

# Service Trip Attraction and Duration in Commercial Establishments

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# Background



# Freight and Service Activity in Establishments

**Establishments attract freight deliveries all the time...**



**...while service activity is also been received at establishments**



# Service Visits Use Curbside Space...



# and... for a Long Time...



# Key Observations

- ❖ Service-related traffic poses numerous challenges:
  - ❖ Increases congestion
  - ❖ Occupies large portions of curbside space
- ❖ Little research has been made on service activity:
  - ❖ Types and quantity of vehicles used
  - ❖ Nature of the service activity
  - ❖ Duration of the service
  - ❖ What sectors produce most traffic
- ❖ This study explores service activity at the establishment level to provide insight to these questions



# Service Trip Generation Models



# Service Trip Generation Models

- ❖ STG is the number of service trips generated by a commercial establishment
  - ❖ Service Trip Attraction (STA): number of vehicle trips that arrive at the establishment to perform a service activity
  - ❖ Service Trip Attraction (STP): number of vehicle trips that leave service establishments
- ❖ Based on Establishment Surveys
  - ❖ Collected data about service visits received at commercial establishments
  - ❖ Estimated models to predict STA using employment
    - ❖  $STA = f(\text{Employment})$
- ❖ No data were collected for STP (because of the budget constraint)





# Descriptive Analysis



# Key Statistics

- ❖ Collected surveys from 277 establishments
  - ❖ 106 from New York's Capital Region (CR)
  - ❖ 171 from NYC Metropolitan Area (NYC)
- ❖ Over 90% reported less than 1 daily service trip attracted
- ❖ The most frequent type of vehicle used was a van, followed by the 2-axle truck, car, and pick-up truck.

