COMMERCIAL VEHICLE PARKING AVAILABILITY AND BEHAVIOR FOR RESIDENTIAL DELIVERY IN NEW YORK CITY

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ABSTRACT

This research summarized characteristics of commercial vehicle parking issues in residential land use area in New York City. Increasing demand of direct-to-home delivery creates small volume but frequent commercial vehicle curb side parking activities in dense urban area---New York City. To identify challenges unique to residential deliveries, 15 census tracts with 3 land use categories are identified first. Then both freight demand driven by business units and residential units are discussed. Off-street loading spaces availability condition is provided by examining zoning requirement of parking/loading spaces for buildings. On-street parking and loading space availability characteristics are analyzed based on the New York City Department of Transportation's Parking Regulation Database. The NYC Department of Finance's Parking Violation Database is also used to evaluate parking violation types, frequencies, and trends. Curb parking space availability and commercial vehicles' parking violation are compared among case study census tracts including residential, commercial and mix land uses to identify the potential relationship between patterns.

Discussion about that relationships did point out in residential area, current curb parking regulation do not consider parking and loading spaces for commercial vehicles to making deliveries. With expecting exponential increase of residential delivery demand in next 5 to 10 years, this design preference would generate much more traffic congestion and environmental challenges resulting from commercial vehicle parking violations. To address this challenge, potential curb management strategies to better accommodate residential deliveries are discussed.

INTRODUCTION

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 estimates that for the first quarter of 2015, U.S. retail e-commerce sales were $80.3 billion, accounting for 7.0 percent of total retail sales (1). This report also states that, 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 (2) state 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 evolved 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 (3). E-commerce requires fast and reliable delivery that is different from traditional delivery (4). E-commerce home deliveries usually consist of small parcel sizes; these deliveries are often completed using smaller delivery vehicles such as vans that make many stops. E-commerce deliveries are conducted not only in commercial areas, but also in residential areas. Commercial deliveries are usually made to stores with large trucks operated with a private fleet or by third party carriers, while residential deliveries are accomplished by major couriers and parcel services(4). For direct-to-home deliveries, failed delivery attempts result in high repeated delivery rates, increasing carriers' operating costs; one study conducted in UK estimated that 12% of residential deliveries require multiple attempts (5). UPS, a worldwide logistic provider, notes that delivering to residential addresses is more expensive than to businesses since businesses tend to receive multiple packages (6). At the same time, residential deliveries are only expected to grow with e-commerce already accounting for about 45 percent of UPS' business, and expected to reach 50 percent within five years.

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 (PP)(7). In the US, Amazon has implemented delivery lockers and UPS is using Access Points (8). While these alternatives offer operating efficiencies to carriers and in some cases better service to consumers, Morganti et al. estimated that in France about 90% of all consumers still request home deliveries(9). UPS estimates the 74 percent of customers still prefer delivery to home (8).

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. Much of the growth in residential freight demand is occurring in densely populated cities already struggling to accommodate existing commercial freight activity. Here, the struggle to accommodate growing freight demands is exacerbated by urban policy trends favoring “green” passenger modes. 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. (10) and Conway, Faivre, and Conway (11) both have 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. Morris (12)notes that beyond maintaining minimally acceptable service levels for pick up and deliveries, operational elements required by freight are often after-thoughts due to their relative invisibility.

Strategies for Improving Truck Accessibility

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 percent, New York City’s regulations for the number of bays required for off-loading facilities have not changed since 1972. Jaller, Hodge, and Holguin-Veras (13)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.

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, PARK Smart peak-rate parking (14). New York also conducted the off-hour delivery pilot, which reduces demand for curb space during peak periods (15). These strategies have produced mixed results. Smart and commercial meters have effectively increased vehicle turnover rates (14), but delivery windows have proven to have little effect in areas where unenforced service vehicles occupy these spaces for long durations (16). While the pilot project clearly demonstrated the benefits of off-peak deliveries, expansion of the program has been limited by receiver unwillingness willingness to accept deliveries during the off-peak.

