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Parking for residential delivery in New York City: Regulations and behavior

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ABSTRACT

Increasing demand for direct-to-home deliveries requires frequent delivery of small volumes; these deliveries generate growth in commercial vehicle curb side parking activities in dense urban areas. In New York City, which has extremely densely developed, mixed land uses, this new demand is only exacerbating already challenging conditions for urban delivery. This study utilizes a number of existing “open” datasets from New York City to compare commercial vehicle parking regulations and violations in commercial, mixed-use, and residential land use areas in New York City. Results suggest that parking availability – and resulting violation rates – vary considerably by area and roadway type, and that current curb parking regulations are not adequate to accommodate growing residential demand.

1. Introduction

1.1. Residential delivery demand

Recent years have seen tremendous growth in e-commerce and direct-to-home deliveries. Sales data released by the US Census Bureau estimate that for the first quarter of 2015, U.S. retail e-commerce sales were $80.3 billion, accounting for 7.0% of total retail sales (Bucchioni et al., 2015). With the exception of 2009, when the economic downturn severely impacted retail sales, the e-commerce share of total retail sales has been growing since steadily 2006. Already this growth has impacted the organization of retail supply chains. Lim and Shiode (2011) note that successful delivery of packages to customers distributed across a large geographic area requires a careful designing and management of the physical distribution network including terminals, distribution centers, and the network paths that connect them. Their study pointed out that to meet future on-line shopping demand, the cost efficiency and service reliability of the existing physical distribution network must evolve into a more centralized network structure with increased capacity at transshipment facilities.

At the end of the changing retail supply chain, new dedicated delivery services are required to perform growing and increasingly complex last-mile deliveries (Jones and Lasalle, 2013). E-commerce requires fast and reliable delivery that is different from traditional delivery (OECD, 2003). E-commerce home deliveries usually consist of small parcel sizes, often completed using smaller delivery vehicles (e.g. vans) which make many stops. While traditional commercial deliveries are usually made to stores with large trucks operated with a private fleet or by third party carriers, residential deliveries are accomplished by major couriers and parcel services (OECD, 2003). E-commerce deliveries are conducted not only in commercial areas, but also to residential homes. UPS, a worldwide logistics provider, notes that delivering to residential addresses is more expensive than to businesses since businesses tend to receive multiple packages (Carey, 2014). For direct-to-home deliveries, failed delivery attempts result in high repeated delivery rates, increasing carriers' operating costs; Visser et al. (2014) noted that 12% of residential deliveries require multiple attempts. However, residential deliveries are only expected to grow.

To address the high cost of residential deliveries, carriers have recently experimented with alternative delivery strategies to replace direct-to-home services. Morganti discusses two alternative strategies that are increasingly common in Europe - delivery lockers and pick-up points (Morganti et al., 2014a). In the US, Amazon has implemented delivery lockers and UPS is using “Access Points” (Singer and Ogg, 2015). While these alternatives offer operating efficiencies to carriers and in some cases better service to consumers, Morganti et al. (2014a)

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estimated that in France about 90% of all consumers still request home deliveries (Morganti et al., 2014b). UPS estimates the 74% of customers still prefer delivery to home (Singer and Ogg, 2015).

1.2. Commercial vehicle space requirements

As the market for direct-to-home deliveries of consumer goods continues to grow, so does commercial vehicle demand for off-street or on-street loading space in residential land use areas. Much of the growth in residential freight demand is occurring in densely populated cities already struggling to accommodate existing commercial freight activity. Due to the rapid pace of change in both freight demand and supply chain organization, parking and land use regulations have not kept up with growth in demand. Morris (2004) noted that while deliveries to commercial properties in cities over the past 30 years have increased by 300%, New York City's regulations for the number of bays required for off-loading facilities have not changed in several decades. Jaller et al. (2013) studied the on-street parking demand and supply for commercial vehicles in Manhattan, New York, concluding that available space is inadequate in most zip codes. The struggle to accommodate growing freight demands is exacerbated by urban policy trends favoring “green” passenger modes. Morris (2009) notes that beyond maintaining minimally acceptable service levels for pick up and deliveries, operational elements required by freight are often afterthoughts due to their relative invisibility. Aiming to meet the needs for all road users, Complete Streets policies generally favor vulnerable pedestrian and bicycle modes with little recognition of the added burden that new street and parking configurations may impose for freight delivery. Conway et al. (2013) identified accessibility challenges imposed by curbside bicycle lanes, including increased delivery distances, increased parking fines, inability to offload freight directly onto a curb, and increased risks to the driver associated with exposure to conflicts during parking and delivery.

