

14.1 Summary of Model Development

The demand data used in the model has been collected using a mixture of observed and synthetic data, and has been constructed following guidance laid down in TAG Unit M1-M3.

Extensive origin-destination data, collected across twenty six roadside survey locations in and around the study area ensured that the model accurately reflected actual trip movements around the areas local to the schemes.

The synthetic demand was generated using software created for the purpose; namely CTripEnd and NATCOP; using established data sources including from Census, NTS, and employment survey data.

The modelled network was created from the ITN network, a reliable data source provided by Ordnance Survey. The finer points of junction coding and link speeds and capacities were modelled with reference to Google Earth and LCC guidance regarding the highway conditions. Extensive checks on the coded network were conducted.

The modelled assignment satisfies WebTAG criteria for a well converged model.

Modelled flows and journey times compare very favourably to observed data, both for data used as part of the model building process, and independent data.

Both screenline and journey time validation in the model meets the criteria set out in guidance for the majority of the comparisons made.

Where the traffic count criteria is not met, it is important to note that the majority of counts that do not meet the WebTAG criteria are located away from the main area likely to be impacted by the scheme.

14.2 Summary of Standards Achieved

The standards to which the model aimed to conform are set out in Chapter 3. Table 14-1 summarises how the model has actually performed against those standards:

Table 14-1- Model Performance Standards

Model aspect	Criterion	Acceptability Guideline	Actual model performance
Prior Matrix validation	Differences between modelled flows and counts should be less than 10% to 15% of the counts	All or nearly all screenlines	Satisfies criterion in all time periods
Matrix estimation	Matrix zonal cell values	Slope within 0.98 and 1.02 Intercept near zero R ² in excess of 0.95	Satisfies criterion in all time periods
	Matrix zone trip ends	Slope within 0.99 and 1.01 Intercept near zero R ² in excess of 0.98	Largely satisfies criterion in all time periods
	Trip length distributions	Means within 5% Standard deviations within 5%	Largely satisfies criterion in all time periods
	Sector to sector level matrices	Differences within 5%	Fails criterion in all time periods. Few sector-sector movements are fully observed however, so this is likely to be expected. In addition, GEH values for majority of these case are less than 5.
Assignment convergence	Delta and %GAP	Less than 0.1%	Satisfied for all time periods
Link calibration	Individual flows within 100 veh/hr of counts for flows less than 700 veh/hr	> 85% of cases	<p>AM peak: criteria met for car flows on 90% of links, and for total vehicles on 91% of links</p> <p>Interpeak: criteria met for car flows on 95% of links and for total vehicles on 95% of links</p> <p>PM peak: criteria met for car flows on 91% of links and for total vehicles on 89% of links.</p> <p>In summary, criteria satisfied in all time periods and for the SRN separately.</p>
	Individual flows within 15% of counts for flows from 700 veh/hr to 2,700 veh/hr	> 85% of cases	
	Individual flows within 400 veh/hr of counts for flows more than 2,700 veh/hr	> 85% of cases	
	GEH < 5 for individual flows	> 85% of cases	

Model aspect	Criterion	Acceptability Guideline	Actual model performance
Link validation	Same as for link calibration, but for independent counts		<p>AM peak: criteria met for car flows on 89% on links, and total vehicles on 81% of links</p> <p>Interpeak: criteria met for car flows on 86% of links and total vehicles on 82% of links.</p> <p>PM peak: criteria met for car flows on 88% of links and for total vehicles on 78% of links.</p> <p>Overall statistics are affected by validation counts to the south of the model, otherwise 85% achieved around scheme.</p>
Journey times	Modelled times along routes should be within 15% of surveyed time, or 1 minute if higher	> 85% of all routes	Criteria met for 93% of journey time routes in the AM, 86% in the IP and 89% in the PM time period.
VDM Realism Test	Overall fuel cost elasticity between -0.30 and -0.35 and car journey time		

Table 14-1 demonstrates that the vast majority of the model standards set out in Chapter 3 are met.

Some of the criteria related to validation count and matrix estimation performance are not met, however, there are understood reasons why that is the case, as detailed in each of the previous sections

It can be seen that the journey times are well within WebTAG criteria, which is important and demonstrates the models' ability to replicate traffic speeds and delay, and of particular importance to routing, and future economic appraisal.

14.3 Assessment of Fitness for Purpose

The model performs well against the model standards previously set out and this should serve to give confidence and provide reassurance that the model is representative of current conditions.

However, it is acknowledged that simply meeting the validation criteria does not in of itself qualify the model to be a suitable tool for assessing the effects of transport schemes, and in particular the Preston Western Distributor scheme.

In addition to the model meeting the WebTAG criteria, further confidence in the ability of the model to represent current traffic conditions should be sought from the modelled journey times on all parallel routes to the scheme, the excellent performance of the model to counts and journey times on the Strategic Road network, and other local roads around the study area, which demonstrate that the model reflects observed levels of congestion at all points to a high degree of accuracy.

Additionally, modelled traffic flows in the vicinity of the PWD, and each of the screenlines that surround the proposed scheme provide further evidence of the model's robustness in representing current traffic conditions to a high level of accuracy.

Given that the model has been demonstrated to have been constructed in a manner consistent with guidance, has been developed in conjunction with local LCC checks and Highways England TAME input, and is representative of traffic conditions likely to be impacted by the scheme in the future, it is expected that a high degree of confidence may be placed in the model for the purposes of scheme assessment, appraisal, economic and environmental appraisal, as described in the opening sections of this report.

Appendix A Model Zones and Sectors



Figure A-1 - Map of all zones within the model

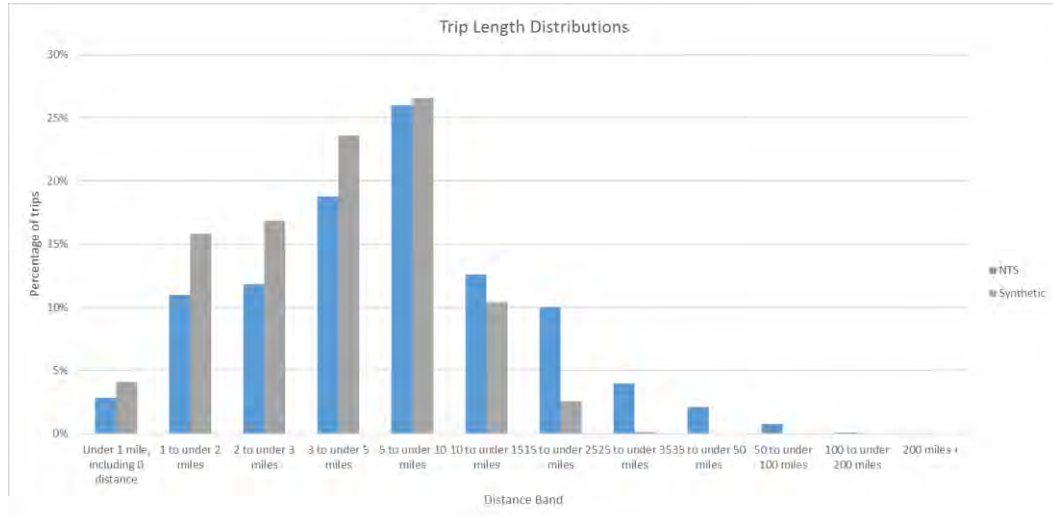
Appendix B Link Types and Parameters

ID	Area	Description	FF Speed – kph (mph)	Speed at Capa. – kph (mph)	Car and LGV cruise Speed	HGV cruise Speed (kmh)	Capa. (PCU)	n
1	Rural	4-lane Motorway Gyratory	64 (40)	35 (22)	64	56	6,565	3.75
2	Rural	3-lane Motorway Gyratory	64 (40)	32 (20)	64	56	5,100	3.8
3	Rural	2-lane Motorway Gyratory	64 (40)	31 (19)	64	56	3,400	1.75
4	Rural	1-lane Motorway Gyratory	64 (40)	31 (19)	64	56	1,700	1.75
5	Rural	5-lane Motorway Gyratory	64 (40)	35 (22)	64	56	8,205	3.75
6	Rural	2-lane A-Road Gyratory	64 (40)	31 (19)	64	56	3,400	1.75
7	Rural	1-lane A-Road Gyratory	64 (40)	31 (19)	64	56	1,700	1.75
8	Rural	3-lane A-Road Gyratory	64 (40)	31 (19)	64	56	5,100	1.75
9	Rural	4-lane A-Road Gyratory	64 (40)	31 (19)	64	56	6,800	1.75
10	Rural	3-lane Slip-Road Motorways	92 (58)	55 (34)	92	64	5,190	2.35
11	Rural	2-lane Slip-Road Motorways	92 (58)	55 (34)	92	64	3,460	2.35
12	Rural	1-lane Slip-Road Motorways	92 (58)	55 (34)	92	64	1,730	2.35
13	Rural	4-lane Slip-Road Motorways	92 (58)	55 (34)	92	64	6,920	2.35
14	Rural	Rural 6-lane Motorway	112 (70)	79 (49)	112	96	13,140	2.75
15	Rural	Rural 5-lane Motorway	112 (70)	79 (49)	112	96	10,950	2.75
16	Rural	Rural 4-lane Motorway	112 (70)	74 (46)	112	96	8,760	3.1
17	Rural	Rural 3-lane Motorway	112 (70)	74 (46)	112	96	6,570	3.3
18	Rural	Rural 2-lane Motorway	112 (70)	67 (42)	112	96	4,380	2.9
19	Rural	Rural 1-lane Motorway	112 (70)	76 (48)	112	96	2,190	2.9
20	Rural	Rural 5-lane ATM Motorway	99 (62)	74 (46)	99	64	10,925	4.7
21	Rural	Rural 4-lane ATM Motorway	99 (62)	74 (46)	99	64	8,740	4.7
22	Rural	Rural 3-lane ATM Motorway	99 (62)	74 (46)	99	64	6,555	4.7
23	Rural	Rural 4-lane Narrow Motorway	80 (50)	67 (42)	80	60	8,760	6
24	Rural	Rural 4 lane A-Road	112 (70)	73 (46)	112	96	7,600	2.75
25	Rural	Rural 3 lane A-Road	112 (70)	73 (46)	112	96	6,030	2.75
26	Rural	Rural 2 lane A-Road	104 (65)	68 (43)	104	88	4,020	2.7
27	Rural	Rural S10 Very Good A-Road	96 (60)	42 (26)	96	64	1,730	2.05
28	Rural	Rural S7.3 Good A-Road	88 (55)	41 (26)	88	64	1,640	2.35
29	Rural	Rural S7.0 Typical A-Road	60 (38)	38 (24)	60	56	1,640	2.1
30	Rural	Rural 5 lane A-Road	112 (70)	73 (46)	112	96	9,500	2.75
31	Rural	Rural S7.3 Good A-Road (50mph limit)	75 (47)	41 (26)	75	60	1,640	2.35
32	Rural	Rural 2 lane A-Road (50mph limit)	75 (47)	41 (26)	75	60	3,280	2.7
33	Rural	Rural S7.3 Good B-Road	88 (55)	41 (26)	88	64	1,640	2.35
34	Rural	Rural S7.0 Typical B-Road	60 (38)	38 (24)	60	56	1,640	2.1
35	Rural	Rural S6.5 Bad	52 (33)	40 (25)	52	48	1,640	1.35
36	Rural	Rural S7.3 Good B-Road (2 lanes)	88 (55)	41 (26)	88	64	3,280	2.35
37	Rural	Rural S7.3 Good B-Road (50mph limit)	75 (47)	41 (26)	75	60	1,640	2.35
38	Rural	Rural 2 lane B-road	104 (65)	68 (43)	104	88	4,020	2.7
39	Rural	Rural 3-lane B-road	104 (65)	68 (43)	104	88	6,030	2.7
40	Rural	Rural 2-lane B-Road (50mph limit)	75 (47)	41 (26)	75	60	3,280	2.35
41	Rural	Dual Lane Slip-Road A-Roads	87 (54)	42 (26)	87	87	3,460	2.05
42	Rural	Single Lane Slip-Road A-Roads	87 (54)	42 (26)	87	87	1,730	2.05

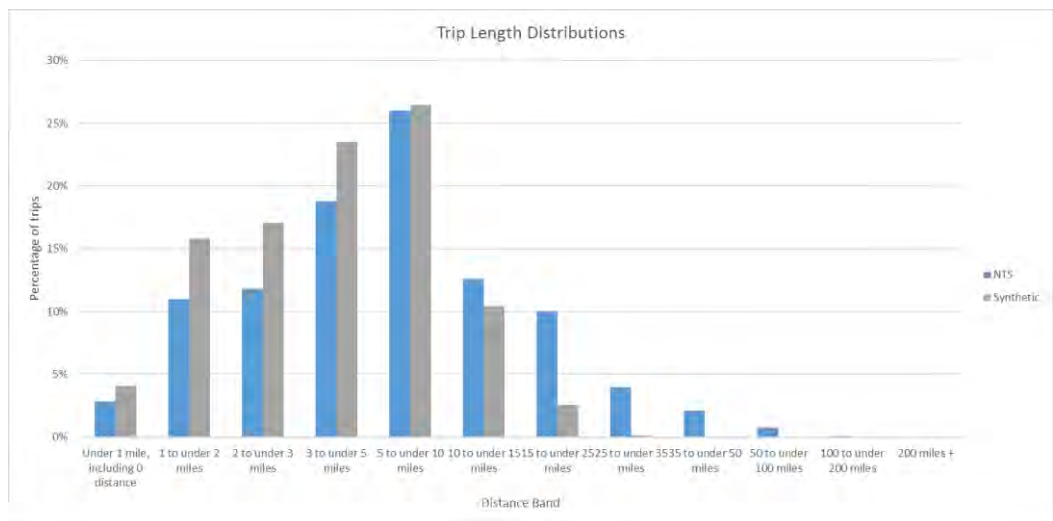
ID	Area	Description	FF Speed – kph (mph)	Speed at Capa. – kph (mph)	Car and LGV cruise Speed	HGV cruise Speed (kmh)	Capa. (PCU)	n
43	Rural	4-lane Slip-Road A-Roads	87 (54)	42 (26)	87	87	36,920	2.05
44	Rural	Unclassified Roads	50 (31)	40 (25)	46	44	1,640	1.35
45	Suburban	Suburban 4-lane A-Road Slight Development	75 (47)	35 (22)	73	62	6,565	2.3
46	Suburban	Suburban 3-lane A-Road Slight Development	75 (47)	34 (21)	73	62	5,100	2.3
47	Suburban	Suburban 2-lane A-Road Slight Development	71 (44)	35 (22)	69	62	3,400	1.15
48	Suburban	Suburban 1-lane A-Road Slight Development	64 (40)	24 (15)	62	54	1,700	2.6
49	Suburban	Suburban 4-lane A-Road Typical Development	64 (40)	35 (22)	62	54	6,565	3.75
50	Suburban	Suburban 3-lane A-Road Typical Development	64 (40)	32 (20)	62	54	5,100	3.8
51	Suburban	Suburban 2-lane A-Road Typical Development	64 (40)	31 (19)	62	54	3,400	1.75
52	Suburban	Suburban 1-lane A-Road Typical Development	64 (40)	31 (19)	62	54	1,700	1.75
53	Suburban	Suburban 2-lane A-Road (30mph limit)	48 (30)	31 (19)	46	46	3,400	1.75
54	Suburban	Suburban 1-lane A-Road (30mph limit)	48 (30)	31 (19)	46	46	1,700	1.75
55	Suburban	Suburban 4-lane B-Road Slight Development	75 (47)	35 (22)	73	62	6,565	2.3
56	Suburban	Suburban 3-lane B-Road Slight Development	75 (47)	34 (21)	73	62	5,100	2.3
57	Suburban	Suburban 2-lane B-Road Slight Development	71 (44)	35 (22)	70	63	3,400	1.15
58	Suburban	Suburban 1-lane B-Road Slight Development	64 (40)	24 (15)	62	54	1,700	2.6
59	Suburban	Suburban 4-lane B-Road Typical Development	64 (40)	35 (22)	62	54	6,565	3.75
60	Suburban	Suburban 3-lane B-Road Typical Development	64 (40)	32 (20)	62	54	5,100	3.8
61	Suburban	Suburban 2-lane B-Road Typical Development	64 (40)	31 (19)	62	54	3,400	1.75
62	Suburban	Suburban 1-lane B-Road Typical Development	64 (40)	31 (19)	62	54	1,700	1.75
63	Suburban	Suburban 2-lane B-Road (30mph limit)	48 (30)	31 (19)	46	46	3,400	1.75
64	Suburban	Suburban 1-lane B-Road (30mph limit)	48 (30)	31 (19)	46	46	1,700	1.75
65	Suburban	Suburban 3-lane B-Road (30mph limit)	48 (30)	31 (19)	46	46	5,100	1.75
66	Suburban	Unclassified Roads	50 (31)	40 (25)	46	44	1,640	1.35
67	Urban	Urban 60mph Fixed Speed	96 (60)	96 (60)	91	91	99,999	0
68	Urban	Urban 50mph Fixed Speed	80 (50)	80 (50)	77	77	99,999	0
69	Urban	Urban 40mph Fixed Speed	64 (40)	64 (40)	60	60	99,999	0
70	Urban	Urban 30mph Fixed Speed (30mph limit no impedances)	48 (30)	48 (30)	45	45	99,999	0
71	Urban	Urban 25mph Fixed Speed (30mph limit limited impedances)	40 (25)	40 (25)	38	38	99,999	0
72	Urban	Urban 20mph Fixed Speed (30mph limit significant impedances, or 20mph no impedances)	32 (20)	32 (20)	31	31	99,999	0
73	Urban	Urban 15mph Fixed Speed (20mph limit limited impedances)	24 (15)	24 (15)	22	22	99,999	0
74	Urban	Unclassified Roads	50 (31)	40 (25)	48	48	1,640	1.35
75	Rural	Unclassified Roads	40 (25)	33 (21)	40	40	1,640	1.35
76	Rural	Unclassified Roads	24 (15)	24 (15)	22	22	1640	
77	Rural	Unclassified Roads	32 (20)	32 (20)	30	30	1640	

Appendix C Synthetic Trip Length Distribution

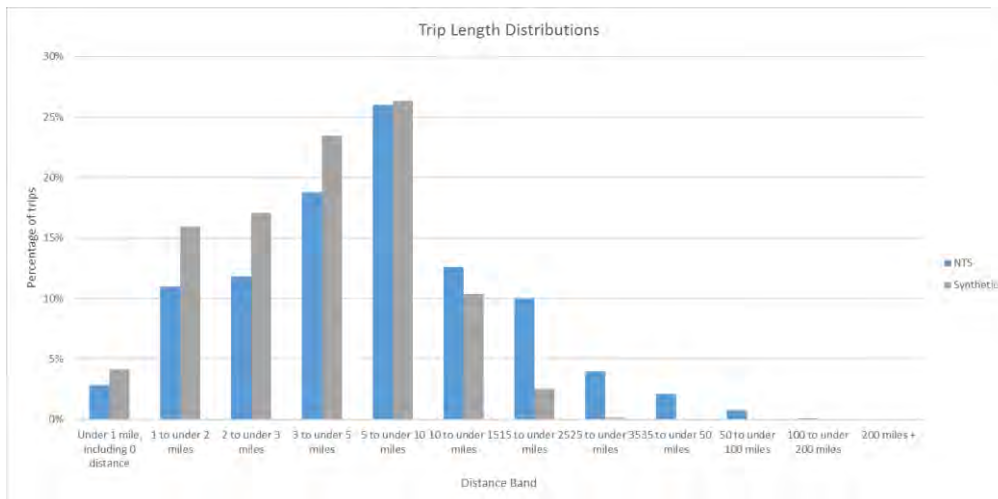
Home Based Work – AM – Internal to Internal only