In Washington DC, by realizing the importance of using loading docks wherever available, managers from affected stakeholders worked together to identify pilot locations for off-street loading. The Department of Transportation installed paint and signage to reserve off-street loading space; the Police Department is in charge of enhancing enforcement to discourage illegal parking and make way for loading and unloading vehicles(17). Washington D.C. implemented the Downtown Curb-Space Management Program on one of its congested downtown streets. Actions taken 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 (17). Post-implementation data showed a signification reduction in car and bike travel times along the study area from September 2006 to May 2007. In Philadelphia's central business district, the Parking Authority implemented 36 Package Delivery Zones reserved specifically for registered package delivery companies (18).

A number of international cities have also implemented policy to improve commercial curb space management. The Paris Transport Department's guideline imposes a minimum of one delivery bay every 100 meters in the city streets. In London and Paris, some bus lanes are shared with delivery vehicles (19). In Japan, Pilot Programs on urban freight have focused on the management of loading/unloading and parking spaces (20). Time sharing is a good way to improve the road network and parking capacity. In Barcelona, Spain, the municipality has created an innovative organization on some of its main boulevards, by devoting the two lateral lanes to traffic in the peak hours, deliveries during off peak hours, and residential parking during the night (19).

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. Two exceptions are the installation of delivery windows at residential buildings in NYC (16) and the designated parking for parcel delivery in Philadelphia(18) noted above. While the growing demand for direct-to-home deliveries is well recognized, little specific attention has been given to resulting impacts on the parking and loading space required for residential freight trips or the adequacy of existing regulations to provide space to accommodate this demand. Through case study analysis of Manhattan, New York census tracts with varying land use characteristics; this paper aims to evaluate the adequacy of existing zoning regulations and parking space availability to accommodate growing demand for residential goods movements.

METHODOLOGY

This study consisted of five primary steps:

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

Step 1: Preliminary Data Processing

This study relies 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. Both parking violations and parking sign locations were then mapped to individual census tracts.

Step 2: Census Tract Selection

NYCDCP’s PLUTO database was employed to categorize census tracts into different land use types. PLUTO contains comprehensive land use, building, and geographic category information (including census tract) for individual tax lots in NYC. For each tax lot, the total building area, residential area, office area, retail area, storage area and factory area are given. Using this information, individual census tracts can be categorized into land use types: Commercial, Mixed Use, and Residential. To characterize census tracts, the total percentage of space dedicated to commercial ($P_{(C)}$) and residential ($P_{(R)}$) uses in each census tract was estimated:

$$P_{(C)} = \frac{\sum_t Commercial\ Area}{\sum_t Total\ Building\ area}; \quad P_{(R)} = \frac{\sum_t Residential\ Area}{\sum_t Total\ Building\ area}$$

(Eq. 1)

where,

$$Commercial\ Area = office\ area + retail\ area + storage\ area + factory\ area$$

t : set of tax lots belonging to the census tract.

Census tracts were then categorized using the following ranking:

$P_{(C)} - P_{(R)} \geq 10\%$: Commercial use census tract
$-10\% \leq P_{(C)} - P_{(R)} \leq 10\%$: Mix use census tract
$P_{(C)} - P_{(R)} \leq -10\%$: Residential use census tract

Once sorted, the census tracts were then ranked using parking violation rates. The violation rate in each census tract was defined as the ratio of total violations counted divided by the total curb length (identified from the LION database) in that census tract. After ranking the Census tracts for land use type, the top five tracts by violation rate were selected. The selected tracts are shown in Figure 1.

