OPTIMIZING BIKE SHARING SYSTEM STATIONS FOR IMPROVING USAGE EFFICIENCY AND ECONOMIC VIABILITY: A CASE STUDY IN NEW YORK CITY.

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Dissertation submitted in partial fulfilment of the requirements for the degree

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name of the supervisor: Dr. T. Sivakumar

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DEDICATION

I dedicate this work to my beloved family.

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Abstract

The global population has increased from 7.4 billion to 8.2 billion during the last decade, and 55% of people live in cities, this ratio expected to rise to 68% by 2050. This has left cities with the difficult burden of controlling traffic congestion and pollution while meeting the high demand for city infrastructure. Bike sharing systems (BSS) have quickly gained popularity as an appealing and long-term solution to these issues yet their distribution is often criticized as unequal, with stations clustered in wealthier neighborhoods, and rigorous evidence on local economic impacts remains limited. This study estimates the causal economic effect of BSS station openings on visits to nearby points of interest (POIs) and derives sitting guidance to enhance both usage efficiency and inclusivity. The difference-in-differences design was applied along with propensity score matching for pairing treated POIs with comparable control POIs.

The results highlight a significant average treatment effect of ≈ +17% increase in POI visits during the first 3 months after opening a bike station nearby. However, the effects are heterogeneous. By distance from POI to station, gains are largest very close to the station, 0–100 m: ~+26%; 100–200 m: ~+17%. These patterns suggest practical siting rules: prioritize locations within ≤ 300–400 m of target POIs, aiming for ≤ 100 m in high-potential areas, and tailor placement to local urban form to improve access and equity. Future work should extend the panel back to initial rollout (e.g., 2013), examine time-of-day/weekday variation, and explore broader built-environment and equity metrics across cities. The findings provide actionable evidence for policymakers, planners, operators, and local businesses on where BSS stations can most effectively stimulate nearby economic activity while supporting a more inclusive and sustainable mobility network.

Keywords: Bike sharing systems; Causal impact; Difference in Different methods; Economic viability; Inclusion; Optimizing; Point of interest

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AI – Artificial Intelligence

ATT – Average treatment effect on the treated entity

BS – Bike sharing

BSS- Bike Sharing Systems

CI – Confidence Interval

DiD- Difference in Difference

EBSS – Electric Bikes Sharing Systems

E-Scooter – Electric Scooters

FMC – Fifteen Minutes City

MaaS – Mobility as a Service

MKD – Mapping Knowledge Domain

NYC – New York City

POI – Point of Interest

SBBS - Station-based bike-sharing

TWFE – Two Way Fixed Effect

USA – United States of America

U.S – United States