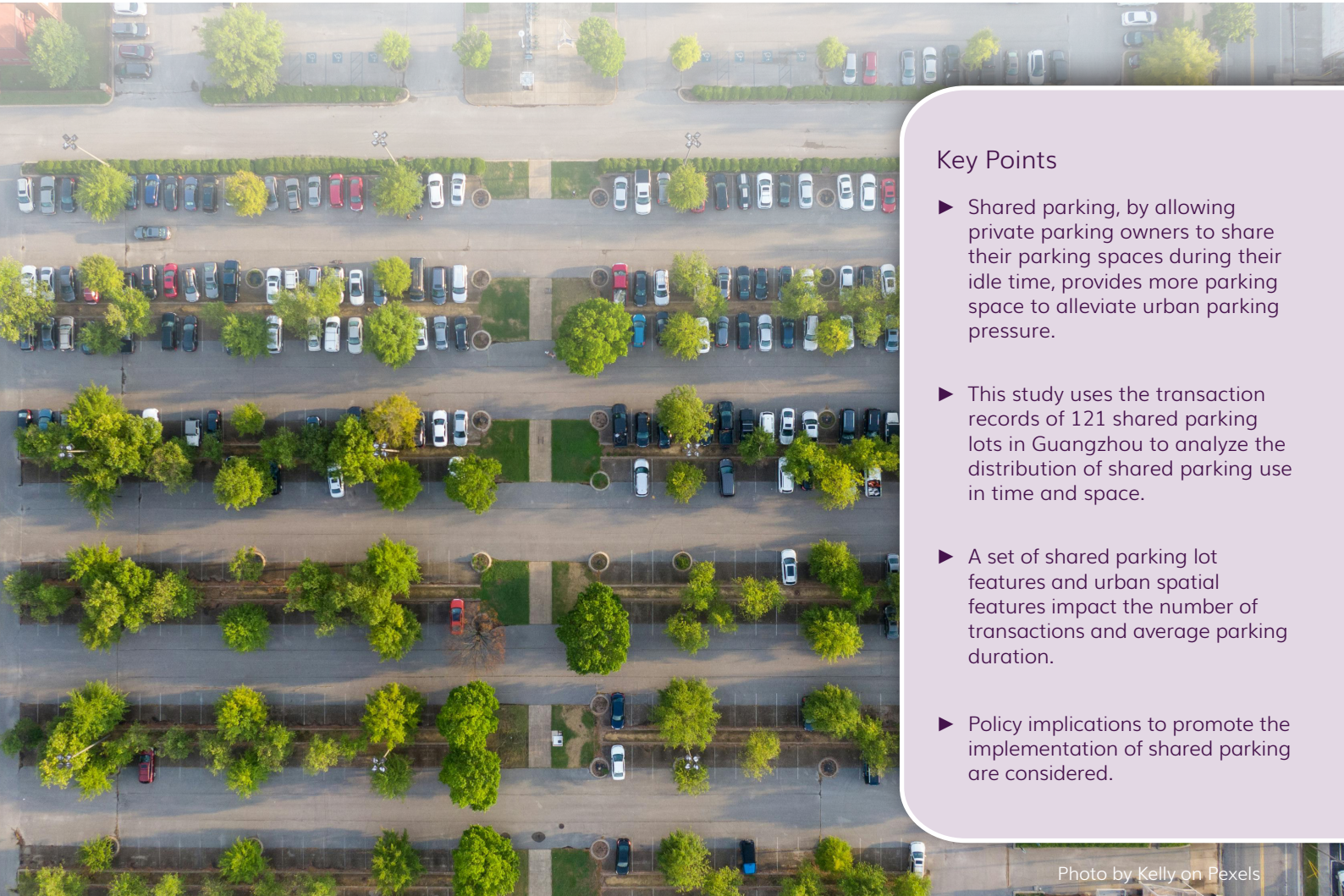


Factors Influencing Shared Parking Use in Time and Space: A Case Study in Guangzhou

Juan WANG, Pengyu ZHU



Key Points

- ▶ Shared parking, by allowing private parking owners to share their parking spaces during their idle time, provides more parking space to alleviate urban parking pressure.
- ▶ This study uses the transaction records of 121 shared parking lots in Guangzhou to analyze the distribution of shared parking use in time and space.
- ▶ A set of shared parking lot features and urban spatial features impact the number of transactions and average parking duration.
- ▶ Policy implications to promote the implementation of shared parking are considered.