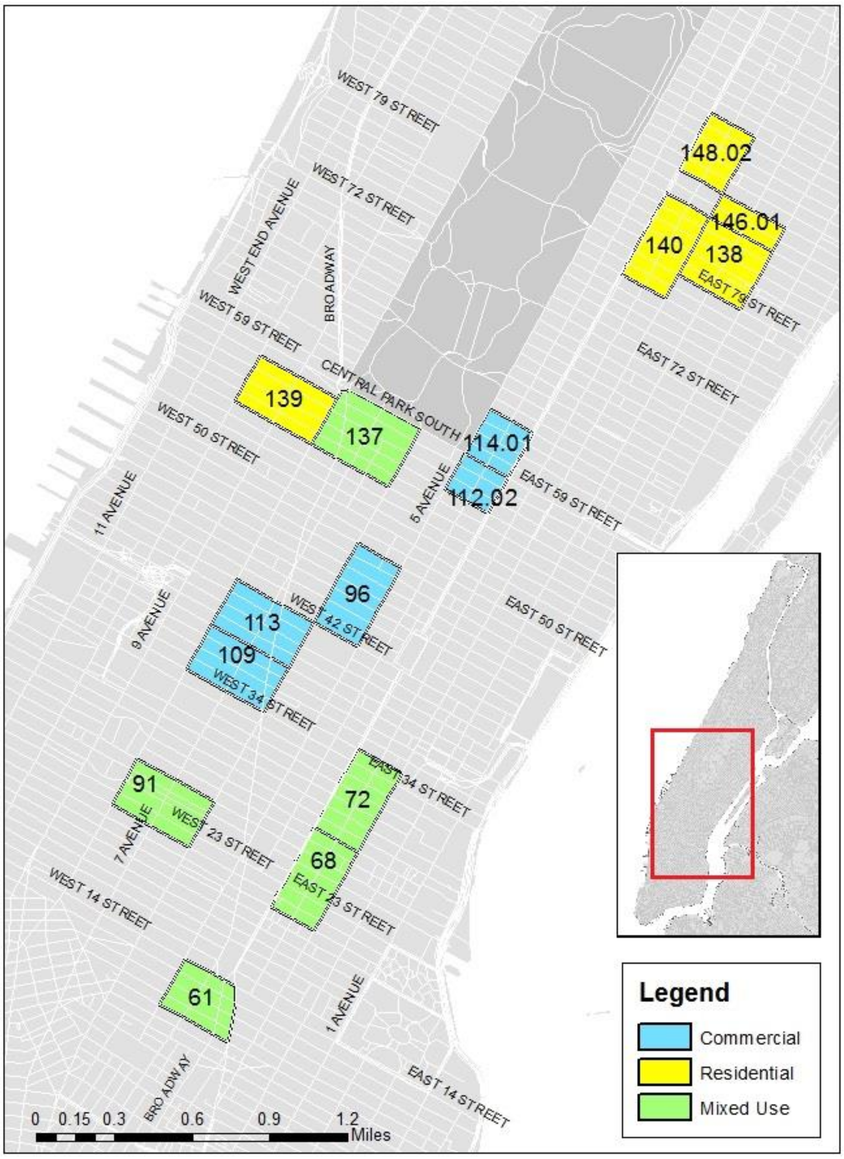

FIGURE 1 Selected Census Tracts in NYC

Step 3: Evaluation of Residential Freight Demand

Method of Analysis

Commercial vehicle parking demand can be categorized into two types: commercial and residential. “Commercial” demand for parking is relatively well-understood; in 2013, Jaller, Holguin-Veras, and Hodge (21) estimated “occupancy rates” for Manhattan zip codes during the two-hour morning peak period. This occupancy rate is the ratio of commercial vehicle demand for curb space to the available curb space (linear ft parking demand/ linear ft building frontage). Demand for curb space was estimated using a freight-trip generation model. This model relied on local employment data to estimate demand as a function of land use or industrial sector and employment(22). The five commercial use census tracts evaluated in this study are located in zip codes with estimated occupancy rates between 101 and 844%. These values indicate that available space is already inadequate to accommodate demand. The mixed-use census tracts are in zip codes with occupancy rates ranging from 40 to 92%. The five residential use census tracts have lower occupancy rates range from 24 to 27%.

