

The Shared Benefits of Capital Bikeshare: Economic Impacts in Five Washington, D.C. Neighborhoods

Andrea Hamre
Dr. Ralph Buehler

This study investigates potential economic effects of bikesharing, with a focus on local businesses and the neighborhood level, and highlights a potential area of collaboration between transportation planners and economic developers. This study makes a unique contribution by surveying users at bikeshare stations about intended spending related to the bikeshare trip as well as businesses located adjacent to those same stations about perceived spending by bikeshare users at those businesses. Using a sample of five Capital Bikeshare stations in Washington, DC, we conducted an intercept survey of 333 users at each of the stations and a door-to-door survey of 140 local businesses within 0.1 miles of the stations. We found that riders are motivated to use the system due to travel time (73%) and cost (25%) savings. In addition, 16% of riders report making new trips because of Capital Bikeshare. Meanwhile, 23% of users reported spending more money because they used bikeshare. We found that 20% of the businesses in our sample report a positive impact on sales, and 70% identify a positive impact on the neighborhood. Our findings suggest bikesharing may generate shared benefits among users and businesses relating to new trips and new spending.

Introduction

Bikesharing is a flexible form of transport that typically offers individuals short-term bicycle usage to and from a network of stations equipped with payment kiosks and docks in exchange for daily, monthly, or annual membership fees (S. Shaheen, Guzman, & Zhang, 2012; S. A. Shaheen, Martin, Cohen, & Finson, 2012).

While bikesharing offers a wide range of benefits relating to air quality and congestion, public health, transit access, transportation system efficiency, and neighborhood accessibility (DeMaio, 2009; ITDP, 2013; S. Shaheen et al., 2012; S. A. Shaheen et al., 2012), concerns have been raised regarding the repurposing of limited public space as well as the impact of these systems on local businesses (Fascik, 2013; Wemple, 2011). Supporters contend that bikesharing attracts new customers, while opponents argue the systems deter customers and waste valuable public space. The purpose of this study is to improve understanding of the economic impact of bikesharing systems, with a particular focus on the neighborhood level, and relates to the potential for collaboration among transportation planners and economic developers.

First, we present an overview of the existing

literature relating to economic analyses of cycling and bikesharing. Then, we describe a conceptual framework for our analysis. We subsequently introduce our empirical method for studying the economic impacts surrounding five Capital Bikeshare (“CaBi”) stations in Washington, DC, which entailed both a user intercept survey and a door-to-door survey of local businesses. Then, we present

Andrea Hamre is a PhD candidate in Urban Affairs & Planning at Virginia Tech’s Alexandria Center. She has a Master’s degree in Applied Economics from Virginia Tech and a Bachelor’s degree in Environmental Studies from Middlebury College. Her research interests include active travel, commuter benefits, and multimodalism.

Ralph Buehler, PhD, is an Associate Professor in Urban Affairs & Planning and a Faculty Fellow with the Metropolitan Institute at Virginia Tech’s Alexandria Center. Most of his research has an international comparative perspective, contrasting transport and land-use policies, transport systems, and travel behavior in Western Europe and North America.

our empirical analysis and results, and conclude with a discussion of our findings.

Literature Review

To date, only a few studies have focused on the relationship between economic development and cycling, in general, or bikesharing, in particular. These studies have investigated: 1) the relationship between mode choice and spending patterns; 2) whether bikesharing generates new travel and spending; and 3) how businesses perceive the impact of bikesharing systems.

Clifton et al (2012) conducted a unique analysis of consumer spending and mode choice using intercept surveys at 78 local businesses in the Portland metropolitan area. Overall, they found that customers arriving by modes other than the automobile spent amounts similar to or greater than customers arriving by automobile and that non-driving customers also tended to visit spending locations more frequently. In their bivariate analysis of the relationship between consumer spending and mode choice, they found cyclists to have higher expenditures per month than drivers in all three types of businesses included in the study (\$81.76 vs. \$68.95 for convenience stores, \$81.90 vs. \$40.78 for bars, and \$48.40 vs. \$40.06 for restaurants). Once controlling for several trip, demographic, and business characteristics, their multivariable statistical analysis of consumer spending per trip found no significant difference between cyclists and drivers. These results suggest cyclists are competitive consumers in terms of spending.

transport. In particular, 65% of walkers visited the area 21-30 days per month, while 48% of cyclists, 16% of public transport riders, and 15% of drivers visited with that same frequency. Further, they found 52% of walking customers spent \$100-\$499 CAD per month in the area, while 42% of cyclists, 30% of drivers, and 28% of public transport riders spent that amount.