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Policy Focus

In big cities, parking difficulties have caused great distress to citizens and transport authorities. To reduce these problems, parking management initiatives aimed at increasing the utilization rate of public parking spaces have been applied, while the utilization rate of privately owned parking spaces remains low during their idle time. Thus, shared parking, which enables private owners to share their parking spaces during their idle time, would possibly contribute to alleviating the urban parking shortage. In recent years, with the rise of the sharing economy and the maturity of information communication technology (ICT), the concept of shared parking re-emerged, emphasizing shared parking users can reserve

parking spaces and pay online through intelligent platforms.

Despite researchers' attention to such an innovative and sustainable way to relieve parking pressure, the implementation of shared parking in the real world remains at the planning stage in a lot of cities for reasons like legalization disputes, which also explains why there is little research on the use features of shared parking. Compared with the conservative attitude towards shared parking in some countries, China pioneers in shared parking legislation and implementation, particularly in big cities in the most need of utilization rate enhancement.

This policy bulletin summarizes a study by Wang, J., & Zhu, P. (2024) that uses data from 121 shared parking lots in Guangzhou, China to analyze the influence of a set of explanatory factors on shared parking use, addressing the following questions:

- What are the spatial distribution features of the shared parking lots? When do the shared parking transactions start in a day and how long do they last?
- How do the features of shared parking lots and urban spaces influence the total number of transactions? How do they influence the average parking duration?

Study Methodology

The study uses 418,635 transaction records data of 121 shared parking lots in Guangzhou, China from November 2020 to October 2021, which are derived from the Chinese largest shared parking platform – Airparking. Each shared parking lot record contains the information of parking lot name, coordinates, land use, construction type, implemented duration, and capacity. Each transaction record contains the information of parking lot name, car type, reservation placing time, waiting time, parking start time, parking end time, timeout duration, transaction grading, and open comments for the transaction.

Moreover, geodata of Guangzhou, including the information of POIs (points of interest, e.g., tourism attractions, office buildings, and shopping centers/streets), are extracted from online open source data.

Based on the data, the study first discusses the spatial and temporal distribution features of shared parking. After that, a quasi-Poisson regression model is introduced to understand influential factors on the total number of transactions at different shared parking lots, while a linear regression model is introduced to understand influential factors on average parking duration.

Findings and Analysis

Spatiotemporal Distribution Features of Shared Parking

Figure 1a to 1d show the spatial distribution of shared parking lot features. As shown in Figure 1a, 78.51% of shared parking lots are clustered in city central districts, i.e., Tianhe District (35.54%), Yuexiu District (21.49%), and Haizhu District (21.49%), which fits the higher parking demands in city central districts arising from higher urbanization rates and population density. Moreover, residential shared parking lots are most widely distributed, early in every district, while business office shared parking lots mainly cluster in central administrative districts. Most shared parking lots with more than 500 transactions in the observed year also cluster in central administrative districts.

For parking lots of different land-use types, the average number of transactions at different hours of the day, and the percentage of transactions with different parking duration on weekdays and weekends, are shown separately in Figure 2. For example, residential shared parking lots, where the largest number of daily transactions take place, see the first peak time of transactions around 8-9 am on weekdays, followed by an abrupt drop, a second smaller peak time at 18 pm, and a continuous drop until the second day at 6 am. However, on weekends, the number of transactions arrives at its peak around 10 am, then fluctuates until 18 pm before dropping down. On both weekdays and weekends, the largest percentage of parking duration is less than 1 hour.

