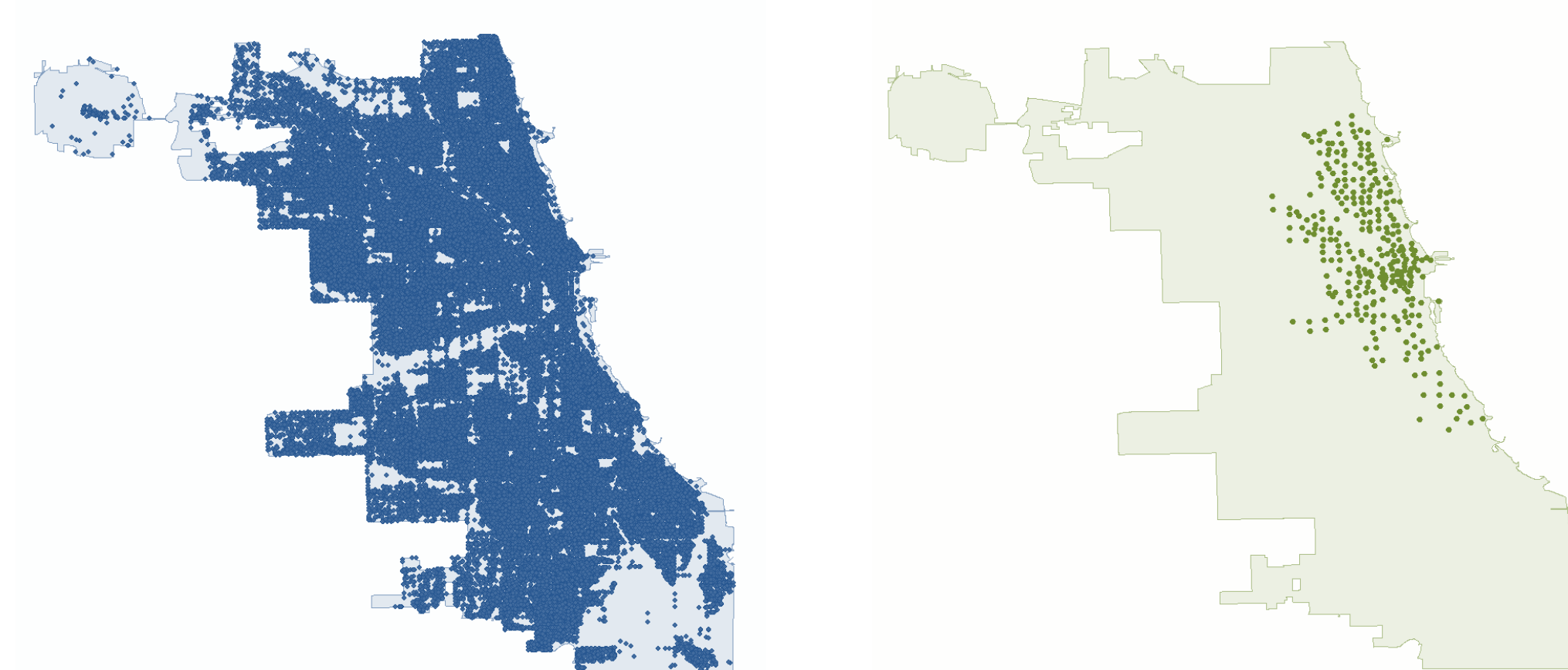


INTRODUCTION

- ❖ The main motivation behind this study is the role of transportation in urban sustainability, particularly bike-sharing as a sustainable mode of transport
- ❖ The objective is to use publicly available time-series data to examine the extent to which crime activity around a station may deter from bike-sharing and affect the number of trips generated from that station,