Schoner et al (2012) conducted a comprehensive assessment of the economic activity associated with stations in the Minneapolis/St. Paul Nice Ride system using trip data for 116 stations, as well as a survey of 29 local businesses and a survey of 1,197 system subscribers. Overall, they found station activity to be positively associated with food-related businesses and job accessibility. In addition, they observed generally positive attitudes among businesses toward the bikesharing system. Further, they learned that users often travel to spending destinations and that the bikesharing system encourages some new trips that would not have otherwise occurred. In particular, the authors found each additional food-related business within a quarter-mile of a station to be associated with a 4.47% increase in station activity. Among businesses, 17% indicated they would support replacing car parking with a Nice Ride station and 8% would support replacing sidewalk space. Based on their user survey, Schoner et al estimated users spend between \$7.00-\$14.00 per trip on shopping, dining, and entertainment/recreation. In addition, they found evidence to suggest that up to 13% of trips (depending on the type of business) would not have occurred within the station

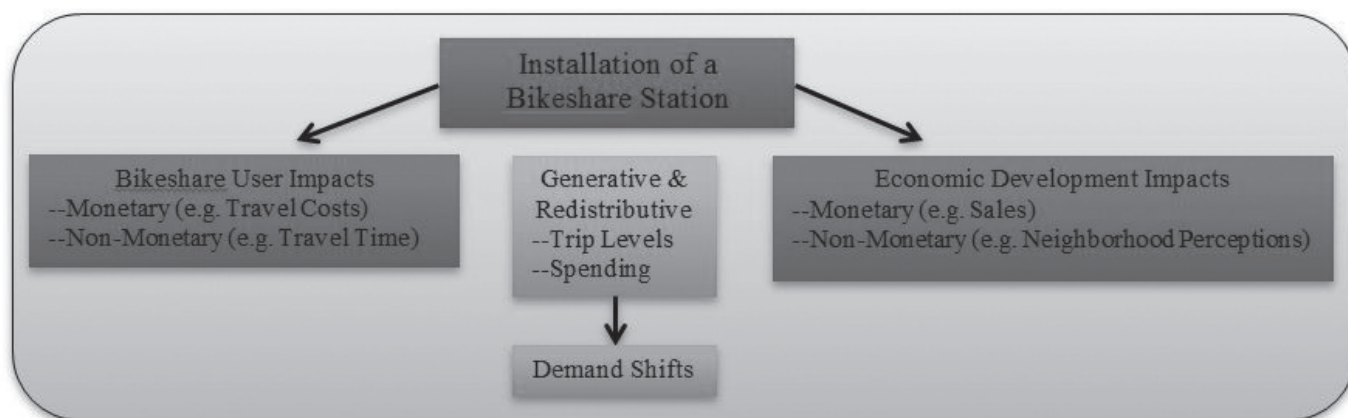


Figure 1: Conceptual Model

The Clean Air Partnership (2009) conducted an analysis of on-street car parking and bike lanes using a survey of 61 local businesses and 538 customers on Bloor Street in Toronto's Annex neighborhood. Overall, they found evidence to suggest customers arriving by walking and cycling shop more frequently and spend more per month than customers arriving by automobile or public

area without the bikeshare system. They argue that at least a portion of these trips would not have been made at all without the bikeshare system.

LoSapio (2013) conducted an analysis of the impact of the Capital Bikeshare system on businesses using a survey of 121 establishments in the Dupont Circle neighborhood of Washington, DC. Overall, she found

that 11% of businesses observed an increase in daily traffic related to CaBi and 13% of businesses perceived a positive impact on sales. In addition, 39.0% of businesses considered their location in relation to CaBi stations to be favorable.

Finally, Capital Bikeshare itself has collected information through member surveys (2011, 2013) on the relationship between the bikeshare system and patronage of local businesses. In 2011, 83% of users reported being “somewhat” or “much more” likely to patronize a business if it were accessible by bikeshare, and in 2013 the combined share was 85%.

Together, these studies suggest that bikesharing is associated with consumer spending and some new travel, and that businesses are generally supportive of the systems and observe some direct beneficial impacts. However, none of the existing literature analyzes the impacts of a bikeshare system from both the user and

business perspective at the neighborhood level. The present study makes a unique contribution by surveying users at bikeshare stations as well as businesses located adjacent to those same stations.