Commercial vehicle “residential” parking demand is driven by individual households. Given the privacy concerns of individuals and private carriers, there is very little information available to estimate demand for residential CV trips. As a starting point to provide a rough estimate of the demand for “residential” freight trips, a number of total packages received by each selected census tract was estimated using data from most recent Household Diary Study (2012) from United States Postal Service (23). The study states that while many carriers serve the package delivery market, FedEx, UPS and the U.S. Postal Service are the largest players. This report also mentioned that in 2005 and 2006, the recovering economy and the emergence of e-commerce boosted the package market. To estimate the total number of packages received in each census tract, two datasets were used: the 2012 Household Diary Study (HDS) rate of packages received per week as a function of household income and 2012 ACS 5-Year estimates for “Household Income in the last 12 Months” by census tract. Multiplying the HDS rate for each income category by the number of households of each income level, a total estimate of expected packages per week can be estimated. Due to overlap in ACS and USPS income categories, a range is estimated assuming highest and lowest possible delivery rates for uncertain income levels. As this estimate relies directly on 2012 data, it is likely conservative given the rapid growth in ecommerce.

Since USPS Sunday delivery services were not introduced until later in 2014 and FedEx and UPS do not perform Sunday delivery, it can be assumed that a negligible number of residential packages were delivered on Sunday in January 2014. Under this assumption, a number of packages delivered per day can be calculated for each census tract as the total number of packages received per week divided by six. Finally, the numbers of stops needed to complete package delivery can be evaluating using sensitivity analysis; this analysis examines trips resulting from packages per stop ranging from 1 to 10.

Results and Discussion

The results of this analysis are provided in Table 1.

TABLE 1 Estimated Residential Packages Delivery Stops in Each Census Tract

Census Tract	Buildings (#)	Total Space (1000 sq. ft)			Res Units (#)	2012 Households	Est. Residential Packages /wk*	Est. Residential Package/day	Sensitivity Analysis (Delivery Stops/day)		
		Building	Com	Res					1 package per stop	5 package per stop	10 package per stop
Commercial											
96	169	16,750	16,476	274	378	119	61 to 62	10	10	2	1
109	137	18,103	17,795	309	479	62	34 to 36	5 to 6	5 to 6	1	1
112.02	42	8,449	7,000	1,449	681	211	110 to 115	18 to 19	18 to 19	3	1
113	109	18,830	18,762	67	114	88	49 to 50	8	8	1	1
114.01	103	7,104	4,669	2,435	1348	633	318 to 342	53 to 57	53 to 57	10 to 11	5
Mixed Use											
61	176	5,997	3,426	2,571	2748	2248	1134 to 1230	189 to 205	189 to 205	37 to 41	18 to 20
68	198	8,695	5,101	3,594	4642	3782	1872 to 2000	312 to 333	312 to 333	62 to 66	31 to 33
72	262	10,062	5,348	4,713	5657	4526	2343 to 2508	390 to 418	390 to 418	78 to 83	39 to 41
91	239	9,001	4,922	4,134	4604	3678	1885 to 1971	314 to 328	314 to 328	62 to 65	31 to 32
137	154	19,347	11,732	7,615	6807	4143	2138 to 2235	356 to 372	356 to 372	71 to 74	35 to 37
Residential											
138	350	7,752	1,012	6,740	8483	7379	3782 to 4032	630 to 672	630 to 672	126 to 134	63 to 67
139	217	9,400	3,487	5,914	7506	5652	2730 to 2949	455 to 491	455 to 491	91 to 98	45 to 49
140	308	7,674	642	7,033	4692	3889	2136 to 2228	356 to 371	356 to 371	71 to 74	35 to 37
146.01	146	2,877	557	2,320	3020	2264	1199 to 1263	199 to 210	199 to 210	39 to 42	19 to 21
148.02	167	5,866	975	4,891	4160	3513	1887 to 1990	314 to 331	314 to 331	62 to 66	31 to 33

Although these demand estimates clearly rely on a number of assumptions, they do provide an understanding of the order of magnitude of residential delivery stops and of the relative demand generated by different land use types. It is clear from this table that the demand for packages in residential census tracts and mixed-use census tracts is significant, and is much larger than in commercial census tracts. The final truck trip generation rates will vary considerably as a function of supply chain organization. The rates applied to estimate deliveries include packages from all carriers; however, the resulting number of trips will vary considerable depending on the number of carriers delivering to an address. Similarly, while time-insensitive deliveries can be grouped for multiple-package deliveries, other time-sensitive delivery types such as perishable food products ordered online may require separate delivery of an individual package.