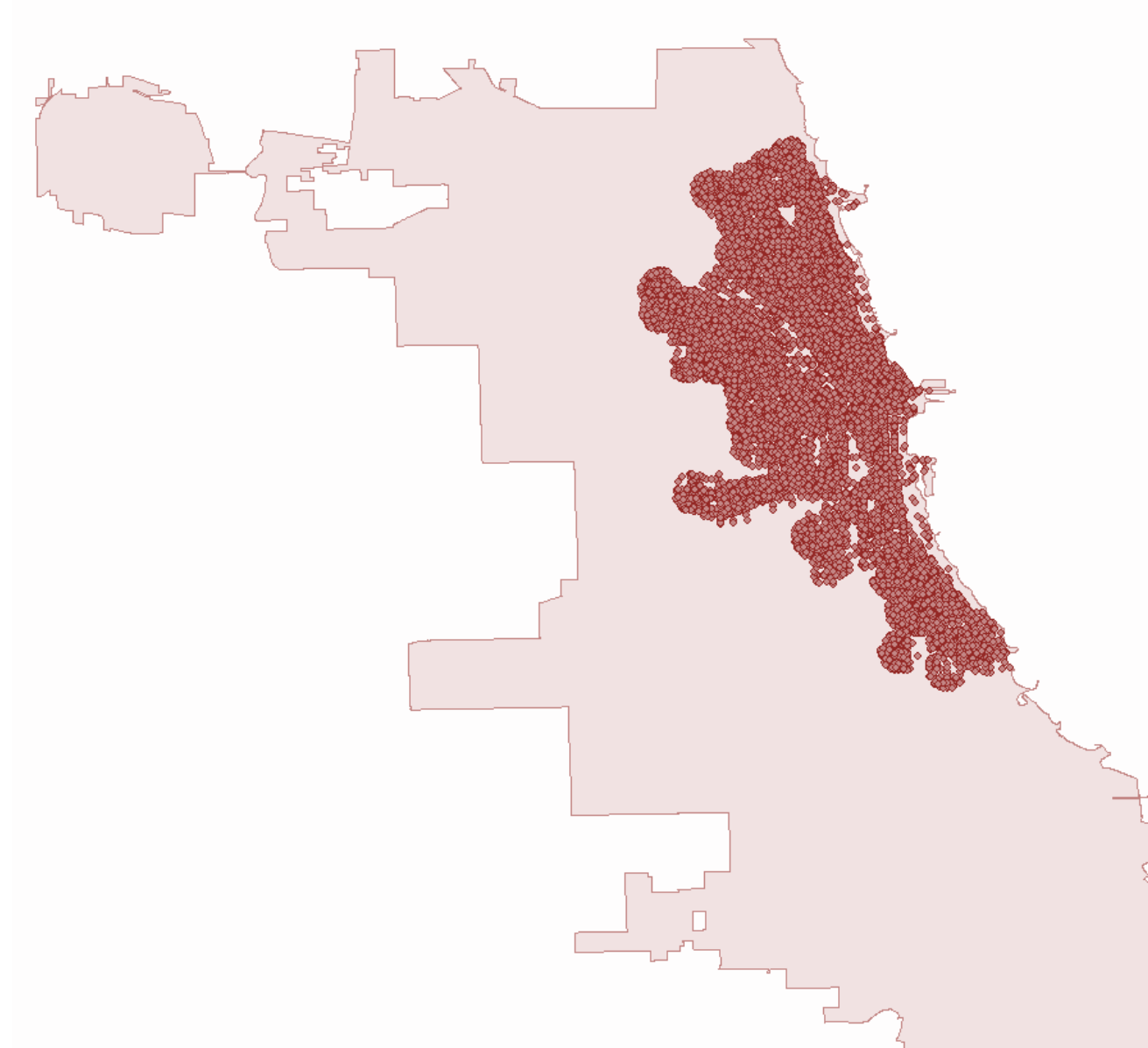
DATA SETS

- ❖ The Divvy data set, obtained from the company's website, contains information on trip ID, start time, end time, origin station and destination station for 300 bike stations that were operating in Chicago between 2014-2016.
- ❖ The crime data set, obtained from the city of Chicago data portal, contains information on case ID, date, time, location, and type for crimes reported between 2014-2016.
- ❖ An Exploratory Factor Analysis was run on the crime data set to reduce the number of crime types included in the model to three main factors.
- ❖ Data sets on population density, business activity, and public transit were readily available from the City of Chicago Data Portal



