areas and have limited functionality, which limits their appeal to consumers.

PROBLEM 2: Motorists engage in more roaming and spend more nonproductive time in their vehicles than is socially desirable, which adds to both congestion and the environmental footprint of their trips.

When information about parking is difficult to obtain, motorists expend more time searching among the options and incur most of the cost by putting additional mileage on their vehicles than is necessary. In the process, urban economies suffer from the increased emissions and congestion as well as an increased number of traffic accidents. A survey conducted by INRIX found that motorists in Chicago spend roughly eight minutes per trip searching for off-street parking. Cumulatively this roaming translates into motorists spending upwards of 56 hours annually searching for parking (INRIX, 2019). Estimates by Millard-Ball et al (2014), and Shoup (2017) indicate that as much as 30% of total vehicle miles in some areas of the country are due to roaming.²

PROBLEM 3: Parking facilities often have lower-than-optimal occupancy levels, in part due to their lack of technical capacity for sophisticated marketing and dynamic pricing. This results in underutilized parking inventory and lost revenue opportunities for parking facility operators.

An average occupancy rate of 80% or more during peak periods is optimal for cities and operationally achievable at parking facilities (Pierce et al., 2013). Cities and parking facility operators benefit when spaces are intensively used. Unfortunately, many private garages average only around 50 - 60% full, far below levels that maximize community benefits (*Ibid*).³ Although such low rates may maximize the profits for parking facility operators who lack sophisticated pricing and research capability, the unused spaces represent lost opportunities for consumers, parking facility operators, and society as a whole.

PROBLEM 4: Parking facilities have been slow to invest in state-of-the-art digital conveniences that enhance the user experience, provide prompt customer support when problems occur, and generate timely feedback to facility operators about customer needs.

Buyers who reserve parking on the official websites maintained by parking facility operators are often not provided with certain conveniences that allow them to optimize their purchases, such as customer ratings, the ability to extend reservations after starting a parking session, and search results that display prices on a map. Customers are often directed to submit queries via email or to consult Frequently Asked Questions pages, rather than to call operators for help directly.⁴ These limitations can deny facility managers the “feedback loop” needed to respond to changing customer needs.

The following section explores how parking booking intermediaries have helped to alleviate the above problems.

THE WAYS PARKING BOOKING INTERMEDIARIES IMPROVE EFFICIENCY

To evaluate the role of parking booking intermediaries, our data team collected a panel data set encompassing 7,400 prices at 502 facilities in the city of Chicago between June and September 2019. This data set was designed to support a systematic review of prices over five three-hour time periods—6 am to 9 am, 9 am to noon, noon to 3 pm, 3 pm to 6 pm, and 6 pm to 9 pm—on multiple days. The data also encompassed prices from drive-up and online purchases for 275 facilities in the broader metropolitan region.

In order to examine the performance of various online platforms, the team identified and compared the information and functionality on websites and apps maintained by parking booking intermediaries with those maintained by parking facility operators. This allowed for a rather insightful assessment of how the customer experience varies based on the purchase/booking options selected. Details of this data appear in Appendix A.

Parking booking intermediaries provide both private and public benefits. Section A below summarizes the benefits to consumers and parking facility operators, while Section B offers perspective on the social benefits from reducing vehicular roaming.

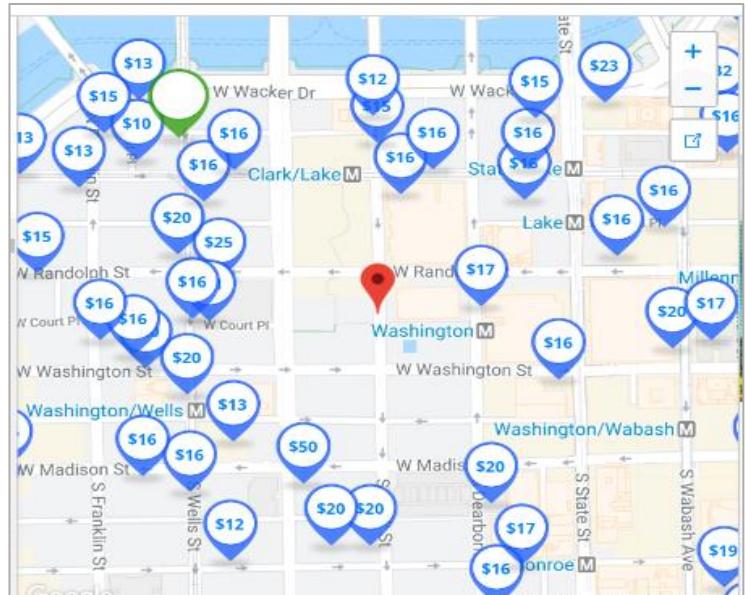
A. BENEFITS TO CONSUMERS AND PARKING FACILITY OPERATORS

FINDING I: Parking booking intermediaries facilitate comparison shopping by providing a comprehensive list of options with a single online search. This allows consumers to more easily find the option that best meets their needs and eliminates the necessity of toggling between multiple websites for trips with different destinations.

The data collected for this report show that the number of options presented to consumers on SpotHero in Chicago is three to 20 times greater than those provided on even the largest online tools managed by private parking facility operators.

In Chicago, many private facilities are owned and/or managed by large private parking facility operators, among the largest being i) **SP Plus Corporation (SP+)**, which operates **parking.com**, ii) **InterPark**, a Chicago-based firm that operates **iParkit.com**, and iii) **LAZ**

Parking, a Chicago-based firm that operates LAZparking.com. An estimated 47% of parking garages and lots in downtown Chicago listed on SpotHero are facilities owned or operated by these three parking facility operators. Each has an official website and an app with login features for storing account information. The number of parking locations they list, however, is small compared to the number they list on SpotHero. On Wednesday, September 18, 2019 at 5 pm, for example, a search for options in



Search results showing the prices and locations of available options in the Chicago Loop district for a SpotHero search. Details of facilities can be found by clicking the icon.

downtown Chicago generated 128 locations on LAZparking.com, 19 on iParkit, and 45 on LAZParking. On ParkWhiz and SpotHero, conversely, there were 144 and 383 respectively.⁵

The geographic range of parking choices represented on parking facility operators' websites is also limited. In the Uptown neighborhood, reservations for 102 and 42 operator locations are listed on the SpotHero and ParkWhiz websites, respectively, compared to 39 on parking.com, three on LAZparking.com and none on iParkit. At O'Hare International Airport, SpotHero shows reservations for 20 operator locations and ParkWhiz shows seven, while the others have no more than one. Those traveling to other metropolitan regions may find, at most, only a limited range of parking choices on facility websites.

The net effect of these differences is that consumers who do not always travel to the same destination would generally find it necessary to toggle between private parking operators' websites to determine the best option. Even then, the number of options provided to these customers would likely be far less than those reservations for operator locations listed on parking booking intermediaries such as SpotHero.