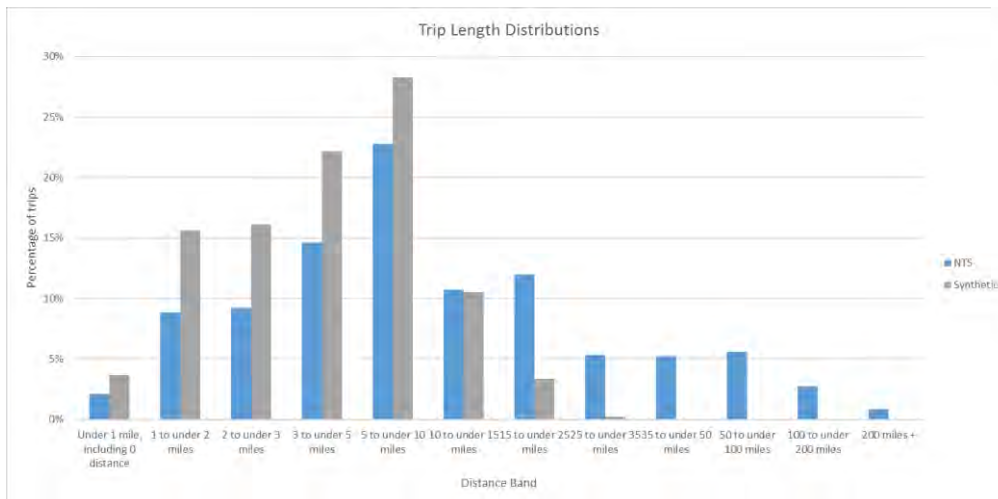
Home Based Work – IP – Internal to Internal only



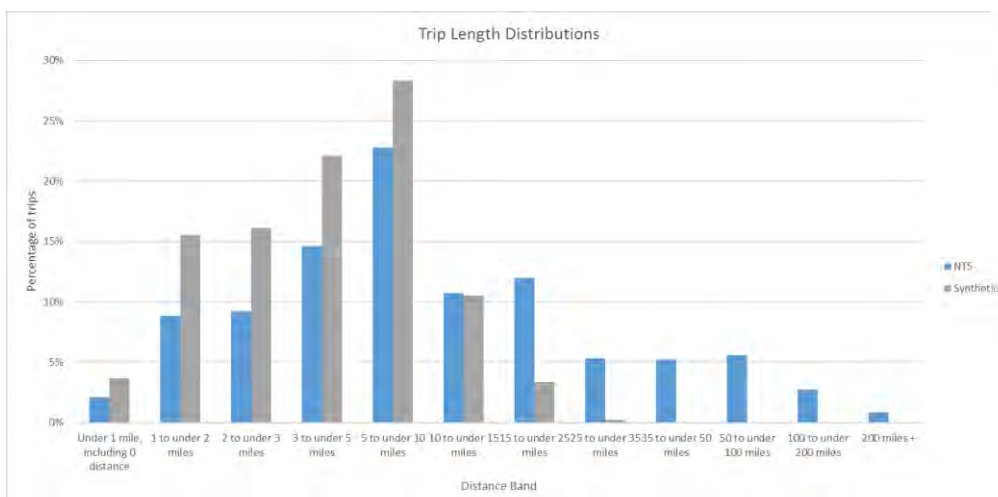
Home Based Work – PM – Internal to Internal only



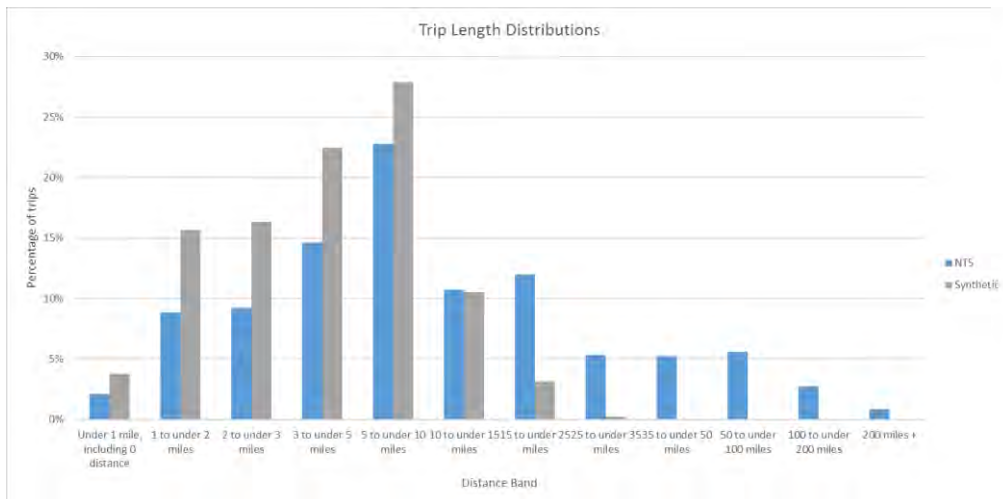
Home Based Employers Business – AM – Internal to Internal only



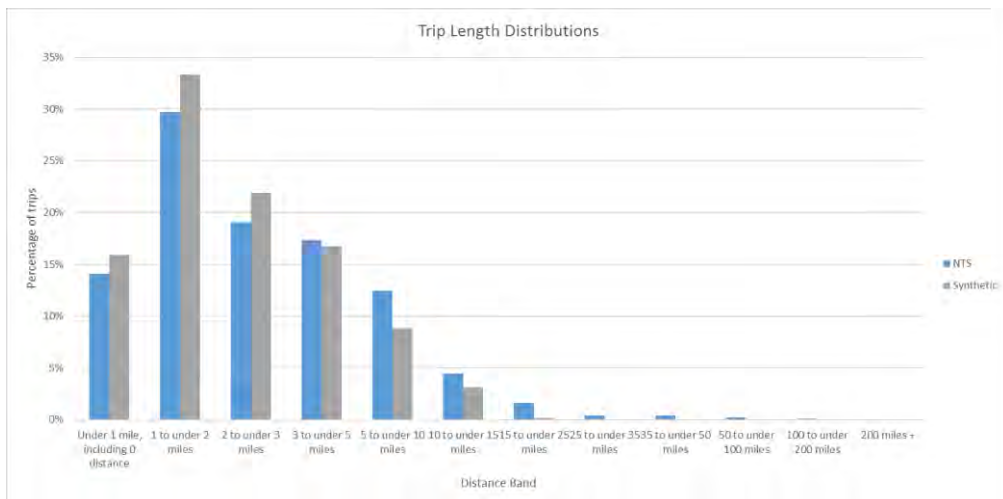
Home Based Employers Business – IP – Internal to Internal only



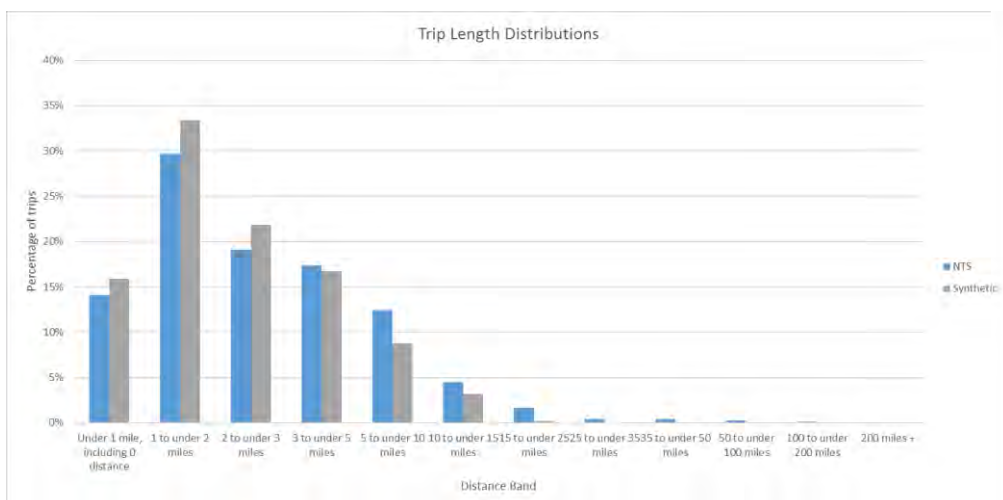
Home Based Employers Business – PM – Internal to Internal only



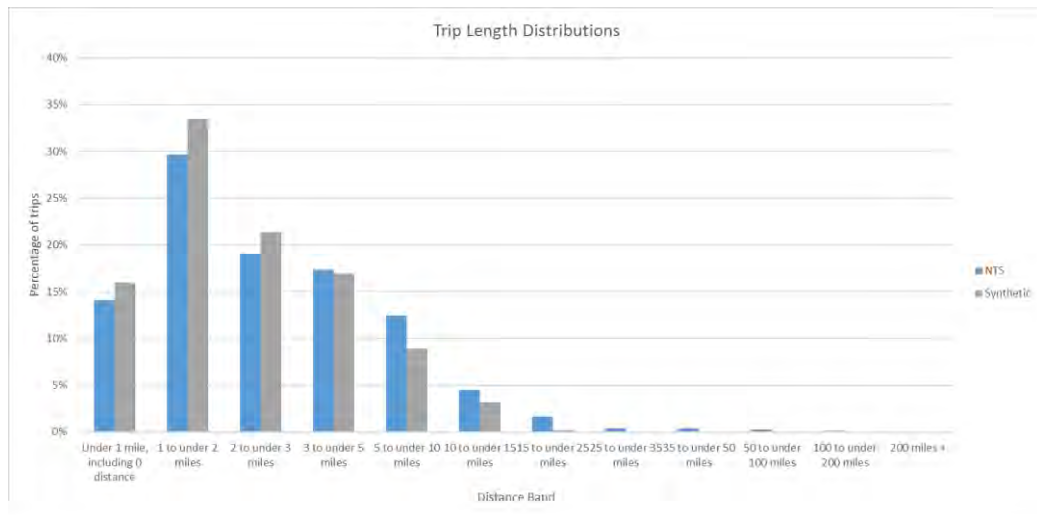
Home Based Education – AM – Internal to Internal only



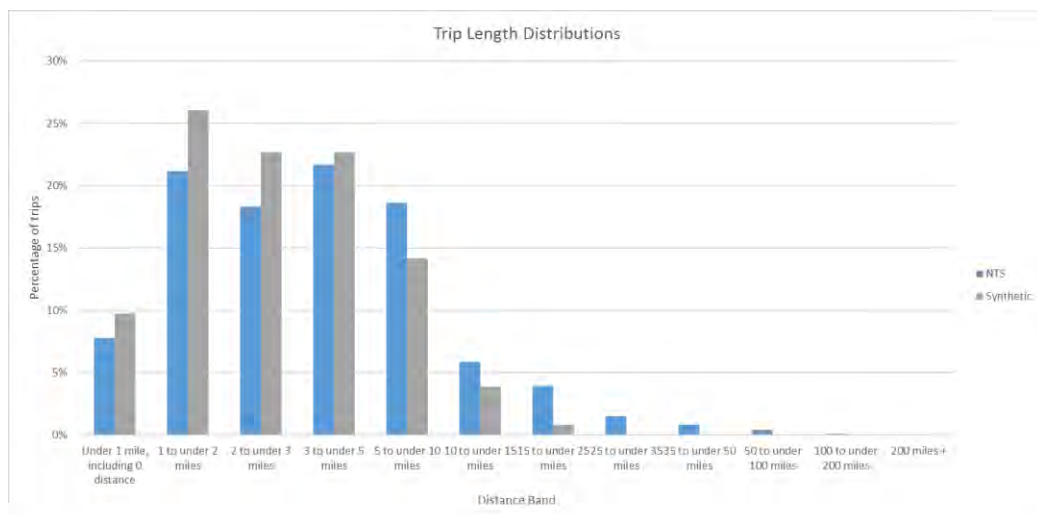
Home Based Education – IP – Internal to Internal only



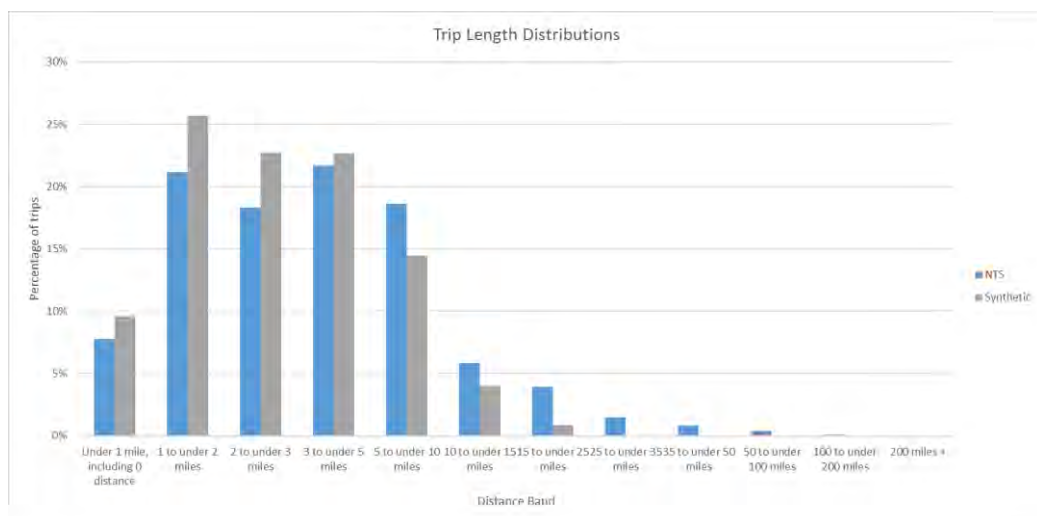
Home Based Education – PM – Internal to Internal only



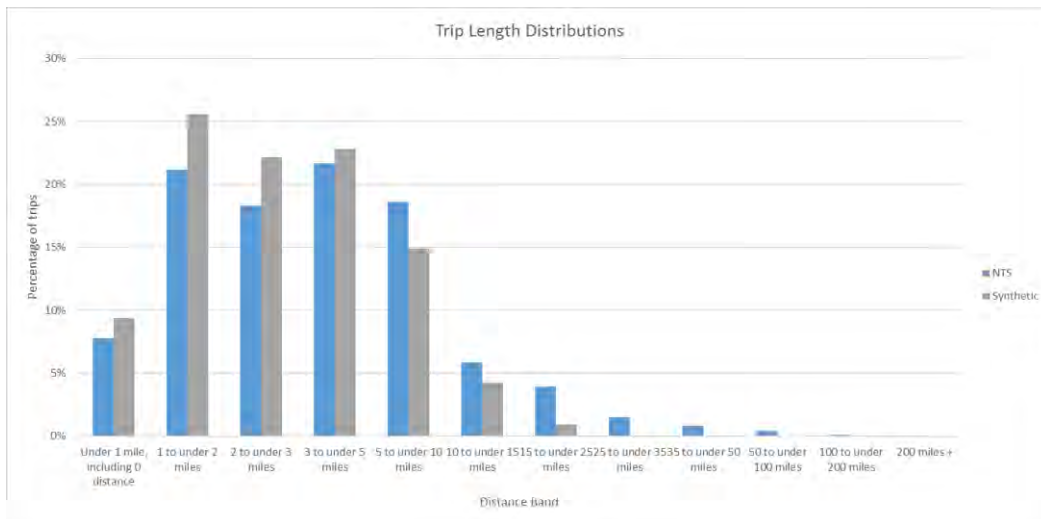
Home Based Shopping – AM – Internal to Internal only



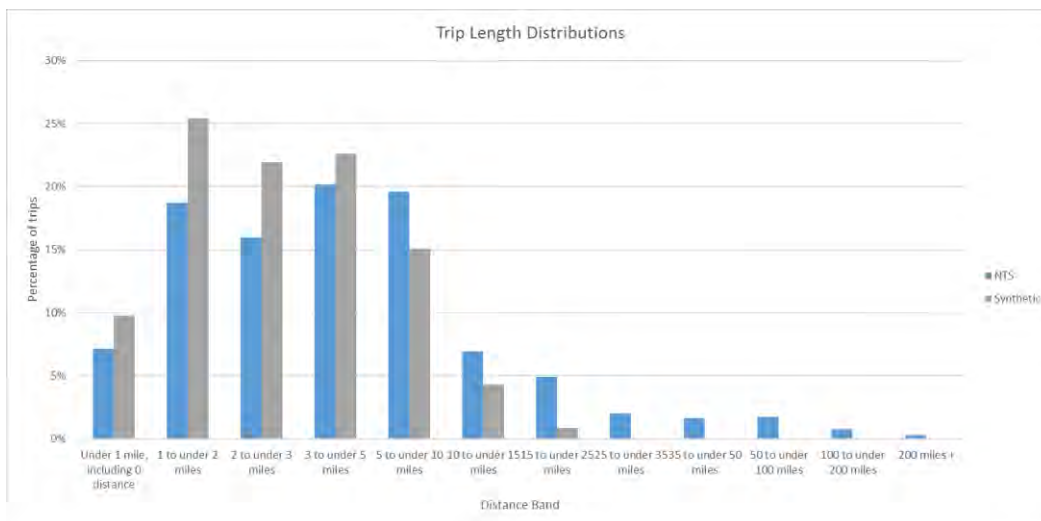
Home Based Shopping – IP – Internal to Internal only



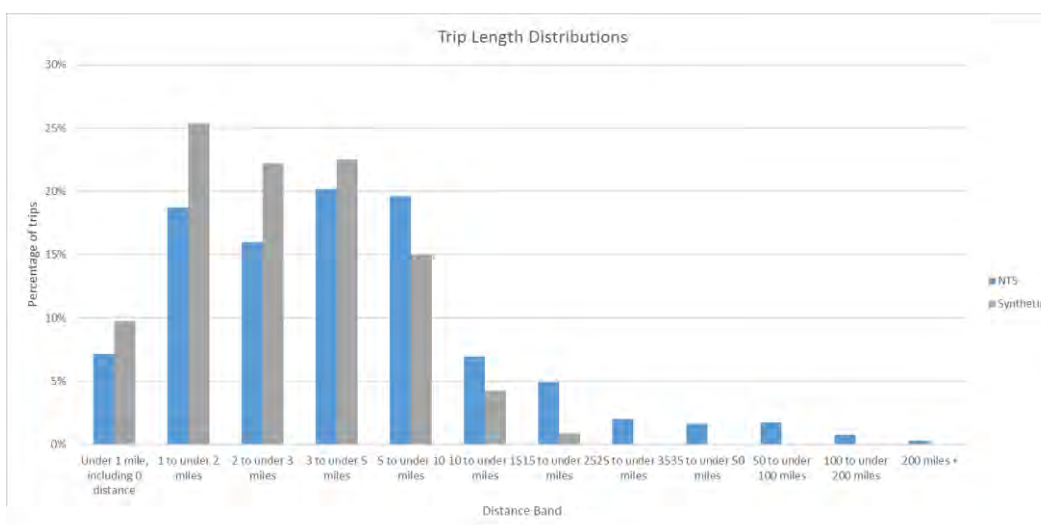
Home Based Shopping – PM – Internal to Internal only