Crimes

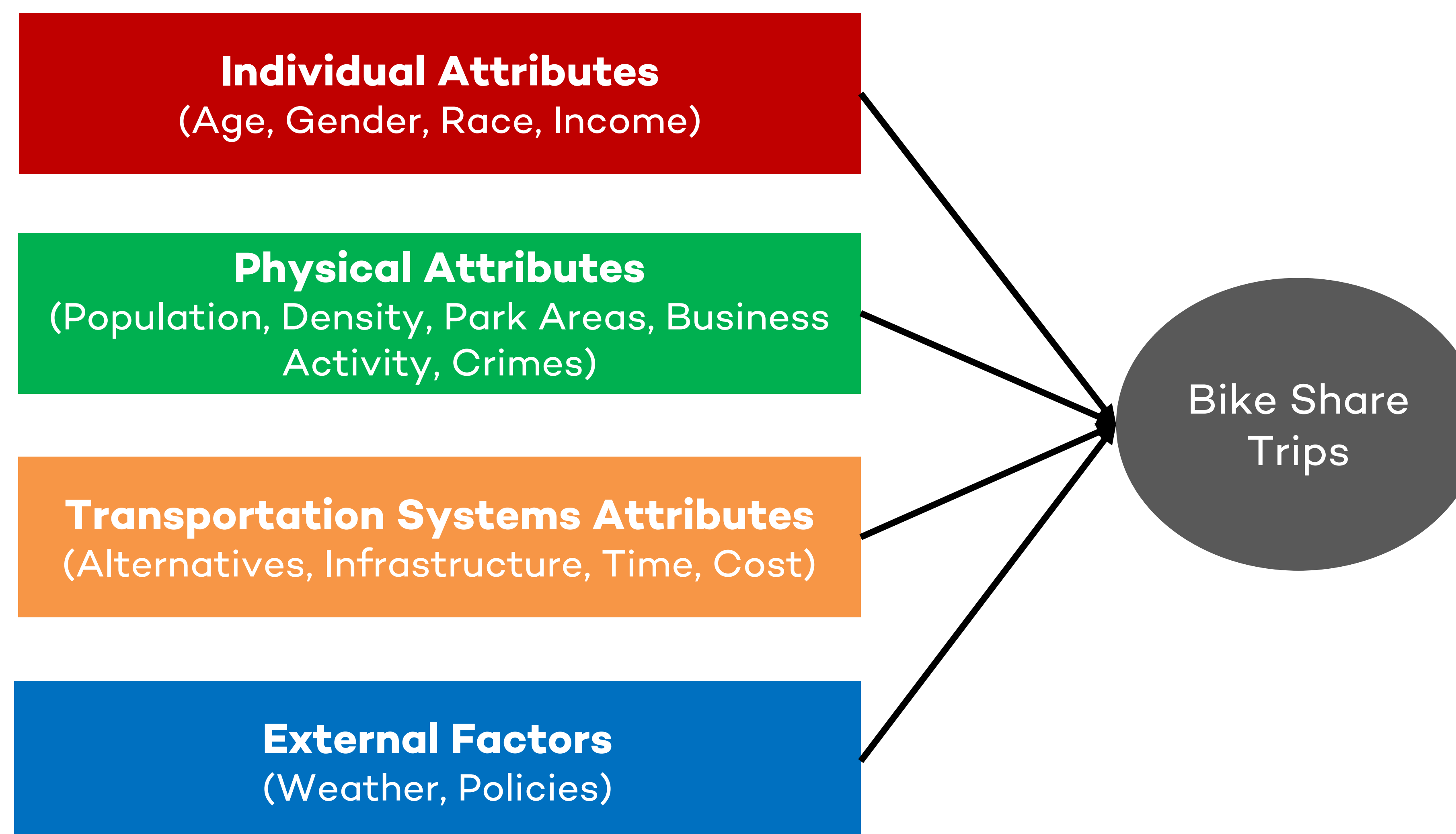
Bike Stations



Crimes near Stations

METHODOLOGY

Conceptual Framework



Time-series Model Specification

$$y_{it} = x_{it}\beta + v_{it}$$

$$v_{it} = \rho_i v_{t-1} + e_{it}$$

- ❖ i : bike stations (1..., N)
- ❖ t : time-periods – months (1..., T)
- ❖ y_{it} : monthly trips generated for bike station i and time-period t
- ❖ x_{it} : vector of explanatory variables with coefficients β ,
- ❖ v : vector of first-order serially autoregressive errors (AR1)
- ❖ ρ_i : serially autoregressive parameter for bike-station i

RESULTS

Variable	Coefficient	t value
Intercept	-885.09	-16.06 *
Park Area	-0.23	-5.9 *
Train Stations	4.39	2.59 *
Bike Routes	10.89	8.05 *
Capacity	52.93	26.9 *
Income (Per capita)	0.62	2.09 *
Population Density	3.10	5.91 *
F1: Crimes Against People	3.83	8.77 *
F2: Crimes Against Properties	-1.13	-2.21 *
F3: Unlawful possession of materials	-3.32	-3.07 *
Month		
2	8.85	1.86
3	159.95	25.7 *
4	328.11	45.99 *
5	585.72	75.48 *
6	798.99	98 *
7	932.87	111.38 *
8	878.65	104.28 *
9	755.43	91.14 *
10	579.09	72.34 *
11	309.68	41.28 *
12	118.73	17.47 *
Year		
2015	61.83	7.91 *
2016	113.08	10.16 *
Observations		10800

* Significant at the 0.05 level

CONCLUSION

- ❖ This study:
 1. Identified the most important determinants of bike share activity studied in the literature and tested them in a formal model
 2. Quantified the relationship of bike sharing activity with a neighborhood's physical characteristics, crime activity and crime types.
- ❖ The model estimates showed that:
 1. Crime has a significant impact on bike share activity
 2. Effects differ by types of crime
- ❖ The results invite researchers to differentiate between types of crime when examining the impact of crimes on travel in general and bike sharing systems in particular, in order to form a more comprehensive understanding of why people use bike share
