Goal

• To characterize delivery activity to large residential buildings in NYC
Data Collection

- November/December 2016
- 9 am – 9 pm weekdays
- A few weekend hours
## Building Characteristics

<table>
<thead>
<tr>
<th>Building</th>
<th>Address</th>
<th>Units</th>
<th>Rent ($/ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronx 1</td>
<td>1020 Grand Concourse</td>
<td>453</td>
<td>26</td>
</tr>
<tr>
<td>Bronx 2</td>
<td>3450 Wayne</td>
<td>399</td>
<td>20</td>
</tr>
<tr>
<td>Brooklyn 1</td>
<td>22 N 6th Street</td>
<td>360</td>
<td>62</td>
</tr>
<tr>
<td>Brooklyn 2</td>
<td>100 Willoughby</td>
<td>500</td>
<td>56</td>
</tr>
<tr>
<td>Manhattan 1</td>
<td>101 Warren St</td>
<td>227</td>
<td>83</td>
</tr>
<tr>
<td>Manhattan 2</td>
<td>1214 Fifth Ave</td>
<td>229</td>
<td>71</td>
</tr>
<tr>
<td>Queens 1</td>
<td>4630 Center Blvd.</td>
<td>184</td>
<td>62</td>
</tr>
<tr>
<td>Queens 2</td>
<td>61-65 Junction Blvd.</td>
<td>314</td>
<td>43</td>
</tr>
</tbody>
</table>
## Observed Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival time</td>
<td>Time vehicle arrived to building</td>
</tr>
<tr>
<td>Departure time</td>
<td>Time vehicle departed building</td>
</tr>
<tr>
<td>Carrier</td>
<td>Carrier company (if observable)</td>
</tr>
<tr>
<td>Vehicle type</td>
<td>Walking personnel (WK), bike (B), scooter (SC), passenger car (PC), cargo van (CV), step van (SV), single unit truck (SU), semi-trailer (ST)</td>
</tr>
<tr>
<td>Parking location choice</td>
<td>Sidewalk (SW), fire hydrant (FH), driveway (DW), legal curb (L), double park (DP), no parking/no standing (NP/NS),</td>
</tr>
<tr>
<td>Shipment Size</td>
<td>The number of parcels delivered during event</td>
</tr>
<tr>
<td>Package type (s)</td>
<td>Soft, bag, box, XL</td>
</tr>
<tr>
<td>Shipper</td>
<td>Logo on box (if observable)</td>
</tr>
</tbody>
</table>
Observed Events

• 295 total deliveries recorded
• 1240 parcels recorded
• 148 “other” parcel deliveries
• 147 meal deliveries (204 bags)
Parcel Delivery Results
Frequencies

• Vehicle trips per 12-hour day:
  • Max: 1 trip per 7 units
  • Min: 1 trip per 33 units

• Parcel deliveries per 12-hour day:
  • Max: 1 parcel per 1.3 units
  • Min: 1 parcel per 6 units
Building Time Distribution

Deliveries per hour recorded

Parcels per hour recorded

Time of the day

Location

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40% Deliveries, 72% Parcels
## Time-Space Consumption

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Count</th>
<th>Parcels</th>
<th>Total Parking Duration (min)</th>
<th>Est. Vehicle Length (ft)</th>
<th>Total Time-Space Consumption (ft*hour)</th>
<th>Time-Space Consumption per parcel (ft*hour/parcel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>10</td>
<td>27</td>
<td>51</td>
<td>19.00</td>
<td>16.15</td>
<td>0.60</td>
</tr>
<tr>
<td>CV</td>
<td>24</td>
<td>54</td>
<td>115</td>
<td>18.68</td>
<td>35.80</td>
<td>0.66</td>
</tr>
<tr>
<td>SV</td>
<td>48</td>
<td>627</td>
<td>791</td>
<td>22.60</td>
<td>297.94</td>
<td>0.48</td>
</tr>
<tr>
<td>SU</td>
<td>12</td>
<td>151</td>
<td>265</td>
<td>30.00</td>
<td>132.50</td>
<td>0.88</td>
</tr>
<tr>
<td>ST</td>
<td>2</td>
<td>5</td>
<td>44</td>
<td>45.50</td>
<td>33.37</td>
<td>6.67</td>
</tr>
<tr>
<td>Sum</td>
<td>96</td>
<td>864</td>
<td>1266</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Parking Location

- Multinomial Logit Model
- No significant variables
  - Building location
  - Parking duration
  - Vehicle type
  - Distributor
  - Time of the day
  - # Parcels
Parking Duration

- Ordered Logit Model
  - Total # Parcels
  - More than 1 building served

- Single delivery
- Multiple deliveries
- Grocery distribution
Food Delivery Results
Food Delivery Frequencies

- Prepared Meals
- Groceries and Meal Kits

Graph showing the normalized 12-hour arrival rate (deliveries/12 hrs/100 units) against rent price ($/Sq. Ft.).
Food Delivery Vehicle Types

Prepared Meals
- Semitrailer: 17.8%
- Single Unit Truck: 5.5%
- Step Van: 4.8%
- Cargo Van: 10.3%
- Passenger Car: 13.8%
- Scooter: 17.2%
- Bicycle: 71.9%

Groceries and Meal Kits
- Semitrailer: 20.7%
- Single Unit Truck: 13.8%
- Step Van: 3.4%
- Cargo Van: 20.7%
- Passenger Car: 13.8%
- Scooter: 10.3%
- Bicycle: 17.2%
- Hand Cart: 0%

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## Grocery Deliveries by Carrier

<table>
<thead>
<tr>
<th>Carrier</th>
<th>Total Deliveries</th>
<th>% Deliveries</th>
<th>Total Parcels</th>
<th>% Parcels</th>
<th>Parcels/Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh Direct</td>
<td>11</td>
<td>36.7</td>
<td>51</td>
<td>38.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Amazon Fresh</td>
<td>5</td>
<td>16.7</td>
<td>22</td>
<td>16.5</td>
<td>4.4</td>
</tr>
<tr>
<td>Peapod</td>
<td>2</td>
<td>6.7</td>
<td>29</td>
<td>21.8</td>
<td>14.5</td>
</tr>
<tr>
<td>Local Market</td>
<td>7</td>
<td>23.3</td>
<td>18</td>
<td>13.5</td>
<td>2.6</td>
</tr>
<tr>
<td>Unknown</td>
<td>5</td>
<td>16.7</td>
<td>13</td>
<td>9.8</td>
<td>2.6</td>
</tr>
</tbody>
</table>
Key Findings so Far

• Major carriers deliver majority of parcels, smaller share of trips
  • Large operators deliver more packages per stop
  • Step vans using space most efficiently

• Time distribution not consistent with traditional commercial deliveries, varies across buildings

• Vehicle types vary considerably by location

• Parking behavior unpredictable with variables considered

• Parking durations generally short, but vary with curbside behavior
Future Research

• 2\textsuperscript{nd} round of data collection expected November/December 2017
• Additional research needed to examine relationship between receiver demographics and deliveries by type, time of day
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Questions?

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