Step 4: Evaluation of existing parking and zoning regulations

Off-Street Parking and Loading

Off-Street parking and loading requirements for establishments in commercial, residential and manufacturing districts are defined in land use zoning codes. In dense and old urban areas, very limited off-street loading facilities for freight use are provided. Insufficient off-street parking for passenger cars and insufficient off-street loading facilities for commercial vehicles, plus much less expensive curbside parking compared to commercial off-street parking are pushing more vehicles to park at the curbside, resulting in more congestion and more pollution (24).

As shown in Figure 1, all of the selected census tracts are located in the Manhattan Core, which extends from the southern tip of Manhattan at The Battery to West 110th Street on the West Side and East 96th Street on the East Side (25). The Manhattan Core has different off-street parking requirements than other districts in NYC. Table 2 summarizes the off-street parking and loading regulations from the City of New York Zoning Resolution (NYCZR) that apply in this area.

TABLE 2 Off-street Parking and Loading Zoning Requirements in Manhattan Core

Use	Requirements	
Off-Street Parking		
Residential Use	Max ratio of 0.2 per dwelling unit	
Retail Use	Max 1 space per 4000 sq.ft. or 10 spaces; whichever is less	
Other Commercial uses	Max 1 space per 4,000 sq. ft. or 100 spaces; whichever is less	
Off-Street Loading berths		
Commercial uses	Min 1 loading berth after 25,000 floor area	Dense Residential Districts; large-scale residential developments
Commercial uses	Min 1 loading berth after 8000 or 25,000 floor area	Varies by Commercial District

There are no minimum off-street parking requirements in the Manhattan Core; rather, maximums apply. Loading berth requirements for residential districts and for commercial districts also apply for Manhattan Core areas. In residential districts in the Manhattan Core, loading berths are required for commercial retail use in large-scale residential building in residential districts..

In the most recently announced Zoning Resolution, two changes were made relevant to loading berths in the Manhattan Core area. Minimum loading dock depth was increased from 33'*12' to 37'*12' because modern trucks serving the Manhattan Core often have lengths that exceed the 33' depth required for a loading dock (26). However, in the same resolution, certain buildings were exempted from having a permanent space for dumpster storage adjacent to the building's loading berth.

While Jaller et al. discussed the importance of having access to a freight elevator to minimize delivery service time(13) , Morris noted that there are no requirements for freight elevators in many major American cities, including New York (27). Bassock et al. noted that even when off-street loading zones are available, entrances may be obstructed when other vehicles park within space required for a truck turning maneuver (28).

In summary, off-street loading spaces for commercial vehicles are extremely limited in the case study areas. Loading berth requirements only apply to commercial uses; no loading requirement exists for residential buildings. Supply is further constrained by lacking freight elevators that increase delivery times to large establishments and lead to higher average parking times for vehicles and lower rates of parking turnover.

On-Street Parking and Loading

Weinberger, Kaehny and Rufo noted that poor management of existing curb parking supply is a major impediment to creating an effective and balanced urban transportation system (24). In the 1970s, Boston, Portland and NYC removed parking minimum requirements and established parking caps or maximums in downtown areas to discourage car ownership and car usage. When development is dense and multi-level, and services such as waste removal are poorly coordinated, service demand for curb space such as parking will be extremely high (28). Insufficient delivery spaces will transfer delivery operations to traffic lanes, and will result in traffic congestion.

In this study, on-street parking supply is directly evaluated using NYCDOT's STATUS database. Because curb spaces are regulated by parking regulation signage, any policies to manage curb space usage are posted on signage along the curb. The STATUS database is a geocoded database containing the text of every street sign in NYC. A data mining algorithm was developed and implemented in Visual Basic to convert the sign text into a quantitative dataset showing the availability of curb parking/loading spaces, As many regulations including street-cleaning days, truck loading zone and no standing zones apply only during specific days and/or times, the dataset identifies the applicability of each regulation during discrete half hour periods. To evaluate overall supply, parking regulations are grouped as "regular" parking (metered and time-limited parking), “commercial dedicated” parking (commercial loading and commercial meter), “open” parking and no parking.