TABLE 1: Comparison of the Number of Parking Locations Listed on Various Online Platforms for Select Geographic Locations

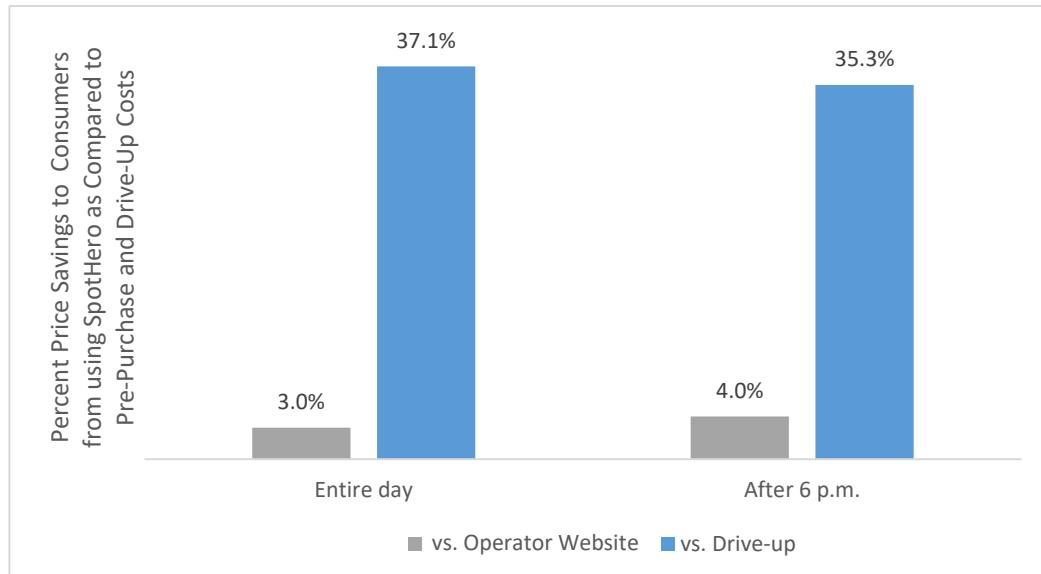
	Parking Facility Operators			Parking Booking Intermediaries	
	 Parking.com	 iParkit.com	 LAZparking.com	 SpotHero	 ParkWhiz
Downtown Chicago (1 E. Madison)	128	19	45	383	144
Midway International Airport	4	0	3	8	4
O'Hare International Airport	1	0	0	20	7
Hyde Park neighborhood (5500 S. Dorchester)	11	4	3	9	2
Uptown neighborhood (4466 N Broadway)	39	0	3	102	42
<i>Total listings in above locations</i>	<i>183</i>	<i>23</i>	<i>54</i>	<i>522</i>	<i>199</i>

These results suggest that parking booking intermediaries serve a role similar to that of travel booking sites such as Expedia, Priceline, or Orbitz, which allow consumers to choose among a wide variety of flights, rental cars, and hotels. In many respects, however, providing a common platform for parking booking is *more* important than for these other travel services due to the fragmented nature of the market for parking, in which brand recognition is low and consumers must choose among hundreds of options. Moreover, whereas major hotel chains, rental car companies, and airlines have nationwide coverage, many parking operators have facilities in only a handful of cities. This makes having an intermediary to compile parking options more important than in these other sectors.

FINDING II: SpotHero provides a strong monetary incentive for consumers to book in advance parking while also fostering more dynamic pricing that is responsive to local demand conditions. Prices and availability change more frequently than for drive-up purchases and purchases on parking facility websites, thereby encouraging more intensive utilization of available spaces.

The data show that the prices charged by parking facility operators on SpotHero are similar to prices offered on the websites of private parking facility operators but are significantly lower than those for drive-up purchases. The attractive pricing combined with ease of use give consumers much stronger incentives to book in advance. Across all three-hour time intervals considered on Thursday, October 17, 2019, for example, average weekday prices on SpotHero (in situations in which a SpotHero price was available) were 3% lower than prices listed on operator websites but 37% lower than corresponding drive-up prices. After 6 pm, prices on SpotHero, when available, were 4% lower than prices on operator websites and 35% lower than drive-up prices.

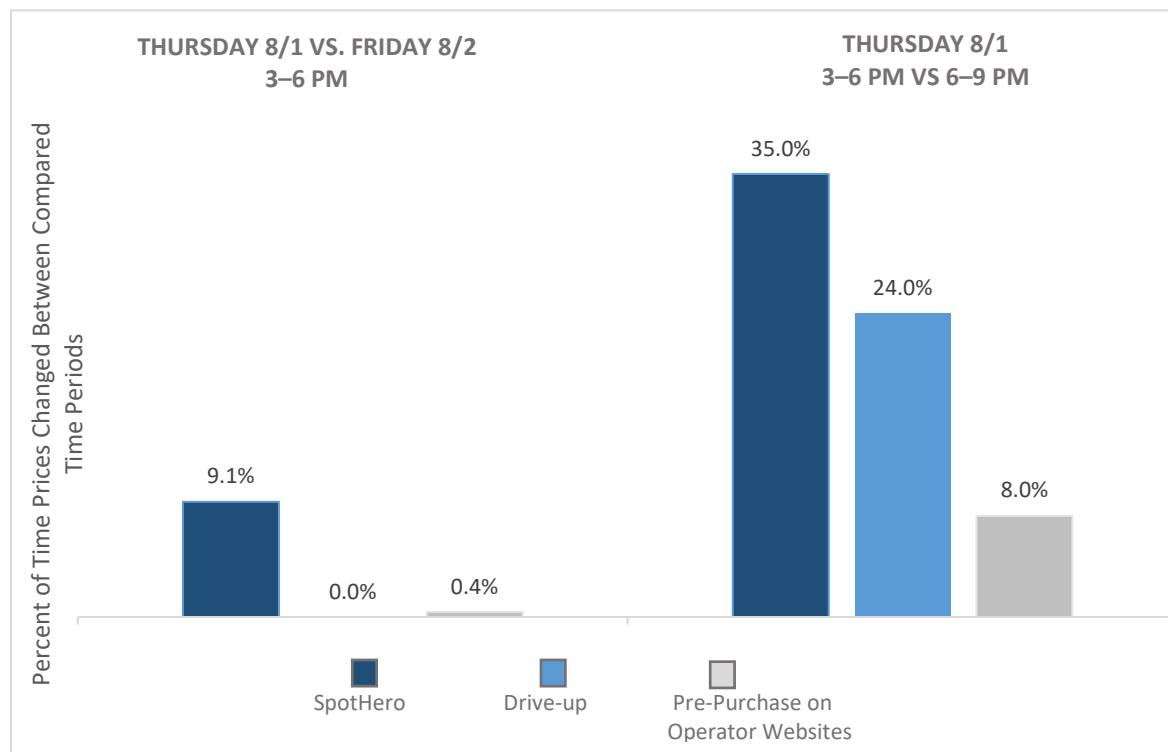
FIGURE 1: Percent Price Savings to Consumers from using SpotHero vs. Parking Facility Operator Websites and Drive-Up



Prices charged by parking facility operators on SpotHero over the three-hour intervals encompassed by our data set are similar to those available for purchase on official parking facility operator websites but markedly less than "drive-up" fares. This chart was created from a sample on Thursday, October 17, 2019.

Prices charged by parking facility operators on SpotHero can be much more dynamic for parking facility operators than drive-up and pricing on parking facility operator-owned websites. Our data show that nearly all parking facilities charge the same prices for drive-up purchases or purchases on their official website each weekday. From one day to the next, however, prices and availability on SpotHero change routinely. In a sample of 284 facilities observed on Thursday, August 1 and again on Friday, August 2, 2019, prices or availability on SpotHero during the 3 pm – 6 pm period changed for 9% of the facilities listed, whereas drive-up and pre-purchase rates and availability were identical in all or nearly all cases. (A facility becoming unavailable on SpotHero is tantamount to a price increase due to the fact the SpotHero listing is typically the lowest price option.)