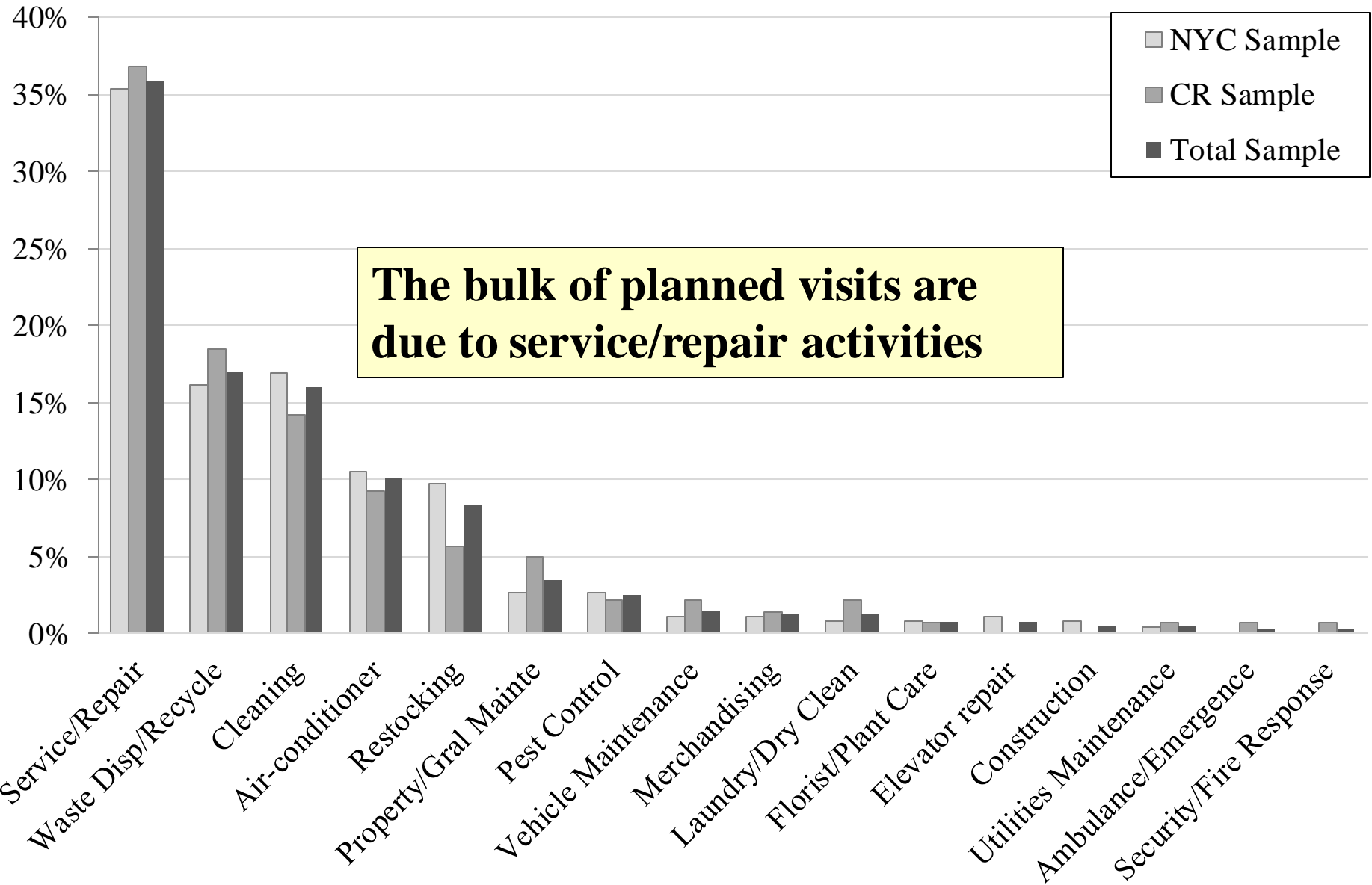


# Breakdown of Sample by 2-digit NAICS

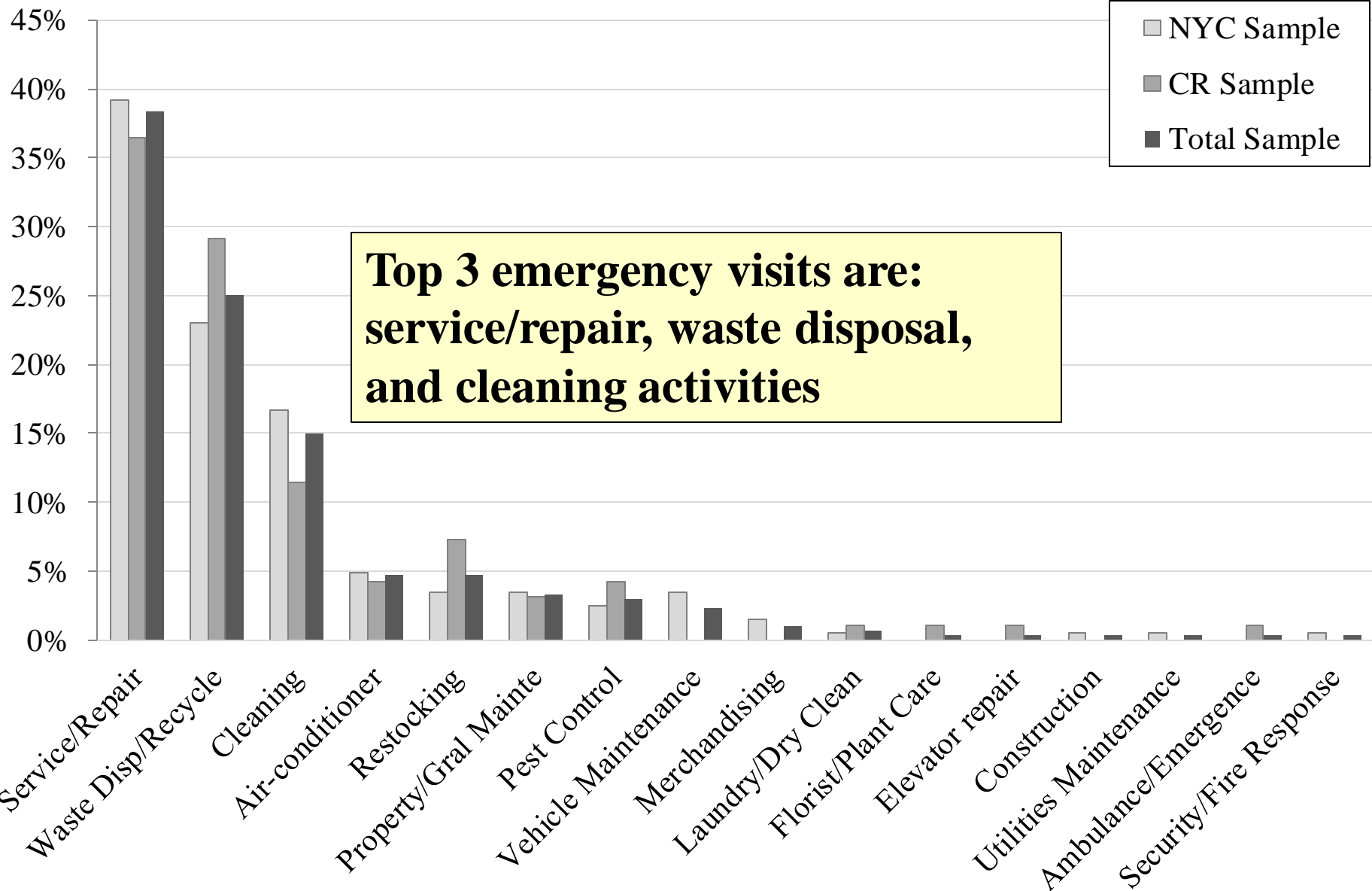
Sector	NAICS	Industry	NYC Sample		CR Sample		Total Sample	
			Obs.	Sample %	Obs.	Sample %	Obs.	Sample %
Freight Intensive Sectors (FIS)	23	Construction	6	3.5%	3	2.8%	9	3.2%
	31	Manufacturing	3	1.7%	3	2.8%	6	2.2%
	32		15	8.7%	8	7.5%	23	8.3%
	33		11	6.4%	7	6.6%	18	6.5%
	42	Wholesale	13	7.6%	18	17.0%	31	11.2%
	44	Retail	10	5.8%	8	7.5%	18	6.5%
	45		3	1.7%	3	2.8%	6	2.2%
	48	Transportation & Support Activities	8	4.7%	1	0.9%	9	3.2%
	72	Accommodation and Food	13	7.6%	4	3.8%	17	6.1%
Service Intensive Sectors (SIS)	51	Information	13	7.6%	7	6.6%	20	7.2%
	52	Finance and Insurance	11	7.0%	2	1.9%	14	5.0%
	53	Real Estate	8	4.7%	4	3.8%	12	4.3%
	54	Professional and Technical Services	7	4.1%	16	15.1%	23	8.3%
	56	Administrative and Waste Services	11	6.4%	11	10.4%	22	7.9%
	61	Education Services	11	6.4%	4	3.8%	15	5.4%
	62	Health Care and Social Assistance	9	5.2%	5	4.7%	14	5.0%
