BOSTON REGION METROPOLITAN PLANNING ORGANIZATION

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TECHNICAL MEMORANDUM

DATE: **January 26, 2023**
TO: **Boston Region Metropolitan Planning Organization**
FROM: **Rosemary McCarron and Debrah Kamau**
RE: **Parking Policy and Trip Generation**

This memorandum presents and summarizes the results of Federal Fiscal Year (FFY) 2022 Unified Planning Work Program (UPWP)-funded study 13310, Parking Policy and Trip Generation. The work scope was approved by the Boston Region Metropolitan Planning Organization (MPO) board on April 28, 2022.

The purpose of this study was to explore the relationship between the amount of available parking at development sites and automotive ownership and usage, including in geographic areas with adequate public transit connectivity. The objectives were as follows:

1. Identify innovative approaches to using parking policy to reduce auto ownership and use to better inform the enactment of new parking policy mechanisms that may improve overall trip-generation rates by reducing automotive trips in both new and existing developments.
2. Inform ongoing trip-generation and parking policy-related work in the region.

This memorandum details limited academic research on how parking supply influences travel behavior. It then lays out potential parking policies and future directions for parking-related research.

1 BACKGROUND

In July 2019, the Metropolitan Area Planning Council released the Metro Boston Perfect Fit Parking Initiative Phase II Report.[1] The report highlighted the oversupply of parking at residential locations in Boston's Inner Core subregion. Overall, 30 percent of residential parking spaces included in the study were not

[1] Metropolitan Area Planning Council (2019). Perfect Fit Parking Initiative, Phase II Report. https://perfectfitparking.mapc.org/assets/documents/Final%20Perfect%20Fit%20Report.pdf

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occupied overnight. The largest predictor of parking demand was available parking supply, which suggests that parking availability influences car ownership.

Central Transportation Planning Staff (CTPS) recently completed the Trip Generation Rate Research study,[2] which compared the predicted vehicle trip generation rates based on the Institute of Transportation Engineers' (ITE) guidance to observed vehicle counts at nine development sites in the Boston region. The study found that ITE trip generation rates were higher than the observed vehicle counts at all sites evaluated. The difference between predicted and observed rates was particularly large for developments with constrained parking availability.

Taken together, these local studies point to an opportunity to use parking policy to help reduce vehicle ownership and trip generation. Given the substantial contribution of vehicle travel to greenhouse gas emissions, understanding the impact of parking supply on automobile ownership and driving behavior can help design policies that help achieve Massachusetts' greenhouse gas reduction goals. CTPS completed a parking policy literature review to better understand how parking supply influences vehicle ownership and use. CTPS then used these findings to develop policy recommendations and potential avenues for future research.

2 SELECTED LITERATURE REVIEW

The following section reviews the available literature on how parking influences vehicle ownership and travel behavior. Though the relationship between land use, the built environment, and travel behavior is well studied, the body of research on how parking policy affects peoples' decisions to own or use a vehicle is small because of the limited availability of data on parking supply and usage. Following is a summary of key studies that help elucidate the relationship between parking, vehicle ownership, and travel behavior.

2.1 Residential Parking

Household Parking Facilities: Relationship to Travel Behaviour and Car Ownership (2017)

Authors: Petter Christiansen, Nils Fearnley, Jan Usterud Hanssen, KåreSkollerud

[2] Central Transportation Planning Staff (2022) Trip Generation Research. https://www.bostonmpo.org/data/calendar/pdfs/2022/MPO_0428_Trip%20Generation_Rate_Research.pdf

Summary

This research builds on the 2013 Norwegian National Travel Survey (NTS) by selecting a subset of more than 2,400 urban residents to complete an additional detailed survey on parking availability at their home. By relating information from the detailed residential parking survey to the broader NTS, the researchers demonstrated that access to private parking triples the likelihood of owning an automobile. For those who own a car, the distance between their parking space and the residence plays a role in mode choice. Those who park more than 50 meters from their place of residence are less likely to use their vehicle and more likely to walk or take public transportation instead, particularly for non-work trips.

Residential Parking Costs and Car Ownership: Implications for Parking Policy and Automated Vehicles ***(2019)***

Authors: Francis Ostermeijer, Hans RA. Koster, Jos van Ommeren

Summary

This research focuses on residential parking in urban areas in the Netherlands, where residents without private parking can purchase low-cost on-street parking permits and those with access to private parking are ineligible for these permits. To estimate implicit residential parking costs, the authors estimated the impact of private off-street parking on housing prices. Using the variation in these implicit parking costs between districts, the authors estimate that parking costs explain approximately 30 percent of the variation in vehicle ownership rates.