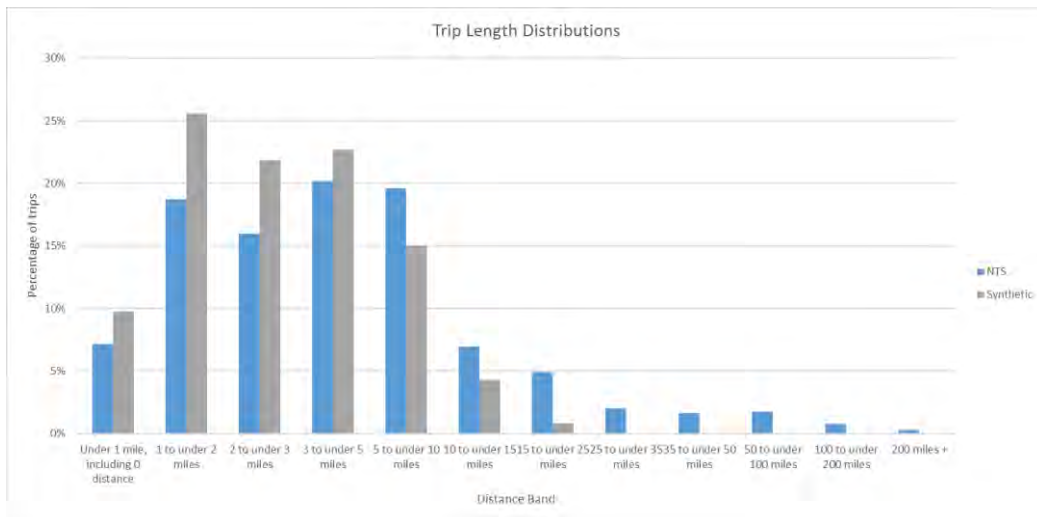
Home Based Other – AM – Internal to Internal only



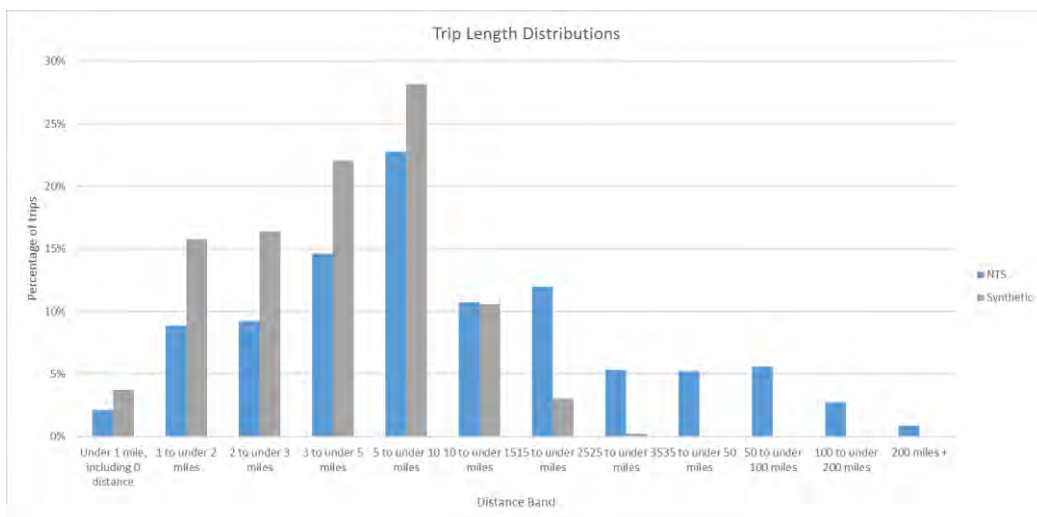
Home Based Other – IP – Internal to Internal only



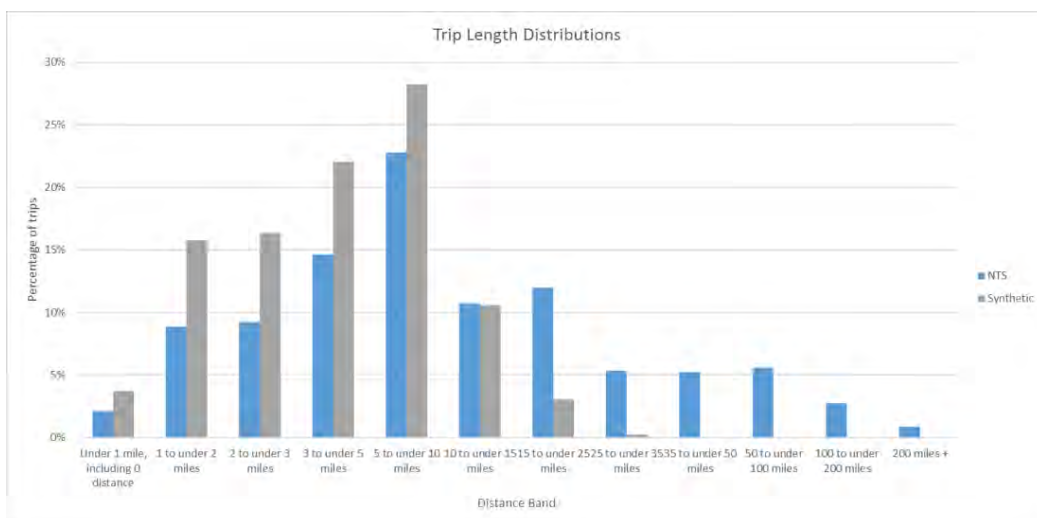
Home Based Other – PM – Internal to Internal only



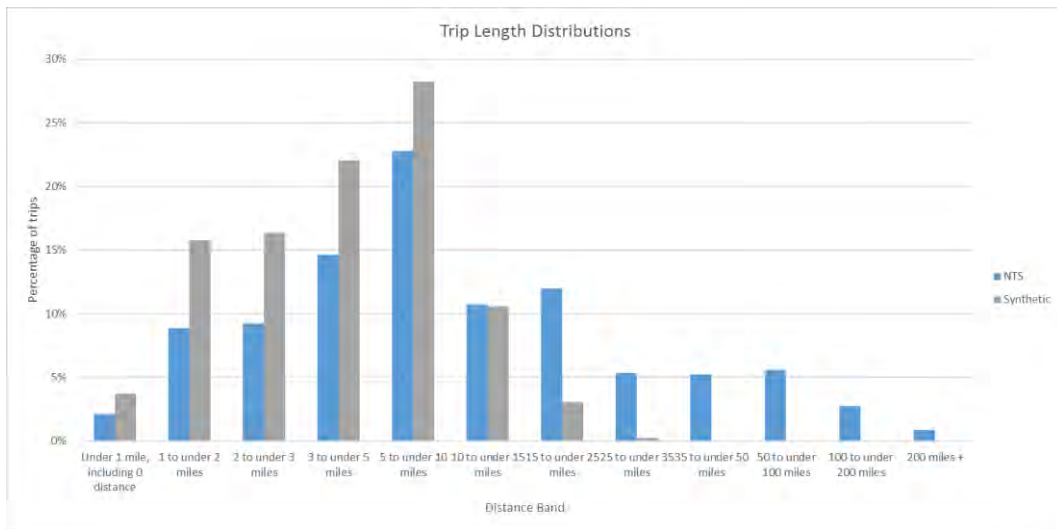
Non-Home Based Employers Business – AM – Internal to Internal only



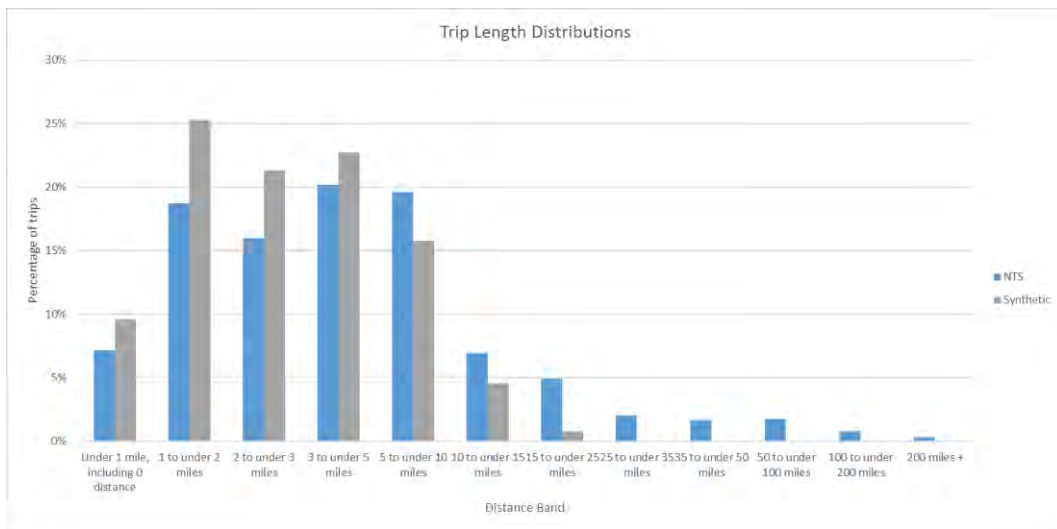
Non-Home Based Employers Business – IP – Internal to Internal only



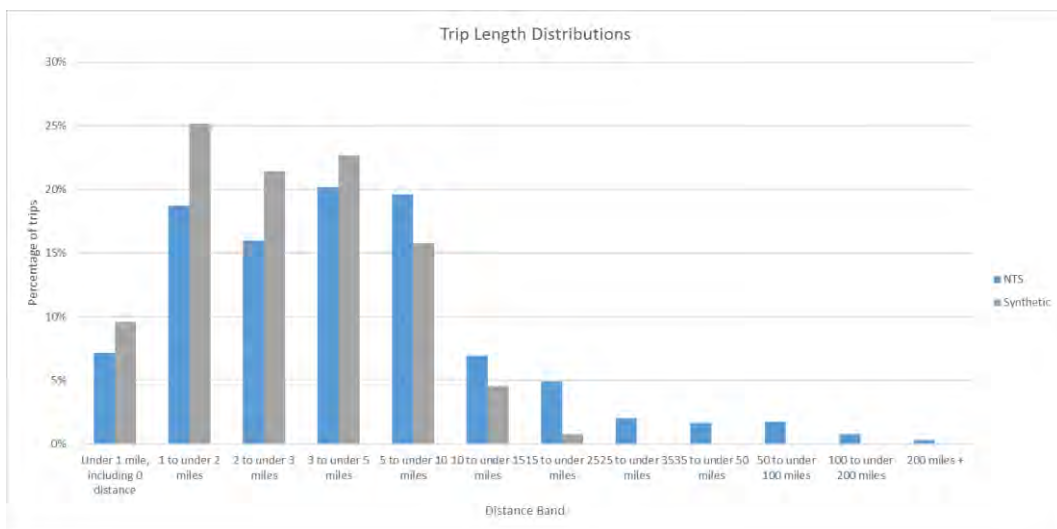
Non-Home Based Employers Business – PM – Internal to Internal only



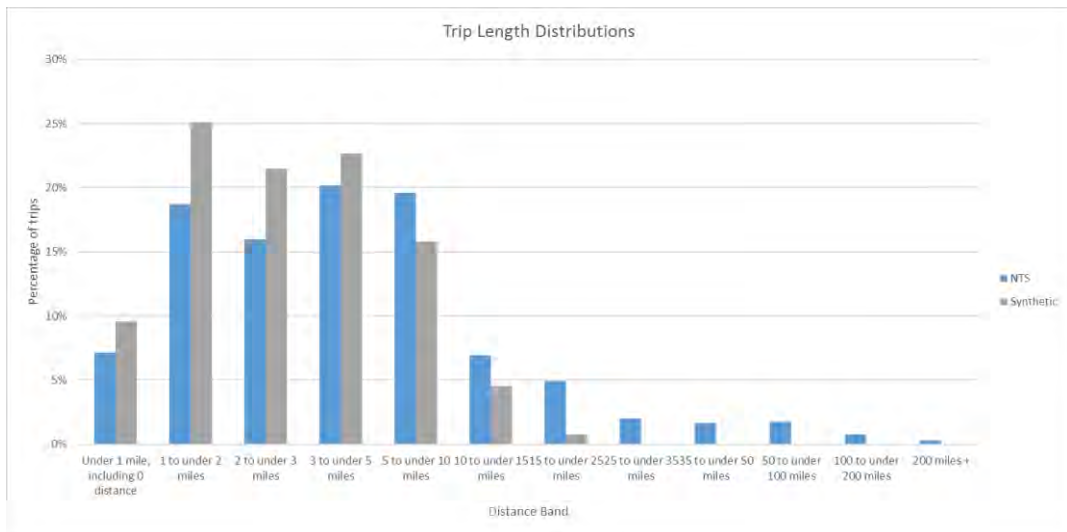
Non-Home Based Others – AM – Internal to Internal only