1.3. Strategies for improving truck accessibility

Internationally, a number of studies and policy initiatives have been undertaken to address commercial vehicle accessibility concerns in dense cities. Since 2001, the NYC Department of Transportation has deployed a number of curb management strategies including dedicated delivery windows, paid commercial parking, and peak-hour parking pricing (Schaller et al., 2011). New York also conducted the off-hour delivery pilot, which reduced demand for curb space during peak periods (Holguín-Veras, 2008). These strategies have produced mixed results. Smart and commercial meters have effectively increased vehicle turnover rates (Schaller et al., 2011), but delivery windows have proven to have little effect in areas where unenforced service vehicles occupy these spaces for long durations (Hodge, 2015). While the pilot project clearly demonstrated the benefits of off-peak deliveries, expansion of the program has been limited by receiver barriers to accept deliveries during the off-peak. The NYC THRU Streets program also tried the method of increasing enforcement on THRU streets to reduce illegal parking and to increase curb clear time (City of New York, 2004).

Washington, DC implemented a “Downtown Curb-Space Management Program” on one of its congested downtown streets; specific actions taken as part of this program included the relocation of curb space by adding new signage, lengthening of loading zones from 40 feet to 100 feet wherever possible, adding multi-space meters, adding metered loading zones, and increasing parking enforcement (Bomar et al., 2009). Post-implementation data showed a signification reduction in car and bike travel times along the study area from September 2006 to May 2007. The city also designated off-street loading areas with paint and signage (Bomar et al., 2009). In Philadelphia's central business district, the parking authority implemented 36 “Package Delivery Zones” reserved specifically for registered package delivery companies (Dickson, 2015).

A number of international cities have also implemented policies to improve commercial curb space management. The Paris Transport Department's guideline imposes a minimum of one delivery bay every 100 m on city streets. In London and Paris, some bus lanes are shared with delivery vehicles (Dablanc, 2011). In Japan, Pilot Programs on urban freight have focused on the management of loading/unloading and parking spaces (Futumata, 2009). Time sharing is a good way to improve the road network and parking capacity. In Barcelona, the municipality has created an innovative organization on some of its main boulevards, by maintaining travel lanes at the curbside in the peak hours, allowing deliveries during off-peak hours, and providing residential parking during the night (Dablanc, 2011).

While many strategies have been implemented to better regulate commercial parking demands, these have primarily targeted traditional commercial vehicle activities. Few curb management implementations have been targeted for residential building access or for parcel deliveries. While the growing demand for direct-to-home deliveries is well recognized, little specific attention has been given to quantifying related activity, to estimating the resulting impacts on the parking and loading space required for residential freight trips, or to evaluating the adequacy of existing regulations to provide space to accommodate this demand. One reason that little research has addressed this issue is the limited data available to estimate residential freight trip generation and to characterize residential delivery activity. To provide insights on differing conditions for commercial vehicle parking in commercial, mixed-use, and residential areas of Manhattan, New York City without specific estimation of block level demands, this study employed a variety of secondary “open” data sources.

2. Databases and methods

To identify parking availability and parking violation characteristics in commercial, mixed-use, and residential land use areas, this analysis consisted of five primary steps:

1) Preliminary data processing;
2) Census tract selection;
3) Approximation of residential freight demand;
4) Evaluation of existing parking and zoning regulations, and resulting supply; and
5) Examination of commercial vehicle parking behavior.

This study relied on a number of publicly available datasets, including: land use (PLUTO) and single-line street baseline data (Lion) from the NYC Department of City Planning; census tract geometries and 2012 American Community Survey 5-year Household Income Estimates from the US Census Bureau; NYC Department of Finance parking violations; NYC Department of Transportation traffic sign database (STATUS); and United States Postal Service (USPS) Household Survey estimated package demand rates. To enable evaluation of case study areas, the NYCDOF parking violation records were prepared for analysis. First, January 2014 parking violation records were extracted from the database, which includes records since 2012. These records were then sorted by vehicle type to identify commercial vehicle (CV) violations: in total, 102,638 records, including “Delivery”, “Refrigerated Truck”, “Semi-Trailer” and “Van” vehicle types were identified. Each record includes detailed information, including violation code, issue date, time, and location of the infraction. Addresses were geocoded in ArcGIS; records missing the county or house number or including a void street name were deleted. In total, 99,615 violations (97%) were geocoded successfully. It should be noted that these cited parking activities do not necessarily reflect all violations, but only those subject to enforcement. Both parking violations and parking sign locations were then mapped to individual census tracts.