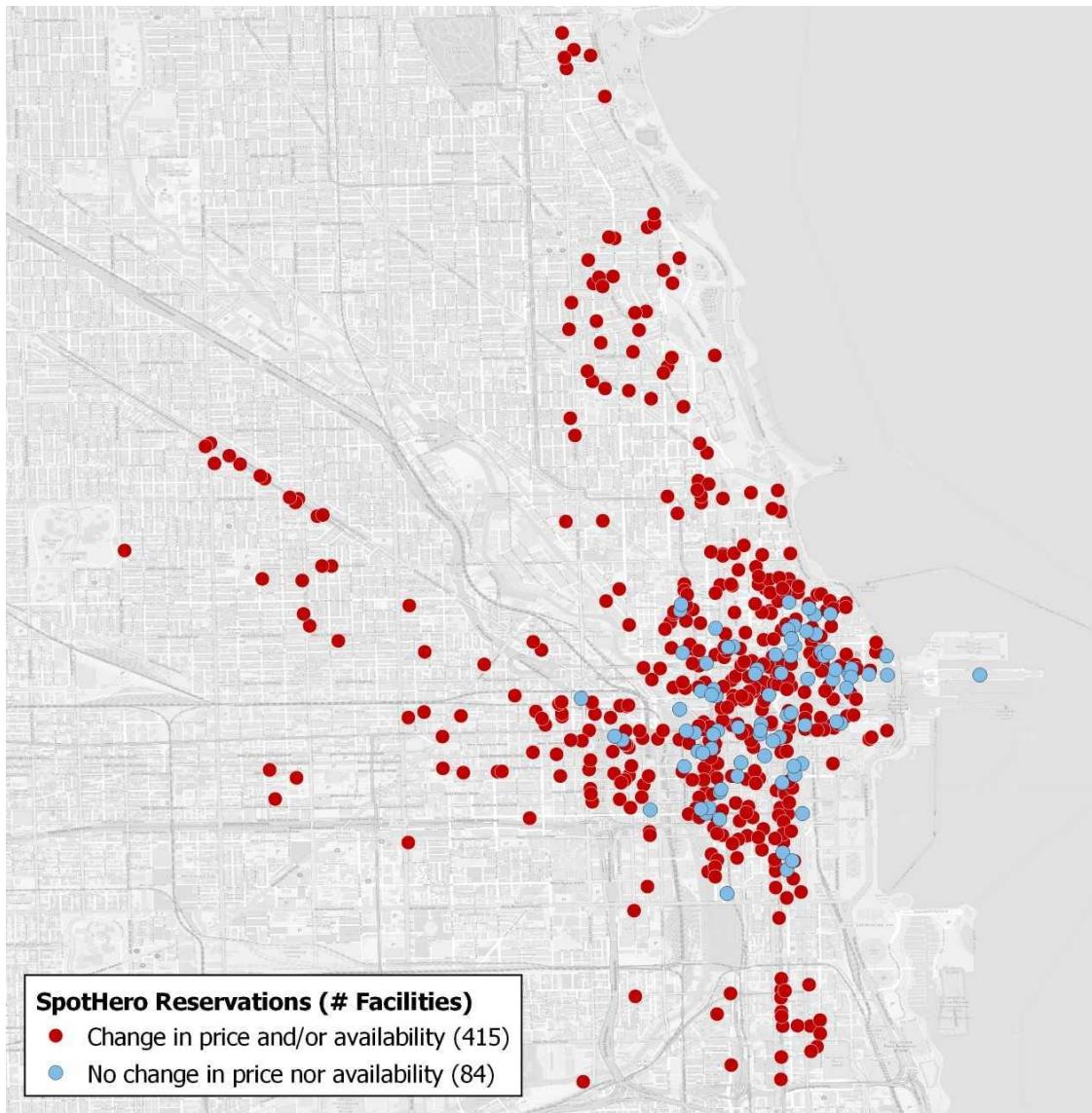
FIGURE 2: Percent of Time Prices Changes Between Successive Time Periods



Prices on SpotHero change more frequently than prices for drive-up purchases and pre-purchase sales on parking facility operator websites. This chart (left) shows the percentage of times prices changes during the 3- 6 pm interval on consecutive days and (right) instances in which parking facilities changed for parking between 3-6 pm and 6 – 9 pm on the same day.

Over the course of a single day, prices on SpotHero were also more dynamic. Between the 3 pm – 6 pm and 6 pm – 9 pm periods on August 1, 2019, prices or availability on SpotHero changed for 35% of the facilities listed, whereas drive-up and pre-purchase prices or availability changed 24% and 8% of the time, respectively. A notable exception to the trend is during the morning and early afternoon, when many private parking facilities offer “early bird” discounts, or price reductions for those who arrive (and leave) before a certain time. Such adjustments, however, are not truly dynamic: they are pre-determined discounts that generally remain the same day after day and month after month.

FIGURE 3: Parking Facility Operators Listed on SpotHero that Changed Price and/or Availability over Study Period



This map shows instances in which parking facilities changed their prices or availability for three-hour bookings on Wednesday, June 24, 2019. This occurred when a facility raised or lowered its price, became available after being unavailable, or became unavailable after being available, over the course of the day. A facility becoming unavailable on SpotHero is often tantamount to a price increase since buyers need to select from more expensive drive-up or pre-purchase options. Note how outlying facilities are much more likely to have a dynamic aspect on SpotHero than downtown facilities.

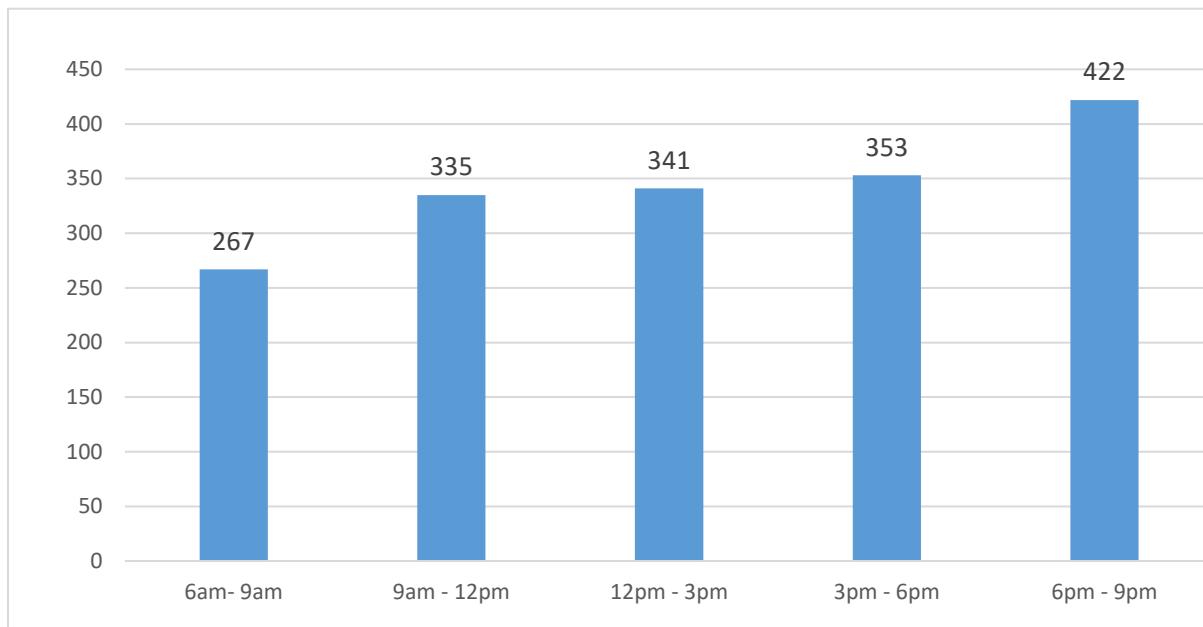
FINDING III: Parking booking intermediaries have several technical advantages that facilitate rapid price changes in response to supply and demand fluctuations. For instance, these intermediaries serve as outlets for parking facility operators' disposal of extra parking spaces not otherwise likely to be used, such as during late afternoons and evenings, which, in turn, allows cities to more effectively accommodate parking needs without adding additional capacity. The increased utilization adds to the income that municipal governments receive from parking taxes.