Figure 1a Location of shared parking lots in the city (left) and central districts (right)

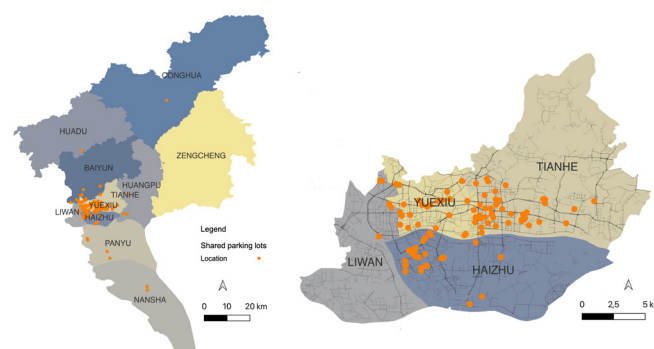


Figure 1b Land use type of shared parking lots in the city (left) and central districts (right)

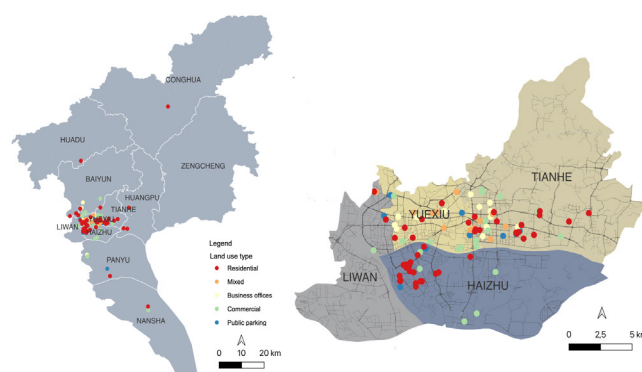


Figure 1c Implemented duration of shared parking lots in the city (left) and central districts (right)

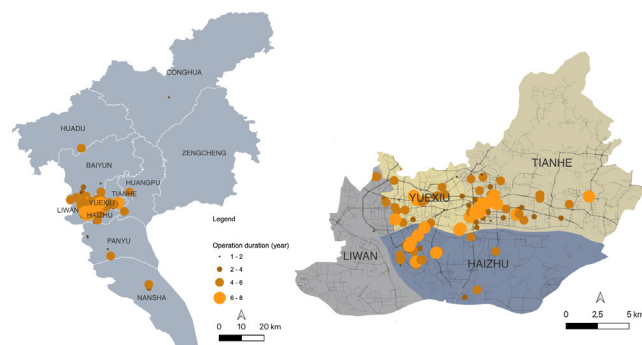


Figure 1d Total number of transactions of shared parking lots in the city (left) and central districts (right)