Building upon the literature discussed above, our economic analysis is guided by the following conceptual model (Figure 1). We conceptualize the economic contribution of a bikeshare station to be comprised of user effects, such as travel costs, as well as economic development outcomes, such as sales at local businesses (NCHRP, 2000). Additional impacts relating to social and environmental factors are not the focus of our study. User and economic development impacts may be: 1) monetary or non-monetary; and 2) generative or redistributive in nature (Button & Reggiani, 2011; NCHRP, 2000). We conceptualize that both generative (i.e. new) and redistributive (i.e. shifted from another area) impacts could function as demand shifters for individual businesses at the

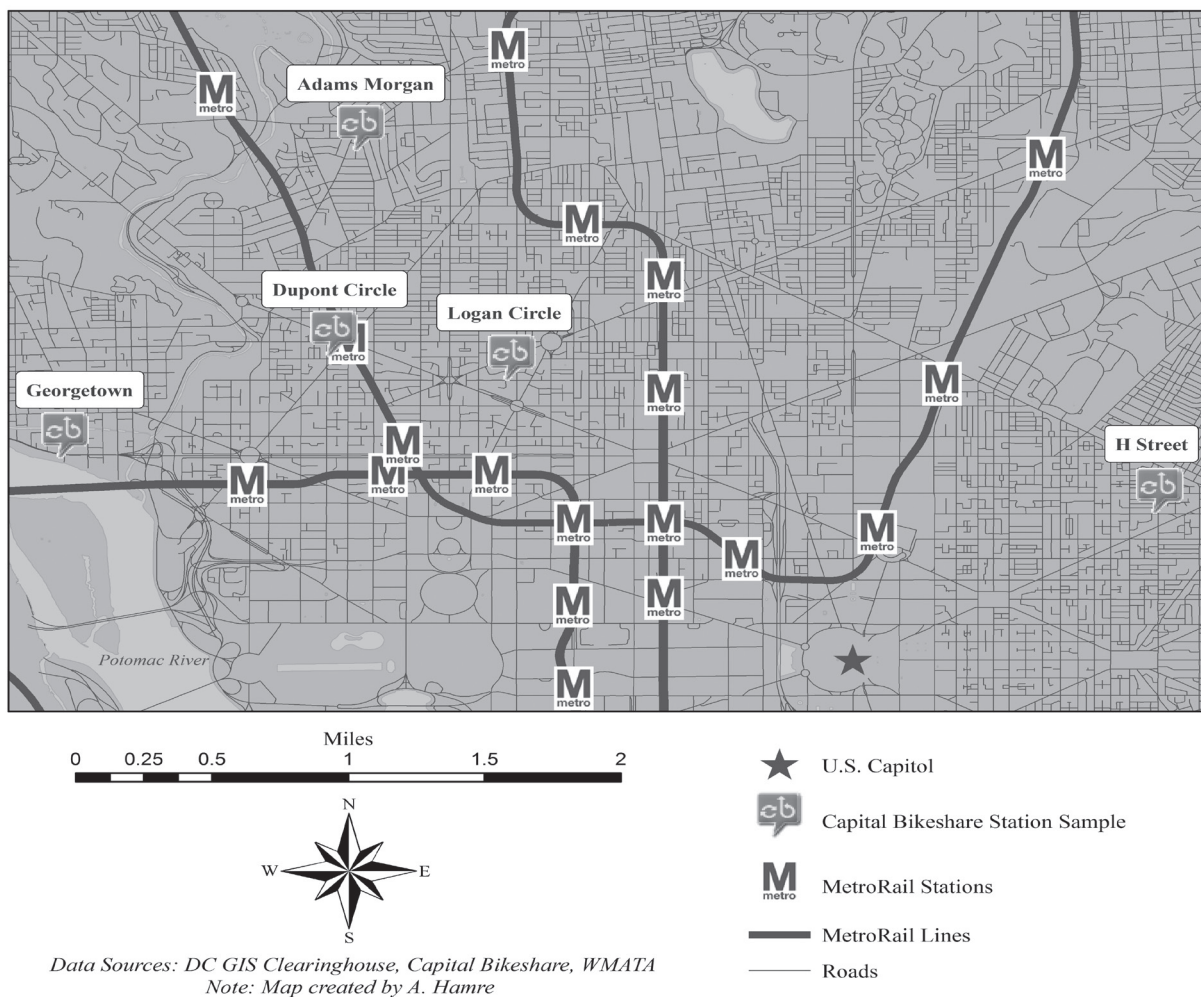


Figure 2: Location of stations studied. Station locations in Georgetown, Dupont Circle, Logan Circle, Adams Morgan, and H Street NE.

neighborhood level. Thus, our conceptual model provides a guide for empirically evaluating the notion of a “green dividend” (Smart Growth America, 2013), whereby at least a portion of travel cost and time savings derived from less driving could be transferred into more spending in the local economy.