Google Street Image and geospatial mapping in ArcGIS are used to match hydrant and off-street parking entrances/driveway to its corresponding block. A number of previous researchers have employed this tool in NYC, including Weinberger(29) who used it to identify household off-street parking and Guo who used it to measure total parking supply available to households in low density areas of NYC.

In this project, the amount on-street available space during a specific time frame at a single street curb was converted into a total number of available spaces in a census tract by adding all available spaces of all curbs in that census tract:

$$n = \frac{\sum_i \frac{l_c}{N_s} - l_H^i - l_E^i}{l_T}$$

(Eq. 2)

Where:

n: Number of available space for commercial vehicles during a specific time frame at a single street curb

i: Currently activated signage

l_c: Street curb length

N_S: Total number of activated parking signage along that curb

l_H: Length occupied by fire hydrant

l_E: Length occupied by curb cut (off street parking entrance or driveway)

l_T: Average truck parking space length, 33 feet (21)

After processing of the database, an average available parking space density for a given time frame from Monday to Friday can be calculated. The time frames are defined as: morning (7AM-10AM), noon (10AM-2PM), and afternoon (2PM-7PM).

Results and Discussion

Results for each census tract type are shown in Figure 2.

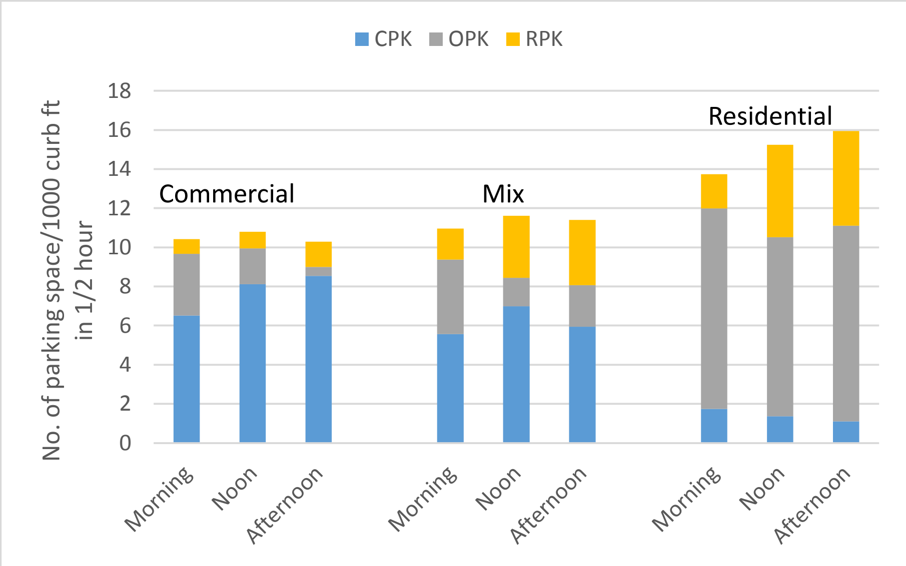

FIGURE 2 Available Parking Space Rate According to Different Land Use Census Tract

The figure reveals some interesting patterns. During all three time frames, the overall rates of parking space availability are highest in residential census tracts. Rates in mixed-use areas are slightly higher than in commercial use areas. In residential areas, parking space availability rates increase from morning to noon and from noon to afternoon, while in both mixed-use and commercial areas, available parking space rates increase from morning to noon then decrease from noon to afternoon.

However, the characteristics of space regulation types are different in residential census tracts compared to mixed-used and commercial census tracts. In residential census tracts, dedicated commercial parking space rates in each time frame are less than 2 spaces per 1000 ft. Around 90% of all available spaces are regulated as "open" parking or "regular" parking. While commercial vehicles are permitted to park in these spaces, the turnover rate for these spots is extremely low. Among total number of spaces available for parking in commercial census tracts, the percentage of dedicated parking for commercial vehicles increase from the morning to the afternoon. Mixed-use areas are similar to commercial areas; however, while overall parking space availability is slightly higher, dedicated commercial parking space is lower than in commercial use areas. In mixed-use areas, 50-60% of parking supply is "commercial dedicated."