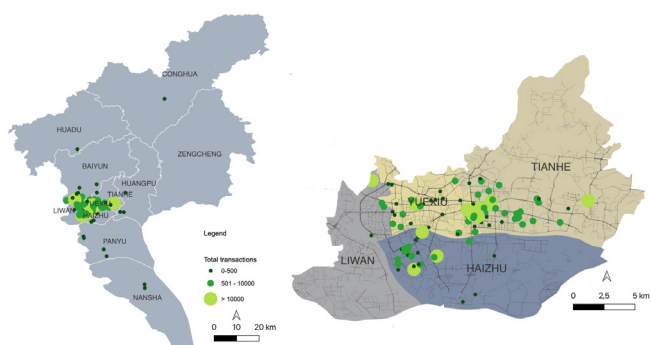
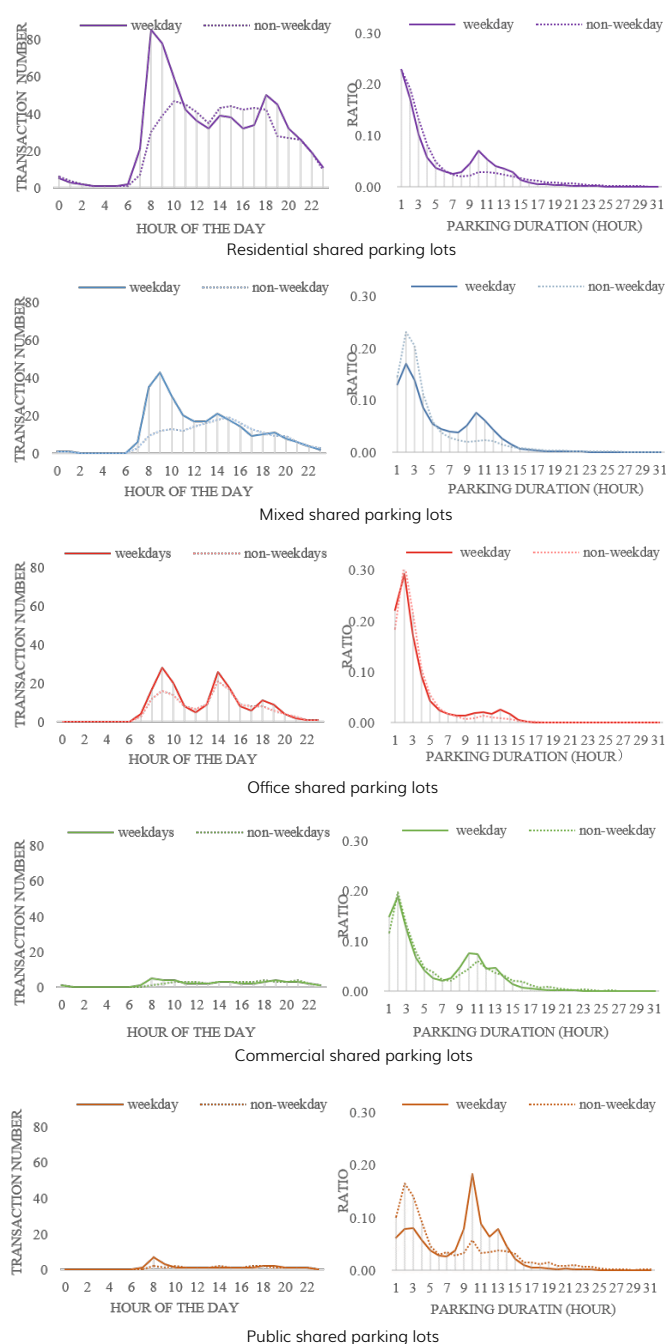


Figure 2 Transaction number at different hour of a day (left) and ratio of parking duration (right)



Influential Factors on Number of Shared Parking Transactions

Based on the regression results, implemented duration of shared parking, parking lot capacity, land-use type, number of business office buildings, art-related POIs, and bus stations (within 750 meters) have a statistically significant impact on the number of transactions. In particular, the mean of number of transactions increases by 5.3%, with each additional month of shared parking implementation in the parking lot, which could be explained by higher user awareness and better services based on operation experiences. As for parking capacity, with each increase of 10 parking lots, the mean of number of transactions increases by 0.1%. Also, compared with mixed land-use shared parking, commercial shared parking has 67.8% fewer transactions, and residential shared parking has 43.9% fewer transactions.

Regarding the influence of POIs, one more business office building within 750 meters increases the mean of number of transactions by 3.1%, while one more art-related building, which is supposed to be less often visited in China and equipped with sufficient parking space, decreases transactions by 10.7%.

Besides, with one more bus station located within 750 meters, the mean of number of total transactions decreases by 9.4%, which can probably be explained by the assumption that bus services can reduce car usage.

Influential Factors on Average Shared Parking Duration

Based on the regression results, land-use type, number of business office buildings, number of hospitals, and peak time have a statistically significant effect on average parking duration. In particular, the public shared parking lots have the longest average parking duration, followed by residential parking lots, business office parking lots, mixed parking lots, and commercial parking lots. Regarding the surrounding POIs' influence, one more business office building within walking distance decreases the mean parking duration by 0.032 hours, while one more hospital nearby decreases the mean parking duration by 0.187 hours.