The dynamic nature of the SpotHero listings results in pricing more closely scaled to supply and demand conditions. Such dynamism is attributable to three technical factors.

- I. **SpotHero, like other parking booking intermediaries, has algorithms that help facility operators determine their optimal pricing.** These tools recommend price adjustments in response to competitive actions and shifts in supply and demand—a capability that most parking facility operators do not have to the same degree. These tools move parking facilities closer to “airline-style pricing”, which has allowed airlines to increase their load factors (percentage of seats filled) from an average of around 70% in the 1990s to around 90% today. More dynamic pricing can also help increase occupancy for parking facility operators.
- II. **Individual parking facilities tend to regularly appear and disappear on SpotHero in response to facility-specific circumstances and local demand conditions.** The data shows that many firms and organizations that list on this platform—such as churches, schools, and certain retail businesses—opt to make spaces available only during select times. Some offer spaces only during evenings and on weekends, perhaps when the spaces are not needed for their regular clientele. Others apparently also turn to parking booking intermediaries when they have a large amount of excess capacity during regular business hours, perhaps due to cyclical business patterns. The net effect is a constantly changing list of options available to consumers on SpotHero.

On Monday, June 24, 2019, for example, the number of facilities listing their parking availability grew from 267 in the 6 am to 9 am period to 341 between 12pm and 3 pm, before growing to 391 between 3 pm and 5 pm and 422 from 6 pm to 9 pm, a 58% increase compared to the initial, early morning period. Among the entire 502 facilities that appeared over the course of the day, only about 68% were present during all five-time intervals considered. Conversely, nearly all of the official pre-purchase sites had spots available during *all* five time periods, suggesting that they are not used in the same manner.

FIGURE 4: Number of Listings on SpotHero by Time of Day
Monday, June 24, 2019



III. **Offering sporadic discounts through booking intermediaries helps alleviate surpluses and shortages without appearing to be “exploitative” to regular customers.** Parking facility operators use SpotHero in the same way that restaurants use Groupon and other online outlets to encourage sales during periods of soft demand rather than adjusting menu prices. In this way, they can provide their regular clientele a predictable experience but still adjust prices for the segment of the market using SpotHero.

FINDING IV: Digital conveniences offered by parking booking intermediaries add to the quality of the experience for consumers and create a “feedback loop” for parking facility operators to help them improve their operations. Customer ratings and other measures serve as *de facto* regulators of product quality, reducing pressure on local governments to monitor quality.

Our analysis indicates that more than 20% of parking facility operators listed on SpotHero do not offer the option to pre-purchase a reservation on the official website of the parking facility operator. Some of these do not have websites at all. For these facilities, of course, various online conveniences are also not available, such as extending reservations without returning to the facility, obtaining a lost receipt by logging in to a digital account, or checking out customer reviews of the facility.

The three parking facility operators studied for this report all offer apps, mobile ticketing, and search engines to support reservations. Some of the notable conveniences offered by SpotHero, however, are not universally available on iParkit, Parking.com, and LAZparking.com (Table 3).

Conveniences for Selecting and Reserving Parking

- **Customer Ratings:** SpotHero provides customer ratings of parking facilities and the number of rating responses, while ParkWhiz provides ratings only. The other sites do not have ratings.
- **Cancellations:** Nearly all facilities available on iParkit, ParkWhiz, and SpotHero allow cancellation up until the start of your reservation on the app. The study team was not able to identify an online feature on parking.com that allows for cancellations and refunds. LAZparking.com requires cancellation to occur 24 hours in advance.
- **Prices and Distances on Map Displays:** Unlike ParkWhiz, SpotHero and iParkit, LAZparking.com does not display prices of search results on a map. Users must click each option to access the price. iParkit does not provide the distance of the parking options to the desired destination in the initial search results; users must click each listing to obtain this information. Parking.com's maps show facilities for which advanced reservations cannot be made but does not show prices for these facilities without the user clicking them individually.
- **Minimum Duration of Time:** Approximately 25% of listings on parking.com require users to purchase 12 hours or more of time, which discourages reservations of short duration. All or nearly all (more than 95%) listings on ParkWhiz, iParkit, LAZparking.com, and SpotHero allow reservations of as little as three hours of time.
- **Reservation extensions:** Reservations made through SpotHero can typically be extended after a reservation has already started. Some of the parking options on ParkWhiz also allow users to do this. The other sites lack this functionality.

Directions and Telephone & Driving Support

- **Navigation capabilities** ParkWhiz, Parking.com and SpotHero have link-outs to Apple Maps, Google Maps, and Waze on their apps and websites. iParkit has link-outs to the first two of these, while LAZparking.com has a link-out to Google Maps.
- **Entry pass sent via text:** SpotHero can send entry barcodes via text, whereas the other sites do not.
- **Information on confirmation email:** ParkWhiz and SpotHero provide detailed descriptions of driving directions (including tips), height limits for garages, and other supplemental information in a “things you should know” section in a confirmation email, whereas the other sites do not.
- **Telephone support:** Randomly placed calls suggest that parking booking intermediaries provide more immediate support than the parking facility operator sites. In seven out of eight calls to intermediaries, a representative was reached within 30 seconds, whereas all but two of 12 calls to private parking facility operators required longer waits or went to voicemail.⁶ SpotHero is the only platform that lists on the customer support or contact page of its website a common telephone number for the entire country. LAZparking.com offers a local phone number if you click its map. (See Endnote 6 for details of randomly placed calls).

TABLE 2: Conveniences and Information Available on Booking Intermediaries vs. Parking Facility Operator Websites⁷

	Private Parking Facility Operator			Booking Intermediaries	
	 Parking.com	 iParkit.com	 LAZparking.com	 SpotHero	 ParkWhiz
Customer score and # of reviews posted				✓	Score only
Cancellation allowed until start time		✓	✓	✓	✓
Prices shown on map of search results	Most	✓		✓	✓
Minimum length of reservation 3hrs or less	Most	✓	✓	✓	✓
Able to extend time after start time		✓		✓	Some
Navigation capabilities	Apple Maps, Google Maps & Waze	Apple Maps & Google Maps	Google Maps	Apple Maps, Google Maps & Waze	Apple Maps, Google Maps & Waze
Parking reservation pass available by text				✓	
Listing of things you should know in confirmation email (Note a)			✓	✓	✓
Info provided on amenities, disabled, 24/7, EV charging, etc.	✓	✓	✓	✓	✓
In/out privileges for most facilities	Some	✓		✓	Some
Parking reservation pass can be stored on app	✓	✓	✓	✓	✓
Apple Pay accepted		✓		✓	✓
Google Pay accepted		✓		✓	✓
Immediate and consistently available telephone support rather than voice mail or extended holds (See Endnote 6)				✓	✓
Can store info on multiple vehicles or credit cards in account	✓	✓	✓	✓	✓
Mobile pass available for nearly all facilities		✓	✓	✓	✓
Login available through Facebook and Google Mail accounts				✓	✓
Monthly parking available on app	✓	Website only	Website only	✓	✓
# of commuter benefit services integrated for monthly payments (See Table 3)	2	1	1	7	1
# of options for expense report integration (See Table 3)	1			4	2

Note a. Common features of items in these emails are driving directions, height limits, and instructions if spot is unavailable.