Methods

As receiving regions are strained by rapid population growth to investigate the economic impact of bikesharing at the neighborhood level, we collected primary data from CaBi users and businesses in five Washington, DC neighborhoods. Our empirical strategy entailed three main steps: 1) bikeshare station selection; 2) design and implementation of the user intercept survey; and 3) design and implementation of the business survey.

Capital Bikeshare Station Selection

We sought to collect data based upon a diverse station sample that represented neighborhoods from across Washington, DC with high levels of commercial activity and bikeshare use. First, we chose a station in the Dupont Circle neighborhood. This station was located near a MetroRail station, had the highest level of activity in the Capital Bikeshare system during the 2nd Quarter of 2013, and was located in the neighborhood studied by LoSapio (2013). We selected four additional stations outside the typical MetroRail walkshed, estimated to be a

10-minute (or 0.5-mile) walk based on the existing street network and a pace of three miles per hour. This walkshed measure fits within relevant estimates that vary from one-fifth to one-half mile (O’Sullivan & Morrall, 1996; Weinstein Agrawal, Schlossberg, & Irvin, 2008). These stations had high levels of station activity and high levels of commercial activity within 0.1 miles of the station, and also represented four additional distinct neighborhoods. In particular, we used weekend trip data from the 2nd Quarter of 2013 and the ReferenceUSA business database along with the North American Industrial Classification Codes for retail (44, 45), entertainment/recreation (71), and service (72) businesses to identify these stations. We chose to include stations with high commercial activity, as opposed to those located in residential areas, in order to generate a sample suited to investigating the impact of bikeshare on local businesses at the neighborhood level. Our rationale for using weekend ridership data was based on our intention to survey users on weekends, described below.

The final sample was comprised of stations in the following neighborhoods and at the following locations (Figure 2):

- Georgetown (C & O Canal & Wisconsin Ave NW)
- Logan Circle (14th St NW & Rhode Island Ave NW)
- Adams Morgan (Adams Mill Rd NW & Columbia Rd NW)

Table 1: Capital Bikeshare User Survey Results

User Survey	% of surveyed
Top reasons for using CaBi	
Travel Time	73%
Enjoyment	42%
Exercise	41%
Travel Costs	25%
Share of Users Traveling to Spending Destination	66%
Spending Less Than \$10	6%
Spending \$10-\$49	65%
Spending \$50 or More	29%
Spending Within 2 Blocks of Station	34%
Spending Within 4 Blocks of CaBi Station	45%
Spending Greater than 4 Blocks/Did Not Know	22%
Share of Users Making New/Induced Trip	16%
Share of Users Making a Trip Regardless of CaBi	78%
Share of Users Spending More Because of CaBi	23%

- H Street (13th St NE & H St NE)
- Dupont Circle (Massachusetts Ave & Dupont Circle) - included for comparison

User Survey

We designed the 2013 Virginia Tech Capital Bikeshare User Survey to understand the spending patterns of CaBi riders in relation to bikesharing and station neighborhoods. We worked with Virginia Tech graduate students enrolled in a Fall 2013 studio class to design and conduct a 23-question intercept survey. The graduate students conducted the surveys in 2-4 hour shifts over four weekends in October 2013 at the five CaBi stations described above by approaching users as they returned bikes to the stations. We chose to survey on weekends, when commute trips were less likely and discretionary trips were more likely. This was due to the likelihood of a higher participation rate from non-commuters who were less time-constrained, as well as the higher likelihood that discretionary trips could be associated with commercial activity. The survey focused on the most recent CaBi trip taken. We allocated more hours to conducting surveys at the stations with higher activity levels, and our response rate was typically at least 50% per shift.