Step 5: Examination of commercial vehicle parking behavior

Method

To analyze the violation distribution patterns in each type of land use during the three time frames, violation rates for each land use type were estimated by dividing the sum of all violations by the sum of available parking during a given time for all five census tracts.

Results and Discussion

Figure 3 shows the total violation rates during each type period in each land use type.

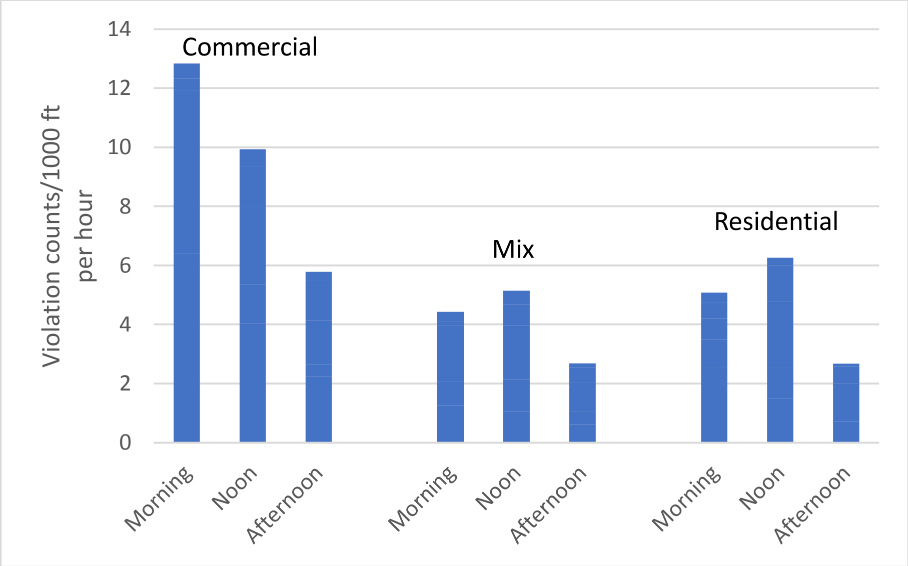

FIGURE 3 Parking Violation Rate According to Different Land Use Census Tracts

Violation rates are highest in commercial census tracts. In each time frame, violation rates in commercial use census tracts are around (or more than) double the rates in mixed-use and residential areas, In commercial areas, violation rates experience a quick drop from morning to noon and then from noon to afternoon. The rate distributions in mixed-use and residential areas are similar; both have a slight increase from morning to noon, then have a quick decrease from noon to afternoon. Interestingly, the violation rates in residential census tracts are higher during morning and midday than those in mixed-use census tracts.

Fifty-five of 99 possible violation codes were found in the selected census tracts. Violation codes can be group into five categories for evaluation: no standing or parking, double parking, no meter receipt, overtime parking and others. The “No standing or parking” category includes the records for all commercial vehicles parked in an area where parking is prohibited; for example, general no standing area, bus stop, bike lane, etc. “Double parking” includes: 1) any double parking in Midtown Manhattan where double parking is not allowed and 2) double parking in Manhattan where double parking is allowed, but where the driver chose to double park in area where signage indicates no parking. “No meter receipt” violation means that the commercial vehicles is occupying a legal metered space, the meter is not paid. “Overtime parking” violation means that either the commercial vehicle’s meter receipt expired or it parked in one space longer than allowed. “Other” violations include citations such as expired vehicle registration issue, late inspection, etc. Figure 4 shows the distribution of violations by type for each land use and time period.