Moreover, the peak hours of shared parking lots have an impact on parking duration. The mean parking duration of parking lots with peak hours between 10-12 am on weekends, is 0.858 hours shorter than average, while that of parking lots with peak hours between 18-20 pm on weekends is 1.488 hours longer than average, which might be associated with users' parking purposes at different times of the day.

Recommendations

Providing Assistance to Newly Established Shared Parking Lots

As the study reveals, parking lots with a longer shared parking implemented duration have more transactions, which might be associated with better reputation and mature management. Thus, to enhance the utilization of newly established shared parking lots, providing management assistance in improving service quality would be helpful. Besides, advertising may also help new shared parking lots to attract more users within a shorter operation time, in which shared parking operators could benefit from governmental policy advocacy.

Considering Job Density in Shared Parking Site Selection

The study finds that the number of business office buildings nearby impacts both the number of transactions and the average parking duration. Thus, urban areas with high job densities should be considered good candidates to implement a shared parking policy. Also, considering that business office visits often occur during work hours, residential shared parking lots, which are more likely to be idle during residents' working time, should be considered as a suitable type to serve the business parking needs.

Tailoring Implementation Plans for Diverse Shared Parking Types

The study reveals varied operational features in different shared parking types, which calls for tailoring implementation plans for diverse shared parking types. For example, considering the result that residential parking lots arrive at their shared parking peak around 8-9 am, a period already bustling with neighborhood traffic, strategic coordination (e.g., designated shared parking lanes and spaces to segregate the traffic flows) is indispensable to ensure an efficient and harmonized coexistence of original neighborhood traffic and shared parking activities, therefore enhance the overall effectiveness of the shared parking solutions.

Main Reference

Wang, Juan & Zhu, Pengyu. (2024). The distribution of shared parking use in time and space: A case study in Guangzhou, China. *Journal of Transport and Land Use*. 17. 603-623.



Juan WANG is an advisor and researcher in the field of sustainable mobility and transport. She received her PhD in Urban and Transportation department in Eindhoven University of Technology, Netherlands. Dr. Wang was a postdoctoral researcher at HKUST (GZ) and HKUST (CWB). She is currently an advisor at HetEnergieBureau B.V., Eindhoven, Netherlands. She is passionate about contributing to policy development, and translating research into practical applications in order to promote sustainable transportation use and improve the urban living environment. She has so far focused on sustainable transportation mode choices, shared transportation, EV charging station allocation, and transportation satisfaction. Meanwhile, she worked on the interaction of transportation strategy and urban land use management. She is a specialist in quantitative analysis, spatial analysis, and computational simulation.



Pengyu ZHU is Associate Professor in the Division of Public Policy at HKUST. His research focuses on 1) travel behavior, location choice, implications for economic and environmental issues; 2) links between transportation infrastructure, housing market, and economic developments; 3) urban planning and policy decision-making by spatio-temporal big data analytics. His work has been published in major academic journals such as *Landscape and Urban Planning*, *Urban Studies*, *Annals of Regional Sciences*, *Transportation*, *Transportation Research Part D*, *Urban Geography*, *Cities*, *Annals of the American Association of Geographers*, and *International Journal of Environmental Science and Technology*. He was also among the world's top 2% scientists in 2023 and top 1% in 2024, based on TopResearchersList.com ranking by Elsevier and Stanford University. In recognition of his academic excellence, Prof. Zhu has been recently awarded 5.2 million HKD and conferred the esteemed title of 'RGC Research Fellow'.

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Contact Us

☎ (852) 3469 2721

✉ ppolpr@ust.hk

📍 The Hong Kong University of Science and Technology
c/o Division of Public Policy (PPOL)
Room 4611, Academic Building, Clear Water Bay,
Kowloon, Hong Kong