Non-Home Based Others – IP – Internal to Internal only

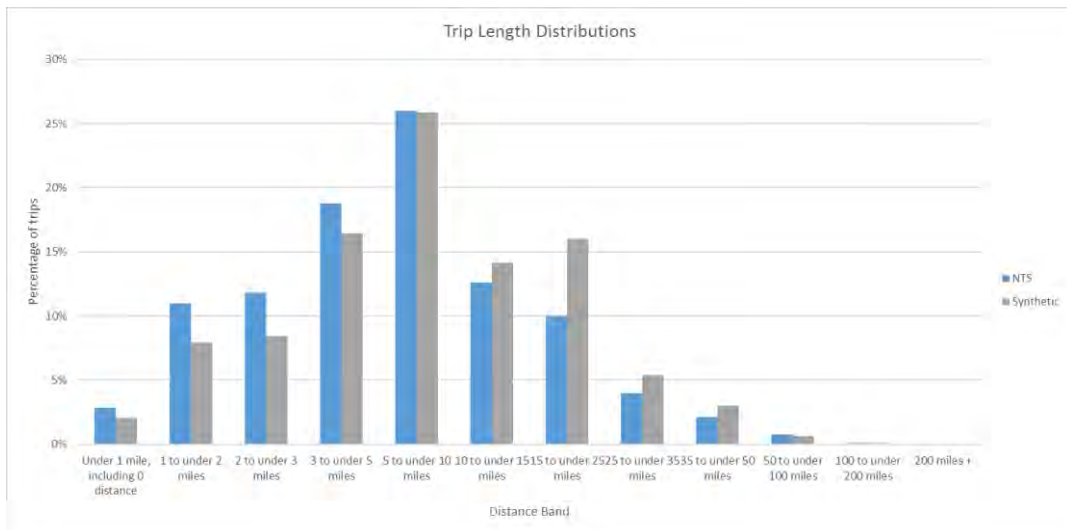


Non-Home Based Others – PM – Internal to Internal only

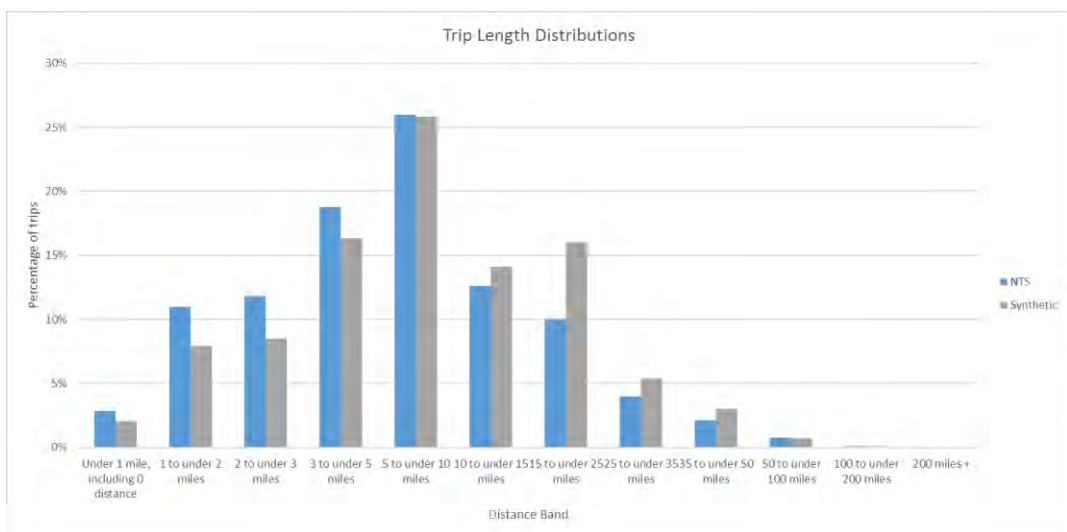


*I-I, I-E, E-I: Internal to Internal, Internal to External, External to Internal

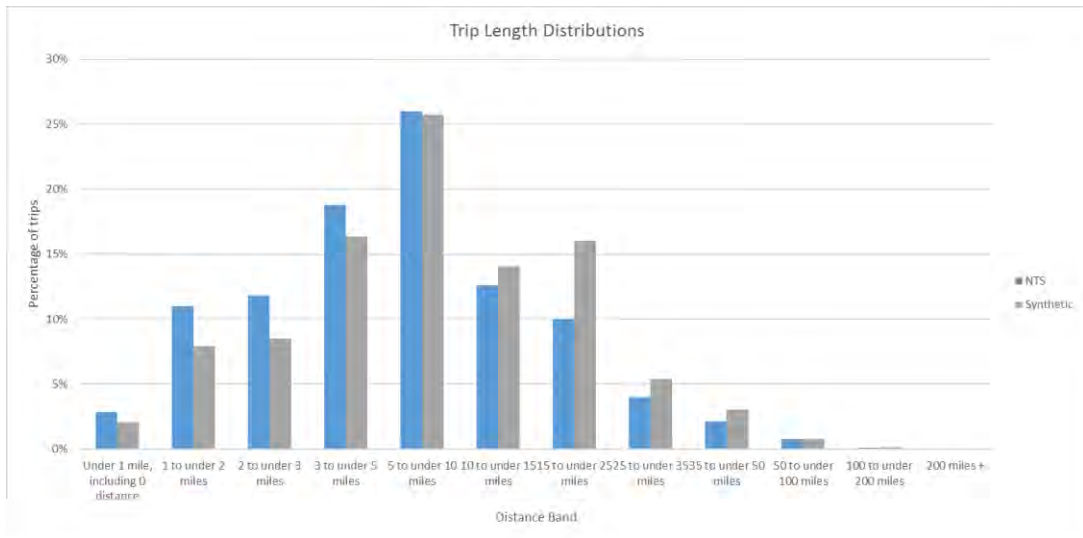
Home Based Work – AM – I-I, I-E, E-I



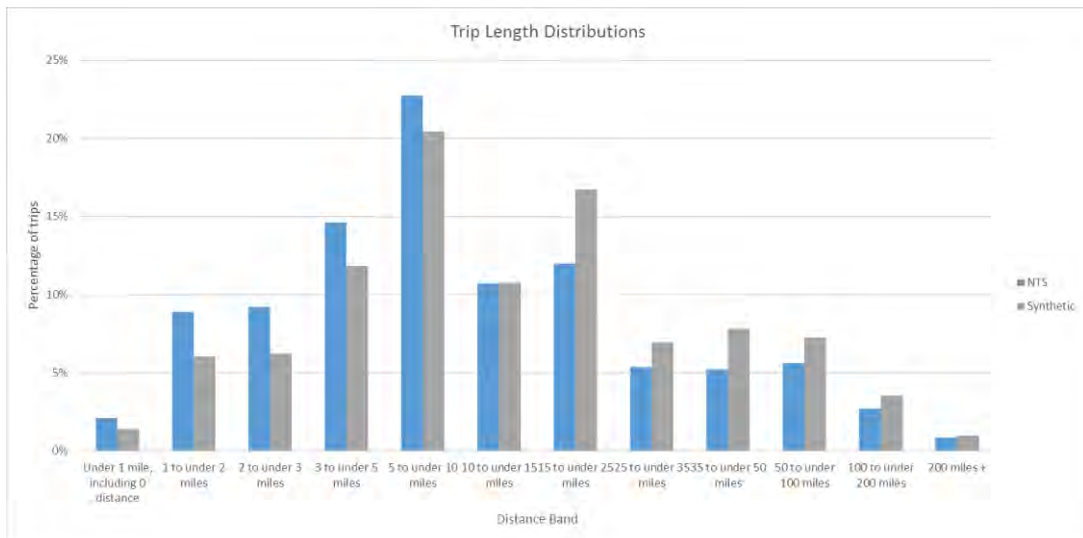
Home Based Work – IP – I-I, I-E, E-I



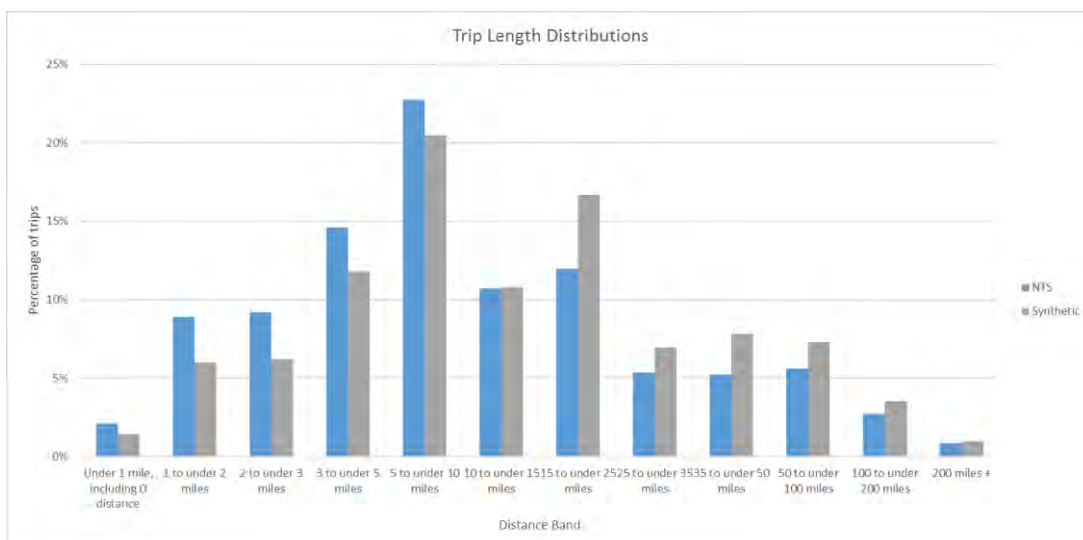
Home Based Work – PM – I-I, I-E, E-I



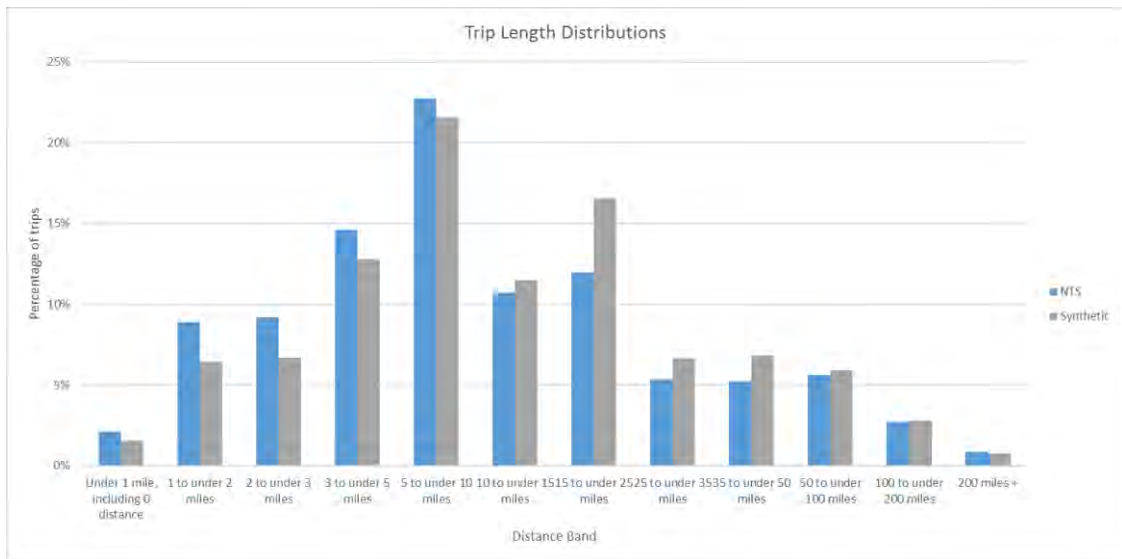
Home Based Employers Business – AM – I-I, I-E, E-I



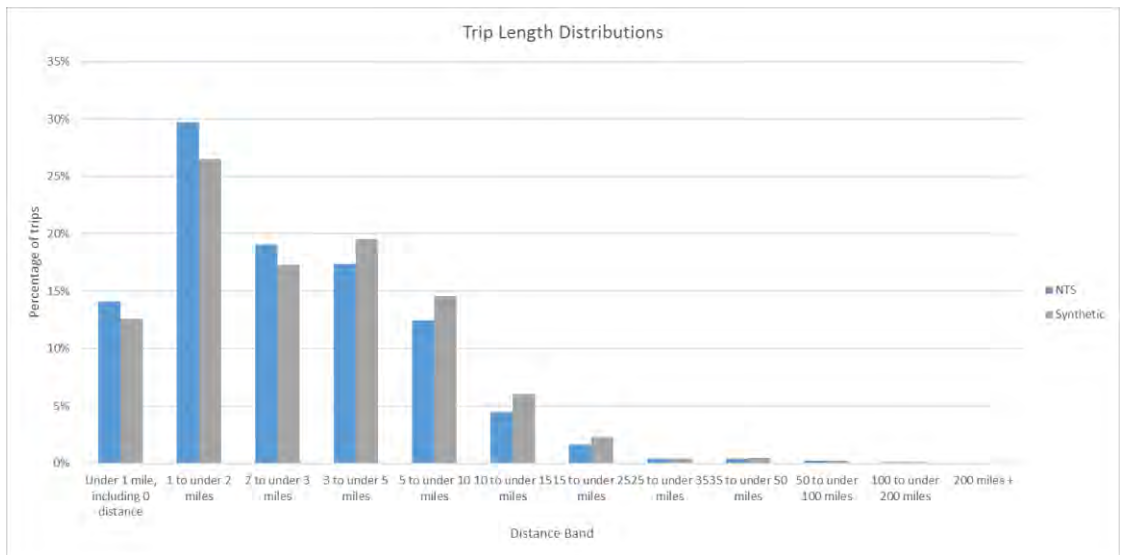
Home Based Employers Business – IP – I-I, I-E, E-I



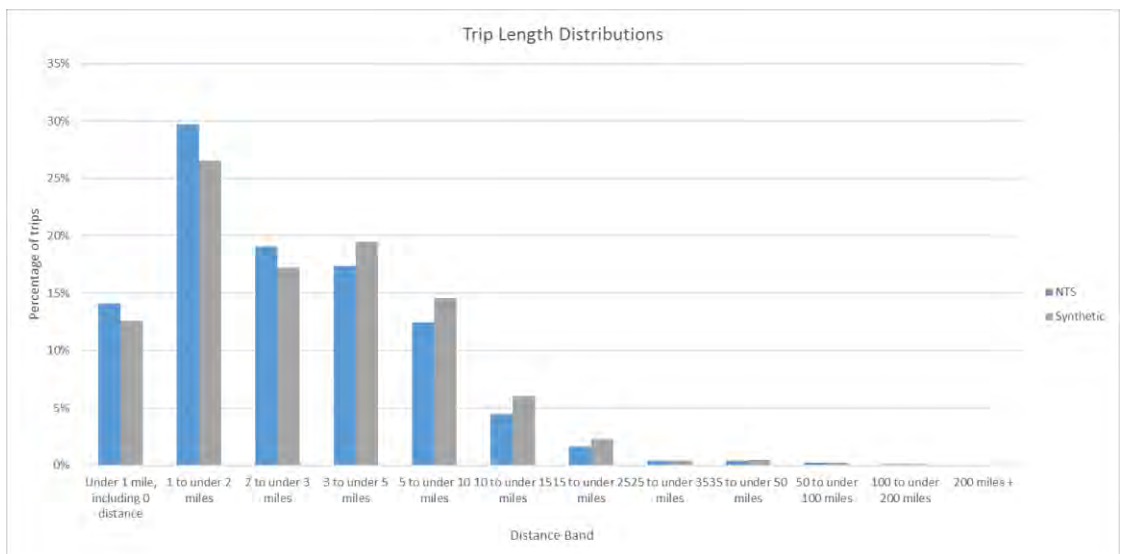
Home Based Employers Business – PM – I-I, I-E, E-I



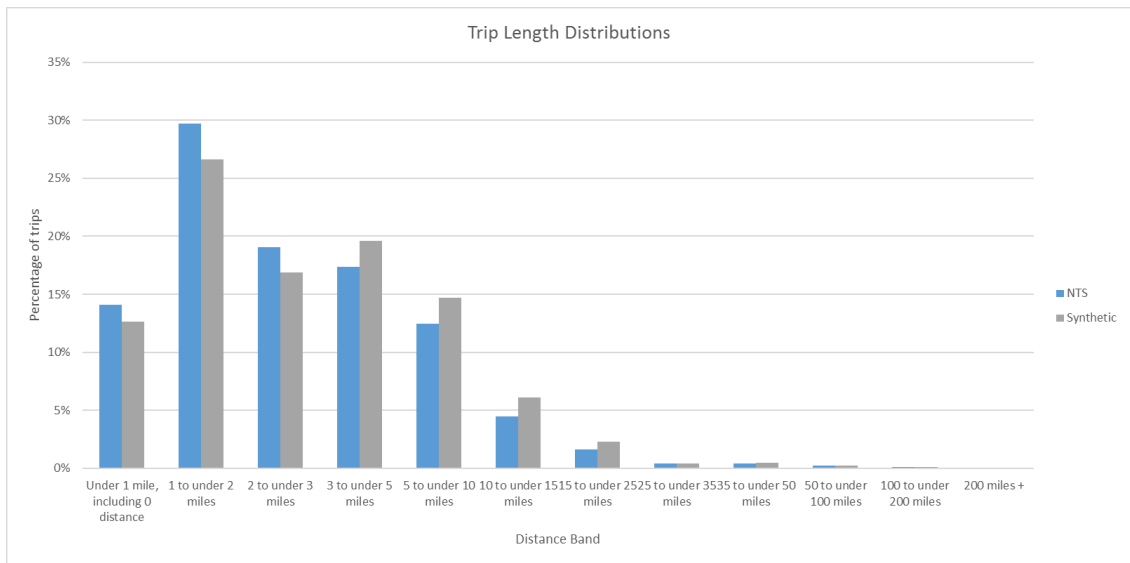
Home Based Education – AM – I-I, I-E, E-I



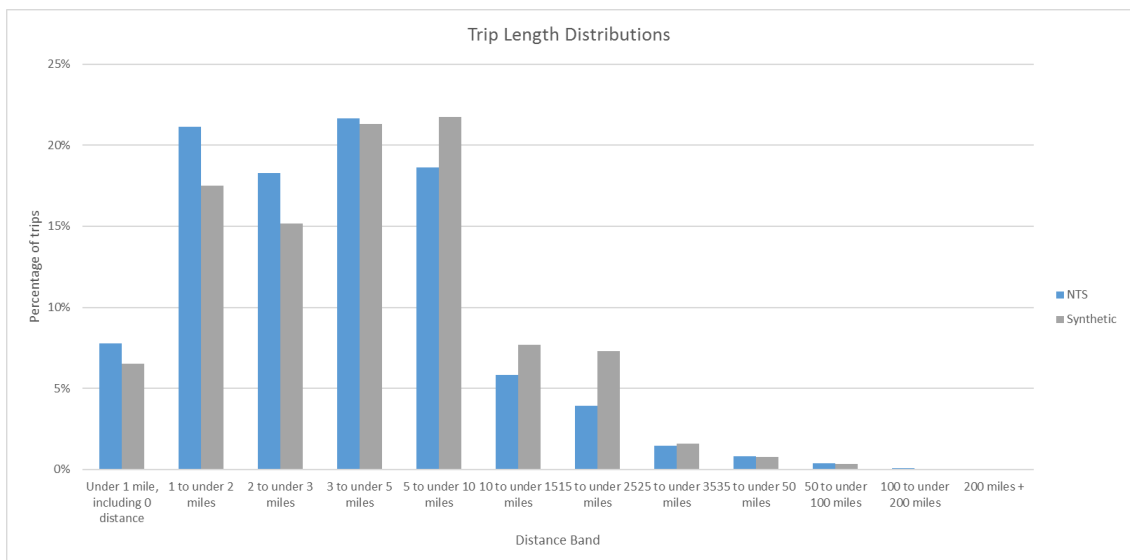
Home Based Education – IP – I-I, I-E, E-I



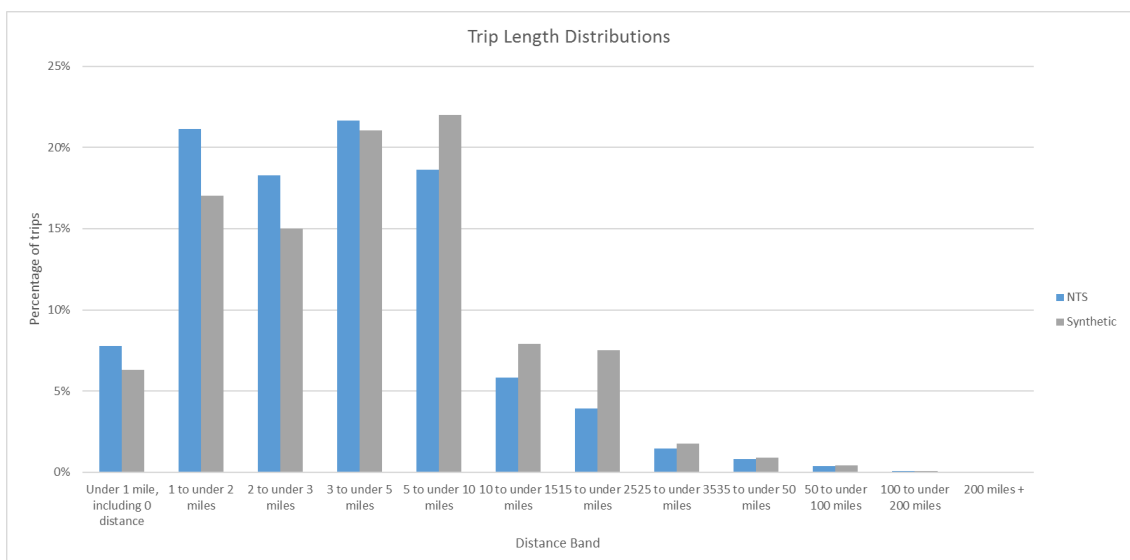
Homed Based Education – PM - I-I, I-E, E-I



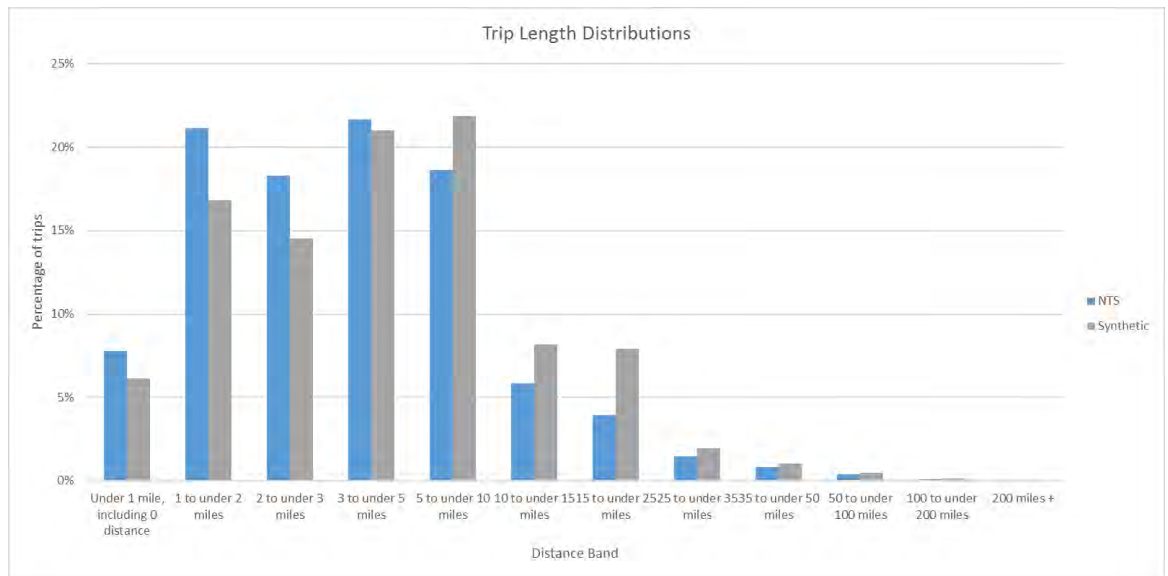
Home Based Shopping – AM - I-I, I-E, E-I



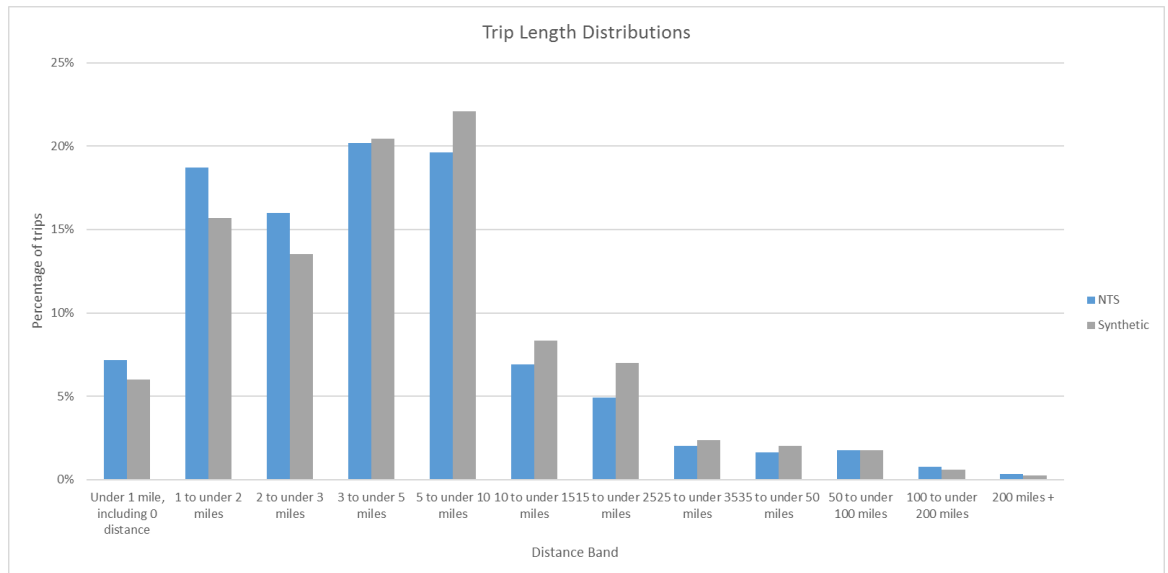
Home Based Shopping – IP - I-I, I-E, E-I