Advance Payments Options, Commuter Benefits, and Expense Accounting

- **Payment methods and login options:** ParkWhiz and SpotHero support payment via Apple Pay and Google Pay, whereas among the other three sites only iParkit does. These intermediaries also allow customers to log in with their Facebook and Gmail accounts.
- **Commuter Benefits Programs for Pretax Purchases:** SpotHero is the only site that allows *daily* and monthly parking with parking facility operators on both its website and app. ParkWhiz allows only for daily parking on these platforms. SpotHero has integrated with seven services, while the other sites have integrated with one or two (see discussion below).
- **Monthly Parking on App:** All websites allow searches and payment for monthly parking with parking facility operators. Parking.com and SpotHero also allow this on their apps.

TABLE 3: Expense Account Services Available with Parking Facility Operators and Booking Intermediaries

	Private Parking Facility Operator			Booking Intermediaries	
Expense Account Service(s) Available	Parking.com	iParkit.com	LAZparking.com	SpotHero	ParkWhiz
Commuter Benefits on App and Website	Concur*			Certify Concur Expensify ChromeRiver	Concur Expensify
	WageWorks* TransitChek* (redirect only)	WageWorks (website)	WageWorks (website)	WageWorks TransitChek Ameriflex Beneversal CommuterCheck Edenrod eTrac GoNavia (app + website)	Edenred (app + website)

*Information about options for parking.com not provided on app or website but can be obtained by accessing a link taking the user to another site, making a phone call, or some other means.

Shown above in Table 3 are the **commuter benefit programs** that are integrated into each platform. Among the seven integrated into SpotHero's app and website are WageWorks, TransitChek, and Expensify, which are among the largest. ParkWhiz has integrated Edenred into its app and website. Parking.com has two options, and iParkit and LAZparking.com each have one. In most cases, the services are not integrated into their apps. The level of complexity to the user varies. SpotHero is the only platform having seamless integration of multiple in-app options with no requirement to navigate between online sites.

Another feature made available is integration with **expense account services**, such as Certify, Concur, Expensify, and Chromeriver. SpotHero has integrated all four services, while ParkWhiz has integrated the first two. Parking.com has integrated Concur, with the other two not yet integrated (Table 3). SpotHero and ParkWhiz are the only two platforms that have integrated expense account services into their apps.

Many consumers may only value some of the above features; nevertheless, those who have come to rely on certain conveniences may experience a certain amount of frustration as they jump from site to site, where they will find some features only sporadically available. In some instances, locating features is difficult due to non-intuitive or less standardized website and app designs.⁸

B) SOCIAL BENEFITS FROM REDUCED ROAMING

A notable benefit to cities from increased use of parking booking intermediaries (as opposed to drivers arriving and looking for parking) is the reduction in vehicle travel on local streets. This includes reduced roaming for both on-street and off-street parking, which are considered in separate sections below.

FINDING V: Under conservative assumptions about roaming for off-street parking, parking booking intermediaries reduce the social cost generated by excess driving—including congestion, safety impacts and emissions—by about \$1.35 per trip. Over the course of the year, these benefits likely exceed \$10 million to the city.

In the past, motorists have often had little choice but to guess if a parking facility would be available and that the price would be acceptable when they arrived at their destination. Finding an option that was suitable to them often meant circling the block looking for an on-street spot or a sign for a garage. In the midst of the severe traffic congestion that exists in many parts of Chicago—particularly in the Central Area, North Lakefront, and other densely built areas with rapidly growing pedestrian, bicycle and rideshare activity—motorists searching for parking would often miss garages or parking lots on their first drive past them. When this occurred, it was often necessary for them to circle back, adding further to traffic congestion. Even after locating a garage, drivers may find that the facility was full.

By using a booking intermediary, consumers are routed to an exact address. Many use GPS navigation systems that direct them to the entrance of the garage. To model the potential social benefits of reduced roaming that occurs when motorists book a parking spot reservation through an intermediary, the Chaddick Institute team drew upon one of its past studies on the social costs of driving (Schwieterman, 2018). This study estimated that driving in Chicago generated costs in the form of accident and injury risk at a rate of \$0.04 per mile and increased emissions at a rate of \$0.078 per mile. Due to the prevalence of parking garages in the Central Area, a part of the city much more congested than the region as a whole, our analysis assumes the benefits of congestion reduction at \$0.87 per mile, an estimate supported by academic research.⁹

Analysis was then conducted to measure the mileage generated by motorists who roam. To avoid overstating the impact, we evaluated only scenarios in which no motorists roamed for extended periods or traveled long distances before selecting an option.

The model assumes that motorists who roam:

- i. Limit their search entirely to an area with 0.3 miles of their intended destination;
- ii. Drive to three parking facilities in this area; and
- iii. Select one of the three facilities they evaluated, each with equal probability, and then drive to that facility.

TABLE 4: Social Benefits from Reductions in Roaming for Off-Street Parking

	Benefits from Roaming Avoidance			
	Per Mile	Per Trip	Annual Benefit Scenario	
Type of Benefit	Model Assumption	Benefit Per trip	Roaming avoided on 25,000 daily trips	Each visitor to Chicago avoids roaming .25 times
Safety impacts	\$0.040/mi	\$0.04	\$390,787	\$610,271
Congestion	\$0.870/mi	\$1.07	\$9,722,229	\$15,182,658
Pollution/emissions	\$0.078/mi	\$0.10	\$870,897	\$1,360,031
Total	\$0.988/mi	\$1.20	\$10,983,913	\$17,152,960

The parking facilities to which our hypothetical motorists travel were selected from SpotHero listings in the area using a random number generator. Travel distances are computed assuming motorists drive to the three facilities in random order.

Using these assumptions, the model estimates that the average motorist roams 1.22 miles before entering the facility in which they park.¹⁰ In many instances, motorists make circuitous journeys due to one-way streets and restrictions on turns at intersections.

Applying estimates of the social costs mentioned earlier (Table 4), the model shows that the average motorist who roams generates \$1.20 in social costs per trip, of which most (\$1.07) is attributable to congestion. The cumulative impacts to the city can be quite large. Although there is no publicly available data on the total number of off-street parking transactions that are made daily in Chicago, or the share of these that are booked through parking booking intermediaries, our analysis suggests that the benefits from reduced roaming, conservatively estimated, are likely at least \$10 million annually.

Two scenarios we evaluated support this assertion. First, our analysis of public parking garages in the city suggest that at least 170,000 transactions for paid off-street parking are made daily in Chicago (see Appendix A). If parking booking intermediaries reduce 25,000 roaming trips daily—about one trip out of seven—the benefits would be \$11.0 million annually. Such volume equates to about 35 daily transactions per facility listed on a parking booking intermediary.¹¹

Second, Chicago attracts 57 million visitors annually (Chicago Loop Alliance, 2018). Some visitors no doubt roam on multiple occasions over the course of their visit. If parking booking intermediaries reduce the amount of roaming by .25 trips per visitor (as in, one in four visitors avoids roaming on one occasion), the net benefits are \$17.2 million annually. Although additional research is needed to develop more

refined estimates, it seems clear that the benefits from intermediaries may be quite large and that these benefits will rise as the share of transactions made on these platforms grows.

The above estimate may underestimate the costs dramatically due to the unique conditions downtown. It excludes the possibility that motorists will conduct search beyond 0.3 miles from their destination (perhaps acting on impulses to travel to a different neighborhood in search of a better price) or get lost or miss a turn—all of which could drive the distances upward. We also ignore the tendency for many motorists to first drive to their destination before starting their search for parking, which, too, can generate additional mileage not encompassed by our model.

The model's assumptions do not take into account the heightened risk of injury or loss of life to pedestrians and bicyclists downtown compared to other parts of the city. Nor does it fully account for the tendency for the largest parking facilities to be in the most heavily congestion parts of the city. The estimate also excludes the private costs borne by the motorists, such as lost time or additional vehicle depreciation, when roaming.