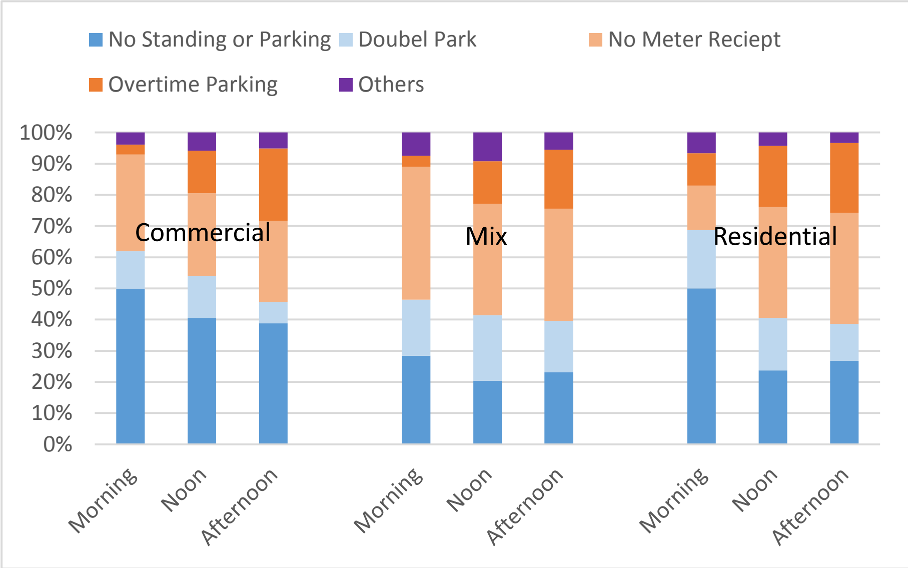

FIGURE 4 Parking Violation Rate Percentile According to Different Land Use Census Tracts

In terms of violation types, "no standing or parking" and "double parking" violations are likely caused by in inadequate number of legal parking spaces. While the total rate of these violation types is highest in commercial areas during all three time frames, the highest share of these types of violations as a percentage of total violations occurs in the morning time frame in residential census tracts.

CONCLUSIONS AND RECOMMENDATIONS

Comparison across Land Uses

Among many factors that affect commercial vehicle drivers' decision to park illegally when they are conducting freight activities at the curb side, demand and space availability are most critical. Based on the preceding analysis, the following observations can be made:

Commercial vs. Mixed-Use Census Tracts

In commercial census tracts, parking demand driven by commercial activity is much higher than demand in mixed-use census tracts. However, parking demand for residential delivery is much lower in these commercial census tracts. While parking space availabilities are similar in commercial and mixed-used areas, parking violation rates are much higher in commercial census tracts than in mixed-use areas. This difference is likely due to the higher demand for commercial deliveries in commercial census tracts (13).

Mixed-Use and Residential Census Tracts

Mixed-use census tracts have higher business delivery demand and slightly lower residential delivery demand than residential census tracts. Parking violation rates are slightly lower than violation rates in residential census tracts during all three time frames. A reasonable explanation is that the regulation types on available parking spaces are very different. In residential areas, around 90% of all available spaces are regulated as “open” parking or “regular” parking. Spaces with no cost or time limit are usually occupied by passenger vehicles, with a low turnover rate. This means that although commercial vehicles are permitted to park in those spaces, a very low percentage of them are actually available for commercial vehicles to make a delivery.

Policy Recommendations

Based on results from this study, a number of policy recommendations can be made. First, it is clear from the basic demand analysis that particularly in residential areas, households are now a significant generator of truck trips. Current zoning regulations that do not include loading berth requirements based on residential building area should be revisited. Future zoning regulations should define explicit off-street access requirements for residential buildings, including both loading areas and freight elevators. Second, it is clear from the analysis of parking violation rates across time periods that rates vary due to a mismatch between available supply and demand. Results suggests that in general, and especially for mixed-use and residential areas, there is a need for more detailed evaluation of the temporal distribution of commercial vehicle trips to better align parking regulations to accommodate these trips. Finally, it is clear from the analysis that on-street parking regulations in residential areas are overwhelmingly dominated by “open” spaces with no meter cost and no time limit. As these spaces are frequently occupied for long periods of time by local passenger cars, space available for commercial vehicles is very limited. While NYC has previously implemented dedicated delivery windows at residential building locations to address this need, their effectiveness was limited by long term parking of service vehicles in these spaces compounded by a lack of enforcement (16). One future strategy that could be considered is application of dedicated parking explicitly for parcel deliveries, as was done in Philadelphia (18). While this may not address enforcement concerns, it may deter some service vehicles from occupying the space.

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