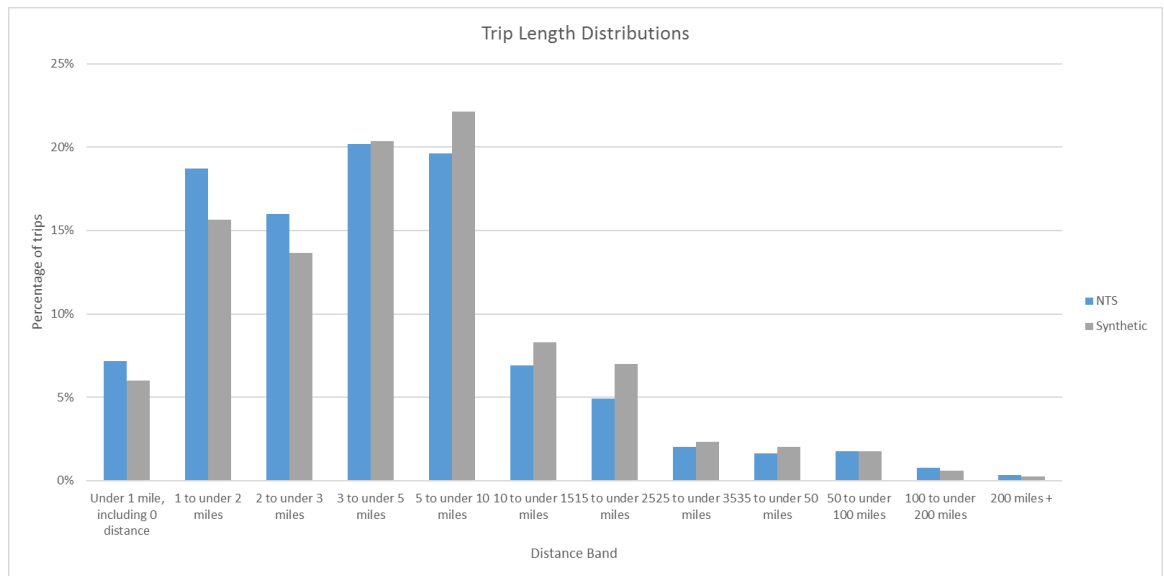
Home Based Shopping – PM - I-I, I-E, E-I



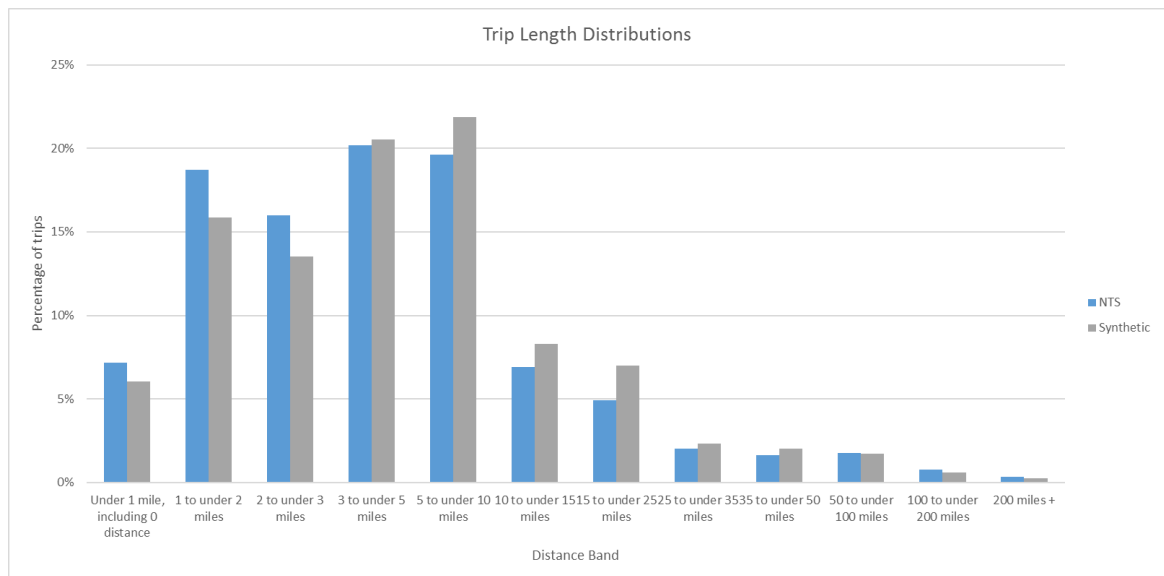
Home Based Other – AM - I-I, I-E, E-I



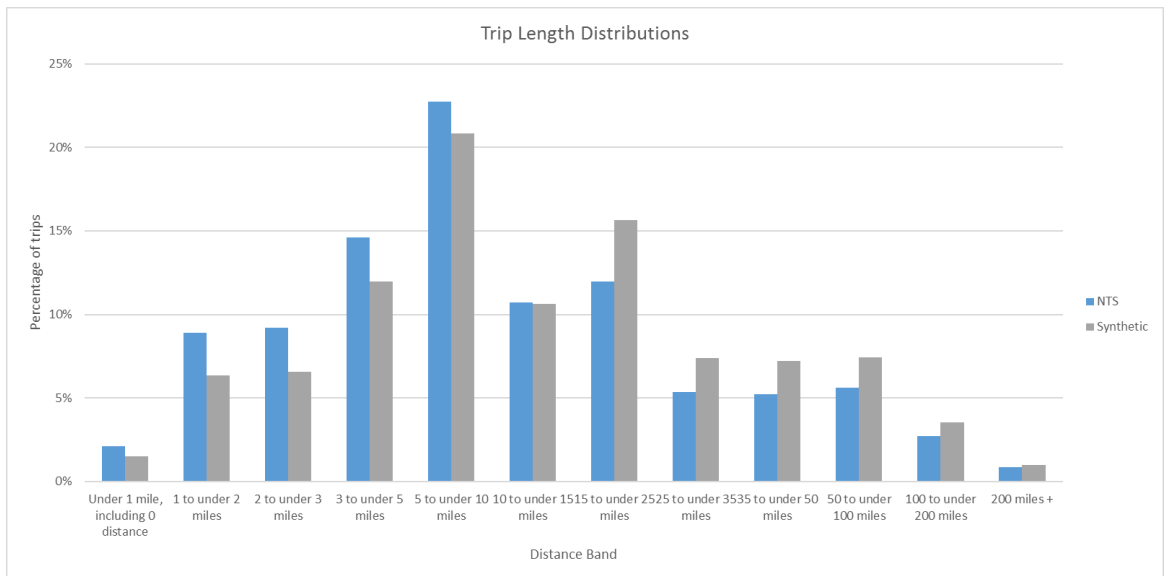
Home Based Other – IP - I-I, I-E, E-I



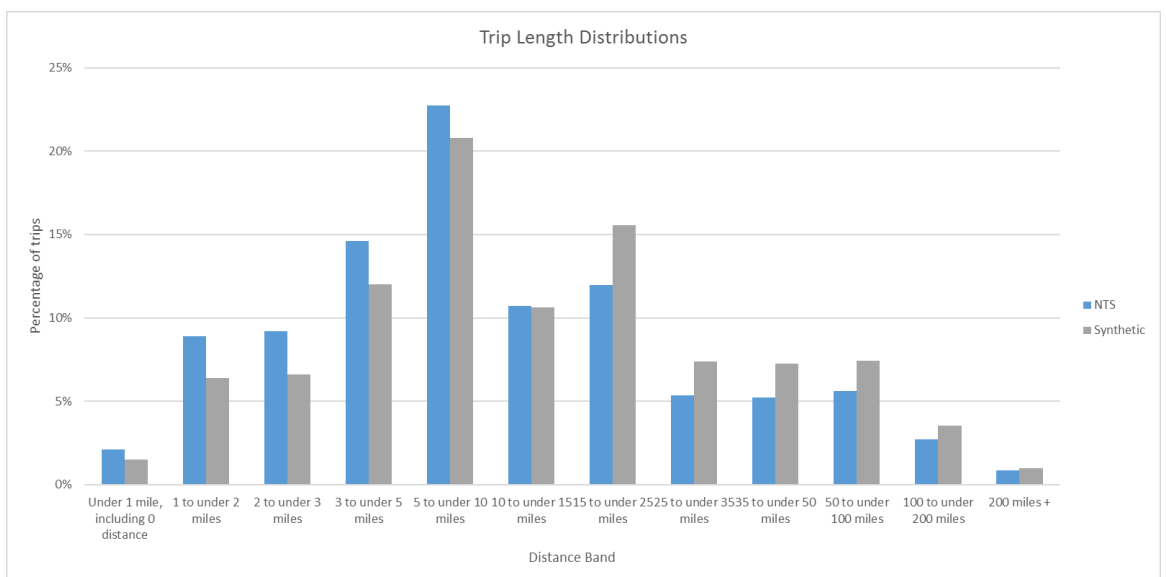
Home Based Other – PM - I-I, I-E, E-I



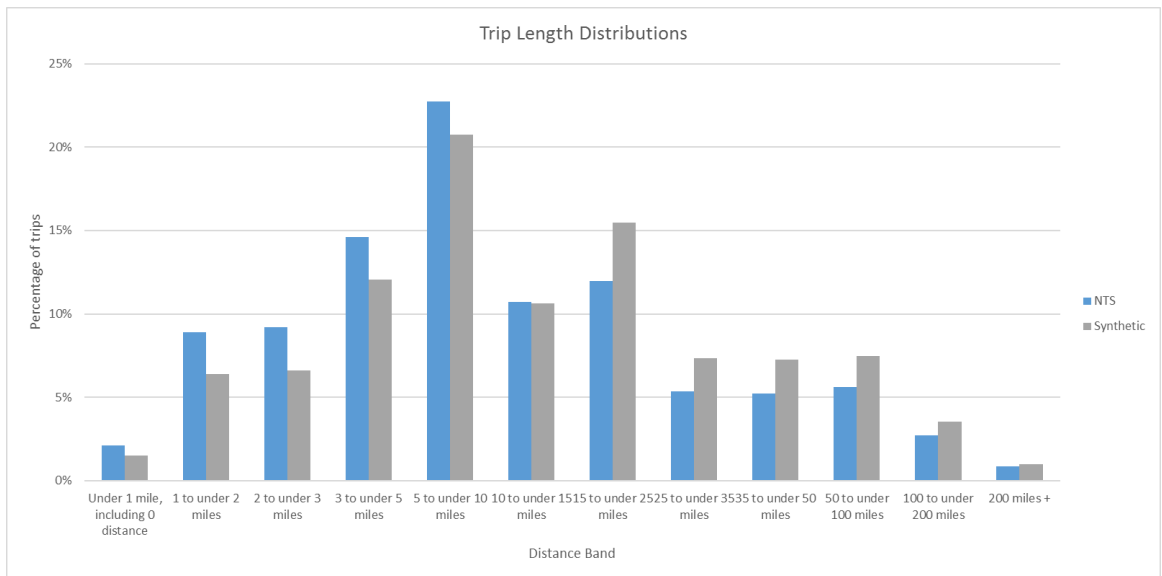
Non-Home Based Employers Business – AM - I-I, I-E, E-I



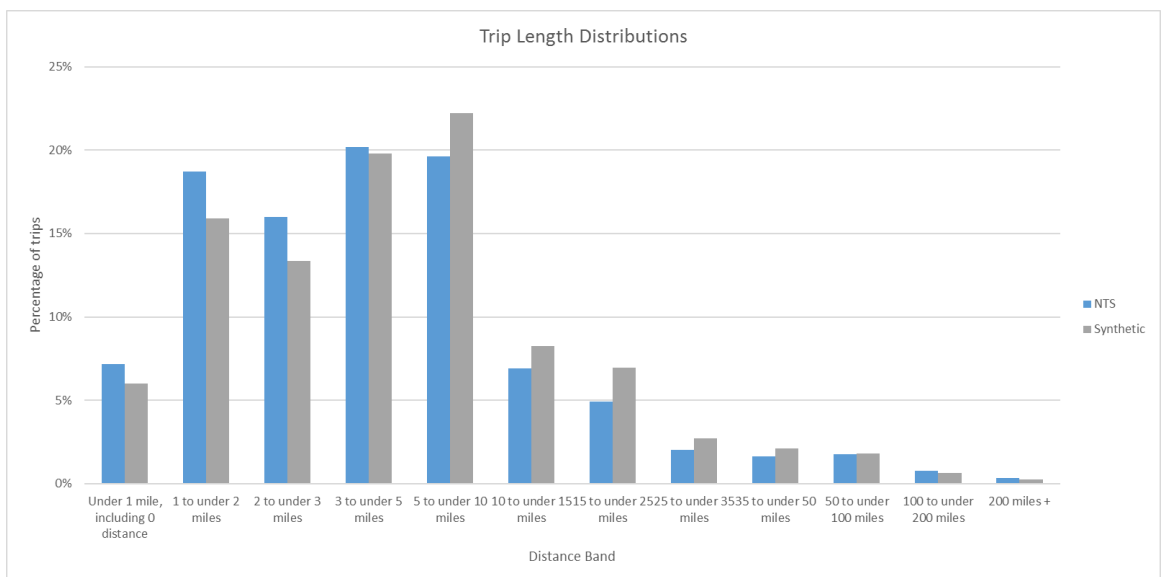
Non-Home Based Employers Business – IP - I-I, I-E, E-I



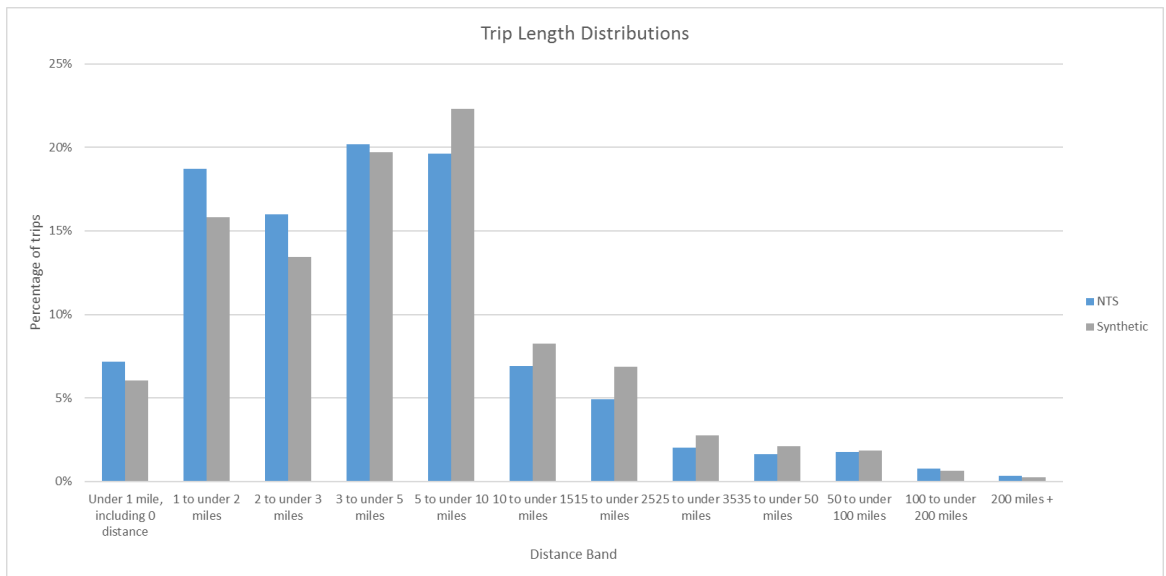
Non-Home Based Employers Business – PM - I-I, I-E, E-I



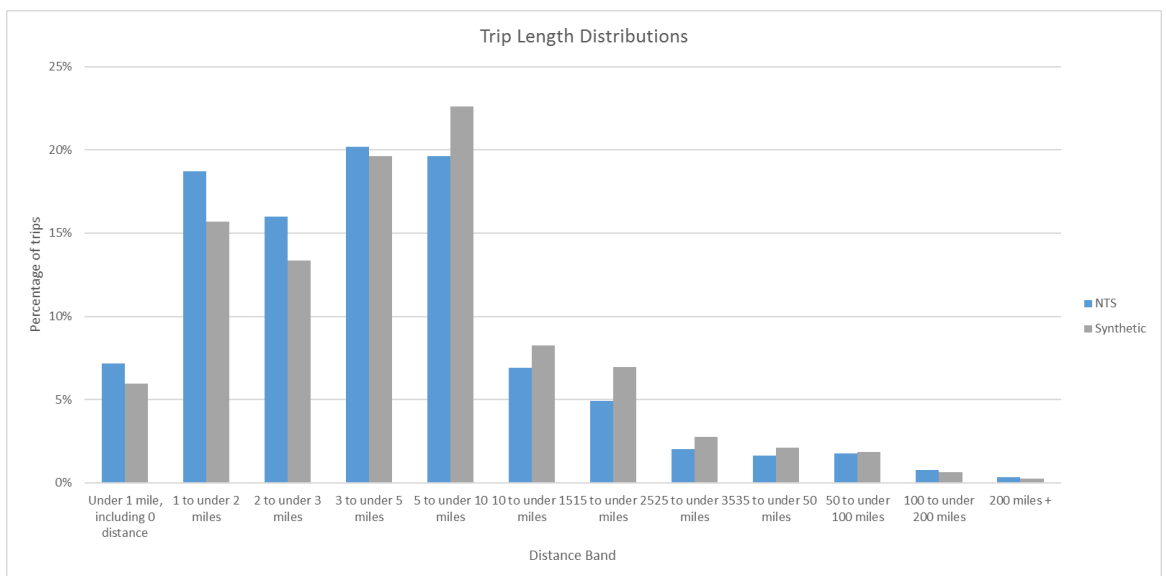
Non-Home Based Other – AM - I-I, I-E, E-I



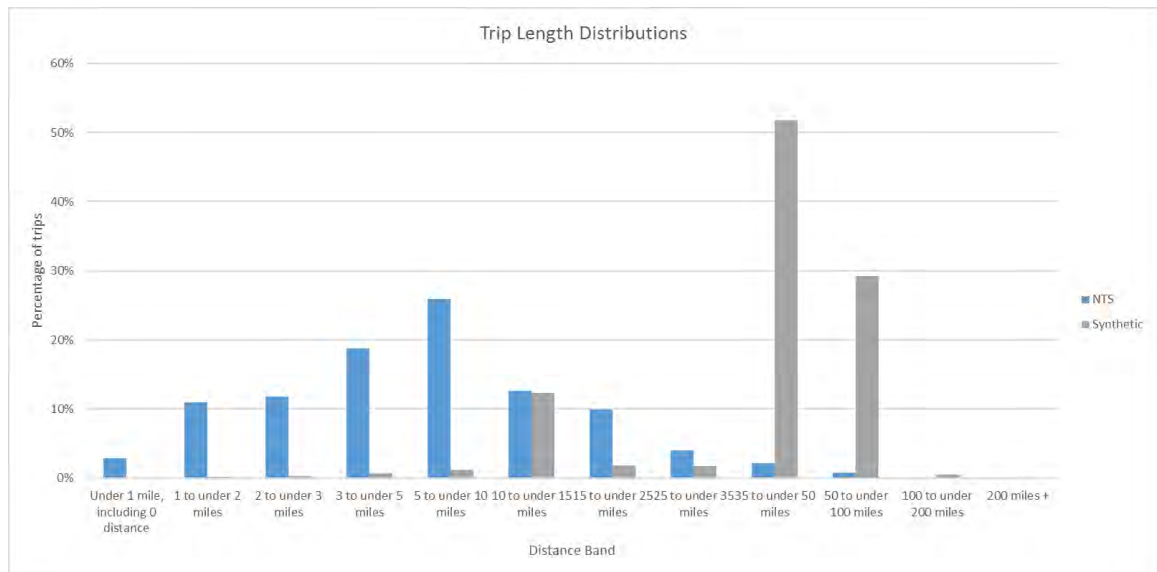
Non-Home Based Other – IP - I-I, I-E, E-I