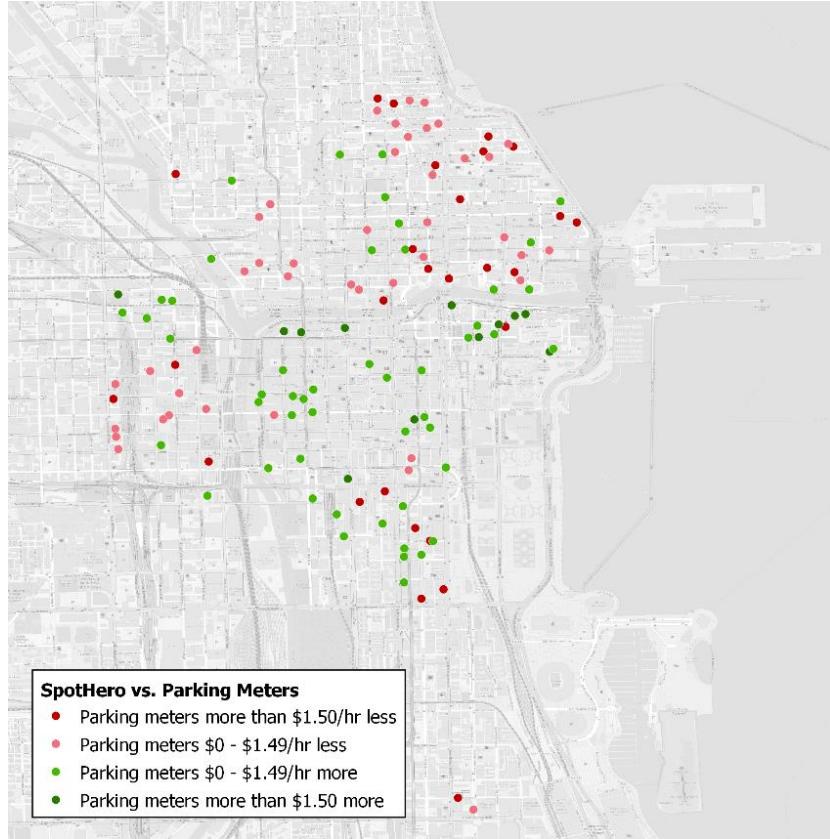
FINDING VI: In many instances, parking booking intermediaries effectively reduce the price of off-street parking to levels below those available at parking meters, which further discourages roaming.

Booking reservations for parking spots through intermediaries such as SpotHero also reduces incentives for customers to roam while looking for on-street metered parking. Through a series of spatial analyses, we compared prices for parking facility operators—standardized by hour—offered on SpotHero and off-street drive-up parking rates to those offered via the city's on-street parking meters (see Appendix B for methodology). Chicago's on-street parking meters are priced with respect to three geographic areas of the city: \$6.50 per hour in the Loop, \$4 per hour outside the Loop but within the "central district", and \$2 per hour at meters in neighborhood commercial districts, all of which are limited to a 2-hour maximum stay. The maps presented in Figure 5 show instances where nearby on-street parking meter prices are either higher (green) or lower (red) than prices on SpotHero (Figure 5a) or drive-up off-street parking (Figure 5b). Note how the share of facilities shaded green is higher on the SpotHero map (40 percent) compared to the drive-up purchase map (20 percent).

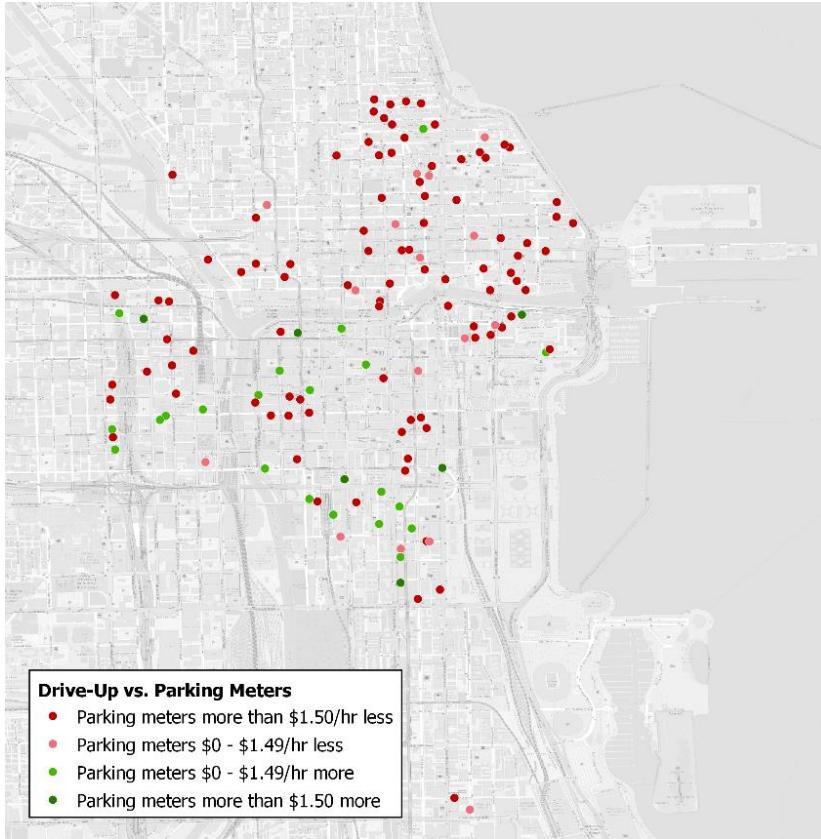
These results show that customers who check prices on SpotHero generally feel less incentive to search for on-street parking than those who would otherwise make drive-up purchases.

FIGURE 5: SpotHero & Drive-Up Prices vs. Parking Meter Prices

A) SPOTHERO VS. PARKING METERS



B) DRIVE-UP PRICES VS. PARKING METERS



These maps show how customers conducting a search on SpotHero have less incentive to roam in search of a parking meter with a lower price than those making drive-up purchases. Where the symbols are green, customers do not have an incentive to roam. The green circles on Map A represent instances where prices (measured as an hourly rate for a three-hour reservation) are lower on SpotHero than nearby parking meters. Those on Map B are instances where the hourly drive-up purchase prices at parking facilities are lower than a similar hourly rate at parking meters.

CONCLUSION

SpotHero and other parking booking intermediaries are reducing search costs, fostering more dynamic pricing, and serving as *de facto* regulators of product quality. By creating mechanisms to more effectively balance supply and demand, these intermediaries help align the private decisions of parking operators more closely with public goals. Furthermore, they give private facilities abundant data on the availability and prices of competitors, which allows them to avoid some of the inefficiencies that have hampered parking allocation in the past. In this way, parking booking intermediaries should be regarded as tools to support the movement toward “Smart Cities” (i.e., cities relying on advanced technologies to promote the efficient use of urban resources).

A notable finding from the analysis is that a significant distinction exists between supplying parking (as parking facility operators do) and providing a common platform through which suppliers and demanders of parking can book and list available space (which booking intermediaries do). Parking booking intermediaries are conduits that help parking facilities reach a larger base of consumers and help consumers better understand their options.

The expansion of these parking booking intermediaries raises important questions for public governing bodies. These include:

- **Should standards be established for the collection and dissemination of data about parking usage?** Municipalities have an opportunity to harness the data generated by intermediaries to evaluate urban planning issues. They will, however, need strategies to systematically collect it and protect the confidentiality of the users.
- **Should municipal governments integrate parking booking intermediaries into efforts to encourage carsharing, provide off-street waiting areas for ridesharing providers, and support urban planning initiatives to assure that adequate parking is available in neighborhoods?** The ability of public agencies to work with an intermediary representing several thousand facilities throughout the region provides opportunities for creative strategies to enhance mobility and alleviate parking shortages. Public bodies could strike agreements with developers or neighborhood groups to support additional parking for carsharing programs and work with ridesharing providers to make off-street waiting areas available. Intermediaries also provide opportunities for municipalities to work with community groups and developers on neighborhood-specific parking strategies, which could include strategies to encourage additional supply of parking at peak times.