Bundled Parking and Vehicle Ownership: Evidence from the American House Survey ***(2017)***

Author: Michael Manville

Summary

The American Housing Survey (AHS) includes questions regarding vehicle ownership and whether residential parking is included in the respondent's rent or purchase price. Using the 2003 AHS, this study demonstrates that households where the cost of parking is bundled with other housing costs are 60 to 80 percent less likely to be vehicle free. Bundled parking is also related to a higher likelihood of commuting by vehicle, but this relationship may be driven in part by the increased likelihood of vehicle ownership. The author conducted several additional analyses to control for self-selection bias (people who want to own a vehicle select residences with bundled parking) and found no evidence that this bias was driving the overall findings.

How the Built Environment Affects Care Ownership and Travel: Evidence from San Francisco Housing Lotteries (2020)

Authors: Adam Millard-Ball, Jeremy West, Nazanin Rezaei, Garima Desai

Summary

This study also attempts to eliminate self-selection bias from the influence of parking availability on driving behavior by leveraging affordable housing lotteries. Because the number of households that qualify for affordable housing in San Francisco is much greater than the number of available units, households tend to apply for all affordable housing lotteries regardless of their preferences for location characteristics such as walkability, transit accessibility, or parking availability. The effect is a random assignment of households to different residential developments. The researchers surveyed 779 housing lottery winners about their vehicle ownership, travel behavior, and employment status. Only 33 percent of households with no on-site parking owned a vehicle, whereas 81 percent of those in developments with at least one parking space per unit owned a car. Regression analysis revealed that the parking ratio was a strong predictor of vehicle ownership and frequency of driving. Availability of on-site parking did not influence the probability that residents were employed, suggesting that limiting parking supply does not limit employment opportunities.

2.2 On-Street Parking

Guaranteed Parking — Guaranteed Driving (2008)

Authors: Rachel Weinberger, Mark Seaman, Carolyn Johnson, and John Kaehny

Summary

Using two neighborhoods in New York City as a case study, this research examines how an ample supply of off-street parking influences commute mode choice. The Jackson Heights and Park Slope neighborhoods have similar vehicle ownership rates and ratios of travel to drive time to the central business district. The authors developed a mode choice probability model using factors known to influence commute mode such as income level, home ownership, work location, and employment type. Though the model predicts that Park Slope residents would be five percent more likely to commute by car, Census data indicate that Jackson Heights residents are 28 percent more likely to commute by car. The authors hypothesize that this unexpected outcome is due to the higher rates of guaranteed parking in Jackson Heights. The supply of parking spaces per car owner household was similar in the neighborhoods, but the ratio of on-street to off-street parking was quite different. Thirty-one percent of car owning

households in Jackson Heights have access to on-site, off-street parking compared to five percent for Park Slope.

Residential Street Parking and Car Ownership (2013)

Author: Zhan Guo

Summary

This study examines the interaction between free on-street parking, residents' travel behavior, and vehicle ownership. The researcher used street level and aerial images to determine the availability of off-street parking and the crowding level of on-street parking around 407 single-family or small multi-family residences in the New York City region. These parking data were related to household travel survey data to generate a multinomial logit car ownership model. This model estimates that the average car ownership would increase almost 18 percent from 1.27 to 1.5 cars per household if on-street parking was abundant and uncrowded. The presence of uncrowded on-street parking increased the likelihood of a household owning one or more cars even though all residences in the study had access to off-street parking in a garage or driveway.

2.3 Commercial Parking

Food Shopping in the Urban Environment: Parking Supply, Destination Choice, and Mode Choice (2010)

Authors: Donald W. Maley and Rachel Weinberger

Summary

This study aimed to understand how surface parking lots at supermarkets influence travel behavior. The research focused on supermarkets in six different walkable neighborhoods in Philadelphia, Pennsylvania. Three of the stores had large surface parking lots and large setbacks from the street. The other three had a pedestrian-oriented design. Through surveys of residents within a one-half mile of each supermarket, the researchers modeled mode choice for trips to that supermarket. Looking only at residents with access to a vehicle, 22 percent of those surveyed in the auto-oriented market neighborhoods always walked to the supermarket, compared to 53 percent in the pedestrian-oriented market neighborhoods. The research demonstrated that limited parking supply influenced a respondent's decision to walk to the grocery store but was not a significant factor in the decision to shop at that store versus another supermarket.