Business Survey

We designed the 2013 Virginia Tech Capital Bikeshare Business Survey to understand the impacts of the Capital Bikeshare system on local businesses. Again, we worked with Virginia Tech graduate students enrolled in the studio class to design and conduct a 22-question in-person paper-based survey. The graduate students conducted the surveys over five weeks in October and November 2013 at businesses located within 0.1 miles of the five CaBi stations discussed above. We obtained a list of 326 businesses in this radius from the ReferenceUSA database using the NAIC codes 44 (Retail Trade), 71 (Arts, Entertainment, and Recreation), and 72 (Accommodation and Food Services). Respondents included business owners, managers, and other staff. With the survey, we sought to collect information about perceptions of the impact of the bikeshare system. We allocated more hours to conducting surveys in the stations areas with higher numbers of businesses.

Results

User Survey

A total of 333 users completed our survey after dropping off a bike at one of the five selected CaBi stations. In general, our sample had a similar demographic profile to the most recent Capital Bikeshare Member Survey (2013). The majority of respondents were under the age of 35 (67%) and male (65%). About half of respondents (53%) reported having attained a master's degree or higher and nearly all respondents (94%) had a bachelor's degree. Only 10% of respondents reported a household income less than \$35,000 and over a quarter reported

a household income above \$125,000. Approximately 66% of respondents were Annual members of Capital Bikeshare, while another 23% were 24-hour members.

Large segments of our sample shared several motivations for choosing CaBi. In particular, 73% of respondents were motivated to use CaBi because of shorter travel times, while 42% cited enjoyment, 41% reported exercise, and 25% cited lower travel costs. In addition, 66% of users reported traveling to a destination associated with consumer spending (e.g. food-related or entertainment). Of those users, 65% planned to spend \$10-\$49 and 29% planned to spend over \$50. Most users traveling to spending destinations indicated they would be spending at a business nearby the station, with 34% reporting spending would occur within 2 blocks of the station and an additional 45% indicating spending would occur within 4 blocks.

About one in six respondents (16%) indicated they would not have made their trip without the presence of the CaBi station, while 78% indicated they would have made the trip regardless of CaBi and 6% reported being unsure. Of those respondents who reported making an induced trip, 19% indicated they would have likely stayed home rather than traveling to another neighborhood. Overall, 23% of users indicated they were likely to spend more during the trip because of CaBi, and 67% indicated they were likely to spend the same amount or were unsure.

Business Survey

A total of 140 businesses completed the business survey out of the initial list of 326 total businesses for an overall response rate of approximately 40%. Response rates varied across station areas, from approximately 24% in Adams Morgan to 51% in H Street, as well as business type, from 17% for non-food and non-retail businesses to 51% for food-related businesses and 63% for retail businesses. The vast majority of respondents were aware of the CaBi system (88%), and 32% reported having experience using the system. Most businesses did not know if CaBi had any effect on customer traffic levels. Nevertheless, approximately 10% perceived an increase in customer traffic. One in five businesses perceived that CaBi has positively impacted their sales while another 79% reported a neutral impact or were unsure and 1% perceived a negative impact. In addition, most businesses (70%) indicated CaBi has had a positive effect on the neighborhood, while another 29% reported a neutral impact or were unsure. Further, 69% described the location of their business in relation to CaBi as favorable, and 59% indicated they would like more CaBi stations to be added. Regarding public space tradeoffs, 22% of businesses indicated they would have a positive reaction to replacing sidewalk space with a CaBi station, while an additional 26% would be neutral and 52% would have a negative reaction. Finally, 29% would have a positive reaction to replacing car parking with a CaBi station, while an additional 32% would be neutral about removing

car parking in favor of a bikeshare station and 39% would have a negative reaction.

Discussion and Conclusions

Our analysis of five Capital Bikeshare station areas suggests that the stations may have significant economic effects at the neighborhood level, based on the intentions and perceptions of users and businesses surveyed in this study. In terms of user effects, the results of our survey suggest that users incur both monetary and non-monetary benefits in terms of lower travel costs and time savings. We found that most users (73%) were motivated to use CaBi because cycling was faster than other modes for that particular trip, while 25% were motivated because using the system offered monetary savings. In terms of economic development outcomes, the results of our business survey suggest that businesses perceive both monetary and non-monetary benefits such as increased customer traffic and sales, as well as positive impacts on the neighborhood. Our business survey indicated 20% of businesses perceived a positive impact on customer sales, while 70% reported a positive impact on the neighborhood.