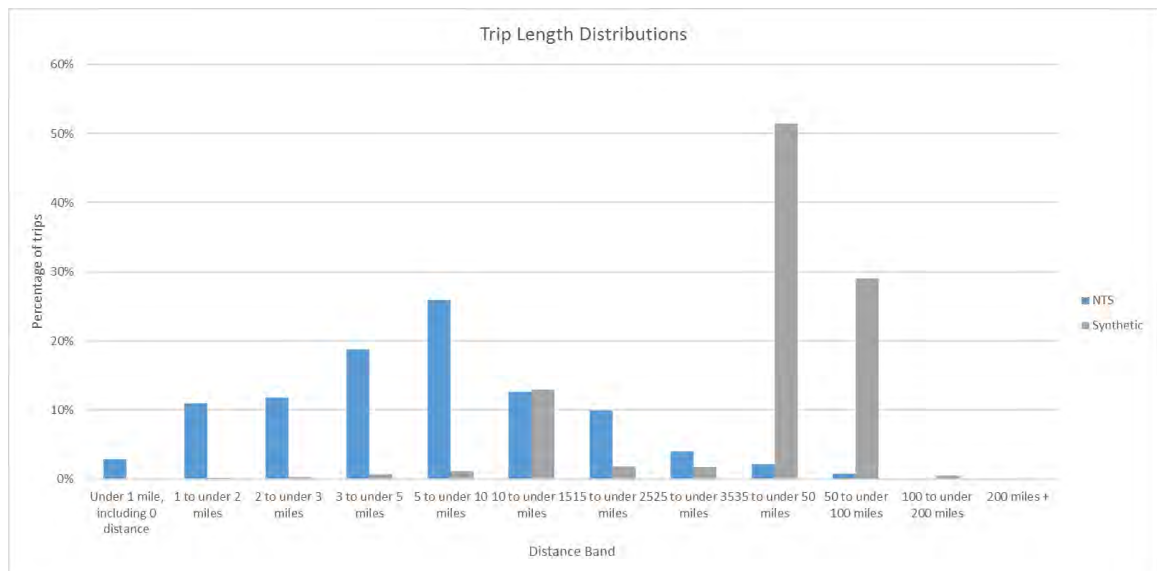
Non-Home Based Other – PM - I-I, I-E, E-I



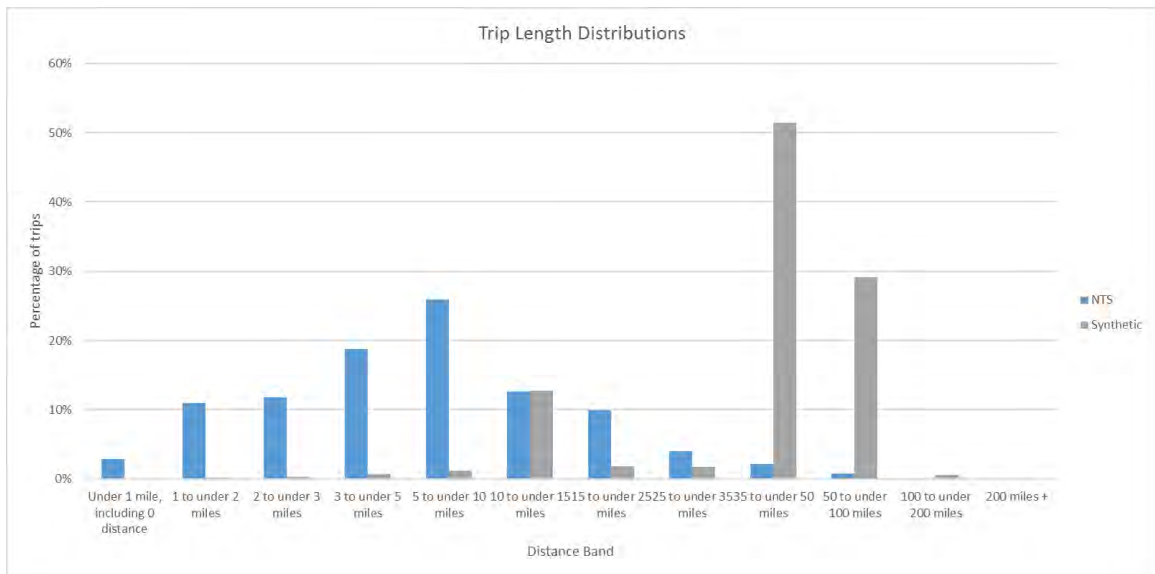
Home Based Work – AM – All Externals



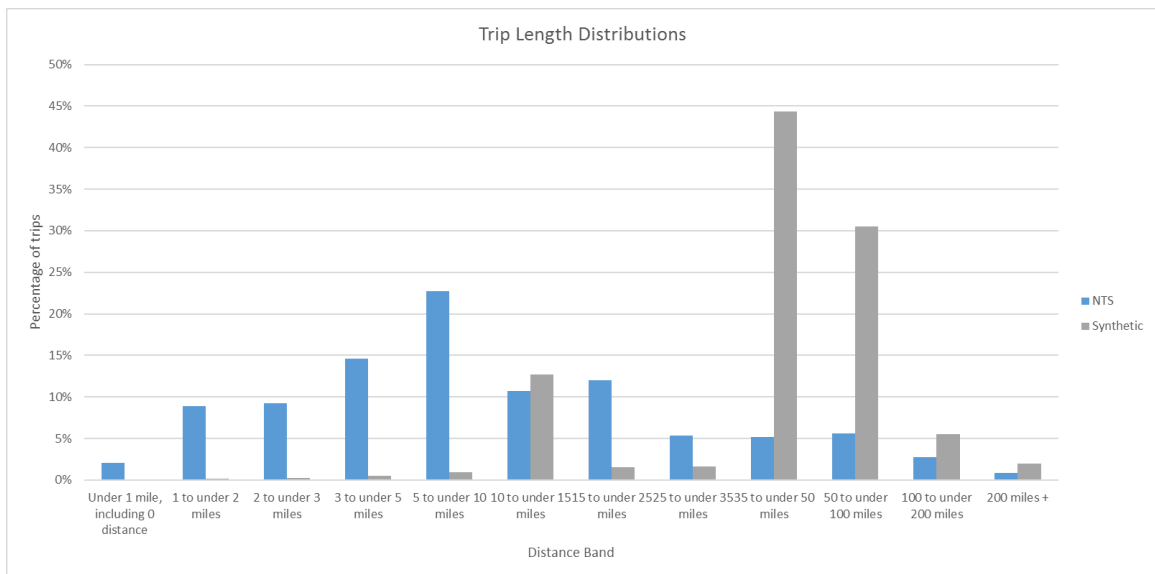
Home Based Work – IP – All Externals



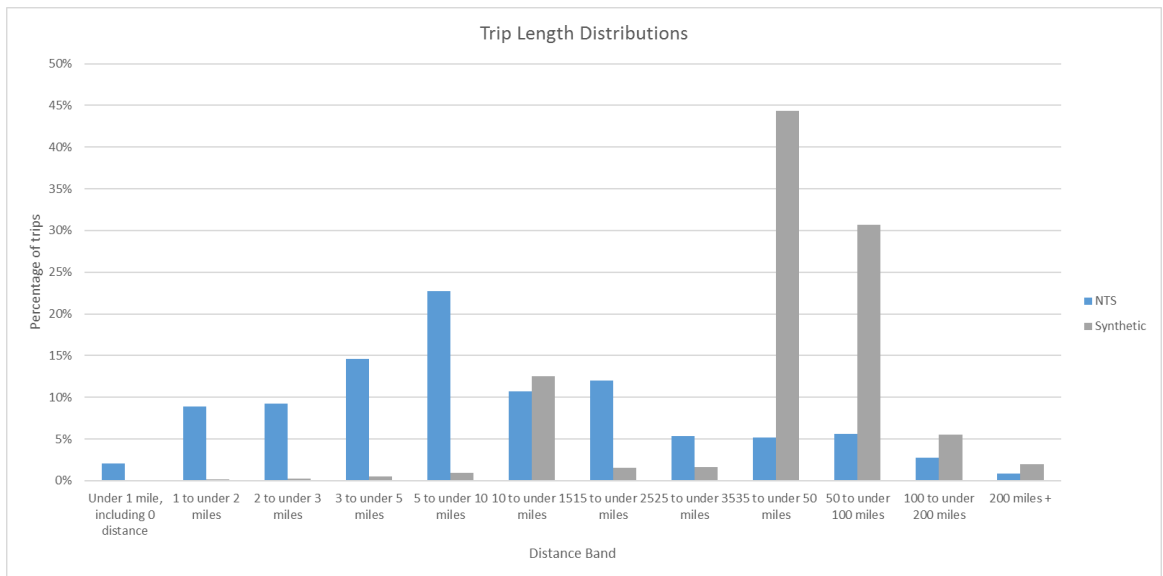
Home Based Work – PM – All Externals



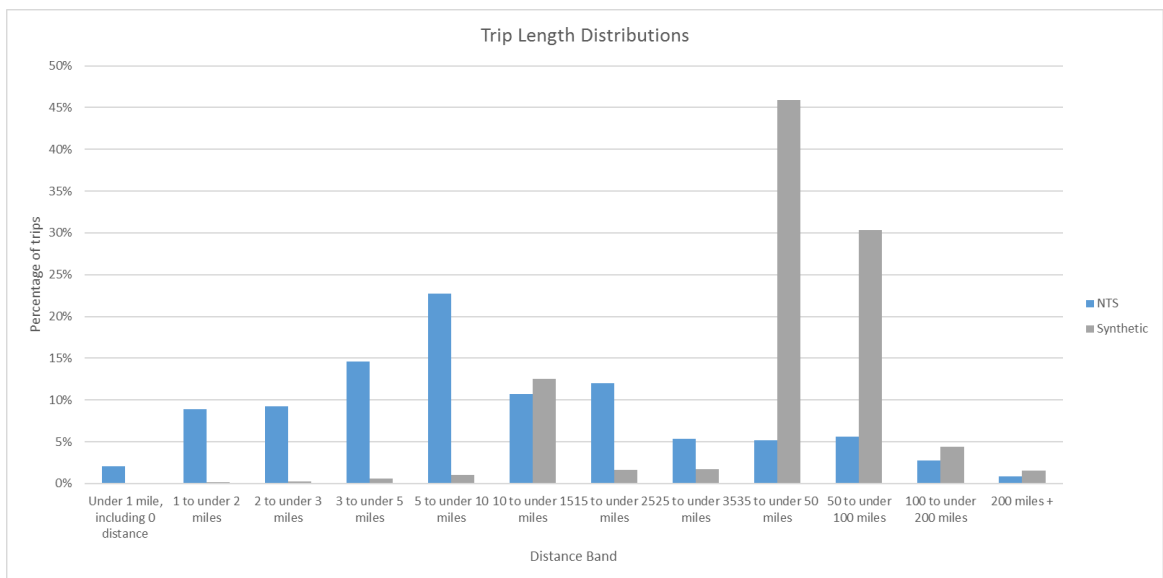
Home Based Employers Business – AM – All Externals



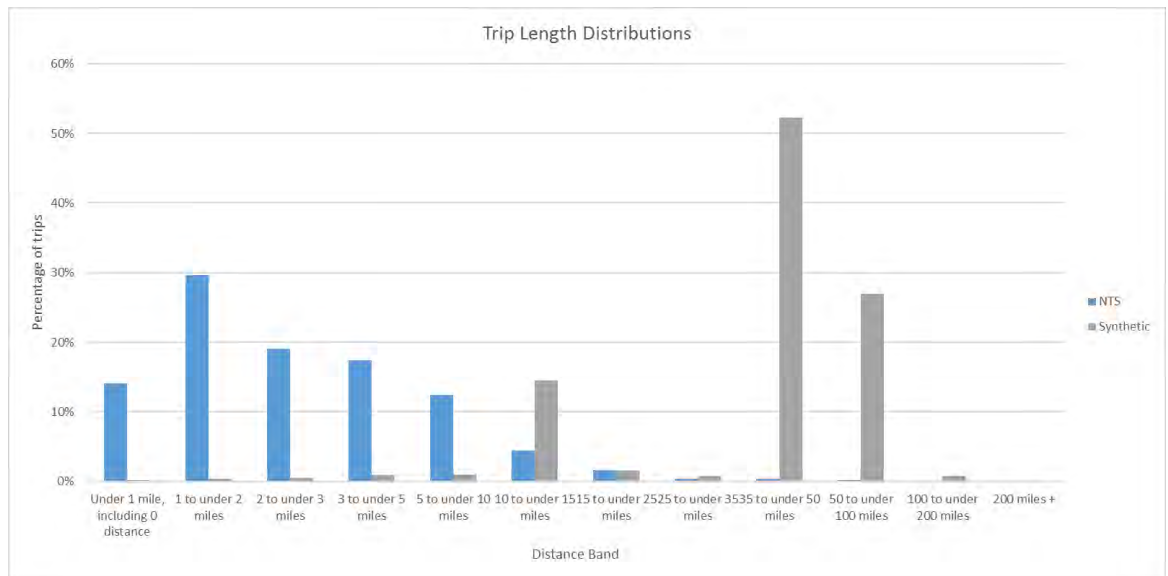
Home Based Employers Business – IP – All Externals



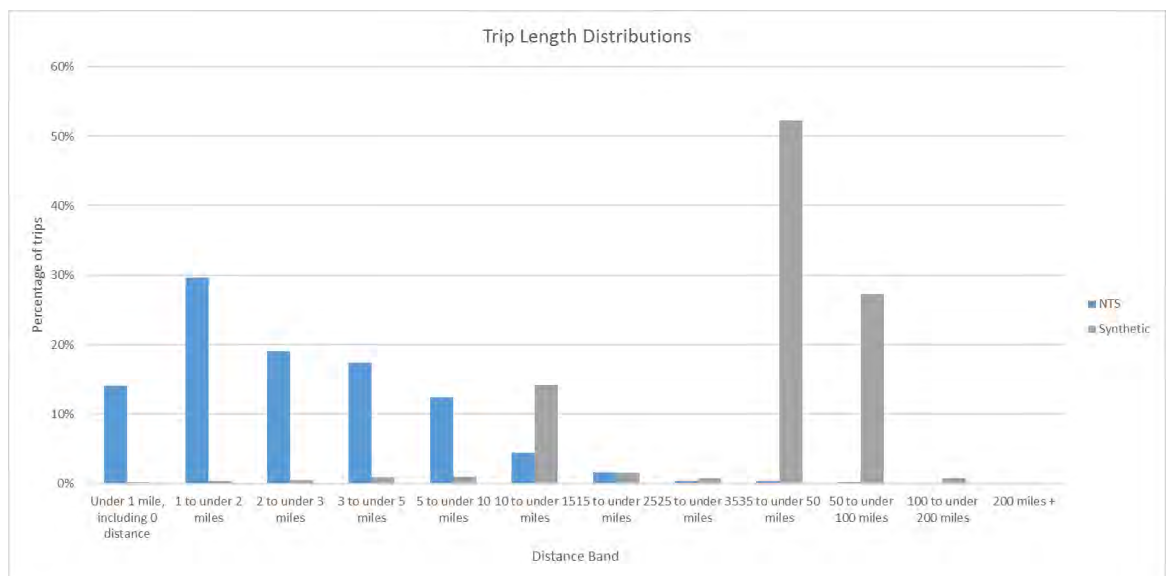
Home Based Employers Business – PM – All Externals



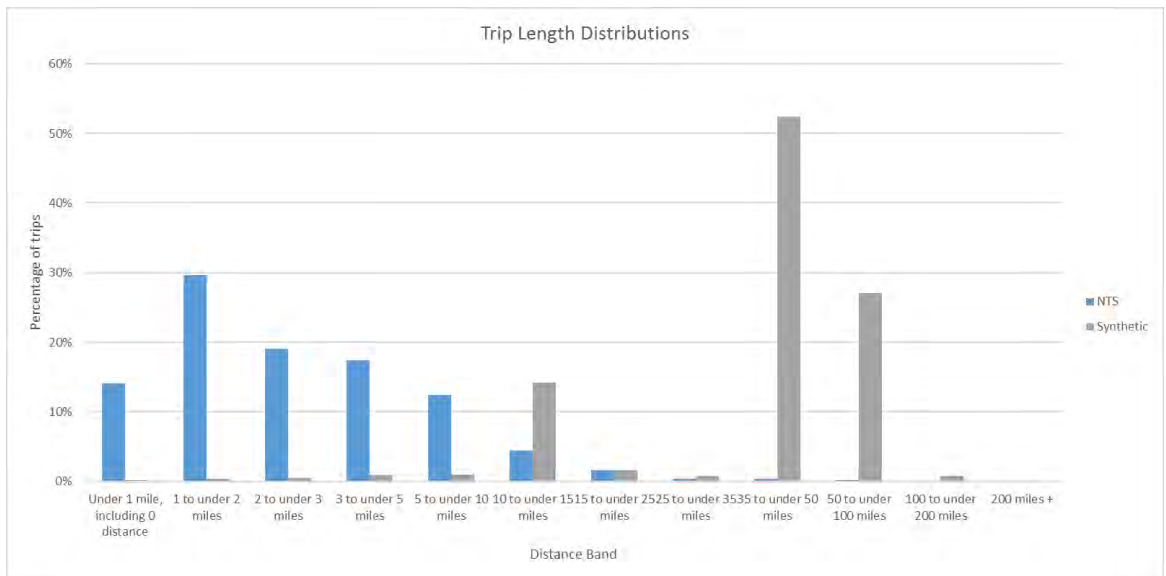
Home Based Education – AM – All External



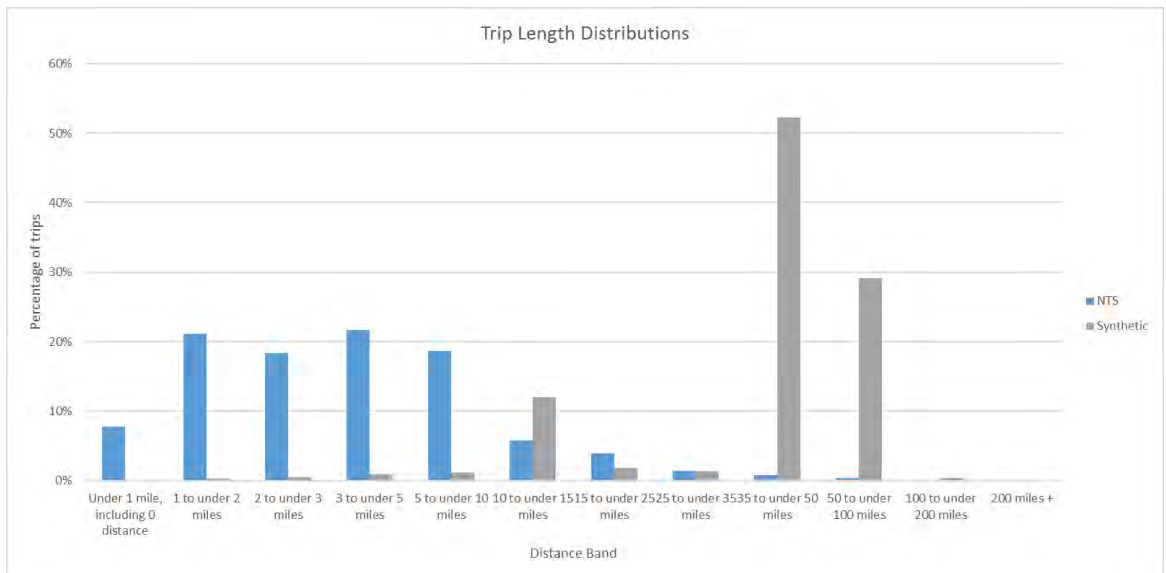
Home Based Education – IP – All External