Should taxes applied to parking facilities also be applied to the commissions earned by intermediaries? Parking is among the most highly taxed goods and services in the city. The City of Chicago levies a 22% tax for daily parking on weekdays and on all weekly and monthly parking. It imposes a slightly lower rate of 20% for parking on weekends. Cook County imposes a 6% tax on daily parking and a 9% tax for weekly or monthly parking. Starting in January 2020, the State of Illinois will levy a 6% tax on hourly, daily or weekly parking, and a 9% tax for monthly parking. This will bring the total tax burden to 32% and 34% for daily parking on weekdays and weekends, respectively, and up to 40% for monthly parking.

The research presented in this study makes clear that parking booking intermediaries are not themselves the owners or operators of parking facilities and do not own or lease spaces at these facilities. As such, parking booking intermediaries serve a markedly different role than parking facility operators. Moreover, by increasing parking utilization, study results suggest that increased usage of parking booking intermediaries has the potential to significantly increase governmental parking tax revenue while also generating other social benefits as outlined above.

Considering the benefits of intermediaries outlined in this study, municipalities should tread lightly when considering imposing taxes on commissions earned by intermediaries. Extending parking taxes to commissions would likely reduce the number of garages willing to advertise on such platforms. Taxing commissions earned by parking booking intermediaries may also result in fewer consumers using the associated platforms and fewer transactions generally, in part because some of the cost of the tax would be passed on to consumers in the form of higher commissions. Consumers would then have greater incentive to return to more wasteful parking practices, such as guessing on parking availability and roaming.

Excluding the commissions paid to parking booking intermediaries would align taxation policy with that of other tech-oriented tech services, such as the exemption of sales tax on OpenTable, the popular reservation service for restaurants, which receives payment from restaurants for the marketing services they provide. Similarly, delivery fees charged by Grubhub and Uber Eats are not subject to sales tax. For these services, public taxation bodies appropriately make a distinction between tech-based services that facilitate sales and the transportation service being provided. The evidence is compelling that a similar distinction should be made for parking booking intermediaries.

APPENDIX A: Estimating the number of Daily Transactions at Chicago's Parking Garages and Lots

No reliable estimate is available for the total number of paid parking spaces within the City of Chicago or the number of times daily parking is purchased. There are about 36,000 metered on-street parking spaces (Chicago Parking Meters, 2019) and an additional 644 off-street “public garages” based on the number of active licenses issued by the City of Chicago’s Department of Business Affairs and Consumer Protection (Table A.1).¹ Approximately 315 of these 644 parking facilities are located in the downtown area, defined, for this study as the area bounded by Roosevelt Road (South), Halsted Street (West), North Avenue (North) and the lakefront.

Although the capacity or number of spaces and average utilization for these 315 facilities is not publicly available, we estimate—based on inventories gathered from the SP+ Parking lists—the number of spaces per garage to be roughly 150. This suggests that there, as a rough order of magnitude, about 130,000 spaces in parking garages throughout Chicago.

If we also assume that each parking spot is utilized 1.5 - 2 times daily, due to the tendency for some users to park only for a short period of time, then the number of paid parking occurrences will be 115,920 – 224,400, with a midpoint estimate of around 170,000 (Figure A.1). Additional research is needed, however, to develop more refined estimates of the quantity of paid parking throughout the city.

TABLE A.1 Estimates of The Number of Daily Parking Transactions

	Conservative	Moderate	Aggressive
Number of facilities	644	644	644
Average capacity	120	150	200
Turnover per day	1.5	1.75	2.0
Total paid parking transactions per year	115,920	169,050	224,400

By combining work commute flows from the US Census Bureau’s Origin-Destination Employment Statistics (LODES, 2017) dataset with transportation mode share information made available via the American Community Survey (ACS) for the same year, we estimate that 445,662 commuters drive into Chicago’s Central Area for work on a regular basis (Figures A.1 and A.2). This estimate also suggests that the number of daily parking transactions is well over 100,000.

¹ The city defines “parking garage” as “any building, structure, premises, enclosure or other place, except a public way, within the city, where four or more motor vehicles are stored, housed or parked for hire, in a condition ready for use, or where rent or compensation is paid to the owner, manager or lessee of the premises for the housing, storing, sheltering or keeping of such motor vehicles.”

FIGURE A.1
Locations of Downtown “Public Garages”

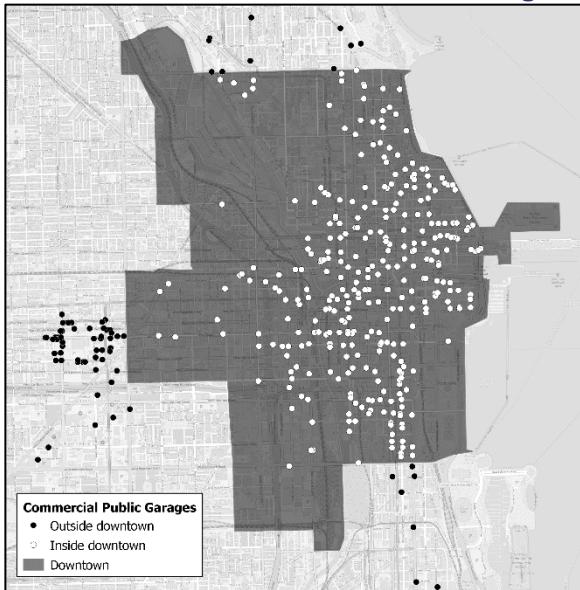
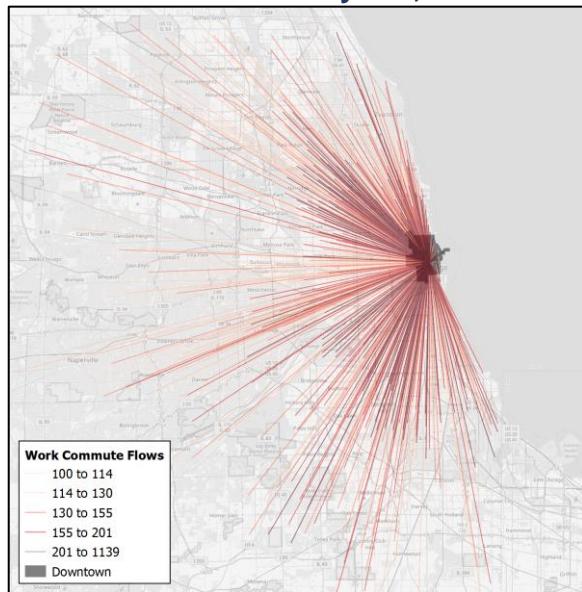