	71	Entertainment	12	7.0%	2	1.9%	14	5.0%
	81	Other Services (except Public Admin)	7	4.1%	0	0.0%	7	2.5%
<b>Total</b>			<b>171</b>	<b>100%</b>	<b>106</b>	<b>100%</b>	<b>277</b>	<b>100%</b>

**In total, 49.3% corresponds to FIS, 51.7% to SIS**

# Service Activities for Planned Visits



# Service Activities for Emergency Visits



# Willingness to Accept in Off-Peak Hours

Willingness to Accept Planned STA in the OH	NYC Sample		CR Sample		Total Sample	
	Obs.	Sample %	Obs.	Sample %	Obs.	Sample %
Very Willing	19	11.7%	8	7.6%	27	10.1%
Somewhat Willing	19	11.7%	18	17.1%	37	13.8%
Neutral	8	4.9%	3	2.9%	11	4.1%
Not Too Willing	34	20.9%	24	22.9%	58	21.6%
Not At All Willing	83	50.9%	52	49.5%	135	50.4%
<b>Total</b>	<b>163</b>	<b>100%</b>	<b>105</b>	<b>100%</b>	<b>268</b>	<b>100%</b>
<b>Overall Sample Average % of Planned STA in OH</b>						
Very Willing		43.6%		42.8%		43.3%
Somewhat Willing		17.4%		30.7%		22.1%
Neutral		1.1%		1.1%		1.1%
<b>Total</b>		<b>62.1%</b>		<b>74.6%</b>		<b>66.6%</b>

