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Cruising and on-street parking pricing: A difference-in-difference analysis of measured parking search time and distance in San Francisco

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ABSTRACT

When on-street parking is scarce, the cost of parking includes the extra time and fuel spent searching for a parking space (or cruising). Cruising also unnecessarily contributes to local congestion, vehicle emissions, air pollution, and climate change. The theoretical literature shows that these social costs can be reduced, or even eliminated, if high-quality information on the demand for and supply of parking is used to set parking prices at optimal levels. Not surprisingly, cities plagued by parking shortages, congested streets, and limited financial resources are interested in parking policies that reduce cruising and improve the efficient use of their existing parking and roadway infrastructure. The current study sheds light on the effect of the San Francisco parking pricing program (known as SF*park*) on curbside parking search time and distance in urban neighborhoods on non-commuter parking. The study differs from previous empirical evaluations of similar parking pricing programs in its use of direct field measurements of parking search time and distance, rather than simulated data or proxy variables, such as parking availability. We use generalized mixed effect difference-in-difference models with data collected before and after the implementation of SF*park* in both treatment and control areas to estimates effects of the San Francisco smart parking project, most importantly the demand responsive parking pricing scheme. The models control for time effects by using data from a separate control area, as opposed to using variables such as block face parking price and employment. The results suggest a significant reduction in average parking search time and distance due to SF*park*. Average parking search time and distance declines by approximately 15% and 12%, respectively, from the control to the treatment areas.

1. Introduction

When on-street parking is scarce, the cost of parking includes the extra time and fuel spent searching for a parking space (or cruising). Cruising also unnecessarily contributes to local congestion, vehicle emissions, air pollution, and climate change. In urban neighborhoods, these costs may be significant: average parking search times can range from 3.5 min to 14 min, and as much as 8% to 74% of traffic can be attributed to cruising (Shoup, 2006). The theoretical literature shows that these social costs can be reduced, or even eliminated, if high quality information on the demand for and supply of parking is used to set parking prices at optimal levels (Anderson and de Palma, 2004; Arnott and Inci, 2006; Arnott and Rowse, 1999, 2009).

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Not surprisingly, cities plagued by parking shortages, congested streets, and limited financial resources are interested in parking policies that reduce cruising and improve the effective use of their existing parking and roadway infrastructure. Most empirical evaluations of non-commuter curbside parking pricing examine effects on parking occupancy (and in some cases double and illegal parking), but not on the time and distance of parking search travel (Chatman and Manville, 2014; Kelly and Clinch, 2009; Ottosson et al., 2013; Pierce and Shoup, 2013). Only two studies empirically examine the effect of parking pricing on the time and distance of parking search travel. Van Ommeren et al. (2012) use self-reported parking search time data and find that average cruising time is only 36 s per trip. This is in the Netherlands where local on-street and off-street parking are consistently priced. Millard-Ball et al. (2014) apply theoretical models calibrated with parking sensor data from the SF*park* pricing program in San Francisco and find that parking pricing significantly impacts the number of city blocks cruised.

The current study sheds light on the effect of SF*park* on non-commuter curbside parking search time and distance in urban neighborhoods. The study differs from previous empirical evaluations of similar parking pricing programs in its use of direct field measurements of parking search time and distance, rather than simulated data or proxy variables, such as parking availability. We use generalized mixed effects difference-in-difference models with data collected before and after the implementation of SF*park* in both treatment (also called pilot) and control areas. The models control for time effects by using data from a separate control area, as opposed to using variables such as block face parking price and employment.

1.1. Background

SF*park* was implemented in eight neighborhoods in the city of San Francisco (Fillmore, Downtown, South Embarcadero, Mission, Civic Center, Marina, Fisherman's Wharf, and Port of San Francisco), as indicated in Fig. 1 below. These areas encompass approximately 7000 on-street parking spaces (about 25 percent of city's total) and 12,250 off-street parking spaces located in parking garages and one parking lot. Magnetic parking sensors, installed in on-street parking spaces, capture and transmit parking occupancy data. New parking meter technology allows payment by credit cards and remote payment (the previous meters required coins). The one to two-hour parking time limits were also relaxed. Sensors and meters wirelessly transmit data to the San Francisco Municipal Transportation Agency (SFMTA) enabling monitoring of occupancy levels.

SFMTA monitored average parking occupancy over a six-week period by block, by three time periods (morning, mid-day, and afternoon), and for weekdays and weekend days. SF*park* began to charge parking fees on Sundays during the pilot program using a similar pricing structure as weekdays and Saturdays (even during evening hours); however, effective July 2014, the operation of parking meters was stopped on Sundays for most of the on-street metered parking spaces. If observed average occupancy drops below the 60% target average occupancy, then rates decrease by as much as 50 cents per hour. If observed average vehicle occupancy exceeds the 80% target average occupancy, then rates increase by 25 cents per hour. The minimum hourly meter rate is 25 cents per

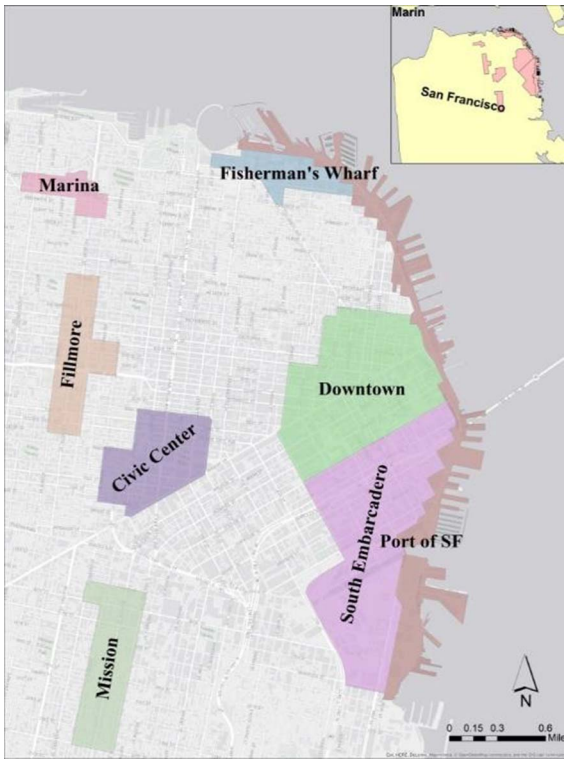

Fig. 1. SF*park* neighborhoods.