Project Title: Urban Travel Time Variability: Spatio-Temporal Analysis for New York City

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Traffic congestion is an important aspect of quality of life, mobility and accessibility in urban areas. The economic cost of congestion is in the order of billions of dollars especially for dense urban cities. Besides the congestion which relates to the magnitude of travel time, travel time variability is also studied extensively by researchers as an additional measure for transportation network efficiency. In order to enhance the efficiency of urban traffic flow in New York City (NYC), numerous policies have been discussed, including different transportation pricing schemes. Pricing schemes – particularly variable pricing – should incorporate the severity of congestion and levels of travel time variability at different times of day and areas throughout the City. However, most of the existing discussions are based on number of trips and bridge/tunnel crossings in the City, mainly because the necessary data to calculate travel time related measures have not been extensively available. This study uses NYC Taxi and Limousine Commission (TLC) dataset which includes trip information (including pickup and drop off location as well as travel distance and time information) for all registered taxis in NYC. Until very recently, TLC's taxi trip dataset were originated by yellow taxis which can legally serve anywhere in the city, but largely serve in Manhattan due to taxi drivers' higher potential hourly income in relatively more business oriented Manhattan. In order to increase the taxi service in the City, TLC introduced boro taxis which are restricted to serve at Brooklyn, Queens (except LGA and JFK airports), Bronx, Staten Island and upper Manhattan (north of north of West 110th street and East 96th street).

In this respect, the recently available boro taxi data fill the crucial gap to provide travel time data for unsufficiently covered areas in the City. This proposed study utilizes both yellow and boro taxi datasets as probe vehicle data to provide the necessary spatio-temporal congestion and travel time variability patterns, in order to aid relevant policy discussions in New York City.

The results indicate that Queens exhibit distinctive travel time characteristics, possibly due to its mixed facility road network of major highways and urban roads. Travel time patterns in Upper Manhattan (described as north of 60th street) are found to be closer to the patterns in Brooklyn than the trends in Lower Manhattan (below 60th street). It is discussed that congestion pricing for Manhattan should cover the whole day during weekdays as Manhattan exhibits an all-day-long congestion rather than the traditional peak/off-peak congestion. High congestion on weekends in Manhattan is also identified and possible extension of the pricing to weekends is discussed. By projecting origin destination coordinates onto the Manhattan grid network, the street (East-West) and avenue (North-South) travel rates are analyzed using linear regression. It is shown that street travel can be up to 4 times of the avenue travel rate and this significant difference is not particularly affected by the congestion levels. Meanwhile, the crosstown (East-West street) travel are equally slow during congested weekdays and uncongested weekends. In order to address this consistent problem, use of congestion pricing revenues for MTA's crosstown SBS investments (as envisioned in Move NY plan) is a viable option.

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