**Two-thirds of the establishments were inclined to accept planned service visits during the off-hours**



# Estimates of Service Activity in US Cities



# STA Rates for Selected US Cities

	Kansas City, KS	Austin, TX	Columbus, OH	San Jose, CA	Seattle, WA	Washington, DC	Boston, MA	New York, NY
Population (2016)	151,042	916,906	852,144	1,023,031	688,245	672,391	669,158	8,560,072
Total Area (sqmi)	124.8	320.8	218.6	177.5	83.8	61.1	48.3	300.4
Population density	1,210.1	2,858.3	3,898.1	5,763.1	8,209.6	10,997.6	13,841.7	28,499.2
Establishments	2,965	33,661	20,106	20,508	33,019	22,804	13,071	245,009
Employment	66,670	629,432	472,088	375,824	595,301	511,541	404,412	3,786,192
FTG/day	17,277	117,216	87,997	80,165	117,681	56,647	43,929	873,380
STA/day	1.493	12.222	8.176	7.495	15.145	11.695	6.824	88.640
STA as % of FTG+STA	8.47%	9.44%	8.50%	8.55%	11.40%	17.11%	13.45%	9.21%
STA/Establishment-day	0.503	0.363	0.407	0.365	0.459	0.513	0.522	0.362
STA/Employment-day	0.022	0.019	0.017	0.020	0.025	0.023	0.017	0.023
STA/sqmi-day	11.960	38.100	37.402	42.220	180.651	191.290	141.158	295.112
STA/person-day	0.010	0.013	0.010	0.007	0.022	0.017	0.010	0.010





# STA Rates for Most Congested ZIP Code

	Kansas City, KS	Austin, TX	Columbus, OH	San Jose, CA	Seattle, WA	Washington, DC	Boston, MA	New York, NY
ZIP Code(s) analyzed	66111	78701	43215	95112	98101	20036	02116*	10001*
Population (2016)	9,691	7,875	14,322	62,039	12,408	5,836	23,215	23,332
Total road length (mi)	362.55	80.33	232.43	238.70	54.95	20.44	50.64	31.64
% Available curbside space	83.5%	67.7%	77.8%	77.8%	78.2%	74.3%	82.4%	87.7%
Total curbside length (mi)	302.73	54.38	180.83	185.71	42.97	15.19	41.73	27.75
Establishments	377	2,996	2,571	2,197	2,918	2,824	2,070	7,276
Employment	14,534	59,387	67,682	44,735	85,430	65,962	62,567	146,044
STA/day	187	970	925	747	1,564	1,474	1,185	2,438
STA/mi-day	0.618	17.837	5.118	4.022	36.394	97.034	28.398	87.845
STA/Establishment-day	0.496	0.324	0.360	0.340	0.536	0.522	0.572	0.335
STA/Employment-day	0.013	0.016	0.014	0.017	0.018	0.022	0.019	0.017
STA/Person-day	0.019	0.123	0.065	0.012	0.126	0.253	0.051	0.104



# Service Duration



# Service Durations (in minutes) by FIS/SIS

Sector	NAICS	Description	Mean	Obs
<b>Total Sample</b>				
		Freight Intensive Sectors	90.18	
		Service Intensive Sectors		
		All sectors		
<b>NYC Sample</b>				
		Freight Intensive Sectors	109.53	58
		Service Intensive Sectors	109.13	75
		All sectors	107.56	133
<b>Manhattan, NY Sample</b>				
		Freight Intensive Sectors	61.45	31
		Service Intensive Sectors	78.56	34
		All sectors	70.40	65

**Key insight:**  
 Service activity takes approximately 90 minutes  
 While freight deliveries take 15 minutes in average