- ❖ The results also invite policy makers to consider occurrence of different types of crime in their decisions in initiating bike share programs and the areas they choose for those programs.

MODEL VARIABLES

Variable	Chosen variables	Pre-processing	Kept or dropped?
Bike share ridership (Independent)	Total number of monthly bike trips out of a station	Not necessary	Kept
	Crimes	- Factor Analysis to choose smaller number of crime types to include in the regression - Spatial aggregation of crimes by a 0.5 miles around a station	Kept
	Population density	Spatial aggregation of the population at the census block level where a bike station is located normalized by block area	Kept
	Park recreation area	Spatial aggregation area of recreational parks in acres within 3 miles radius of a bike station	Kept
Physical Characteristics	Business Activity	number of active limited business licenses in 2014 within 1 mile radius of a bike station	Dropped due to multicollinearity with train stations (0.94)
		number of active retail food licenses in 2014 within 1 mile of bike stations	Dropped due to multicollinearity with train stations (0.8)
		Indicator that takes value of 1 if a station is located in the Central Business District, 0 otherwise.	Dropped due to multicollinearity with train stations (0.8)
		Estimated income (\$) divided by population at the community level where bike station is located	Kept
Transportation Systems Availability	CTA Bus Stops	number of CTA bus stops within 1-mile radius of a bike station	Dropped due to multicollinearity with train stations (0.8)
	CTA Train Stations	number of CTA train stations within 1 mile of a bike station	Kept
Bike-sharing infrastructure	Bike Routes	total number of bike route miles is available within 1-mile radius of a bike station	Kept
	Bike Station Capacity	total number of bikes a station can hold at the same time	Kept
Mode Attributes			Not included due to the analysis of bike share activity, not mode choice.