While many of these effects are likely redistributive in nature, we also found evidence to suggest that a portion of these outcomes are generative and relate to new trips and new spending. Our results suggest 16% of users made new trips because of the presence of the CaBi station, and 19% of those traveling to the neighborhood regardless of CaBi reported increased spending due to having taken CaBi. From the perspective of the individual business, we expect both generative and redistributive effects to act as demand shifters. Our user survey suggests that the CaBi stations are encouraging new trips to the station areas and new spending at nearby businesses. The results of our business survey mirror this finding from the user survey, as 10% of businesses perceive increases in customer traffic and 20% perceive increases in customer sales. Therefore, we find support for the notion that bikesharing may generate a “green dividend” (Smart Growth America, 2013) whereby at least a portion of the travel cost and time savings incurred by Capital Bikeshare users is being spent at businesses surrounding stations.

While caution should be taken in directly comparing the magnitude of our findings to those of prior studies, due to such differences as sampling design, geography, and demographics, our findings are largely consistent with those presented in other recent studies. First, our study supports the recent findings that indicate cyclists, in general, and bikeshare users, in particular, are likely to visit businesses near stations (Capital Bikeshare, 2011, 2013; Clifton et al., 2012; Schoner et al., 2012; The Clean Air Partnership, 2009). We found that 66% of users reported traveling to spending destinations, and of those 63% planned to spend \$10-\$49. This is higher than the \$7-\$14 estimated spending per trip found by Schoner et al (2012), and may be related to the higher cost of living and higher incomes in the Washington, DC area compared

to the Minneapolis/St. Paul area, as well as the focus on weekend spending in the present study, which could be more discretionary in nature. Further, we found about 16% of users reporting making new trips, which is higher than the upper range of 13% given for various business types by Schoner et al (2012). A future study could investigate the factors that determine the levels to which bikesharing systems induce new trips.

In terms of business perceptions, both Schoner et al (2012) and the present study found more support among businesses for replacing car parking with bikeshare stations than for replacing sidewalk space. However, we found a higher level of support in our five Washington, DC neighborhoods than they found for the Minneapolis/St. Paul area (29% in our study vs. 17% in their study for car parking and 22% in our study vs. 8% in their study for sidewalk space). Further investigation regarding the factors relating to various levels of support for these public space tradeoffs could result in an important contribution to our understanding of this critical issue. One possible explanation is that businesses in Washington, DC are more accustomed to non-driving customers, given the larger and more extensive public transport system in the region. This finding may also relate to the relatively high traffic congestion levels in Washington, DC, which could discourage driving to spending destinations. Finally, the results of our business survey were largely comparable to LoSapio’s (2013) analysis of the Dupont Circle neighborhood, where we found 10% of businesses perceived increases in daily traffic and 20% perceived increases in sales compared to her findings of 11% and 13% respectively.

There are important limitations to our study design and the generalizability of our findings. First, we collected data during a single time period, so our data are not designed to capture changes over time. It could be that both user and economic development effects will change as more stations are added to the Capital Bikeshare system, more on-street cycling facilities are added throughout Washington, DC, and more people become members of the Capital Bikeshare system. In addition, spending patterns may differ significantly between the 2nd Quarter and other times of the year. Second, our station selection criteria provided us with a sample characterized by high commercial activity. As a result, our findings are likely not applicable to stations in less commercial areas. Instead, user effects might continue to play an important role, while the economic development outcomes are less present at these stations. In addition, our surveying of users on weekends intentionally focused on discretionary trips rather than commute trips; a future study could compare user spending in relation to discretionary versus commute travel. Third, as is typical of primary data collection efforts, our results depend on the comprehension of our survey respondents, both in terms of our survey questions and in terms of their behavior and perceptions. Fourth, our surveys captured stated spending behavior from users

and perceived impacts from businesses, rather than actual spending at businesses or behavior by bikeshare users. Future studies could attempt to measure these outcomes more directly.

Moreover, future studies could focus on questions regarding public space tradeoffs from both the user and business perspective. This could inform comparisons across bikesharing systems and provide a deeper understanding of the factors influencing local debates. Another area for consideration could be further study of the generative and redistributive impacts of bikesharing in terms of trip levels and spending.

Overall, our study suggests there is significant potential for collaborative efforts between transportation planners and economic developers. In particular, we find evidence that bikesharing may significantly benefit both users and businesses by enabling new trips and spending.

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