FIGURE A.2
Work Commute Flows by Car, 2017



APPENDIX B: SpotHero as an Alternative to Metered On-Street Parking

FIGURE B.1: Distribution of Parking Facilities Listed on SpotHero

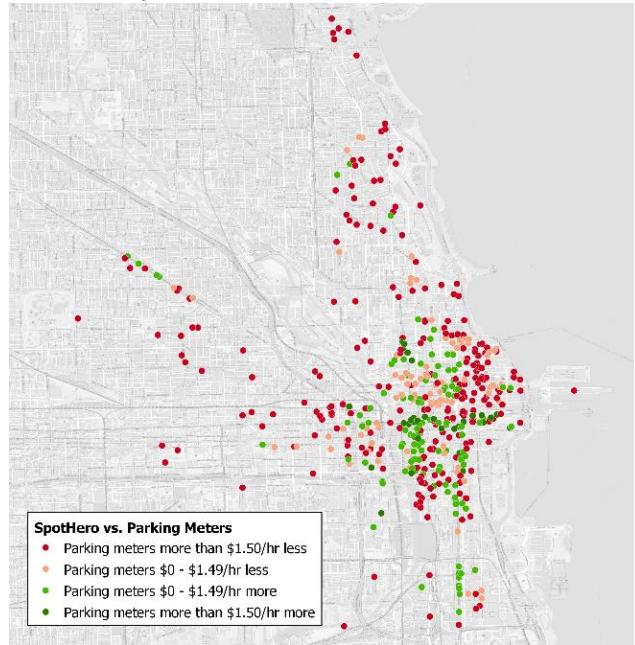
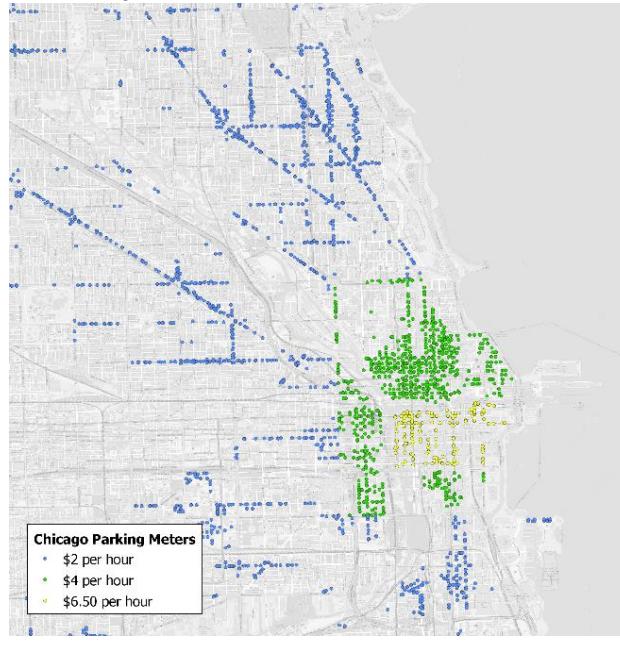


FIGURE B.2: Distribution of Chicago Parking Meters by Rate



The researchers utilized datasets from different sources in order to visualize and compare both on-street and off-street facilities within the city. Parking price and location data were extracted from the SpotHero website for 499 listings (Figure B.1) and the Chicago Parking Meter API endpoint (e.g., http://map.chicagometers.com/get_meters?ne_lat=41.89&ne_lng=-87.59&sw_lat=41.86&sw_lng=-87.65) was used to identify associated locations and rates for on-street parking. To compare on- and off-street prices, the researchers calculated the weighted average of rates for all parking meter spaces located within a 200m buffer of each facility listed on SpotHero during the study period.

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¹ Many cities are taking steps to foster more efficient allocation of municipally-owned facilities through enhanced data collection and dynamic pricing. San Francisco, CA, for example, has adopted the SFpark program, in which sensors adjust pricing at its 14 public garages. Sacramento, CA and Seattle, WA also have sophisticated pricing systems that include such innovations as charging less for the first two hours than the subsequent hours in order to maximize turnover. Similarly, the city of Philadelphia's MeterUP app has a dynamic quality that enables mobile payment at kiosks.

² Shoup, Donald. 2011. *The High Cost of Free Parking*. Updated edition. Chicago: APA Planners Press. Millard-Ball, Adam, Rachel R. Weinberger, and Robert C. Hampshire. 2014. "Is the Curb 80% Full or 20% Empty? Assessing the Impacts of San Francisco's Parking Pricing Experiment." *Transportation Research Part A: Policy and Practice* 63 (May): 76–92. Studies, including Shoup's classic *The High Cost of Free Parking* (2007 and updated in 2011), have shown that in some urban neighborhoods more than half of the vehicles on the street can be circling blocks looking for available on-street parking. In Los Angeles, the average cruising distance was estimated to be about half a mile. Millard-Ball et al. (2014) estimated that San Francisco's adaptive parking pricing program, SFpark, reduced cruising by 50 percent relative to other control blocks not part of the adaptive pricing program.

³ Pierce, Gregory, Hank Willson, and Donald Shoup. 2015. "Optimizing the Use of Public Garages: Pricing Parking by Demand." *Transport Policy* 44 (November): 89–95. The authors of this paper argue that the management of off-street parking garages tends to ignore the logic of both economics and public benefits, showing that maximizing revenue in private garages at 50 percent occupancy is below the level that is optimal for cities.

⁴ See endnote 6 for results of our assessment of the level of responsiveness to phone calls.

⁵ The manner in which ParkWhiz results are displayed makes obtaining a comprehensive count for this intermediary more difficult than for SpotHero. The estimate of 144 facilities in downtown Chicago, which was made on October 15, 2019, is based on expanding the search beyond the list of facilities obtained when entering the address in the search box (in this case, 1 E. Madison).

⁶ Our research team placed four telephone calls to each of the five platforms (Table 5) during normal business hours October 29–30, 2019 to gain insights into their respective level of responsiveness. A representative was reached at ParkWhiz and SpotHero in less than 30 seconds on 7 of 8 calls, with SpotHero's representative reached in less than 10 seconds in each case. In comparison, two of 12 calls made directly to large parking operator websites were answered within 30 seconds. The representative at one operator was reached on average between 1 and 2 minutes, whereas 7 of 8 calls to the other two went to voicemail.

Table 5: Length of Time Needed to Reach a Representative via Telephone

Sample	Parking Operator A	Parking Operator B	Parking Operator C	SpotHero	ParkWhiz
Phone call #1 (10/29/19)	Voice mail	2:38	Voice mail	0:08	0:22
Phone call #2 (10/29/19)	Voice mail	2:28	Voice mail	0:03	0:28
Phone call #3 (10/30/19)	Voice mail	0:05	0:03	0:03	0:07
Phone call #4 (10/30/19)	Voice mail	0:33	Voice mail	0:02	4:00

Although a larger sample is obviously needed for a more definitive analysis, these preliminary results support the public perception that booking intermediaries offer more prompt service over the phone.

⁷ The information about the apps and sites listed on this table was determined by sample searches the study team made and information available on websites (such as terms of use, privacy policy, app, etc.). In some cases, amenities on the private facility operator websites are available but not as clearly indicated or publicized as they are on SpotHero. As a result, there is ambiguity surrounding some of these amenities.

⁸ The results shown in Table 2 are based on a review of websites and apps. In some cases, features are available but difficult to find on these online tools. As a result of this, and the fact that available features are also constantly changing, these results are best viewed as only a general overview of the notable differences.

⁹ Analysis consistently shows that driving in central business districts generates greater¹ congestion impacts than driving in other parts of cities. Some studies show the congestion impact per mile travel is more than twice as large in central business districts. In the model, the assumption was made that the congestion impact was 50% higher than the 0.58/mile region-wide congestion cost estimate made by Harford, resulting in an estimate of 0.87 cents per mile. Note: the estimate from the Harford study was also adjusted for inflation. See Schwieterman (2018).

¹⁰ The simulation shows they travel 0.92 miles evaluating three options and another 0.31 miles driving to the facility in which they have opted to park.

¹¹ This estimate is based on an estimated 650 facilities listed on at least one parking booking intermediary during any given day in Chicago, which includes spots offered at facilities other than public parking lots and garages.