# STA Breakdown by FIS and SIS

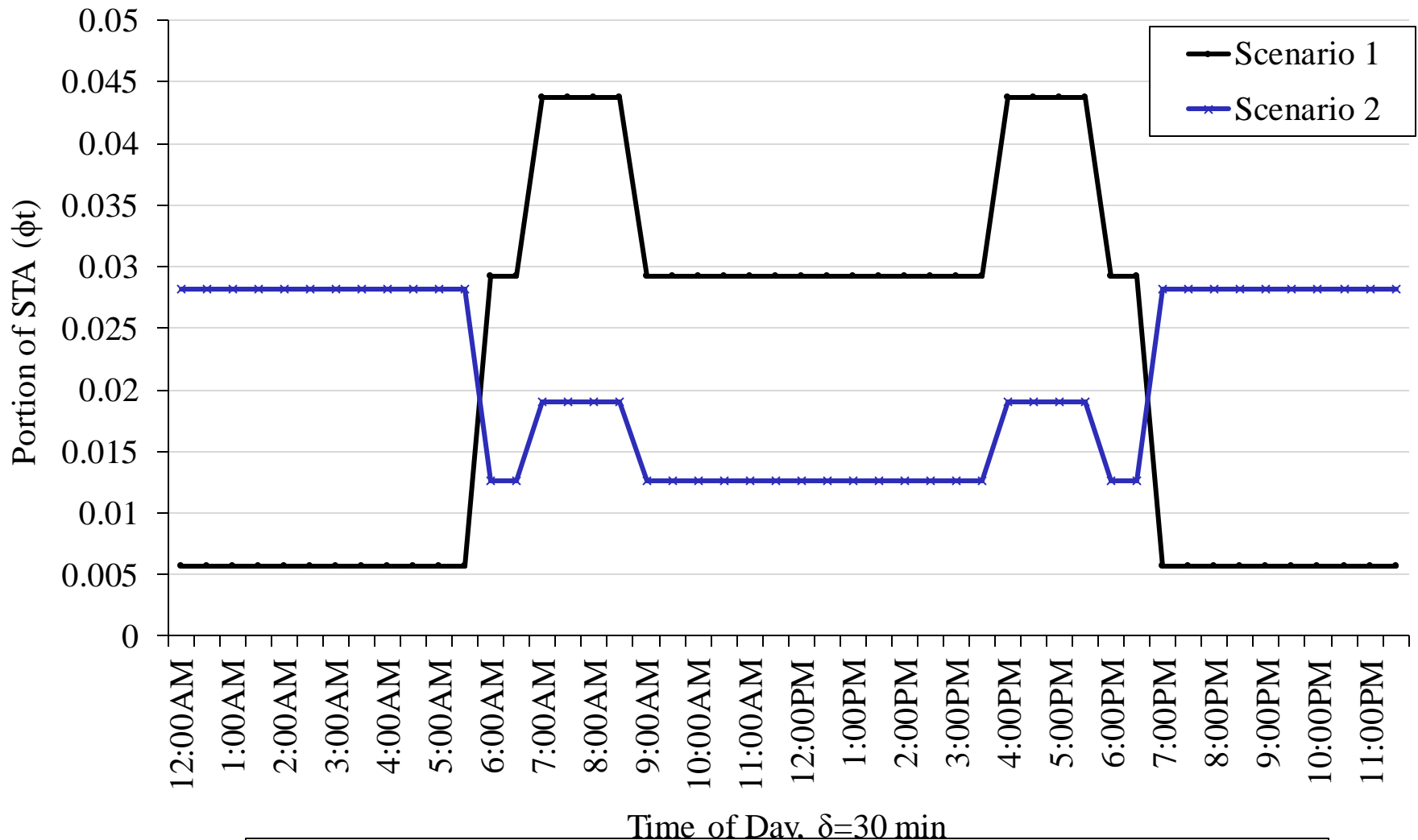
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Total curbside length (mi)	302.73	54.38	180.83	185.71	42.97	15.19	41.73	27.75
STA (FIS) /day	295	299	204	277	403	179	371	939
STA (SIS) /day	39	671	721	470	1,180	1,295	809	1,809
STA (all sectors) /day	187	970	925	747	1,564	1,474	1,185	2,438
STA duration (FIS)	18,154	26,930	18,407	25,003	36,315	16,142	33,452	99,092
STA duration (SIS)	3,100	66,869	71,844	46,779	117,574	128,946	80,547	197,411
STA duration (all sectors)	21,254	93,800	90,251	71,782	153,889	145,088	113,999	296,502
Percent SIS of Total	14.6%	71.3%	79.6%	65.2%	76.4%	88.9%	70.7%	66.6%