***Parking Management, Financial Subsidies to Alternatives to Drive Alone and Commute Mode Choices in Seattle* (2012)**

Authors: Qing Su and Liren Zhou

Summary

The authors leveraged Washington's statewide survey of employees of businesses subject to the state's Commute Trip Reduction law to examine how employer parking policies influence commute mode choice in Seattle. Using a nested logit model that incorporated factors such as travel time and travel cost, the study examined the effects of parking cost and parking supply on commute mode. The resulting data demonstrate that increasing the cost of parking or providing discounted parking for high-occupancy vehicles reduces single-occupancy vehicle (SOV) trips. Employers that provided fewer parking spaces per employee were also less likely to generate SOV commute trips.

3 POLICY OPPORTUNITIES

The research above illustrates that parking cost and availability are important factors in vehicle ownership and use. Parking policies can be effective levers to reduce SOV trips and help achieve climate and sustainability goals. The following section identifies potential opportunities to use parking policy to influence vehicle ownership and driving behavior.

3.1 Policy Frameworks

Kimpton et al defined three approaches to planning for parking.[3] In the predict and provide approach, planners try to predict demand to ensure that everyone who wants to drive has parking. The multimodalism approach acknowledges that some travelers are auto dependent and focuses on providing parking near commuter rail facilities but deprioritizes parking supply in urban and transit accessible areas. Finally, the demand management planning approach comes from the perspective that demand is potentially limitless for free and easy parking. Parking demand cannot be met, so it must be managed.

Policy that manages parking demand is most effective when paired with investments that create safe and attractive alternatives to driving. The demand management planning approach to parking provision may be an appropriate framework in Boston's Inner Core subregion where walking, bicycling, and/or transit are viable transportation options. The multimodalism approach may be more appropriate in outer suburban areas. Regional coordination is necessary to

[3] Kimpton, Anthony; Pojani, Dorina; Ryan, Connor; Ouyang, Lisha; Sipe, Neil; Corcoran, Jonathan. (2020). Contemporary Parking Policy, Practice, and Outcomes in Three Large Australian Cities. Progress in Planning. 153. https://doi.org/10.1016/j.progress.2020.100506

ensure that free and easy parking in one municipality does not undermine another municipality's attempt to manage travel behavior through parking policy.

3.2 Leveraging Transportation Impact Analysis

Municipal policy can help address the limited availability of data on parking supply and usage. Currans et al highlight potential policies around transportation impact analyses (TIA).[4] TIAs typically do not include parking supply as a factor in determining trip generation rates. Municipalities could require developers to provide data on both the on- and off-street parking supply available to the development.

Incorporating parking supply into the analysis could result in more accurate trip generation rates and the data could help build an inventory of parking spaces. Municipal planners can also integrate parking utilization into the traffic monitoring requirements for larger developments. Utilization data could be supplemented with occupant surveys to get a more detailed understanding of travel behavior and to quantify potential neighborhood spillover effects when parking supply is constrained.

3.3 Additional Opportunities

Municipalities could tie off-street parking supply data to assessor data.[5] A better understanding of existing parking supply will help municipal planners make informed decisions about where parking is needed and where excess supply can be adapted for alternative uses. Municipalities could also recommend that developments allocate parking space for shared vehicles or pick up and drop off zones to improve convenience of non-SOV travel as part of the approvals process. Unbundling parking costs from housing costs should be encouraged, particularly in places where there are viable alternatives to driving.

4 FUTURE RESEARCH IN THE BOSTON REGION

Most research on parking focuses on the availability of on-site parking. As demonstrated in the literature reviewed, on-street parking also significantly influences travel behavior and vehicle ownership. Future studies of parking occupancy, including the Lab and Municipal Parking Study funded by the Boston MPO for FFY 2023 could incorporate the availability of on-street parking. Where

[4] Currans, Kristina M; Abou-Zeid, Gabriella; Iroz-Elardo, Nicole. (2021). Linking Residential Parking to Automobile Transportation Impact Outcomes at a Development Level. Transportation Research Record, 2675(1), 321–331. https://doi.org/10.1177/0361198120964791

[5] ibid

possible, building occupants should be surveyed to understand how many people park on-site versus on street.

Among the 189 properties surveyed for the Perfect Fit Parking Study, 105 are believed to have access to free or permitted on-street parking. Further analysis could investigate if free or permitted on-street parking influences the parking occupancies observed in the study.

Future household travel surveys should be supplemented with information about household parking availability. This strategy would fill some of the parking data gaps more quickly than incorporating parking availability into TIAs and could provide valuable insights into parking access and travel behavior in the Boston region.

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