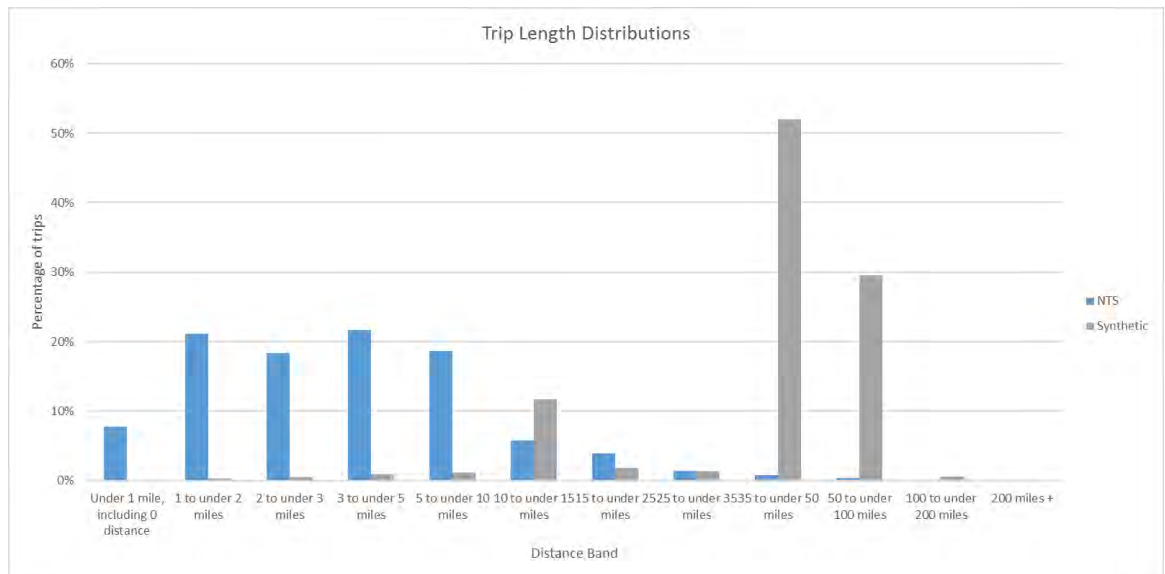
Home Based Education – PM – All External



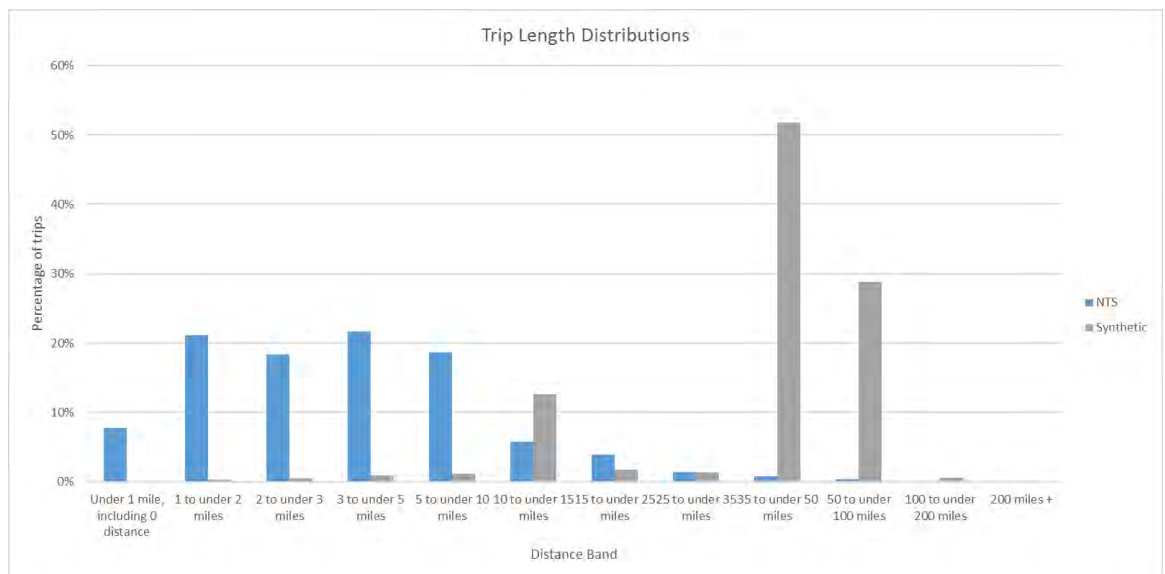
Home Based Shopping – AM – All External



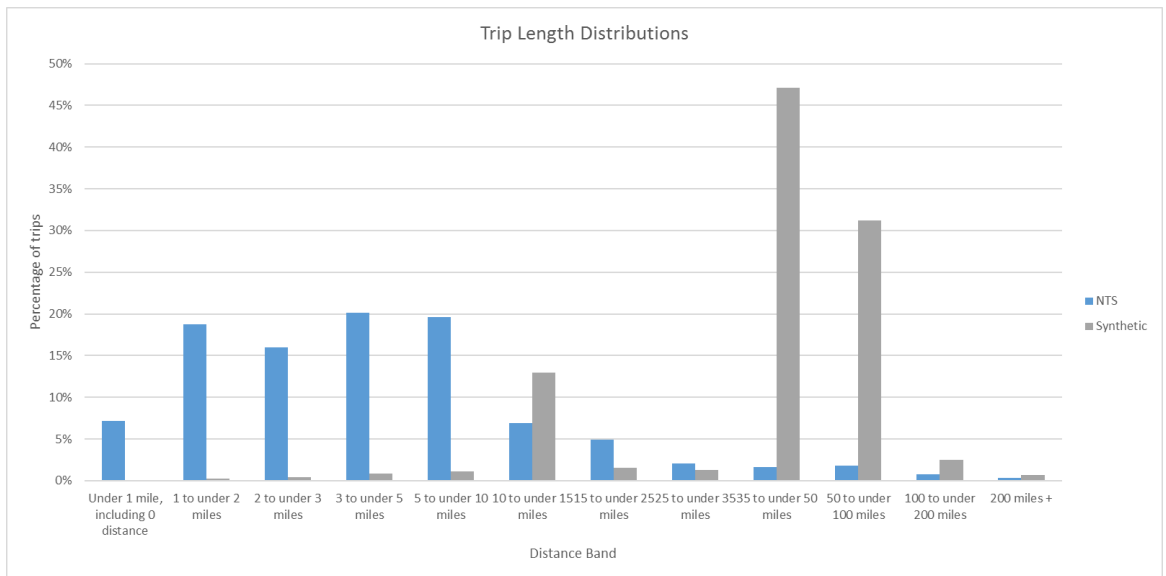
Home Based Shopping – IP – All External



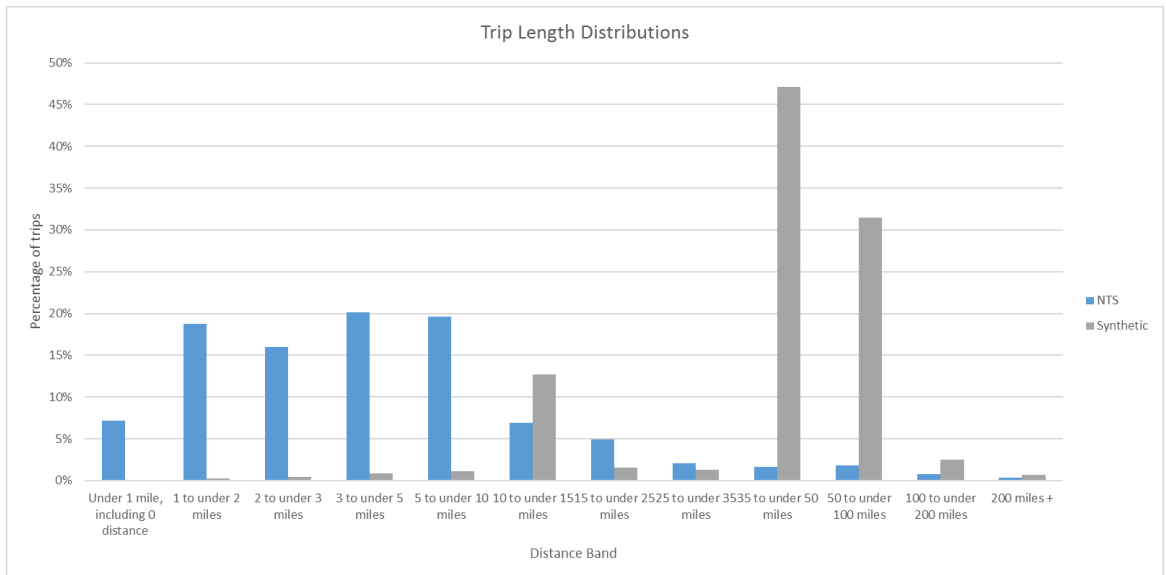
Home Based Shopping – PM – All External



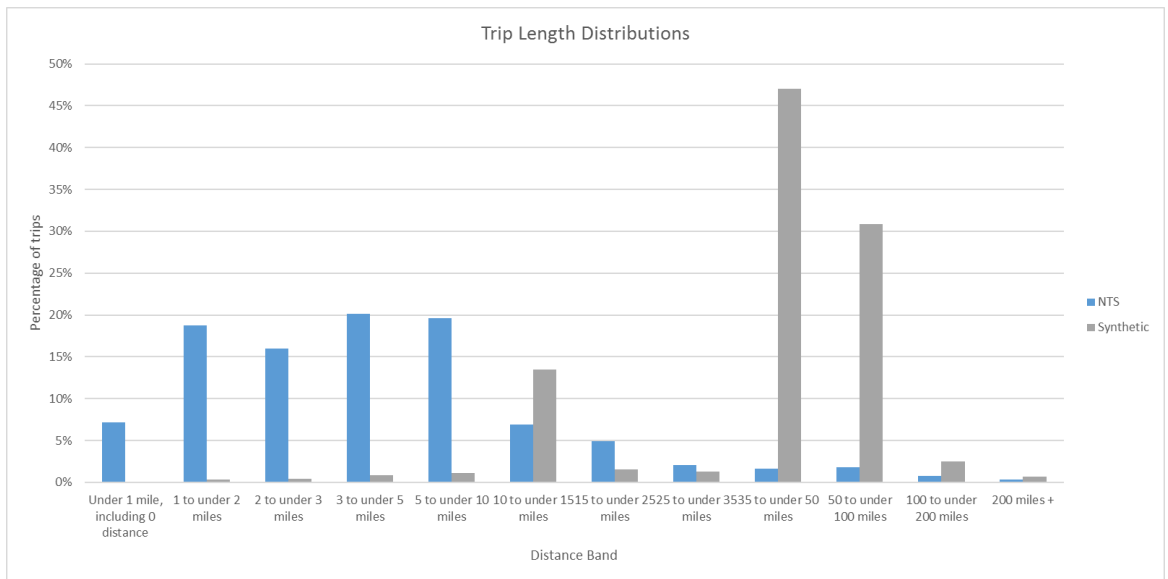
Home Based Other – AM – All External



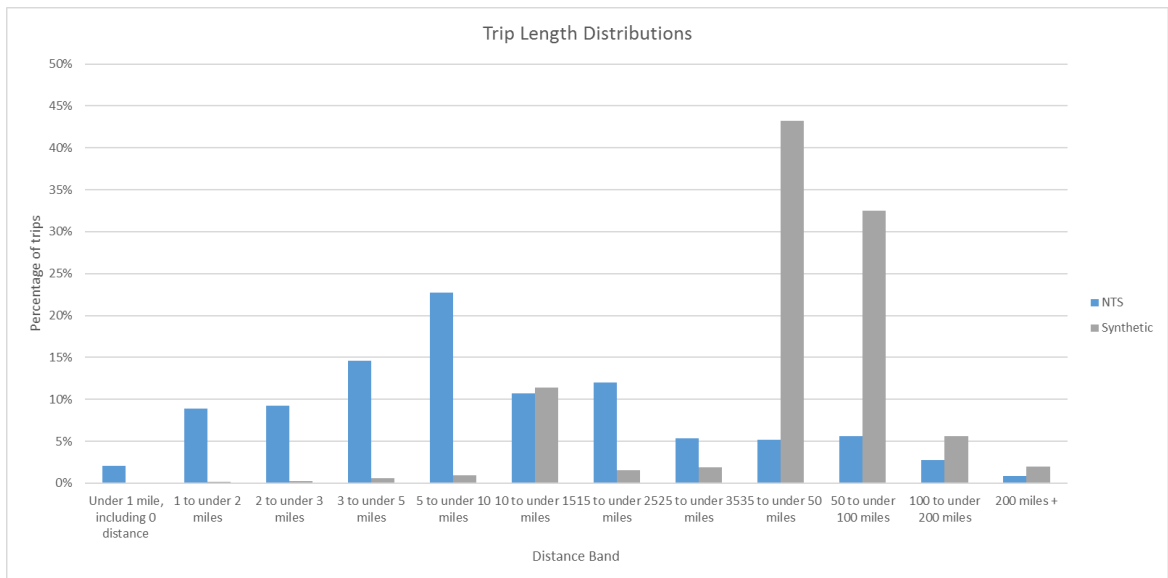
Home Based Other – IP – All External



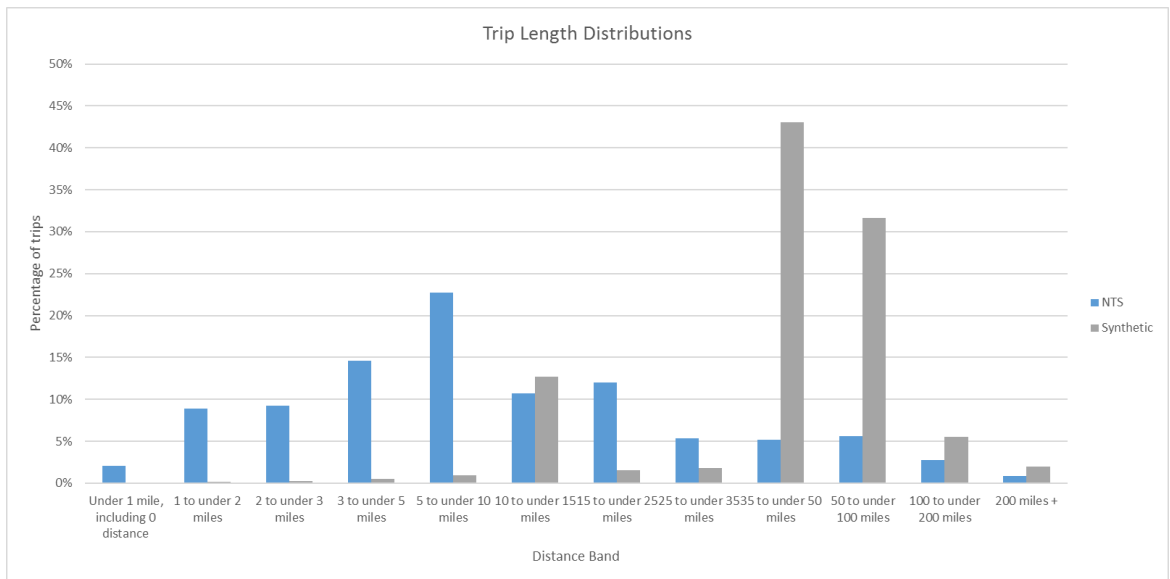
Home Based Other – PM – All External



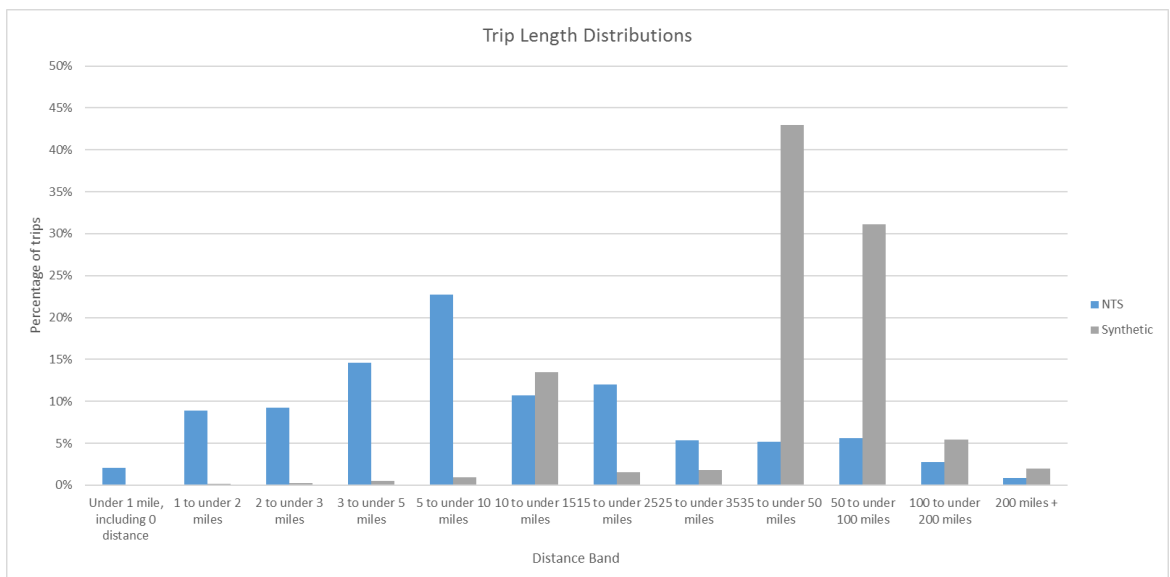
Non-Home Based Employers Business – AM – All External



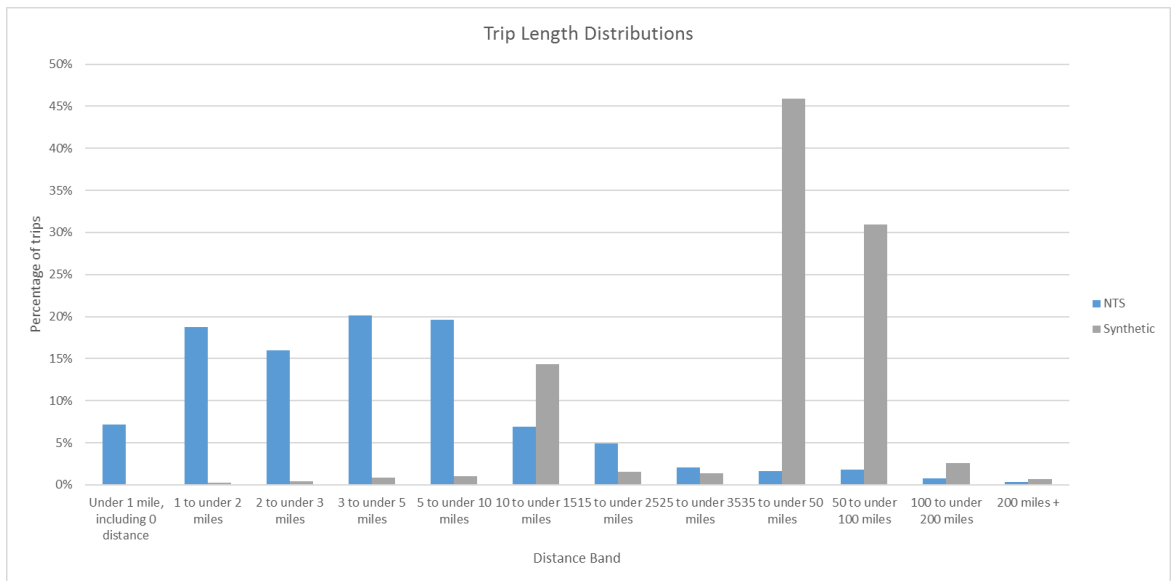
Non-Home Based Employers Business – IP – All External