# Using Duration Estimates to Evaluate Time-of-day Curbside Space Needs



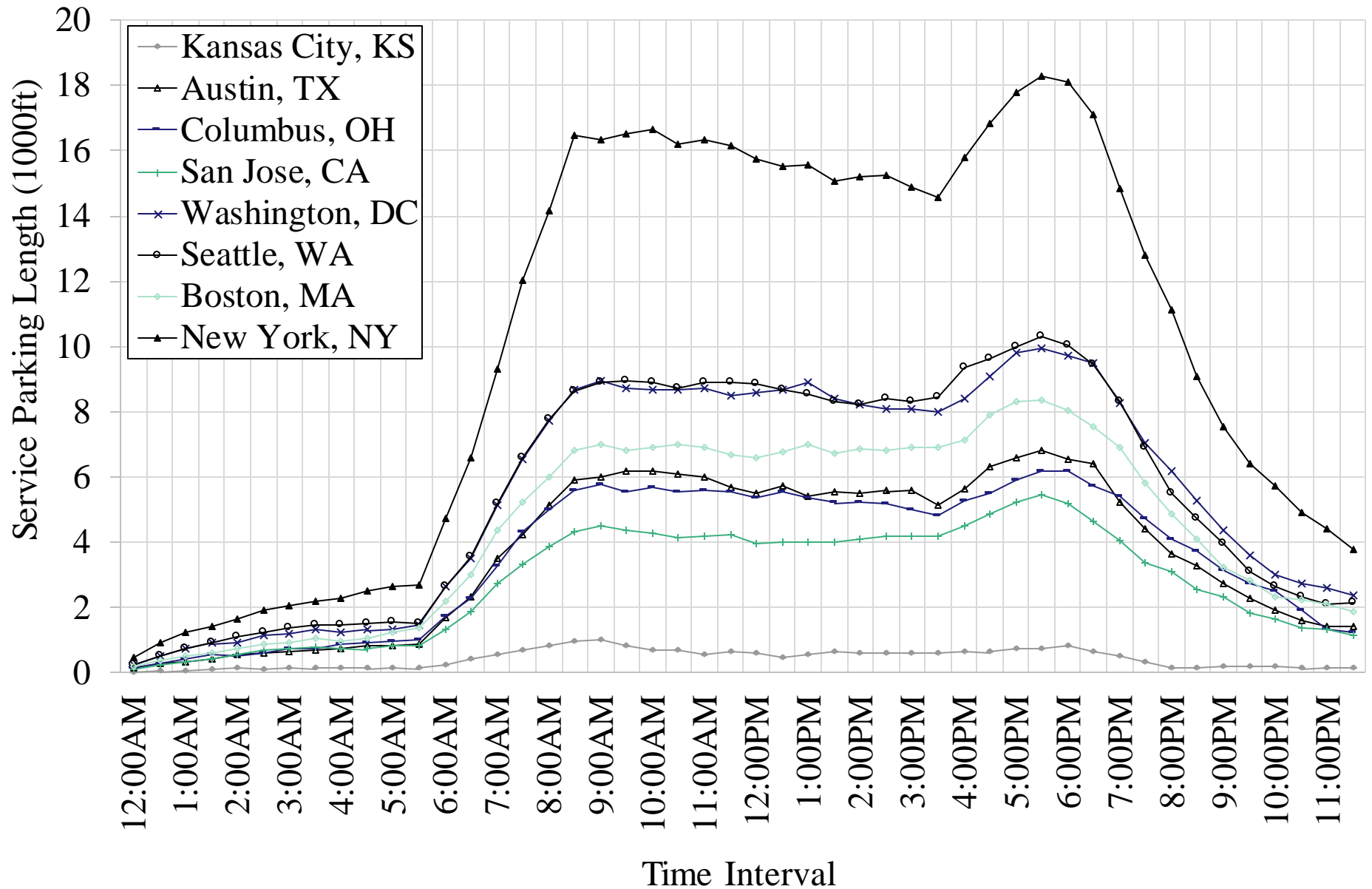
# Time-of-day Scenarios Considered



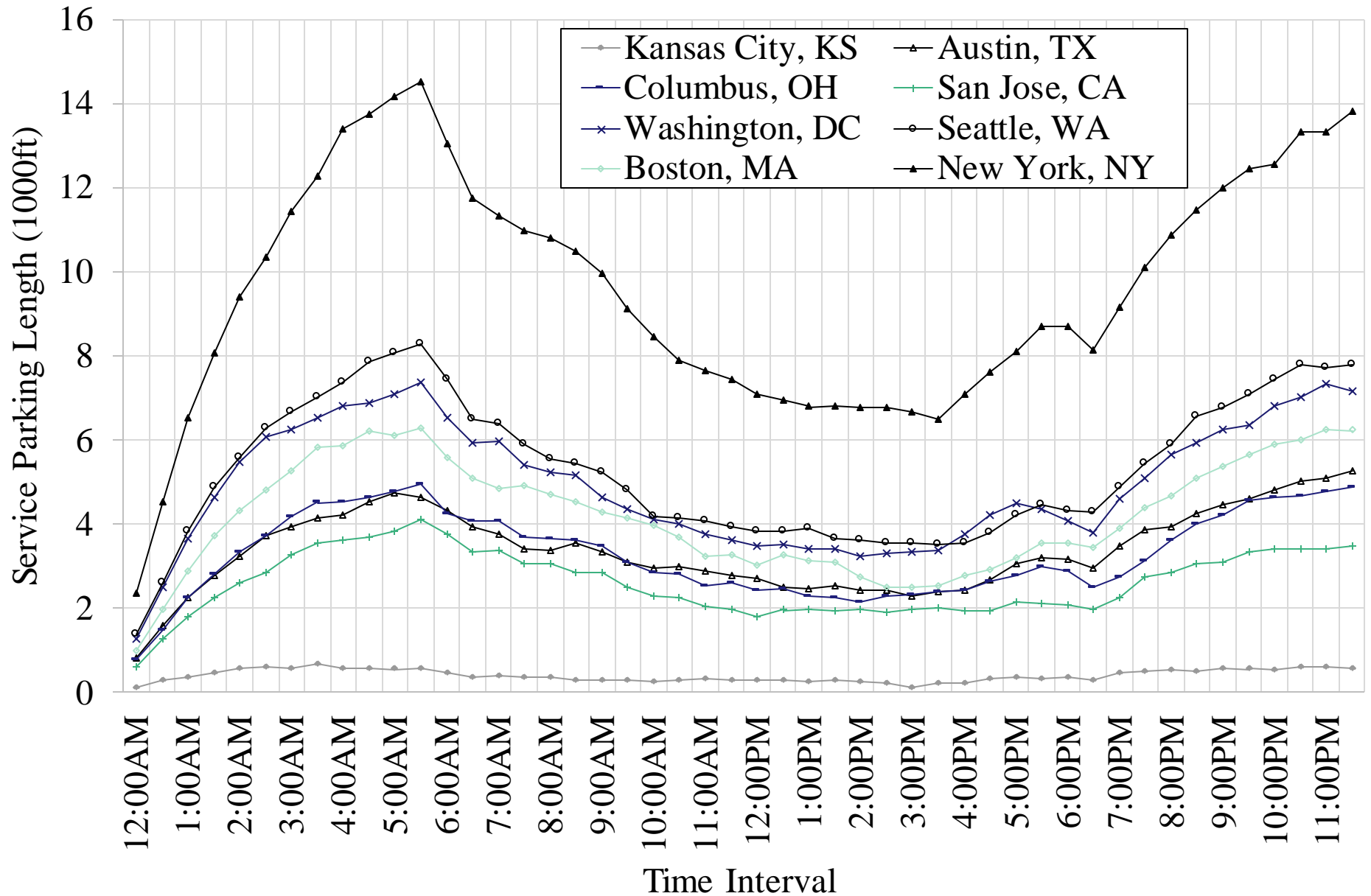
**Scenario 2 considers the possibility of shifting over 60% of service activity to the off-hours**



# STA Parking Requirements for Scenario 1



# STA Parking Requirements for Scenario 2





# Concluding Remarks



# Concluding Remarks

- ❖ Service activity contributes to daily commercial vehicular traffic and consumes a more than proportional portion of the curbside space
- ❖ Service traffic and duration can be estimated as a function of employment, enabling the estimation of the demands for space
- ❖ Breakdown of total service duration by FIS and SIS indicates that SIS represents between 65% (San Jose, CA) and 89% (Washington, DC) of all STA traffic duration.
- ❖ The incorporation of these demands will lead to better allocation of curbside space
- ❖ STA models provide recommendations about:
  - ❖ Service traffic in transportation plans
  - ❖ Curbside space requirements in cities



Questions? Thanks!