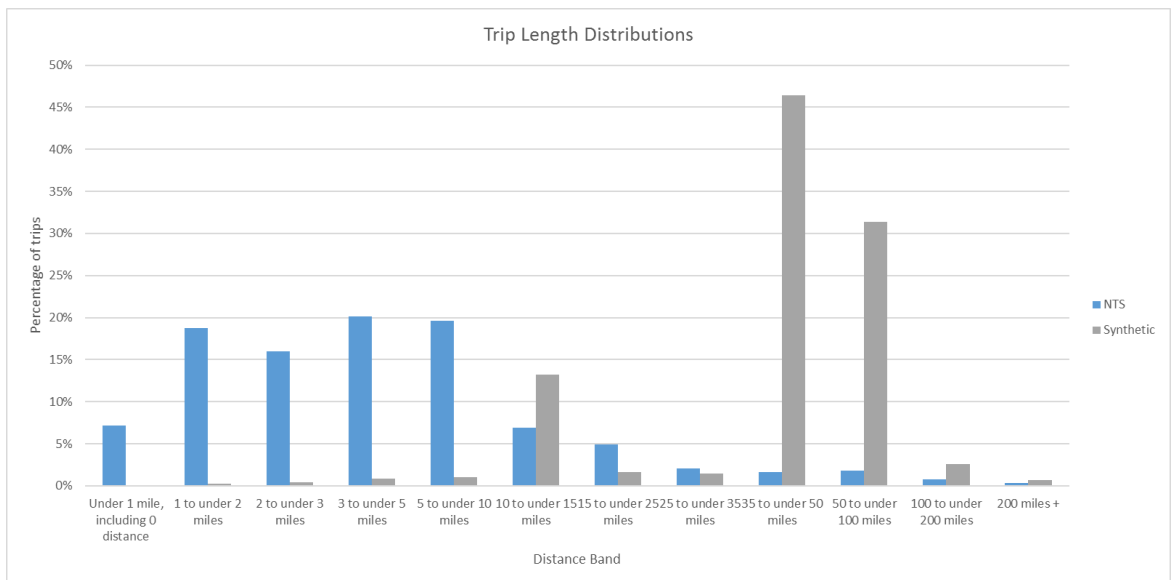
Non-Home Based Employers Business – PM – All External



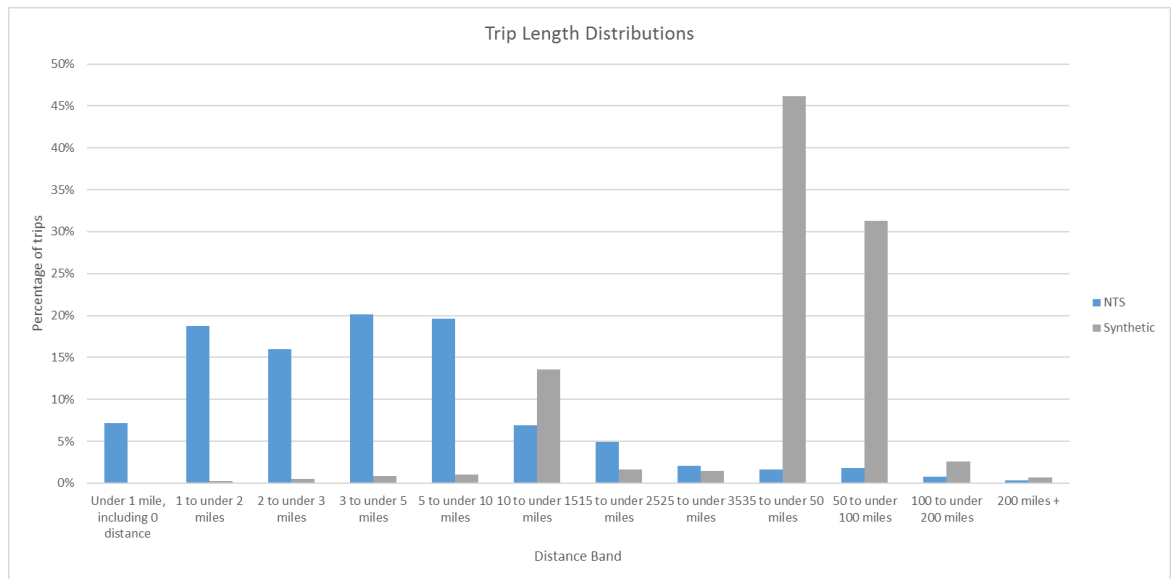
Non-Home Based Other – AM – All externals



Non-Home Based Other – IP – All externals



Non-Home Based Other – PM – All externals

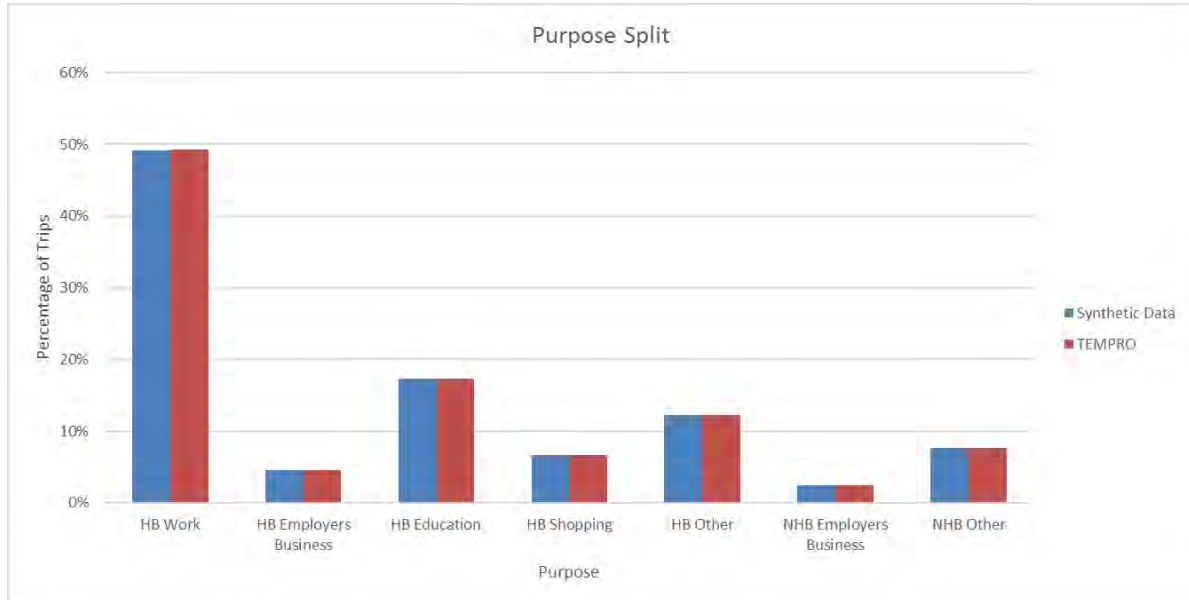


Summary of Coincidence Ratios

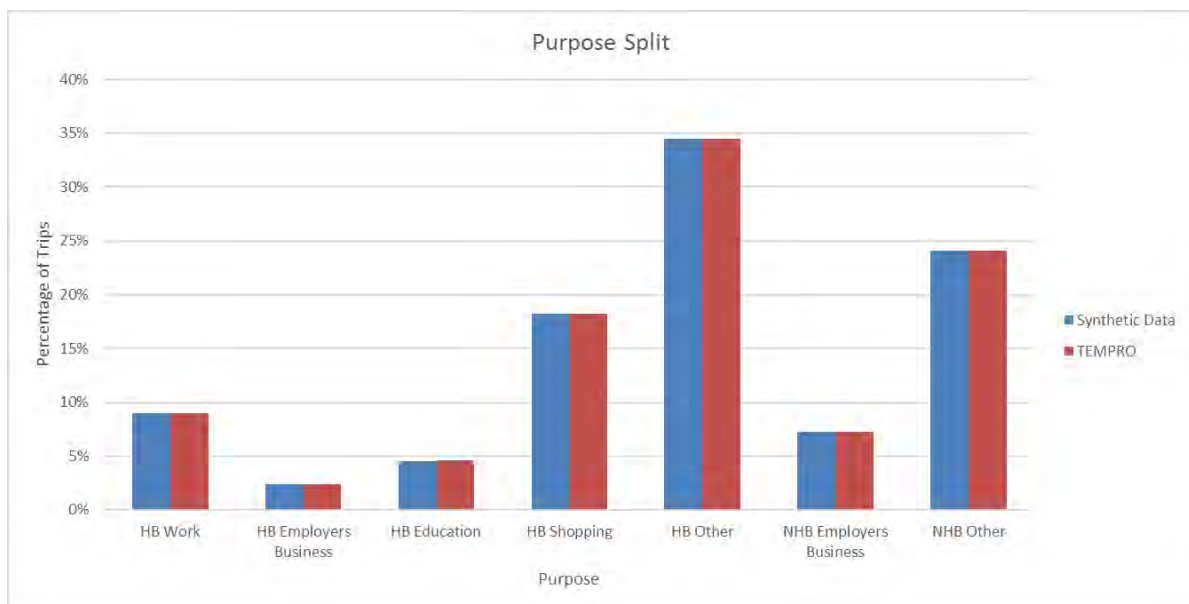
Purpose	Period	Include Externals	CR
HB Work	AM	I-I only	0.717
HB Work	IP	I-I only	0.717
HB Work	PM	I-I only	0.716
HB Employers Business	AM	I-I only	0.559
HB Employers Business	IP	I-I only	0.559
HB Employers Business	PM	I-I only	0.556
HB Education	AM	I-I only	0.847
HB Education	IP	I-I only	0.846
HB Education	PM	I-I only	0.852
HB Shopping	AM	I-I only	0.782
HB Shopping	IP	I-I only	0.79
HB Shopping	PM	I-I only	0.801
HB Other	AM	I-I only	0.699
HB Other	IP	I-I only	0.698
HB Other	PM	I-I only	0.698
NHB Employers Business	AM	I-I only	0.556
NHB Employers Business	IP	I-I only	0.556
NHB Employers Business	PM	I-I only	0.556
NHB Others	AM	I-I only	0.712
NHB Others	IP	I-I only	0.712
NHB Others	PM	I-I only	0.713
HB Work	AM	I-I, I-E, E-I	0.821
HB Work	IP	I-I, I-E, E-I	0.821
HB Work	PM	I-I, I-E, E-I	0.821
HB Employers Business	AM	I-I, I-E, E-I	0.793
HB Employers Business	IP	I-I, I-E, E-I	0.792
HB Employers Business	PM	I-I, I-E, E-I	0.841
HB Education	AM	I-I, I-E, E-I	0.878
HB Education	IP	I-I, I-E, E-I	0.878
HB Education	PM	I-I, I-E, E-I	0.873
HB Shopping	AM	I-I, I-E, E-I	0.843
HB Shopping	IP	I-I, I-E, E-I	0.826
HB Shopping	PM	I-I, I-E, E-I	0.812
HB Other	AM	I-I, I-E, E-I	0.871
HB Other	IP	I-I, I-E, E-I	0.872
HB Other	PM	I-I, I-E, E-I	0.874
NHB Employers Business	AM	I-I, I-E, E-I	0.811
NHB Employers Business	IP	I-I, I-E, E-I	0.812
NHB Employers Business	PM	I-I, I-E, E-I	0.813
NHB Others	AM	I-I, I-E, E-I	0.866
NHB Others	IP	I-I, I-E, E-I	0.865
NHB Others	PM	I-I, I-E, E-I	0.859
HB Work	AM	All externals	0.12
HB Work	IP	All externals	0.121
HB Work	PM	All externals	0.121
HB Employers Business	AM	All externals	0.178
HB Employers Business	IP	All externals	0.178
HB Employers Business	PM	All externals	0.179
HB Education	AM	All externals	0.054
HB Education	IP	All externals	0.054
HB Education	PM	All externals	0.054
HB Shopping	AM	All externals	0.071
HB Shopping	IP	All externals	0.071
HB Shopping	PM	All externals	0.071
HB Other	AM	All externals	0.093
HB Other	IP	All externals	0.093
HB Other	PM	All externals	0.093
NHB Employers Business	AM	All externals	0.18
NHB Employers Business	IP	All externals	0.179
NHB Employers Business	PM	All externals	0.178
NHB Others	AM	All externals	0.093
NHB Others	IP	All externals	0.094
NHB Others	PM	All externals	0.094

Appendix D Synthetic Purpose Split

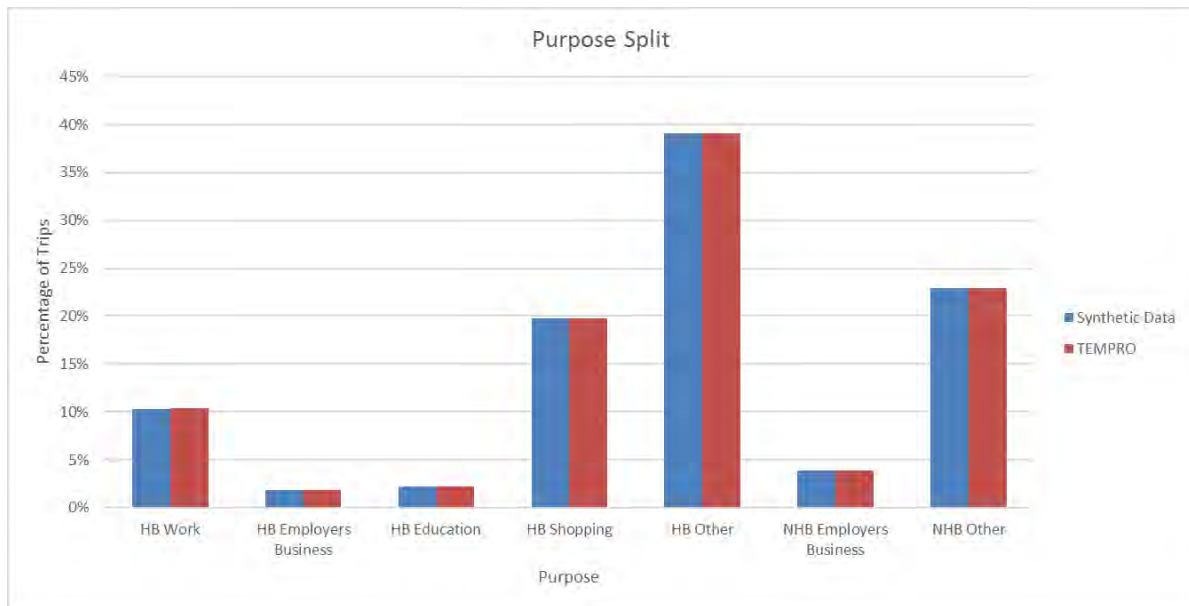
Great Britain - AM



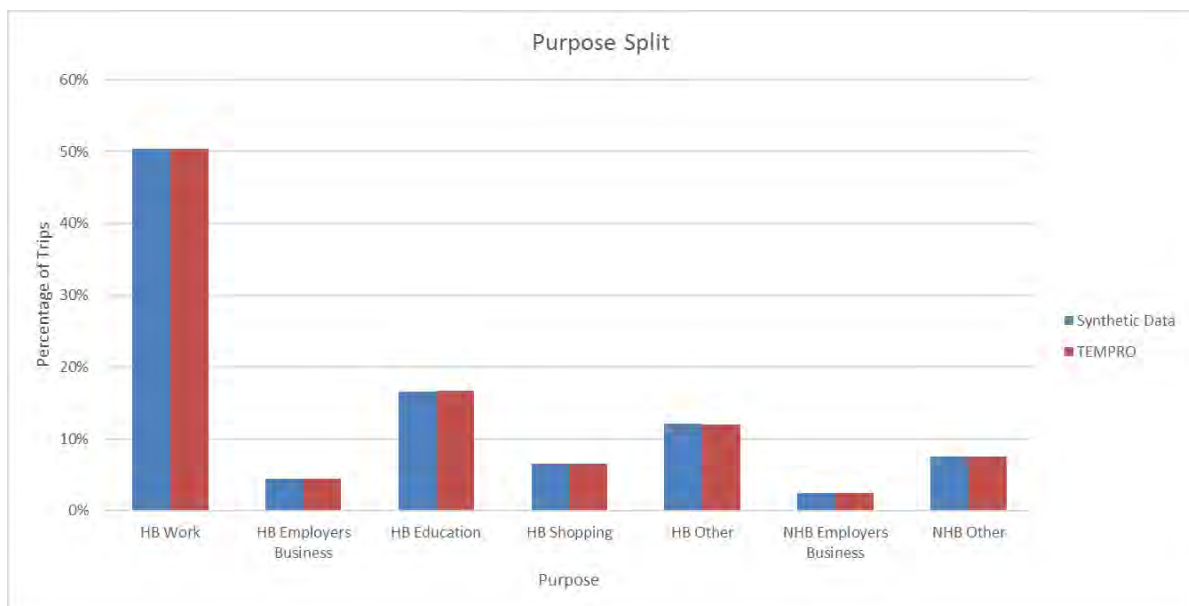
Great Britain - IP



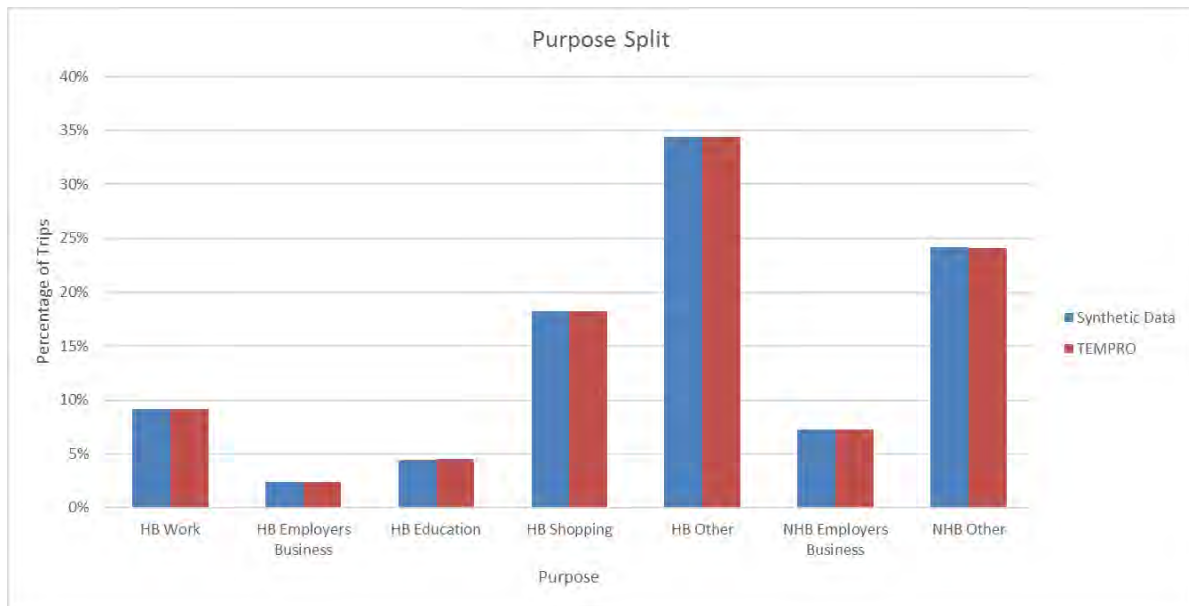
Great Britain - PM



North West - AM



North West - IP



North West - PM

